International Conference

On

FUTURISTIC TECHNOLOGIES

ICFT-2019
(April 19th-20th, 2019)

Editors
Dr. Amit Gupta
Er. Gyanender Kumar

Organized by:

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Er. Ankit Bahl  Assistant Professor, CSE  Coordinator
MESSAGE

I congratulate all the members of Geeta Engineering College for organizing “International Conference on Futuristic Technologies” during April 19-20, 2019. Such activities provide a platform both for the faculty and the student to exhibit their talent. The education system is fast changing and new technologies emerging in different disciplines are needed to be adopted by the students and the staff to maintain pace with the global technological innovations. I hope that the participating delegates of this conference will discuss those emerging trends successfully and share the same with the students of our institute who are fostering the dreams.

I extend my best wishes for the success of the conference.

S. P. BANSAL
MESSAGE

I am pleased to know that the Geeta Engineering College is organizing “International Conference on Futuristic Technologies” during April 19-20, 2019. This conference will provide a platform to the staff and the students to showcase their talent beyond the confines of their curriculum activities. In the current scenario of globalization it is expected that the product of our educational institutes should have an attitude not only to look after their field specialization but also to develop as an individual. I am sure that the conference will bring the best out of the staff and the students, as well as provide a sea of intellectual excellence and imaginative innovation to navigate and conquer.

I wish the conference a success and hope it will receive an enthusiastic response from the targeted audience.

NISHANT BANSAL
MESSAGE

To achieve the best and continuous improvement in all spheres of academics—especially to produce the engineering graduates equipped with the best quality education and training, the task before us is quite challenging. It all depends on the continuous improvement in the quality of faculty competence and knowledge base, which can be enhanced and improved through the medium of such conferences. International Conferences of this sort help us to implement our vision in missionary manner for delivering high quality lifelong learning opportunities, resulting in personal and economic success.

I congratulate the organizing committee for their genuine efforts and consistent hard work and hope that they keep the flame of knowledge burning. I wish everyone, endeavoring to do so, a grand success.

ANKUSH BANSAL
Dr. Sorabh Gupta  
Director  
Geeta Engineering College, Panipat

MESSAGE

Learning is a continuous and unending process and such conferences unveil the treasures of knowledge. In a similar way it serves as a medium to blossom the talents, creativeness and professional skills of an individual.

I believe that the conference will serve its objectives and will provide the necessary impetus in setting forth a dynamic process of continuous interaction amongst professionals of the country. The deliberations of the conference should help setting up the agenda for improvements in our teaching curriculum so that students can successfully match the market requirements in the global scenario.

I convey my greetings and wish a grand success for the event.

DR. SORABH GUPTA
Dr. Amit Gupta  
Dean (R&D) & Chief Convener ICFT, 2019  
Geeta Engineering College, Panipat

MESSAGE

It’s a great honor and privilege for me to be the convener of International Conference on Futuristic Technologies” which is being organized by Geeta Engineering College during April 19-20, 2019.

The Conference aims at bringing together technologist, scientists, academicians, service providers and many others to interact and exchange their experiences, which in turn, would help the students and the faculty to gain immensely at the professional front. I am very confident that the deliberations during the conference will enrich all the participants in particular and the Institute in general. I hope that the sincere efforts of the members of Geeta Engineering College would be prolific enough in making this event a grand accomplishment.

DR. AMIT GUPTA
FOREWORD

This conference proceeding of International Conference on Futuristic Technologies is based on the recent progress in the various fields of science, engineering, technology and management. Futuristic technologies are the technical innovations which characterize the progressive developments. Converging technologies represent previously distinct fields which have common goals and strongly inter-connected. However, the opinion on the degree of impact, status and economic viability of several emerging, converging and futuristic technologies vary.

The contributions in the proceeding are by experts from different countries on the various topics: Data Mining, Cloud Computing, Wireless Sensor Network, OFDM, Antenna Design, Irrigation System, Soil, Structure, Reliability, Maintenance Engineering and management. The subject of Futuristic Technologies is of great importance to the researchers, scientists and personnel from research and development institutes, academia and industry. In recent years, multi disciplinary area spans over each dimension of society.

This proceeding presents a source of knowledge to the engineers, researchers and scientists. The high quality of the proceeding ensures global benefits. It is matter of great pleasure for me to write the forward for the proceeding.

DR. SORABH GUPTA
Director,
Geeta Engineering College
PREFACE

This conference proceeding of International Conference on Futuristic Technologies presents the current scenario in the field of various engineering disciplines and management. The papers comprise both fundamental research and the applications. The contributions in the proceeding have been received from different countries from eminent professionals.

The proceeding covers a large span of topic in the field of futuristic technologies such as: Data Mining, Cloud Computing, Wireless Sensor Network, OFDM, Antenna Design, Irrigation System, Soil, Structure, Reliability, Maintenance Engineering and management. The subject of Futuristic Technologies is of great importance to the researchers, scientists and personnel from research and development institutes, academia and industry. In recent years, multi-disciplinary area spans over each dimension of society.

ICFT 2019 was attended by about 100 people, who presented 60 oral presentations. These consisted of both full papers and abstracts. Both abstracts and papers appeared in the conference proceedings. The authors were invited to submit revised versions of their papers to a special issue of the Journal of Scheduling. The 19 accepted papers are those that received supportive reviews after undergoing a review process in keeping with the expectations of an internationally recognised journal.

The editors acknowledge the valuable contributors of all the authors. We are thankful to the esteemed members of advisory board to review the papers. The wide range of expertise of authors and topics make the proceeding a valuable source of knowledge. This proceeding addresses the interest of researchers, scientists and personnel from Research and Development Institutes, Academia and industry.

Dr. Amit Gupta
Er. Gyanender Kumar
## TECHNICAL SESSION - I

**Date:** April 19, 2019  
**Time:** 11.30 AM to 01.30 PM  
**Venue:** Seminar Hall, Block D  
**Session Chair:** Prof. (Dr.) Jitender Kumar Chhabara,  
Professor, Computer Science Engineering Department,  
NIT Kurukshetra

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Date: April 19, 2019
Time: 11.30 AM to 01.30 PM
Venue: Seminar Hall, Block C
Session Chair: Er. Neeraj Sharma
Executive Engineer,
Command Area Development Division, Kurukshetra

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Date: April 19, 2019
Time: 02.30 PM to 04.30 PM
Venue: Seminar Hall, Block D
Session Chair: Mr. George R. Kruk,
Managing Director,
George Kruk & Associates (P) Ltd., Australia

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## TECHNICAL SESSION - IV

**Date:** April 19, 2019  
**Time:** 02.30 PM to 04.30 PM  
**Venue:** Seminar Hall, Block C  
**Session Chair:** Mr. Argha Chatterjee, Placement Officer, IIM, Rohtak

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**Date:** April 20, 2019  
**Time:** 09.30 AM to 11.30 AM  
**Venue:** Seminar Hall, Block E  
**Session Chair:** Dr. Prerna Dawar,  
Dean (Academics), Geeta Engineering College, Panipat

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**Date:** April 20, 2019  
**Time:** 09.30 AM to 11.30 AM  
**Venue:** Seminar Hall, Block D  
**Session Chair:** Dr. P. C. Tewari, Professor, Mechanical Engineering Department, NIT, Kurukshetra

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**TECHNICAL SESSION - VII**

**Date:** April 20, 2019  
**Time:** 11.30 AM to 1.30 PM  
**Venue:** Seminar Hall, Block D  
**Session Chair:** Dr. P. C. Tewari,  
Professor, Mechanical Engineering Department,  
NIT, Kurukshetra

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Abstract—In Recent times, Machine learning is a powerful technique for the data analysis and for making a future prediction. There are many existing forecasting models which are useful for the prediction in different areas. Acute conjunctivitis, commonly known as “pink eye”, is one of the most common eye infections, particularly among schoolchildren. Because of its highly contagious nature everyone is susceptible especially those in crowded places such as kindergartens, indoor amusement parks and swimming pools. Hence as a precautionary measure, there is an imperative need to predict the future possibilities of Conjunctivitis cases. Therefore, in this manuscript, machine learning based forecasting models are used for prediction of conjunctivitis cases in Hong Kong. Analysis is conducted on the data of past years conjunctivitis cases in Hong Kong, Mean Forecast, Seasonal Naive, Auto ARIMA, Neural Network techniques are used for analysis and forecasting. The surpassing model is adopted based on the accuracy factor. Accuracy of the models are compared with respect to Root Mean Square Error and Auto Correlation Function. Result analysis reveal that the neural network model produces least error and hence is the best prediction model for our dataset in terms of accuracy.

Keywords—conjunctivitis, time series, forecasting, seasonal naïve, neural networks, mean forecast.

I. INTRODUCTION
In today life machine learning model are used too much for prediction and decision making in different areas such as: Stock Market, Medical field, Banking, Sales forecasting etc. With this there are many diseases which are the reason of concern for human’s health like- Heart disease, Alzheimer, Tuberculosis, Conjunctivitis, Dengue and many more. In Hong Kong each week many cases of conjunctivitis are occurring. Health organization is taking many initiatives to put a stop on occurrence of the different diseases. But we can’t do anything until we have pre-information about the disease occurrence and the number of cases of particular disease. Therefore, there is a need to predict the future occurrences so that the total number of cases that might occur in near future can be predicted in advance and further necessary action can be taken to curb that.

Conjunctivitis is an inflammation of the conjunctiva, the protective membrane that lines the inner eyelids and covers the outer surface of the eyeballs. Conjunctivitis takes various forms, e.g. infectious and allergic. The most common form is acute infectious Conjunctivitis (red-eye syndrome) which is mostly caused by bacteria and viruses. Bacterial Conjunctivitis can be caused by a variety of bacteria, with hemophilic influenza and Streptococcus pneumonia being the commonest [1]. Chlamydia trachomatis may also be a cause for bacterial Conjunctivitis in both neonates and adults. Viral conjunctivitis is often associated with an upper respiratory tract infection, and is often caused by adenoviruses and enter viruses. Both eyes are often affected though the symptoms usually start in one eye first. The discharge is thick, whitish or yellowish in bacterial conjunctivitis, and watery in viral conjunctivitis. Other symptoms include tearing, foreign body sensation, itchiness, pain, swelling and redness of the eyes, matted eyelids after sleep, and sensitivity to light [2]. Vision is not affected unless scarring of the cornea occurs after the infection. Government is taking several actions to prevent the occurrence of this disease. Therefore, by prediction of number of cases of Conjunctivitis can help the health organization and government to take required action against the disease.

Time Series Forecasting techniques can be used effectively for prediction of statistical data. Time series is a series of measurements for particular time period. This time period may be daily, weekly, monthly or yearly. Time series forecasting have many applications such as sales forecasting, disease prediction, stock market prediction, economic forecasting, process and quality control, inventory analysis [3]. Therefore, time series forecasting models can be applied and used for predicting future cases of Conjunctivitis. In this research work, data set of previous year Conjunctivitis cases are taken for time series
forecast. For forecasting, different model of forecasting are applied on the dataset and every forecasting model provides different accuracy according to data.

Further, the accuracy of the forecasting model is measured with the help of different error metrics. The error metrics that are considered here are the following: ME(Mean Error), RSME(Root Mean Squared Error), MAE(Mean Absolute Error), MPE(Mean Percentage Error), the detailed description of all is given in section IV.

Rest of the manuscript is organized as follows: Section II contains time series components, methodologies, ensemble detail information and metrics. Section III contains data collection, errors and Section IV and V contains conclusion and future work respectively.

II. METHODOLOGY

![Time Series Forecasting Methodology Diagram]

Fig. 1. Time Series Forecasting Methodology

Fig. 1 represents the summarized picture of Time Series Forecasting process followed. First step is Data Collection, which involves collecting the Weekly consultation rates of acute Conjunctivitis Data of Hong Kong from www.chp.gov.hk website for the time period January 2010 to January 2019. Here in our data we will consider number of Conjunctivitis cases as a single parameter. Second step is Cleaning the Data[4], which involve removing unavailable and invalid data points by replacing them with zero or not available. Third step is to create the time series, which involves converting the data in the time series format. Time series data have some essential component as following [5]-

a) Trend: Trend is long-term increase or decrease of data. If the data contains non-stationarity, it should be removed.

b) Heteroskedasticity: It shows that variability of data is unequal.

c) Seasonality: It means for known and fixed period of time data repeats.

d) Stationarity: It refers that the mean and variance of data is constant.

Fourth step is stationary testing, here we test that our time series data is stationary or non-stationary this done by following tests-

a) ADF (Augmented Dickey-Fuller) Test: ADF test the unit root in the time series sample. It returns value which decide that time series data is stationary or not [6].

b) Lung-Box Test: It is a diagnostic tool to test stationarity. Here also see the p value [7].

Small values of p means times series as Stationary. Next step is to build model, here we apply various time series forecasting model on the statistical time series data which are following-

a) Mean Forecast: This model based on the mean of the time series data. It is widely applicable for Statistical data forecasting.

b) Neural Network: Artificial neural networks forecasting models mathematical models of brain. It uses complex nonlinear relationships between the response variable and its predictors [8]. It is best suited for our data.

c) Seasonal Naive Forecast: It is similar to Naive Forecasting and it is best suited for seasonal data [9].

d) ARIMA (Autoregressive Integrated Moving Average): Combination of AR model that does prediction on past values and MA model that does prediction on random error terms and I stands of integration that is done to make it stationary. It can written as: ARIMA (p, d, q) where, p = non-seasonal AR order, d = non-seasonal differencing, q = non-seasonal MA order.

On applying above forecasting models on our time series data different result for various forecasting model are obtained and the best model is selected with the help of error comparison, and the least error model get selected which shows maximum accuracy of forecasting result. The mostly use error are given below and the parameters used in formulas described in Table1:

<table>
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<th>Parameter</th>
<th>Description</th>
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<tr>
<td>$x_i$</td>
<td>Forecasted Value</td>
</tr>
<tr>
<td>$x$</td>
<td>Actual Value</td>
</tr>
<tr>
<td>$n$</td>
<td>Total number of observations</td>
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</table>
a) Mean Error (ME): It is the average of errors in observation calculated by considering the positive and negative errors without sign [10].

\[ ME = \frac{1}{n} \sum_{i=1}^{n} x_i - x \] (1)

b) Mean Absolute Error (MAE): MAE is average of absolute error values of forecasting result without direction [11]. It is absolute difference between observed and predicted values.

\[ MAE = \frac{1}{n} \sum_{i=1}^{n} | x_i - x | \] (2)

c) Mean Squared Error (RMSE): RMSE estimate the root of the average of squared error. This error is difference between predicted and actual values [12].

\[ RMSE = \sqrt{\frac{\sum_{i=1}^{n} (x_i - x)^2}{n}} \] (3)

d) Mean Percentage Error: Mean percentage error is average of the percentage error. Error is variability between forecasted and actual data [13].

\[ MPE = \frac{1}{n} \sum_{i=1}^{n} \left( \frac{x_i - x}{x} \right)^2 \times 100 \] (4)

III. RESULTS AND DISCUSSIONS

Here for Conjunctivitis incidences forecasting we have used the Tool R. R is most powerful platform used for Statistical analysis in Machine Learning. In this use various Libraries according to required functions in forecasting analysis. Now we have collected weekly Conjunctivitis incidences data in Hong Kong from website https://www.chp.gov.hk. Data is the sum of GOPC and PMP per 10000. Where, GOPC and PMP are General Out-patient Clinics rate and Private Medical Practitioner Clinics rate respectively. Apply cleaning on that data. The GOPC and PMP are General Out-patient Clinics rate and Private Medical Practitioner Clinics rate respectively.

Time series diagram for the total cases of Conjunctivitis named as the object trains is plotted as Fig. 2.

To check the trend and seasonality of the time series we decompose [14] the time series whose outputs is shown in fig. 6.

From the fig. 3 we can conclude that our time series data contains trend and seasonality.

Now various forecasting model is applied on time series and resultant forecasting graph are shown in Fig 4, 5, 6 and 7.
Fig. 5. Seasonal Naïve Forecasting using without Difference Training Data

Fig. 5 shows output graph of seasonal naïve forecasting for prediction of years 2018-2019, the forecasted graph don’t have good trend.

Fig. 6. Auto ARIMA forecasting graph.

Fig. 6 shows output graph of auto arima forecasting for prediction of years 2018-2019 with order (2,1,3)(2,0,0), the forecasted graph is good in seen but error is too much.

Fig. 7. Neural Network forecasting graph

Neural network forecasted graph shown in Fig. 7, describe that for future prediction Conjunctivitis of years 2018-2019, the forecasted graph has some similar trend as actual test dataset trend and least error generated. Errors for the above forecasting model result are quoted in Table 2

<table>
<thead>
<tr>
<th>Model</th>
<th>Train data type</th>
<th>ME</th>
<th>RMSE</th>
<th>MAE</th>
<th>MPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Forecast</td>
<td>Without diff.</td>
<td>-4.351</td>
<td>11.311</td>
<td>9.197</td>
<td>-20.182</td>
</tr>
<tr>
<td>Seasonal Naive</td>
<td>Without diff.</td>
<td>1.648</td>
<td>11.370</td>
<td>9.870</td>
<td>-1.196</td>
</tr>
<tr>
<td>Auto ARIMA</td>
<td>(2,1,3) (2,0,0)</td>
<td>6.647</td>
<td>12.305</td>
<td>9.654</td>
<td>11.000</td>
</tr>
<tr>
<td>Neural Network</td>
<td>Without diff.</td>
<td>2.055</td>
<td>10.276</td>
<td>7.819</td>
<td>-1.259</td>
</tr>
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</table>

IV. CONCLUSION

For Conjunctivitis historical data from period 2010 to 2017, the Forecasting models results are compared with respect to the trend depicted and the error values. On comparison it can be safely concluded that the neural network forecasting model has least root mean square error as 10.276, therefore neural network is best fitted for
our data and other forecasting model have not shown promising results.

V. FUTURE WORK
In future we can enhance further work to improve the accuracy of the forecasting. Accuracy can be enhanced by combining various forecasting models, which is called ensemble technique and then apply to the dataset.

REFERENCES

Analysis and Evaluation of Unstructured Data: Text Mining versus Natural Language Processing

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Abstract—Nowadays, most of information saved in companies is as unstructured models. Retrieval and extraction of the information is essential works and importance in semantic web areas. Many of these requirements will depend on the storage efficiency and unstructured data analysis. Merrill Lynch recently estimated that more than 80% of all potentially useful business information is unstructured data. The large number and complexity of unstructured data opens up many new possibilities for the analyst. We analyze both structured and unstructured data individually and collectively. Text mining and natural language processing are two techniques with their methods for knowledge discovery form textual context in documents. In this study, text mining and natural language techniques will be illustrated. The aim of this work comparison and evaluation the similarities and differences between text mining and natural language processing for extraction useful information via suitable themselves methods.

Keywords—Unstructured, NLP, Mining, XML, HTML

I. INTRODUCTION

In recent years, as a result of the development of information systems and technology, and businesses and other organizations databases, depending on the organization's purpose and structure of various types of data are collected [4]. However, raw data is not processed as long as a meaningless pile of data stored in databases [1].

Development of appropriate software and the company has collected the available data conversion request to information collected by this data processing, data can be used within interesting relationship and patterns appears to be making was required. Today’s, many organization customer data and customers' purchasing patterns related to quality useful [4].

Useful information will be obtained with methods not begin processing. Raw data is rich, knowledge in the event of poor institutions that succeed in competitive markets and to continue their success even more difficult with passing day. Who understand the importance of data collection and query data with retroactive benefits from the highest of all institutions cannot begin to see the biggest help, is data mining. Meaningful information from raw data can be produced by data mining. Techniques used to extract relationships.

Data mining can analyze structured data, while the text and web mining unstructured data is used to analyze and transform data become structured [3, 5]. On the other hand, Natural Language Processing (NLP) applies unstructured data for finding and realizing natural language and textual information. In this study, we analyze both structured and unstructured data. Thus application of data, text, and web mining will be described. Then we explain and review of NLP and text mining usages in text processing. Finally, similarities and differences among of them have investigated.

II. DATA, TEXT AND WEB MINING

Data Mining is knowledge detection and resolution process of databases [3, 6]. It has obtained previously unknown, secret, meaningful and useful patterns being automatically established from large scaled databases [14, 15]. So, data mining knowledge discovery in databases is looking for patterns in data [10]. Likewise, text mining looking for patterns in text.

Text mining is the process of analyzing text to extract information that is useful for particular
purposes. Text is unstructured, amorphous, and complicated to deal with. Nevertheless, text is the most common vehicle for the formal exchange of information.

Data mining algorithms contain a combination of statistical algorithms, mathematical algorithms, and artificial intelligence algorithms (such as neural networks, decision trees, cohere networks, union rules, and etc) [10]. Generally, data mining can analyze structured data. Data mining tools and algorithms in text or web to be finding patterns in data or model before creating the text or web of data must be structured [4, 8 and 9]. As well as text mining could be considered information retrieval as text retrieval or document retrieval, what search engines do [16] and etc in text classification area. Text and Web mining operation will be used in data mining tools to be access structured data can be described [2, 7].

Data mining techniques and their tools [18] are designed to exert structured data from databases. Text mining functionality [19] is similar to data mining, but text mining can work with unstructured data such as PDF files or semi-structured data sets such as emails, XML, and HTML files and etc. So, text mining is a superior way for companies in business fields. Since the most of information in these places is saved as text or in text files [17].

III. NATURAL LANGUAGE PROCESSING

Natural Language Processing (NLP) from 1960 is developed as yet. This research area is sub-filed of Artificial Intelligence (AI) and linguistics regions. Main aim of NLP studying are generation and realizing of natural languages. So, by means of these methods of NLP for processing amounts of textual information is considered very efficient and intelligent. One direction of NLP research relies on statistical techniques, typically involving the processing of words found in texts [20]. One of the NLP applications in text retrieval is usage of these techniques as a necessary component in web search engines, via automated translation tools or in summary generators [21].

By means of NLP techniques, new approach creates usage of rule based methods, leveraging knowledge resources. These can include items such as ontologies and linguistic rules. The statistical human language processing systems need sets of training principled as if indicate the desirable (and/or undesirable) relations and dependencies [22]. In Artificial Intelligence ontologies are developed by humans as models [26]. Ontology serves as a representation vocabulary that provides a set of terms with which to describe the facts in some domain [26].

NLP applications in wide area of AI consist of question answering systems [23], automatic translate of languages to each other, opinion mining systems and etc.

Some of the issues facing the NLP systems contain linguistic variation and ambiguity. The linguistic variation means the possibility of using different words or expressions to communicate the same idea while Linguistic ambiguity is when a word or phrase allows for more than one interpretation [21, 25]. In other hand, Ontology applications in NLP research area are including ontology provides a context for the vocabulary it contains [26, 27 and 28].

IV. UNSTRUCTURED DATA

Most previous studies of data mining have focused on structured data, such as relational, transactional, and data warehouse. However, a substantial portion of the available information is stored in text databases, which consist of large collections of documents from various sources, such as news articles, research papers, books, digital libraries, email messages, and Web pages.

Text databases are rapidly growing due to the increasing amount of information available in electronic form, such as electronic publications, various kinds of electronic documents, e-mail, and the World Wide Web [4].

Nowadays most of the information in government, industry, business, and other institutions are stored electronically, in the form of text databases. Data stored in most text databases are semi-structured data in that they are neither completely unstructured nor completely structured [7].

For example, a document may contain a few structured fields, such as title, authors, publication date, and category, and so on, but also contain some largely unstructured text components, such as abstract and contents [3]. There have been a great deal of studies on the modeling and implementation of semi structured data in recent database research. Moreover, information retrieval techniques, such as text indexing methods, have been developed to handle unstructured documents.
Traditional information retrieval techniques [11, 12] become inadequate for the increasingly vast amounts of text data. Typically, only a small fraction of the many available documents will be relevant to a given individual user. Without knowing what could be in the documents, it is difficult to formulate effective queries for analyzing and extracting useful information from the data. Users need tools to compare different documents, rank the importance and relevance of the documents, or find patterns and trends across multiple documents. Thus, text mining has become an increasingly popular and essential theme in data mining [12].

Structured data, that can be organized structure and therefore can be defined a term used for the actual data. The most commonly used universal type of structured data such as SQL and Access are data sources. For example, Structured Query Language (SQL), columns (variables) and rows (records) based information allows in select. The content of structured data can be organized according to the data types and data is searchable [11].

Unstructured data refers to usually computerized information that either does not have a data model nor has one that is not easily usable by a computer program [8]. Unstructured data distinguishes such information from data stored in fielded form in databases or annotated in documents. Probably the most common types of unstructured data such as image files, PDF, word and text, are kept text files on the web and e-mail log files [11]. In spite of organize E-mail databases with tools such as Microsoft Outlook, which kind of structured data is consider to change raw data.

Structured data types have cell structure such as Excel, although whether or not to present the structured locations are discussed [13]. Many institutions provide unstructured data in databases. Merrill Lynch in 1998 cited estimates that as much as 80% of all potentially usable business information originates in unstructured form [3]. Such estimates may not be based on primary research, but they are nonetheless widely accepted. This is important given that company’s information must be classified. So, data can be classified in the following ways include data type, Data organization, data age and data value [26].

However, the problem of Knowledge Discovery from Text (KDT) [6] is to understand explicit and implicit concepts and semantic relations between concepts existing in unstructured files using NLP techniques [17].

V. Evaluation

Text mining research area for finding patterns in texts includes search and retrieval, document navigation and exploration, text analysis, knowledge management, extraction of topics from texts or groups of text and the analysis of topic trends in text streams[16]. While information retrieval and other forms of text mining frequently make use of word stemming, more sophisticated techniques from NLP have been rarely used [16, 32].

Text classification for region specific databases and path finding by means of reinforcement learning methods are applying for text patterns in this extent [31].

Search function based on two types of discoveries. First is based on content consist of clustering and text categorization. Second based on concept contain predictive modeling, associative discovery, deviation detection, trend analysis. Access methods for texts documents are direct browsing in web environment and information retrieval. Since, learning-based text categorization is the simplest form of text mining [25].

Text mining techniques primarily developed in the domains of information retrieval, statistics, and machine learning [31, 32]. Its aim typically is not to understand all or even a large part of what a given speaker/writer has said, but rather to extract patterns across a large number of documents [16]. They explore Naïve Bayes and SVMs to perform the text classification, they also use grammatical roles derived from an NLP parser [16].

Generally, text mining is extraction of interesting and useful patterns in text data but NLP technologies is as information discovery and NLP techniques supply text classification, text categorization, document clustering, finding groups of similar documents, information extraction, summarization and etc. these are content based techniques. Text classification and Bayesian networks are two popular algorithms in text mining for finding and matching patterns in texts. They explore Naïve Bayes’ and SVMs to perform the text classification, but they also use grammatical roles derived from an NLP parser [16].

Hence the problem of where and how to supply unstructured data in order to find it efficiently,
needs a fresh re-assessment [24]. As for text mining and NLP in intelligent text classification, as a result both of text mining and NLP are two methods for processing textual information. This work is starting with a collection of documents, a text mining tool would retrieve a particular document and preprocess it by checking format and character sets [17] and information extraction.

Using NLP techniques, the entities and relations that act as indicators of recoverable claims are mined from management notes [26]. Text mining techniques can then be applied to find dependencies between different entities, and to combine indicators to provide scores to individual claims. [22].

NLP techniques are used for text that is typically syntactically parsed using information from a formal grammar and a lexicon, the resulting information is then interpreted semantically and used to extract information about what was said [16].

NLP includes techniques like word stemming (removing suffixes) or a related technique, lemmatization (replacing an inflected word with its base form), multirword phrase grouping, synonym normalization, part-of-speech (POS) tagging (such as elaborations on noun, verb, preposition and etc), word-sense disambiguation, anaphora resolution and role determination (such as subject and object)[16].

We will explain the functions and peculiarities of the two key approaches to natural language processing: a statistical approach and a linguistic focus. Statistical processing of natural language [29] represents the classical model of information retrieval systems, and is characterized from each document’s set of key words, known as the terms index.

In NLP document processing for knowledge discovery consist of document pre-processing and Parameterization. This approach is based on the application of different techniques and rules that explicitly encode linguistic knowledge [30].

In document pre-processing level fundamentally consisting in preparing the documents for its parameterization, eliminating any elements considered as superfluous and in parameterization level is a stage of minimal complexity once the relevant terms have been identified [16].

With NLP techniques, the documents are analyzed through different linguistic levels by linguistic tools that incorporate each level’s own annotations to the text [29]. After having identified and analyzed the words in a text, the next step is to see how they are related and used together in making larger grammatical units, phrases and sentences [22, 24]. The techniques used to apply and create parsers vary and depend on the aim of the syntax analysis.

VI. CONCLUSION AND FUTURE WORKS

Structural data obtained using the unstructured model of the data using methods of text and web mining be brought, and from there obtained structural models were compared. The results obtained, text and web mining methods using the obtained model is more successful shows. Unstructured data model to integrate the quality of information can be removed and this result also shows that the unexpected results. Potentially used in the world 80% of all unstructured types of data considered, the use of this data will certainly add value to research. The other important issue is evaluation unstructured data analysis in text mining methods and NLP techniques. Text mining try to finding patterns in textual unstructured files based on contents. NLP try to reach concepts of texts via specific algorithms.

REFERENCES


KRDL’s Text Mining site available at:http://textmining.krdl.org.sg/resources.html, last access 29/6/2011.

Abstract—Detection of black hole is a challenging task. Further, isolating such malicious nodes from communication is also a great challenge. Several previous works addresses trust based model for detection and prevention of malicious nodes. Trust based models will consume time to study the neighbor transmissions and will try to identify trustable nodes based on their data forwarding behavior. But this approach will need considerable quantity of time to identify malicious nodes by constantly monitoring the traffic of the neighbor nodes. Another drawback in this model is, if false positives that is, the standard trust based detection mechanisms may wrongly mark a trustable node as non-trustable node if that node, by chance, is not participating in communication even without any bad intention. In this work, the performance of the algorithm is increased using a Dynamic Trust Handshake based detection mechanism (DTH-AODV). Dynamic Trust Handshake based detection mechanism will detect the malicious nodes very quickly and efficiently in a short time, military rescue like MANETS scenario without much increase in overhead. To prove its better working, a MANETS short time communication scenario is simulated and the performance of standard AODV with and without black hole attack is measured using NS2.35 and compared it with Dynamic Packet Forwarding based Trust AODV (DTH-AODV) protocol in terms of different metrics like total number of packets sent received and dropped, throughput, EED, battery consumed etc. The proposed DTH-AODV will use a Dynamic Trust Handshake mechanism for the reliable detection of malicious behavior in MANET.

Keyword(s)—AODV, DTH-AODV, Dynamic Trust Handshake, Performance, Throughput

I. INTRODUCTION

Mobile Adhoc network (MANET) [1] is a collection of nodes in wireless network in which nodes keeps on changing its position to have a dynamic topology. Topology keeps on changing therefore the path from source node to destination node also keeps on changing which further is determined by routing protocol. In this work, we are using the reactive routing protocol called Adhoc On Demand Distance Vector Routing Protocol (AODV) [2,3] where the route is determined on demand i.e. whenever there is a requirement of route then and only then current route from the source to destination is determined[4-9]. AODV routing protocol has several vulnerability such as:

A malicious node can drop any of the control packet or data packets. A malicious node can modify any field of the control packet and can then forward the packet to its immediate neighbor. The malicious node can send the faked RREP or route reply acknowledgment (RREP_ACK) in response to the control message or it may send fake response message of its own.

In such way, the malicious node may cause the route breakage which may lead to node isolation or flooding of packets which may lead to resource consumption. Due to property that malicious node can also modify fields of the control packet, the malicious mode may impersonate any other node or it may leak the confidential information to the unauthorized node.

In AODV routing protocol, the working depends on the genuine cooperation of node. If any of the intermediate nodes is selfish or non-cooperating or malicious, then the working of complete protocol is compromised. Attacks are targeted to damage basic aspects of security like integrity, confidentiality and privacy. The nodes performing adverse effects on MANETS are classified into two categories: malicious node...
[10] and selfish node [11]. Malicious nodes are those nodes that perform an active attack on MANETs and may be active in route establishment or data forwarding phase, while selfish node performs passively by not forwarding the packet just for sake of saving battery energy.

Due to above said vulnerabilities a number of attacks [12-20] are possible in AODV routing protocol. These attacks are broadly classified into two categories called passive or active attack.

**PASSIVE ATTACK:** In a passive attack, the attacker’s goal is just to obtain information. This means that the attack does not modify data or harm the system. However, the attack may harm the sender or receiver of the message. Main techniques of passive attack are: eavesdropping and timing analysis.

**ACTIVE ATTACK:** Active attack may change the data or harm the system. Attacks that threaten integrity and availability are active attacks. Examples of active attacks on AODV are:

- Attacks by dropping the packets: Such as Blackhole [21-30] or Grayhole attack [31]
- Attacks using modification of protocol message: It may include redirection due to modification of Hop-Count or Modified Destination Sequence number. A Very Common Attack in this category is Denial of Service attack [32-34] where the malicious nodes generate unwanted request packets so as to make the resources unavailable to the other nodes.
- Attacks using impersonation where malicious node impersonates other node
- Attacks using fabrication: Here, Malicious nodes generate false route error message or false routing table overflow message.
- Other attack Such as Worm Hole attack [35-38] or Byzantine Attack [39,40], etc.

This paper focuses mainly on blackhole attack. In Blackhole attack, the malicious node intends itself as having the shortest path through it. Once it is chosen as the intermediate node for the path from source to destination, it drops all the control packets and data packets that are transmitted through it. So, it impacts the performance of the protocol.

**III. IMPLEMENTATION OF BLACK HOLE ATTACK IN AODV ROUTING PROTOCOL**

a) **A. Black hole Attack**

Black hole problem is type of active attack in which malicious node first claims to have the shortest path. Source node chooses the route containing the malicious node to the destination. Once the traffic is routed through itself, it drops the entire data packet routed through it [41-44]. As shown in Fig. 1, let 1 be the source node and 3 be the destination node and 4 is the malicious node. 4 claims to have the shortest path that is why route through 4 (1-4-5-6-3) is selected instead of 1-2-3. But after being selected in the final route 4 drops the entire data packet. The working of black hole attack is further summarized in Fig. 2. The Fig. shows that if the packet forwarded is data packet and the node is malicious, then it drops the entire packet. Otherwise, if the packet if RREQ control packet and the node is malicious then it sends the fake RREP so as to claim itself as having the shortest path. Once it is chosen as the intermediate node, it drops the entire data packet routed through it. In all other cases, it behaves normally [88-90].

![Fig 1: Example showing the working of black hole attack where 1 is the source node, 3 is the destination node and 4 is the malicious node.](image1)

![Fig 2: Pseudo code of aodv routing protocol.](image2)
III. PROPOSED WORK

A lot of research work has been done to find the secured AODV routing algorithm [45-54]. The trust[55-58] based on the packet forwarding behavior of neighbor can be used for detecting misbehavior. This model has been previously presented in several literatures [59-63]. But, by the same trust based logic, some of the neighbors those who were silent and not actively participated in communications will get wrongly identified as malicious. So, simple trust based models will mark a lot of non-malicious nodes as malicious nodes. This will initiate lot of link failures. That is, the link between sources to destination will get broken at different locations on their path because of this false identification of malicious nodes.

The dynamic packet forwarding based trust AODV (DTH-AODV) proposed in this paper will overcome that problem and reduce the possibility of such false marking of non-malicious nodes as malicious nodes. A simple Dynamic Trust Handshake mechanism will help to prevent such false identification.

The main advantage of the proposed detection and prevention scheme is - it will detect and prevent the malicious nodes in the very early stage of AODV route discovery process. So, it will not need any manipulation in routing tables in the route resolving process, because, by the design, it will avoid including malicious hops in routing table even at the route discovery process itself.

In this work, trust value is associated with each node and initialized to 0. If the node is working genuinely i.e. forwarding the packet as per the routing protocol instruction then trust value is incremented otherwise it is decremented.

```cpp
void TrustNode::increaseTrust()
{
    trustValue++;  
}

void TrustNode::decreaseTrust()
{
    trustValue--;  
}
```

Malicious and faulty nodes are then isolated from the network once they obtain a minimum threshold value.

```cpp
bool TrustNode::is Node Trusted()
{
    if (trust Value <= threshold value)
    {
        return false;
    }
    else
    {
        return true;
    }
}
```

Fig 4: Calculation of malicious node

A. Packets Acknowledgment: Acknowledgment is a method of ensuring that packets sent for forwarding have been forwarded. There is a couple of ways that this is possible but Passive Acknowledgment is by far the easiest to implement. Passive Acknowledgment uses promiscuous mode to monitor the channel, this allows the node to detect any transmitted packets, irrelevant to the actual destination that they are intended for. With this, the node can ensure that packets it has sent to a neighboring node for forwarding are indeed forwarded. This has been implemented within PTH-AODV using promiscuous mode to monitor the channel.

B. Packet Precision: As defined by Pirzada et. al [64], Packet Precision ensures the integrity of the data and control packets that are either received or forwarded by other nodes in the network. This type of detection aims to spot packets that have either been corrupted due to a faulty node or have been generated maliciously. This could be done by monitoring the control packets that lead to suitable successful routes. Another possible means is to check the packet information is within certain tolerances. For example, it may be ensured that the sequence number within a reply is not inconceivably higher than the sequence number within the request, as this suggests that the replying node is trying to ensure it is part of the final route.

C. Destination Unreachable Messages: Although Pirzada [64] mentions that it is possible to use Destination Unreachable Messages, no such messages are returned by Ns2.
IV. IMPLEMENTATION OF THE PROPOSED MALICIOUS BEHAVIOR DETECTION IN AODV

A. Implementation of Dynamic Trust Handshake Mechanism

Generally, a trust factor based on the packet forwarding behavior of neighbor can be used for detecting misbehavior as previously presented in several literatures. For example, a trust factor of a node can be derived based on the number of forwarded packets at that neighboring node. But, by the same trust based detection logic, some of the neighbors those who were silent and not actively participated in communications will get low trust factor and will be wrongly identified as malicious. Because of this, the link between source to destination will get broken at different locations on their path because of this false identification of malicious nodes. In our proposed dynamic trust handshake based AODV (DTH-AODV), it will overcome that problem and reduce the possibility of such false marking of non malicious nodes as malicious nodes by introducing a Dynamic Trust Handshake mechanism. The following flow diagram in Fig. 5 explains the implementation of Dynamic Trust Handshake Mechanism in AODV routing agent.

B. The Trust Handshake Message Triggering Mechanism

In this model, the nodes will send a “trust handshake” in a dynamic fashion based on its local state. This Dynamic Trust Handshake mechanism ensures that at least one handshake packet will be send just before any new transmission event. But the frequency of such “trust handshake” message will be controlled by two variables the min_TrustHandshake_Interval and max_TrustHandshake_Interval. So, it will not increase the message overhead tremendously.

The trust handshake message function will be called from different function of AODV whenever a change in state is expected. For example, after doing a regular route table update, the trust handshake message function will be triggered. But according to the way in which The Dynamic Trust Handshake Mechanism working, it will not actually send a handshake message whenever it is triggered. The trigger mechanism may rapidly call the trust handshake message sending function, but it will actually send a new message if an only if there was a considerable gap (min_TrustHandshake_Interval) between two consecutive messages. This will avoid over sending the Trust Handshake messages.

The following flow diagram explains the implementation of Dynamic Trust Handshake Based Malicious Node Detection and Prevention in AODV routing agent. The process flow and pseudo code of Dynamic Trust Handshake Based Malicious Node Detection and Prevention in AODV routing protocol is shown in Fig. 6 and 7.

---

Fig 5: The Dynamic Trust Handshake Mechanism

Fig 6: The process flow of Periodic Trust Handshake Based Malicious Node Detection and Prevention in AODV.
Forward (RREQ pkt, delay) {
  // the node receives the RREQ control packet
  // checks whether it is destination node
  if (destination) {
    // considers the path with highest trust value and sends the route reply along that path
    compute_highest_trust_level ()
    // the optimal path with highest value is chosen and route reply is sent along that path
    highest_trust_value(path)
    sends_RREP_to_source
  } else (not_destination) {
    // if the next intermediate node is not destination then intermediate node checks for the packet by computing the trust level
    if (RREQ_packet) {
      compute_trust_level ()
      // compares the trust value of current node with the trust value of previous node
      if (trust_current_node > trust_previous_node) {
        // intermediate node drops the packet if its trust level is lesser then previous path
        drop(pkt)
      } else {
        // if the new path has more trust value then update trust and hop count and rebroadcast it to next neighbour node
        trust++
        // total number of intermediate nodes is incremented by 1
        hop_count++
        // the RREQ packet is rebroadcasted to next neighbour node
        rebroadcast RREQ
      }
    }
  }
}

Receive (RREP pkt, delay) {
  // waits for specified period
  if (no_duplicate) {
    wait_rrep_wait_time
    update_trust_metric
    next_hop
  } else {
    compute_trust_path
  }
}

Update_Trust_Metric (interval) {
  // wait for the minimum trust handshake interval
  wait_trust_handshake_interval();
  broadcast_trust_handshake;
  trust_value>trust_threshold {
    trust_current_node = trust_current_node + trust_previous_node
  } else {
    drop (pkt);
  }
}

Fig. 7: The Pseudo code of PTH-AODV

C. The Changes Made in NS2 AODV code for Malicious Node Detection and Prevention

The following two files were modified to incorporate the proposed malicious node detection and prevention mechanism in AODV routing agent.

Changes Made in AODV.h
The additional function definitions for detection and prevention of malicious behavior and the variables that will be bound with TCL are declared in AODV.h. By using the variables from a TCL simulation code, we can control the behavior of the routing agent and bring it to detection and prevention mode.

Changes Made in AODV.cc
The actual code of the additional function definitions for detection and prevention of malicious behavior were implemented in AODV.cc. And here the new interfaces to the code through the control variables that will be bound with TCL are written here. By setting the variables from a TCL simulation code, we can control the behavior of the
routing agent and bring it to detection and prevention mode.

D. The Functions Modified for Attack Detection and Prevention.

The function TrustHandshakeTimer()
The Dynamic Trust Handshake Mechanism is implemented with the help of a new timer function in AODV.

The function AODV::SendTrustHandshakePacket()
This function will generate a Trust Handshake packet and transmit it with respect to the conditions explained in the Fig. 4.

The function AODV::recvAODV()
In this function, the trust based detection of malicious behavior has been implemented. As shown in the Fig. 4 of previous section. The malicious behavior detection is done based on the trust factor of the previous hop node from which the message was received.

V. RESULTS AND DISCUSSION

We used network simulator version NS2.35 under Ubuntu linux operating system for obtaining this results[65]. We have implemented the black hole attack as well as attack detection and prevention mechanism on the AODV code of NS2 and did the simulation with the parameters presented in this section and evaluated the performance with respect to the metrics discussed in this section.

A. The simulation parameters

a) Common Parameters: The following common parameters are used for setting up the network. Moreover following parameters are also used to set TCP/UDP flows.

Table 1: Parameters values of Network in NS2

<table>
<thead>
<tr>
<th>Common parameters</th>
<th>Values</th>
<th>Traffic parameter for TCP flows</th>
<th>Value s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topographica 1 Area (m^2)</td>
<td>1800 X 500</td>
<td>Transport Agent</td>
<td>TCP</td>
</tr>
<tr>
<td>Mobility</td>
<td>20m/s</td>
<td>No Flows</td>
<td>10</td>
</tr>
<tr>
<td>Pause Time</td>
<td>20s</td>
<td>Traffic Type</td>
<td>CBR</td>
</tr>
<tr>
<td>Total Simulation Time</td>
<td>100s</td>
<td>Packet Size</td>
<td>1KB</td>
</tr>
<tr>
<td>Routing Protocol</td>
<td>AODV</td>
<td>Interval</td>
<td>100ms</td>
</tr>
<tr>
<td>Mobility Modal</td>
<td>Random</td>
<td>Rate</td>
<td>10KB</td>
</tr>
</tbody>
</table>

b) Variable Parameters: The following parameters are used as variables for analyzing the impact of the attack and detection on different condition.

Table 2: Total number of nodes, number of malicious node and different attack scenarios

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malicious Nodes</td>
<td>15</td>
</tr>
<tr>
<td>Total Nodes</td>
<td>40, 50, 60</td>
</tr>
<tr>
<td>AODV with</td>
<td>No Attack</td>
</tr>
<tr>
<td></td>
<td>Black Hole Attack</td>
</tr>
<tr>
<td></td>
<td>PTH Attack Detection</td>
</tr>
</tbody>
</table>

B. Analytic Results With Respect to Different Network Size

Here we see the analytic results of comparison of black hole attacks with normal AODV (it means performance without any attack). And it is studied with respect to different network size. In the following analysis the total number of nodes in the network is varied as 40, 50 and 60 and among them, the number of malicious nodes kept as 15 and
The following line graph in Fig. 8 shows the impact of attack and detection and prevention mechanism in terms of total data packets sent at application source. As shown in the line graph, under the presence of Blackhole Attack, the application source itself can not able to send much. But while detection the proposed DTH-AODV was able to send as much as normal AODV without any attack.

The following line graph in Fig. 9 shows the impact of attack and detection and prevention mechanism in terms of total data packets received at application destination. As shown in the line graph, under the presence of Blackhole Attack, destination itself is not able to receive anything. But while detection the proposed DTH-AODV was able to receive as much as normal AODV without any attack.

![Network Size vs Received Packets](image)

Fig. 9: Network Size vs Received Packets

The following line graph in Fig. 10 shows the impact of attack and detection and prevention mechanism in terms of routing load. As shown in the line graph in Fig. 10, under the presence of Blackhole the routing load is very high.

But with proposed DTH-AODV based detection and prevention mechanism, the routing load was almost equal to that of normal AODV. In terms of routing load, the performance of Normal AODV, proposed DTH-AODV are almost equal.

![Network Size vs Routing Load](image)

Fig. 10: Network Size vs Routing Load

The following line graph in Fig. 11 shows the impact of attack and detection and prevention mechanism in terms of MAC load. As shown in the line graph, under the presence of Blackhole the MAC load is very high. But with proposed DTH-AODV based detection and prevention mechanism, the MAC load was almost equal to that of normal AODV. In terms of MAC load, the performance of Normal AODV, proposed DTH-AODV are almost equal.

![Network Size vs MAC Load](image)

Fig. 11: Network Size vs MAC Load

The following line graph in Fig. 12 shows the impact of attack and detection and prevention mechanism in terms of total dropped packets at application layer. As shown in the line graph, under the presence of Blackhole Attack the lot of packets were dropped at application layer. But while detection, the packet dropping of proposed DTH-AODV was very much reduced and almost equal to that of normal AODV without any attack. In terms of application layer dropped packets, the proposed DTH-AODV dropped little bit high number of packets-- this is because, the DTH-AODV will try to send more packets than Normal AODV.

![Network Size vs Packets Dropped At Application Layer](image)

Fig. 12: Network Size vs Packets Dropped At Application Layer

The following line graph in Fig. 13 the impact of attack and detection and prevention mechanism in terms of throughput. As shown in the line graph, under the presence of Blackhole Attack the throughput was almost equal to zero. But with detection, the
throughput of proposed DTH-AODV was very much improved and almost equal to that of normal AODV without any attack.

The following line graph in Fig. 14 shows the impact of attack and detection and prevention mechanism in terms of PDF. As shown in the line graph, under the presence of Blackhole Attack the PDF was almost equal to zero. And at low network density PDF is equal to zero. For example, at 40 nodes, it is zero because, among the 40 nodes, 15 are malicious- so that they will able to break all the communication between other nodes. But with detection, the PDF of proposed DTH-AODV was very much improved and almost equal to that of normal AODV without any attack. In terms of PDF, the performance of Normal AODV, proposed DTH-AODV are almost equal.

The following line graph in Fig. 15 shows the impact of attack and detection and prevention mechanism in terms of End to End Delay (EED) of data flows. With respect to the increase of no of nodes in the network, the performance getting decreased. As shown in the line graph, Blackhole Attack seems to be providing lower EED than normal AODV(without attack) – but certainly it does not mean that Black hole Attack is improving the performance of the network. The low end to end delay under attack is due to a strange fact that the attack makes disconnection in TCP flows and since the packets are not at all forwarded to any further nodes, indirectly it is reduce the message overhead in the network and reduced bandwidth usage otherwise it will be consumed by the forwarded data packets. So, the flows that were unaffected by Blackhole Attack (the connections where there is no neighboring attack nodes) utilizes that extra bandwidth and gains some performance.

Further, keep in mind that the end to end delay is only calculated based on the time in which a packet is sent and received. So if a packet is not received, in that case end to end delay cannot be calculated. So this average EED is only the average EED of successfully delivered packets.

The EED of DTH-AODV was little bit higher than normal AODV. Because, under attack detection and prevention, alternate route will be resolved by avoiding malicious nodes on a path. So that the path length will get increased and hence will increase the end to end delay.

The following line graph in Fig. 16 shows the impact of attack and detection and prevention mechanism in terms of consumed battery energy. As shown in the line graph, in the presence of Attack the battery consumption is lesser than Normal AODV (without attack) – but certainly it does not mean these Attacks are improving the performance in terms of energy consumption. The low energy consumption under attacks are due to a strange fact that these attacks makes disconnection in data flows and since the packets are not at all forwarded to any further nodes, indirectly it is reduce the battery consumption at the other nodes otherwise it will be consumed for forwarding the data.
packets. So, the nodes that were unaffected by Attacks (where there is no neighboring attack nodes) preserves some battery power. Understanding this strange fact requires a better visualization of the whole network scenario. It is simple – without any attack, AODV was able to send much and maximum nodes were able to participate in that communication and utilized their energy for transmission/forwarding of packets – so that the energy is consumed in most of the nodes. But in the presence of attack, the packets are getting dropped immediately and the battery powers on other nodes that are not at all forwarding the packets get preserved. With respect to the increase of no of nodes in the network, the performance seems to be getting decreasing.

But, interestingly, the energy consumption in the case of proposed DTH-AODV is little bit lesser than normal AODV. This obviously proves the better working of proposed detection model. Lot of previous papers saying that the attacks will increase energy consumption. Of course, it also may be true – but not in the same sense. For example if an application will continuously try to send data under attack, then the battery of the sending node and some other nodes between sender and attacker nodes will get reduced rapidly. If the application will vigorously try to do retransmission due to loss, then this will increase the energy consumption. But the transport protocol will handle loss scenario and just reduce the sending rate to avoid further loss. That is why the average energy consumed in the network seems to be getting reduced under attack. Understanding this strange fact requires a better visualization of the whole network scenario.

The following line graph in Fig. 17 shows the impact of attack and detection and prevention mechanism in terms of overhead. As shown in the line graph, under the presence of Blackhole the overhead is minimum – because, the black hole just breaks all the communication. But with proposed DTH-AODV based detection and prevention mechanism, the overhead becomes equal to that of normal AODV – it signifies that the proposed DTH-AODV works almost equal to normal AODV.

VI. COMPARISON OF DTH-AODV WITH OTHER TRUST BASED ROUTING ALGORITHM

The table 3 in Annexure-I compares the characteristics of conventional AODV based trust routing algorithm with newly developed algorithm DTH-AODV.

VI. CONCLUSION

In this work we proposed a dynamic trust handshake based detection of black hole attack. We implemented out DTH-AODV under NS2 and compared its performance with the results of Standard AODV and Standard AODV under attack. The main advantage of the proposed DTH-AODV is : it will detect and prevent the malicious nodes in the very early stage of route discovery process. So, it will not need any manipulation in routing tables in the route resolving process, because, by the design, it will avoid including malicious hops in routing table of normal nodes at the route discovery process itself.

A lot of simulation and analysis is done to arrive at significant and interpretable results. The impact of the attack is measured on the detection and prevention mechanism with suitable metrics and explained the improvements in performance. According to the arrived results, proposed dynamic trust handshake based malicious node detection
and prevention mechanism worked good and successfully detected black hole nodes in the network and avoided establishing routes though them. As shown in the results of the previous section, the proposed DTH-AODV improved the throughput and PDF almost equal to that of Normal AODV. In this work, we used unencrypted trust handshake messages in the design. But in future works, we may explore the possibility of using a private key/public key based encryption mechanism for more secure operation. It may increase the operational overhead, so that one may address issues related with overhead due to encryption based trust handshake mechanism.

REFERENCES


A Survey on Different Deployment schemes of sensor nodes in Wireless Sensor Network

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Abstract: In years we all have noticed the arrival of (WSNs) i.e. wireless sensor networks as a latest information-collecting model, in which huge number of sensors distribute over the network area and pull out data of interests by evaluating real-world phenomena from the physical location. One of the leading issues in the field of wireless sensor networks (WSN) is Localization. To route data from source to destination is the challenging tasks in wireless sensor network. From the sensor network area Sensors assemble data and surpass the assembled data to the base station. Lots of deployment methods are here by which one can improve both localization accuracy and localization success rates. The WSN operation is categorized as dynamic, static and energy aware node assignment. Different deployment algorithms of static, dynamic and energy aware protocols are studied in this paper.

Keywords: WSN, Localization of WSN Nodes, Node Deployment.

I. INTRODUCTION

WIRELESS sensor network (WSN) is a particular class of mobile network [2] composed of hundreds or even thousands of self-sufficient and dense devices, which are called sensor nodes. The nodes can perform sensing, processing, and wireless communication tasks. In a typical WSN application, the source nodes collect data from an event and disseminate them toward the sink node using multi hop communication. One of the important problems of any sensor node design is the deployment of the sensor nodes in the area to be monitored. Sensor nodes usually have limited power storage along with processing and communication capabilities. Monitoring of the field may be based on uniform event recognition or differentiated event recognition, where the probability of appearance of the event in the areas concerned varies both geographically and temporally. Finally, it is important to maintain connectivity among the nodes so that the data collected by any individual sensor node can flow through other nodes to the sink node. Deployment of the sensor nodes taking all such objectives together is a very challenging problem.

II. LOCALIZATION OF WSN NODES

Depending on the target applications [3], earlier studies in WSNs generally focus on either outdoor large-scale environments, where planned sensor deployment is difficult, or indoor small-scale monitoring zones, where sensor deployment mechanism is feasible and beneficial. For large-scale WSNs, several works have been proposed to address the energy conservation issue. For the monitoring environments where planned sensor deployment is possible, various static deployment strategies have been introduced to enhance the surveillance coverage. However, such static deployment involves manual sensor placement/installation, and is incapable of dynamically repairing sensing voids (uncovered areas) in the presence of unexpected sensor failures. Consequently, a number of research efforts have explored the movement-assisted sensor deployment techniques by utilizing mobile sensors to
enhance the sensing coverage after an initial random placement of sensors. Those deployment techniques all consider homogeneous sensors (having equal sensing/detection radius). With the motion facilities equipped at the sensing devices, sensors can move around to deploy themselves.

Coverage [10] is one of the key research areas in wireless sensor network which refers to monitoring of a set of targets by sensor nodes. Two types of coverage exist in literature Area Coverage and Point Coverage. In area coverage, a given area is monitored by a set of sensors over a geographical area. In case of point coverage, a set of points is monitored by sensors in a geographical region. Normally the sensing range of a sensor is modeled as a disk in the 2D space or as a sphere in the 3D space, with the sensor located in the center. A sensor is able to keep track of all targets that are within its sensing range. The deployment of minimum number of sensors play a vital role in maximizing the coverage area thereby increasing the efficiency of the WSN. In this paper, we present the node deployment scheme of triangular deployment, grid deployment, hexagonal deployment, pentagon deployment and octagon type of node deployment with coverage maximization. This paper is organized as follows: in section 2 we present the research already reported in literature, in section 3 we address various types of deployments of sensors in 2D and also find the coverage prediction for each of them along with the number of sensor nodes required for each type of deployment. The results are explained in section 4 and we conclude in section 5.

Schemes of Node Deployment [6]: The process of deployment of sensor nodes in WSN is processed out in three main schemes. They are,

I. Static Node Deployment
II. Dynamic Node Deployment
III. Energy aware node placement

In static node deployment, the sensor nodes are fixed in the particular area, because of which the performance reduces. But in case of dynamic node deployment the sensor nodes are mobile and hence the performance is increased. In energy aware node deployment each sensor node is provided with the energy and is utilized for the collecting and transferring the data. It also explains the rate of energy consumption by the nodes for the transmission of data.

A. Primary objective of the node deployment

Application developers mainly appreciate the sensors to get deployed in a manner that aligns to the overall design objectives. Hence, most of the proposed node deployment strategies in the literature have concentrated on maximizing the coverage area; optimizing the energy consumption, achieving the strong network connection, extending the lifetime of the network and/or increasing data fidelity.

B. Static Node Deployment

The static node deployment goes with the best location considering the optimization energy and the location of nodes does not change in the lifetime of WSN. Here, after the sensors’ placing, there is no further movement in the network. Static sensors do not have the ability to get changed with their location.

1) Static node deployment based on deployment strategies.

In WSN, the sensor nodes are generally deployed in a selected area either randomly or deterministically (Controlled). The deployment of the nodes not only impact on the coverage of area but also affects the network topology properties. The controlled type of node deployment is required when the sensors are more costly or when the procedure of the sensors is ideally affected by their deployed area. This deployment methodology achieves the required performance goals depending on the sensor node distribution and level of the redundancy. By considering the fault tolerance as one of the parameters for performance measurement, it is concluded that the R-random deployment has a better...
placement strategy. The main reason for this is the deployment of more nodes near to the base station as they tend to transmit a lot of traffic and thus exhaust their energy (battery) rather quickly. Hence, the maximized sensors population towards the base station safeguards the availability of spares for replacing the faulty relay nodes (RN) and hence results in the network connectivity.

2) Static node deployment based on optimization objective.

In WSN, the sensors have to be deployed in a way that desires with the complete design goals. Hence, most of the deployment methodologies in literature have concentrated on maximizing the coverage, gaining strong network connectivity, increasing the network lifetime and/or achieving the data fidelity. The secondary objectives viz, tolerance of node failure and load balancing has also been considered. An attempt is made to maximize the design goals making use of the minimum amount of resources, e.g., number of sensor nodes. Achieving the design goals through random sensor node distribution is a highest challenge. Meanwhile deterministic deployment theoretically achieves all primary and secondary goals; but the required network resources keep the problem very hard.

C. Static Node deployment Algorithms

The algorithms for static node deployment are Artificial Bee Colony algorithm (ABC) algorithm and Bio-geography Based Optimization algorithm (BBO). These algorithms can also be applied for dynamic node deployment.

The following section explains the ABC and BBO algorithm applied for static deployment.

1) Artificial Bee Colony Algorithm: The ABC algorithm is one among the new approach for the study of both static and dynamic node deployment problem in WSN. This algorithm was introduced by considering the foraging actions of honeybee swans. The coverage rate of ABC algorithm is compared with other dynamic deployments algorithms and has come up with good result (99.34% for 10,000 iterations). The network coverage rate or the total area of coverage of sensors resembles to the fitness value (nectar) of the solution.

2) Bio-geography Based Optimization algorithm (BBO): In the beginning of node deployment, an effective or good coverage rate of the nodes cannot be reached, because of the randomness of the nodes. This BBO algorithm works in combination of both static and dynamic sensor nodes. The BBO algorithm is encouraged by the migration species between islands (or habitats) in search of more compatible islands.

D. Dynamic Node Deployment Algorithms

Finding the positions of the sensor nodes is an important notion of deployment, which in tum depends on the area coverage. In dynamic node deployment type, the sensor nodes are initially positioned in the randomly selected areas. The deployment decision is taken in the beginning of network setup and it does not depend on dynamic changes during the functionality of network. The different dynamic node deployment algorithms are explained in the following sub-sections.

1) Virtual Force based algorithm (VFA): It is one of the popular approaches for node deployment. In this type of the algorithm the obstacles, sensor nodes and the coverage areas are recognized as main perceptions for attractive or repulsive force among the nodes. VF A comes across three assumptions. First, a single node should have the ability to acquire relative position of other nodes within its communication range. Second, all the remaining nodes will move according to the calculated results of the algorithm effectively. And third, all the nodes are similar with Omni-directional sensors, which means that for each node, the sensing range is equal for all nodes and the sensing areas they sensed are circles with node at its midpoint, and hence results in the communication range. AVF A algorithm [5], is designed in which each node Si is related to three kinds of forces: a) repulsive force Fir, exerted by obstacles, b) attractive
force c) attractive or repulsive force, by another node $S_j$, depending on its distance and orientation from $S_i$. The net force on a sensor $S_i$ is the vector sum of all the above three forces.

2) Van Deer Waal's Force based algorithm: The Van Deer Waal's force is the summation both of repulsive and attractive forces between the particles other than those due to covalent bonds or to the electrostatic interaction of ions with one another or with neutral particles [8]. The Van Deer Waal's force (Magnitude of attractive force) can be modeled as below [4],

$$A B F(d) = da - db$$ (2)

where $d$ is the remoteness between the neighboring sensor nodes and $a>b$ where $\phi'$ is attractive force and $\phi'$ is repulsive force [4].

E. Virtual Force directed Co-evolutionary Particle Swarm Optimization (VF-CPSO) algorithm.

This VF-CPSO algorithm is the combination of Virtual Force Algorithm (VFA) and Co-evolutionary Particle Swann Optimization (VF-CPSO) algorithm. CPSO algorithm makes use of number of swarms and minimizes the different modules of solution vectors for dynamic deployment supportively.

F. PSO and PPSO algorithms.

The working of the PSO algorithm includes the swarm (considered as a population) of candidate solutions (also called as components). The components are moved in an area in search of area according to simple mathematical equations. The movement of particle is controlled by the best-known location in the search-space and also the entire swarm's best-known location. As better locations are being exposed, these will then be used to control the movements of the swarm. This procedure is frequently repeated and by doing so it is expected, but not guaranteed, that a satisfactory solution will ultimately be discovered.

G. Energy aware node placement in WSN.

Nowadays the major difficulty for the node deployment is energy consumption and exploitation of WSN technology. The factors such as MAC design with energy efficient, topology management and error control strategies could affect the lifetime of WSN. An energy-efficient scheme objects at optimizing consumption rate of energy from the sensor node level in a WSN. In the beginning the distance between receiver and transmitter is calculated with the available data Transmission so as to minimize the communication energy consumption of the sensor node, and then, the minimum communication energy needed to transfer the data is calculated. The nodes are then set to the sleep mode between two consecutive measurements for energy saving in normal operating conditions.

1) Bio-geography Based Optimization algorithm (BBO)

SEAD protocol is mainly applicable for sink nodes in WSN and is called as a distributed self-organizing protocol. The sink node is also called as relay node and is an external network but is directly connected to WSN. These nodes are considered as moving nodes. They control the sensor nodes. SEAD protocol saves the energy both in constructing and maintaining the Dissemination-tress (D-tree). Hence this protocol is mainly used for saving the communication energy. It balances the endwise delay and energy consumption. SEAD is developed for least cost entry to the tree for the sink using unicast. Simulations results concluded that SEAD accordingly conserves the battery energy of the sensor node powerfully while delivering data without intermission to mobile sinks. The distance between the nodes and data transmission rate is considered by the SEAD protocol.

2) CODE (Coordination based data Dissemination) Protocol

CODE is developed on the basis of network structure and synchronization protocol GAF to deliver an energy efficient data broadcasting path to dynamic sinks for synchronizing sensor networks. It is mainly adopted for
dynamic sink nodes. The density of nodes does not affect the communication overhead of CODE. It is also compared with other protocols like TTDD and SODD for communication overhead and is projected that it is less in CODE because only the coordinators will come into the picture of sending and receiving of data. But in other protocols such as, TTDD and SODD, all N-nodes will interact in the data transmission process. CODE has three major phases; data dissemination, data announcement and query transfer.

3) TTDD (Two-Tier Data Dissemination) protocol

This approach provides the efficient and scalable data delivery to numerous and dynamic (mobile) sink nodes. This protocol also uses network structure, so that the sensors situated at network points prerequisite to acquire the advancing information. The data transmission is based on the virtual grid infrastructure and query flooding method to gain scalability and efficiency. The effect of sink node’s speed increases the TTDD performance. As the sink node moves faster, the rate of energy depletion and connection defeat ratio also increases.

4) DD (Directed Diffusion) protocol

In Directed diffusion, all the sensor nodes are application aware. This results in diffusion to attain energy saving with the selection of empirically better path and by processing the data in the network. This protocol also works on the data centric naming approach to activate the data or packet aggregation. The DD protocol follows several paths till it reaches the best path for flooding the data over the entire network. Directed Diffusion consists of several elements such as, data messages, interests, reinforcements and gradients. Data is collected information; an interest IS a message, which specifies the user needs.

5) ADMR (Adaptive Demand Driven Multicast routing) protocol

This protocol is also called as on-demand protocol as it does not maintain the path information frequently. Fellow nodes in ADMR protocol does not direct explicit leave messages. Here the group fellowship and multicast routes are recognized and rationalized by the source node on demand. The processing tree includes sources, receivers and processing nodes which are not receivers for the related group. The main task of this processing tree is to direct the packets along the defined path from group G to sender S and each sensor node of the tree directs each data packet at most once. There is no coincidental of the occurrence of duplicate packets as this tree maintains the routing tables.

III. LITERATURE SURVEY

In paper [1] author proposed a sensor deployment scheme for k, covered and k, connected network. There is no bound on the relationship between the communication distance and the sensing distance of the sensors, so this can be viewed as a generalized solution. They have also considered multilevel connectivity and multilevel coverage. In that work they assume a binary sensing model and take the sensing and communication ranges of the sensors to be circular in shape. As future work their work can be extended to probabilistic sensing model and also for sensing and communication regions of irregular shape. Energy saving protocols to increase the lifetime of sensor networks can also be implemented on the deployment scheme proposed in their paper and the utility of this scheme for lifetime enhancement can also be investigated.

This paper [2] has addressed the density control scheme for sleep scheduling of a densely deployed sensor network to maximize the coverage and minimize energy consumption for maximizing the network lifetime. This paper is the first of its kind to incorporate differentiated coverage with sleep-scheduling methods in a multi objective optimization framework. The idea of differentiated coverage is very interesting from a practical point of view as it reduces wastage of energy by reducing the level of sensing in
the regions of less interest. Every time a node failure occurs, the multi objective algorithm is called to rearrange the network to have maximum coverage and minimum energy consumption. This sleep-scheduling density control method helps in maintaining required coverage but produces very high network lifetime than traditional deployment schemes. Simulation results clearly indicate that MOEA/DFD out performs MOEA/D, NSGAII, and CPLEX in all those measures. In context to this application, evolutionary algorithms have fared better than mathematical optimizers like CPLEX.

In this paper [3], author proposed an enhanced sensor deployment protocol, entitled EVFA-B, with the objective of providing sufficient surveillance coverage for smart indoor environments. In the development of EVFA-B, distance threshold settings and weight constants (associated with attractive/repulsive forces) have been judiciously designed to effectively increase the sensing coverage ratio. Performance results showed that EVFA-B outperformed other virtual forces algorithms due to its better parameter choices and the incorporation of virtual boundary forces. Furthermore, an automated monitoring network (MoNet) powered by our EVFA-B deployment mechanism was implemented as a proof-of-concept prototype to corroborate the protocol feasibility.

On analyzing the simulation result [4] it is concluded that in the perspective of energy model, mica mote with ASK modulation is more efficient than BPSK and O-QPSK modulation with mica mote and mica z in transmit and receive mode. While mica z consumes less energy in idle mode with BPSK modulation. As in WSN, nodes are operate in four mode i.e. transmit, receive, idle and sleep mode. So comparatively in these four mode mica z energy model consumes less energy than mica mote energy model with ASK modulation. In the perspective of QoS, ASK modulation provide better QoS among three modulation at 868 MHz frequency. As ASK provide high throughput, low delay, and low jitter than BPSK and O-QPSK modulation. At last one more point concluded from above analysis that is BPSK modulation has less fraction of error in received signal but their QoS is worst among ASK and O-QPSK modulation.

WSNs are comprised [5] of resource-constrained nodes. One of the scarce resources of nodes is energy that needs to be preserved so that network lifetime is optimized. In this paper, they have analyzed the problem of network lifetime optimization by balancing energy consumption at different CHs in a clustered WSN. Analysis revealed that the number of clusters and the number of MNs associated with each cluster have significant roles in the optimization of network lifetime by avoiding the energy hole problem. Considering the results of this analysis, we have developed a routing-aware optimal clustering strategy. Our routing-aware optimal clustering strategy considered the deployment of both CH and MN at some predetermined locations. To deploy both CH and MN at some predetermined locations, we have identified Archimedes’ spiral, based on which a deployment function is proposed for distributing MN and CH. Simulation results prove that our scheme achieves the design goal by prolonging network lifetime without compromising the network performance metrics such as end-to-end delay and throughput. The results also show the dominance of our scheme over other competing schemes [5-6] with respect to both set of parameters including parameters for achieving design goal and standard network performance metrics. As a future extension of our work, the clustering strategy may be made more realistic by considering a three-dimensional environment.

WSNs are [6] mainly designed for specific applications. Each application varies in characteristics and requirements. For the diversity of applications, the WSN had to endure for deployment of nodes with the growth of algorithms and protocols. This paper has surveyed and compared different schemes of node deployment. The analysis shows that ABC algorithm which is implemented for both static and dynamic node deployment provides a better performance for parameters such as
number of nodes, coverage rate, standard deviation, energy consumption and computation time. This survey has shown the results of coverage rate as 98.83min1run (164s) for 10000 iterations and standard deviation as 0.0891. It also compares the results of other algorithms of static and dynamic node deployment.

The SEAD protocol, which is an energy aware node deployment protocol is compared with other protocols such as DD, ADMR and TTDD and is found that SEAD consumes mmmum energy. Future work in this area entails the survey of other deployment algorithms such as BBO, CPSO.

This work [7] presents a node deployment approach that takes the shape of a given farmland and calculates an optimal number of nodes. A deployment scheme is proposed with the minimum number of sensor nodes to form a sensor network. The proposed system was evaluated based on different performance metrics. A routing protocol PEGASIS was also selected because it has a better network lifetime than LEACH. Based on the evaluation results, it can be concluded that the proposed node deployment strategy (i.e., scheme) is a better option for precision agriculture in Wireless Sensor Networks (WSNs). The scheme can be used for any shape of the monitored farm area. In addition to precision agriculture, our approach can also be used for other applications of a similar nature such as large scale environmental monitoring. In our future work, we are planning to extend the scheme to address heterogeneous sensor nodes and three-dimensional area. Other deployment strategies like hexagon, square, etc. will also be assessed.

In this paper [8] the nodes of event driven sensor network are placed at optimum inter node distances such that very less residual energy remains on each sensor node after the lifetime of network and further if any node has some finite energy then the sensor node starts working on single hop mode and hence further the lifetime of some sub-regions are extended for some finite period. For the performed experiment the variance in energy consumption and residual energy in the sensor nodes in multi hop and single hop mode is negligibly small and can be neglected.

In a corona-based WSN [9], CHs closer to the sink are loaded more than those farther from it. To overcome this situation, we propose END-BE, which adjusts the initial energy of sensor nodes in the outermost corona. Based on the analysis, we can calculate how many sensor nodes should be deployed into each corona, so that each cluster can use up its energy at approximately the same time. We also propose END-MLT, which further lengthens the network lifetime by arranging appropriate sensor nodes (with "k D 1) in the outermost corona with the goal of balancing the energy consumption in coronas C1 to Ck1. Simulation results show that energy consumption is nearly balanced by implementing END-BE, and the network lifetime is greatly improved by adopting END-MLT. As to future work, we will investigate the energy-balanced node deployment scheme for other models, such as areas with irregular shapes and situations where the sink is located at different places. In addition, what is the best value of "k? The parameter can be further investigated as well.

We have [10] described the different types of sensor node deployment schemes for wireless sensor networks that help us to understand the coverage prediction in each case. Deployment remains one of the most researched topic on the maximization of coverage in wireless sensor networks. We describe the triangle, square, hexagon, pentagon, and octagon type of node placement and give a comparative review of the various node deployment schemes with the coverage prediction and the number of sensors to be used in each case. We find that octagon node deployment scheme has the highest coverage prediction and triangle and hexagon have the least. With the given node placement in the deployment schemes, we find that the triangle and the hexagon node deployment schemes return the same coverage prediction and the number of sensor nodes used. Also although the octagon deployment has the best coverage prediction but it also uses the maximum number of sensors while the hexagon and the triangle use the least number of sensors along with the lowest
coverage prediction. Therefore most practical deployment scheme is the square deployment which uses an average number of sensors for average coverage prediction.

In this paper [11], authors consider partitioned MSNs and investigate the relationship between the node deployment schemes and the connectivity restoration cost. To simulate large-scale node failures in MSNs, we have presented three different node deployment schemes, namely SDkM, SDkM-F, and MD. SDkM populates a single connected component and then applies k-means clustering algorithm to designate partitions. Unlike SDkM, SDkM-F simulates repulsive force on nodes like magnets of opposite orientation. Application of the repulsive force enables forming topologies with nodes distributed uniformly. MD, on the other hand, deploys multiple connected components in an iterative manner. MD ensures that each connected component is deployed apart from each other with a minimum distance based on the defined damage scale. To restore connectivity, we have employed a centralized heuristic and evaluated the cost of recovery in terms of total travel distance and the number of relocated nodes. We have observed that the recovery cost pattern is closely related with the employed deployment algorithm. Therefore, novel recovery solutions must be evaluated according to the considered deployment scheme.

Aerial scattering [13] of SNs has emerged as a practical solution to large scale deployment problem. Such types of schemes are time efficient and can be used to achieve blanket coverage over the large region. But their stochastic nature desist them from achieving the optimal coverage. In this article a uniform distribution scheme for aerially dropped SNs has been proposed. It is an enhancement on the (Centrifugal Cannon based Sprinkler) CCS, which is a basic scheme for stochastic scattering of SNs in large scale regions. The main focus of this work is to increase the coverage achieved by the CCS with optimal number of SNs. This model uses the parachutes with different dimensions to float the SNs with different floating angles in order to reach their destined locations. The simulation results shows that the proposed scheme achieves better coverage than CCS.

IV. CONCLUSION

One of the main issues in WSNs is Localization. In NLOS which means the non-line of sight which is a type of environments a signal which is used to determine the distance between nodes, because of the obstacles between the anchor nodes and other nodes, cannot pass through a straight path. And localization error is increases because of this difficulty. Localization method based AOA measurement has excellent performance in localization in the NLOS conditions. To increase the coverage achieved by the CCS with optimal number of SNs this model uses the parachutes with different dimensions to float the SNs with different floating angles. An optimal policy for scheduling generates by Markov Decision Process model. The analysis results gives that ABC algorithm for parameters such as number of nodes, coverage rate, standard deviation, energy consumption and computation time which is implemented for both static and dynamic node deployment gives a better performance.

REFERENCES


Predictive Analytics: Overview, Challenges and Applications

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Abstract—The previous couple of years have seen a blast in the business utilization of analytics. Organizations around the globe are utilizing analytical apparatuses to pick up a superior comprehension of their client's needs and wants. Predictive analytics has turned into an inexorably hotly debated issue in analytics scene as more organizations understand that predictive analytics empowers them to diminish dangers, settle on canny choices, and make separated client encounters. Accordingly, predictive analytics organizations are picking up force. However, the appropriation rate is moderate, and associations are just start to begin to expose what's underneath with respect to the potential utilization of this innovation. Executed legitimately, the business advantages can be significant. Be that as it may, there are vital traps to consider. The key goal of this article is to study about the usage of predictive analytics in various fields. This article likewise investigates the changing elements of analytics, features the significance of predictive analytics, recognizes determinants of usage achievement, and covers a portion of the potential advantages of this innovation.

Keywords: Big Data, Analytics, Categories of Analytics, Business Intelligence, Predictive Analytics

I. INTRODUCTION TO BIG DATA

Information is becoming quicker than any time in recent memory from an assortment of sources including online networking, cell phones, and the Internet of Things (IoT). As per Gartner Research, information volume will grow 800 percent throughout the following 5 years and 80 percent of that information will be unstructured [1]. A few patterns have added to this information blast incorporating huge development in video and photograph information, amazing use of advanced cells, 50 billion keen associated gadgets on the planet, far reaching use of CRM, ERP, and item/administration logs [2]. Also, developing quantities of organizations are gathering information from their clients. This pattern will proceed later on. Constantly 2020, about 1.7 megabytes of new data will be made each second for each person on the planet. By at that point, our collected universe of information will achieve 44 trillion gigabytes [3]. Most of Big Data (unstructured information) doesn't offer a great deal of significant worth in its natural state. Obviously, one can pull amazing bits of knowledge from this store of information by applying the correct arrangement of instruments and analytics. One can likewise observe examples and fabricate a model of how this information works. When you manufacture a model, you can foresee. The correct utilization of Big Data can empower examiners to discover patterns and give huge bits of knowledge that assistance make esteem and drive operational efficiencies for the undertaking. In addition, Big Data can convey other essential advantages to associations, for example, empowering new items and administrations, bettering satisfying client needs, and encouraging development and analytics use. Experiences covered up beforehand by information too expensive to even think about processing can help in the formation of new items and in the disclosure of approaches to increase upper hands. Additionally, the capacity to process each thing of information in sensible time and effectively abusing the incentive in Big Data expels the troublesome requirement for testing and elevates an analytical way to deal with information.

II. BIG DATA AND ANALYTICS

The expression "Big Data" was begat in mid 1990s and is characterized as information that is excessively huge, complex, and dynamic, and surpasses the preparing limit of ordinary database structures of an association [4]. As indicated by Gartner, Big Data is included high Volume, high Velocity, and high Variety information, which he calls 3V's. The information is too enormous and can't be taken care of effectively, it moves with over the top speed streaming in and out, making it hard to investigate. At long last, the range and sort of information sources are too incredible to even think about assimilating [5]. The demonstration of social affair and putting away a lot of information for possible investigation isn't new. Since 1950s, organizations were utilizing essential analytics to
reveal concealed examples and patterns, show changes after some time, and affirm or challenge speculations. As undertakings have amassed more extensive pools of information in huge information stages, it has made expanded open doors for them to dig that information for predictive bits of knowledge. Regularly, associations can't deal with the information successfully with current database models rather they should pick an elective method to process Big Data to pick up an incentive from it. An all around characterized information the board system is fundamental to effectively use Big Data in organizations around the globe. Information and analytics are assuming vital jobs in improving upper hand. [6] Analytics, as business knowledge, is characterized as a lot of advances, procedures, and apparatuses that utilization information to foresee likely conduct by people, hardware or different sources. By utilizing the privilege analytics, Big Data can convey more extravagant bits of knowledge and reveal concealed examples and connections. More information could convert into more conceivable outcomes for a business just on the off chance that it can find the importance within it [7].

III. OVERVIEW OF PREDICTIVE ANALYTICS

Predictive Analytics is an augmentation of Data Mining innovation. Both depend on a tremendous measure of scientific hypothesis going back to quite a few years. Information mining innovation inspects a lot of information. One can filter through all the disorderly and dreary commotion in information to find examples and utilize that data to survey likely results, and after that settle on educated choices. Information Mining alludes just to past information and reveals connections between quantifiable factors. In spite of being around for so long, Data Mining has not yet achieved the business standard. Customary Business Intelligence is a lot of advances, applications, foundation, and best practices that total information from various sources, set up that information for investigation, and after that give detailing and examination on that information to advance choices and execution. These frameworks are explicitly created to work by associations' examiner and advanced for supporting administrative choices that require accumulated perspectives on data from over a division, unit, or whole association.

Predictive analytics is the natural evolution of BI processes, tools and technologies to forecast future activities, behavior and trends. While BI focuses on historical analysis, analytics builds upon this set of technologies and techniques to re-focus on the future. Traditional BI platforms focus on data preparation and integration and provide analysis via scripting, reports, interactive visualizations, and static dashboards. A critical weakness of customary BI is its idleness in accepting reports. When the chief got the reports, it commonly was past the point where it is possible to attempt any activity. Installed analytics encourage in managing and tending to that inertness by moving from responsive analytics to proactive analytics. Installed analytics embeds knowledge or a lot of firmly incorporated abilities inside the ordinary frameworks or applications, for example, (CRM, ERP, showcasing or budgetary frameworks) that representatives or clients use to improve the analytics experience.

![Predictive Analytics](image)

**Fig 1 Predictive Analytics**

This makes clients increasingly beneficial by joining knowledge and activity in a similar application. There is no requirement for clients to switch between different applications to determine bits of knowledge and make a move. Figure 3 demonstrates the connection between conventional BI and predictive analytics. Predictive Analytics enables associations to wind up forward looking, envisioning and choosing dependent on the information not on suspicions. The accompanying procedures condense steps taken to execute Predictive Analytics:

- **Problem Definition**: Define the undertaking results and business goals. Distinguish the informational collections which will be utilized;
- **Data Collection**: Collect information (organized or unstructured information) from various hotspots for investigation;
- **Data Analysis**: Analyze information utilizing distinctive procedures including investigating, cleaning, displaying, and changing information. The goal is to find helpful data;
- **Statistical Analysis**: Use standard factual models
to approve and test the speculations and the presumptions;
Modeling: Use predictive displaying to make exact predictive models or the best arrangements about future 
Implement Actions: Deploy the expository outcomes in consistently basic leadership process. Screen and audit the model execution to guarantee the it gives the normal outcomes.

IV. ADVANTAGES OF PREDICTIVE ANALYTICS
Conventional analytics require critical improvement time and are available just inside an analytics storehouse that must be gotten to independently. Customary BI devices measure and contrast recorded information with reveal what has occurred before. Then again, predictive analytics utilizes that equivalent data to empower snappy and precise determining. A considerable lot of the advantages offered by predictive analytics are explicit to business applications where analytics is flawlessly coordinated. Be that as it may, associations of all sizes are utilizing Predictive Analytics to help business center capacities, for example, advertising, promoting, deals, and hazard the executives. As per a few ongoing examinations, associations that fuse predictive analytics devices into their business methodologies can understand noteworthy advantages including [8, 9, 10, 11]:
- Optimize profitability and cost proficiency;
- More fast ID of rising chances;
- Higher dimensions of benefit;
- Greater client faithfulness and maintenance;
- Faster recognition and revisions of issues;
- Reduce chance, dispose of waste, and quicken time to progress;
- Determine genuine procedure limit;
- Reduce process duration;
- Optimize assets particularly staffing dimensions and calendars;
- Improve hardware upkeep and dependability;
- Real-time experiences of gear wellbeing and execution;
- Improve accessibility, unwavering quality and basic leadership;

Predictive analytics arrangements change crude information into straightforward and noteworthy experiences. It helps organization staff to exploit the enormous measures of information and use it to settle on ongoing choices that have an essentially positive effect on hardware upkeep and dependability. Early cautioning identification and conclusion of hardware issues help representatives work all the more adequately plan important upkeep and stay away from potential gear disappointment. Predictive analytics arrangements can distinguish issues days, weeks or months before they happen, making time for staff to be proactive. Associations can use predictive resource analytics answers for invest less energy searching for potential issues and additional time taking activities to benefit from each advantage. A few late examinations have reported the key advantages of fusing predictive analytics into association's business knowledge methodologies. An ongoing experimental investigation of 205 Indian assembling associations found that Predictive Analytics had huge effect on social execution and natural execution [12]. Another IBM-supported investigation by Ventana Research found that 68 percent of associations that have executed predictive analytics have picked up an upper hand from it [13]. The examination recognized other noteworthy points of interest including finding new income openings, expanded productivity and client administration, and increased operational efficiencies.

V. CHALLENGES OF PREDICTIVE ANALYTICS
Predictive Analytics faces various execution challenges. A Predictive Analytics Benchmark Research directed by Ventana Research for the benefit of IBM recognized a few difficulties associations have experienced in their utilization of predictive analytics. The investigation additionally recognized the biggest business obstruction to the successful organization and utilization of predictive analytics.

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<th>Technical Challenges</th>
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<tr>
<td>Difficulty of coordinating predictive analytics into association's data engineering; Difficulty of getting to source information; Difficulty of utilizing the outcomes; Volume of data</td>
<td>Lack of assets including spending plan and aptitudes; Lack of mindfulness - a comprehension of how to apply predictive analytics to business issues; Lack of in-house specialists to execute the outcomes; Low precision of results.</td>
</tr>
</tbody>
</table>

These difficulties fall in two classes of technical and organizational difficulties as featured in Table 1 and outlined underneath [14]: Difficulty of coordinating predictive analytics into association's data engineering; Difficulty of getting to source information; Difficulty of utilizing the outcomes; Lack of assets including spending plan and aptitudes; Lack of mindfulness - a comprehension of how to apply predictive analytics to business issues; Lack of in-house specialists to execute the outcomes;
• Focusing on past example;
• The information is too costly to even think about measuring;
• Low precision of results.

Associations ought not to approach predictive analytics as they do other IT anticipates. At the point when predictive analytics is executed appropriately, the business advantages can be considerable. Be that as it may, there are some for the most part key traps to keep an eye out for: Plan ahead: Companies hoping to exploit PA apparatuses should ponder usage forthright. Organizations need to begin with a thorough appraisal of analytics needs, and inner assets and abilities; Make information available for investigation: As with different sorts of business knowledge and business analytics activities, predictive analytics applications must consolidate successful information the board techniques so as to coordinate, bind together and institutionalize information originating from various source frameworks. Without a powerful information the executives’ methodology, analytics endeavors are squandered; Do not Use unpracticed specialists: Implementation of predictive analytics requires information of insights, relapse, and different analytics devices and systems that probably won't be found inside the association. Contract a skillful group made out of information experts, business examiners, analysts, and information engineers; Define the Role of Data Scientists: Organizations frequently give information researchers an excess of obligation and put excessively accentuation on the job of information researchers. Most information researchers don't comprehend business rehearses. Business chiefs ought to be the ones accountable for recognizing the sort of practices and patterns the association ought to anticipate; . Focus on one business activity at the time: Limit the quantity of measurements you track and spotlight on one business activity at once. One should be firmly engaged. Following an excessive number of pointers and following a few business activities can turn into a diversion on the grounds that the human cerebrum essentially can't understand persistently expanding snippets of data at one time.

VI. APPLICATIONS

The market for Big Data analytics specifically parallels the development of Big Data. As indicated by research firm IDC, overall income for Big Data analytics was $130 billion out of 2016. That number is required to reach $150.8 billion out of 2017 and develop to more than $210 billion by 2020 speaking to a 56 percent expansion in only four years. The enterprises driving a lot of this development in 2017 are managing an account, discrete assembling, process fabricating, administrative/focal government, and expert administrations. Together, these five ventures will burn through $72.4 billion on Big Data and business analytics arrangements this year. They will likewise remain the main five enterprises in 2020 when their all out speculation will be $101.5 billion [15].

Predictive analytics is turning into a standard application as associations progressively hope to estimate client conduct, advertize patterns, powerful medicinal medications and that's only the tip of the iceberg. The business esteem picked up from predictive analytics endeavors can mean critical sums. Information of what a specific client is probably going to purchase straightaway, which bit of assembling hardware may separate, and so on can pay profits now.

Predictive Analytics is utilized to anticipate: stock costs, chance, wrongdoings, mishaps, medical issues, emergency clinic confirmations, glitches, oil stream, power blackouts, deals, gifts, clicks, abrogation, misrepresentation, tax avoidance, wrongdoing, endorsements for government benefits, considerations, goal, answers, assessments, lies, grades, dropouts, kinship, sentiment, pregnancy, separate, occupations, stopping, wins, votes, and the sky is the limit from there[8].

Below is the list of business sectors that make use of Predictive Analytics:

Banking, Financial and Insurance: The managing account and budgetary ventures are utilizing analytics so as to examine the probabilities of hazard and default. In addition, analytics encourages them to push their managing an account items dependent on client's obtaining power. The monetary market utilizes analytics in high recurrence exchanging estimation, and pre-exchange choice help analytics. PayPal is utilizing predictive data analysis to help shield its clients from extortion and stop deceitful exchanges before they are prepared [16]. The Security Exchange Commission (SEC) is utilizing data analytics to screen money related market exercises and to get unlawful market exercises. Insurance agencies use analytics to upgrade extortion identification and to give quicker administration in the territory of cases the executives. Life coverage organizations are utilizing it to anticipate the probability an older protection approach holder will pass on inside a couple of years so as to trigger end-of-life directing. Credit scoring is another notable
application for predictive analytics. Monetary organizations utilize a scope of data to survey the probability of future credit installments being made;

A. Healthcare:

The human services industry has utilized analytics to dissect a lot of data rapidly so as to give lifesaving findings or treatment alternatives in an opportune way. Walgreens is utilizing data analytics to make its drug store tasks as client engaged as could reasonably be expected and to customize collaborations with clients and envision their requirements. The organization is utilizing predictive analytics as a component of patient appraisals at its in-store wellbeing facilities. The analytics procedure is gone for improving patient consideration and distinguishing potential wellbeing dangers before they move toward becoming issues [9].

B. Airline Industries:

The carrier businesses over the world are utilizing analytics to foresee flight delays, viably drive client faithfulness programs, and choose what number of tickets to move at each cost for a flight. Southwest and Alaska Airlines are among the best clients of grasped analytics to get changes their method for working;

C. Government:

The legislature is utilizing design acknowledgment in pictures and recordings for improved security and danger location [8,17]. Different uses of analytics in government part include: traffic control, course arranging, clever transport frameworks, and clog the board [18]. The Social Security Administration (SSA) is utilizing analytics to examine social incapacity claims for identification of suspicious or deceitful cases. Also, analytics empowers the SSA to process restorative data quickly and viably for quicker basic leadership;

D. Manufacturing:

Analytics apparatuses have been utilized in unraveling fabricating difficulties including request estimating, coordinated business arranging, supply joint effort and hazard analysis, and in stock administration. Store network experts have utilized Predictive analytics to improve inventory network efficiencies. Predictive analytics can assist makers with satisfying the expanding requests of shoppers who expect items conveyed precisely when guaranteed. Store network experts need a total perspective on their production network as it exists now, yet in addition having the capacity to know where their inventory network should be. By applying predictive analytics instruments to distinguish designs and foresee future occasions, producers gain the capacity to settle on better choices that envision what their clients are requesting now, and will request later on. Data analytics is likewise utilized in self-driving vehicles and robots [11]. Figure 9 demonstrates key advantages of Predictive Analytics in assembling;

E. Retail:

Predictive analytics is additionally being utilized for logical advertising and retailing. The retail business exploits data analytics for extortion decrease, auspicious analysis of stock, and for enhancing staff utilizing data from shopping examples and neighborhood occasions, and so forth. In addition, the industry is additionally utilizing data analytics to decide client reactions or buys and set up for up moving and strategically pitching chances. [18]. For instance, Target utilizes predictive analytics to anticipate which clients had the most likelihood of quickly getting to be pregnant from shopping conduct [19]. The data is then used to contact prospects with offers identified with the requirements of an infant’s folks. Tesco is a huge supermarket working in 13 nations with central command in UK. The organization utilizes predictive analytics to expand reclamation rates of 100 million customized coupons issued every year at its basic need money enlists crosswise over 13 nations.

F. Logistics:

Logistic organizations (UPS, DHL, and FedEx) have utilized analytics to lessen costs and improve their operational effectiveness [20]. Predictive analytics guarantees ships remain on shipshep for freight organizations. For instance, Right Ship, a Melbourne-based freight organization, is utilizing predictive analytics to all the more precisely survey if ships are prepared to be conveyed to the ocean [11].

G. Education:

Authorities at the University of Maryland, utilize predictive analytics to investigate understudy data including grades, socioeconomics, budgetary guide, course calendars, and enlistment status to discover in danger understudies and improve standard for dependability. They accept predictive analytics empowers authorities to intercede with battling
understudies before it is past the point of no return. Analytics help authorities distinguish bottle necks and issues, for example, a troublesome class or other problems that need to be addressed that could lead understudies to drop out. Analytics is utilized to anticipate understudy achievement or disappointment. One of their discoveries is that understudies who select a course exceptionally late tend not to perform well in that class. In this manner, the new school's strategy isn't to let any understudy to take on a class few days before the class begin. The understudy can drop a class four days after the class begins without a punishment. The college is likewise utilizing a data instrument called Student Success Matrix that is created by Predictive Analytics Reporting Framework. Utilizing the analytics apparatus, framework authorities can decide if a ‘C’ grade in a starting showcasing course demonstrates a low shot of understudy to graduate in the major. At that point, they use “Intrusive advising” to assist understudy with improving evaluations or change majors. [22]. College of Phoenix likewise predicts understudy achievement or disappointment so as to target intercession measures including exhorted and instructing. College of Melbourne utilizes a predictive model to recognize which applications for research awards will be endorsed [8].

I. Social Networks:

Active utilization of informal organizations for meeting new individuals is amazing. Social destinations like Match.com, e-Harmony, OkCupid, Tinder, and Badoo utilize some very modern predictive analytics to demonstrate and foresee human fascination. They offer an intuitive route for singles to meet different singles with whom they may somehow or another never run into each other [10]. Facebook utilizes analytics to improve the exactness of recommended individuals you may know and wish to connection to [8].

J. Sports:

Competitive games are a substantial client of predictive analytics. The utilization of analytics to a wide assortment of games is currently standard practice. When marking players, choice advisory group breaks down several point by point measurements from each player and each diversion, endeavoring to foresee future execution and generation. A few insights are even gotten from amusement film by utilizing video acknowledgment procedures;

K. Human Resources:

HR Analytics was the underlying term used to depict the viability of HR programs. Be that as it may, as of late alternate terms came into utilization uniquely, people analytics, ability analytics, and workforce analytics. People analytics has to a great extent turned into the overwhelming term. People analytics applies math, measurements and predictive displaying to HR related data to foresee examples and settle on better choices pretty much all parts of HR procedure with the targets of improving association execution. People analytics is being utilized to help more organizations in their enlisting, remuneration, execution the board, and maintenance endeavors [21]. So also, people analytics have been utilized to figure out which representatives are well on the way to leave, valuate workers’ execution, and choose representative's reward. For instance, Hewlett-Packard has built up a predictive analytics application to figure the likelihood of workers leaving [19]. U.S. unique powers utilizes predictive analytics to figure out which applicants will be effective and deserving of contributing long stretches of preparing. LinkedIn is likewise utilizing predictive analytics to name one's profile with aptitudes it predicts ones have from ones composed substance. Wikipedia predicts which of its about million volunteer editors will suspend their work [8].

L. Marketing, Advertising and the Websites:

Google is a substantial client of predictive analytics and is ceaselessly changing the scene of hunt with this innovation. Utilizing predictive analytics, Google Suggests, Google AutoComplete and Google Instant are creating indexed lists in a split second as clients’ sort. Google additionally improved predictive inquiry, filling in as a customized collaborator that can foresee your necessities, needs, and profound wants. Netflix is additionally utilizing predictive analytics to foresee which films a supporter will like dependent on what he/she viewed [10]. English Broadcasting Company (BBC) gets a large number of endeavored posts on its sites. BBC predicts which remarks will be endorsed for posting on its site diminishing all out quantities of presents which required on be screened by human arbitrators to just a fourth of a million. PayPal use client composed input on its site to evaluate workers' execution, and choose representatives are well on the way to leave, analytics have been utilized to figure out which maintenance endeavors [21]. So also, people analytics, ability analytics, and workforce analytics. People analytics applies math, measurements and predictive displaying to HR related data to foresee examples and settle on better choices pretty much all parts of HR procedure with the targets of improving association execution. People analytics is being utilized to help more organizations in their enlisting, remuneration, execution the board, and maintenance endeavors [21]. So also, people analytics have been utilized to figure out which representatives are well on the way to leave, valuate workers’ execution, and choose representative's reward. For instance, Hewlett-Packard has built up a predictive analytics application to figure the likelihood of workers leaving [19]. U.S. unique powers utilizes predictive analytics to figure out which applicants will be effective and deserving of contributing long stretches of preparing. LinkedIn is likewise utilizing predictive analytics to name one's profile with aptitudes it predicts ones have from ones composed substance. Wikipedia predicts which of its about million volunteer editors will suspend their work [8].
a style originator, predicts and gauges interest for ladies' design line items. At long last, Pandora suggests related melodies dependent on 400 melodic characteristics [8].

VII. CONCLUSION

Endeavors are ceaselessly utilizing new and old methodologies to beat industry challenges and stay applicable in the evolving commercial center. Adjusting to new conditions, developing new contributions and putting resources into cost-sparing innovations are only a couple of roads for changing difficulties into circumstances. In the course of recent years, the sheer volume of data has developed exponentially and new analytics instruments have been created to turn this surge of unstructured, semi-organized, and organized data into experiences. The measure of data accessible is furnishing undertakings with the data expected to work all the more proficiently, viably, and securely, therefore enabling them to defeat a portion of the testing and problematic deterrents. Use and the board of the Big Data are progressively getting to be territories of upper hand. Predictive analytics programming is one of the vital devices that organizations can use to get significant data from the practical data. Subsequently, ventures are receiving predictive analytics as one of the center innovations to probably contend in the market. As examined in this paper, innovation patterns, for example, more noteworthy computational power, expanded data stockpiling limit, the development of cloud-based stages, and advances in calculations have all added to a leap forward in the field of BI and are helping quick advances in Predictive Analytics programming. Predictive Analytics arrangements enable associations to anticipate patterns and follow up on circumstances before they show. Organizations that fuse predictive analytics into their business insight techniques can understand huge advantages through increasingly quick ID of rising chances and quicker location and adjustment of issues and issues. Notwithstanding, as examined in this paper, there are mechanical and authoritative downsides to predictive analytics. The imperative ones are the measure of cutting-edge data it requires and absence of in-house specialists to actualize the outcomes. While this would not be an issue for bigger associations, littler firms may not see as helpful innovation thus. Associations around the globe are working in an undeniable mind boggling and focused condition. This paper recognized contemporary difficulties confronting associations and investigated the capability of predictive analytics in tending to these difficulties. Furthermore, this paper proposed an applied structure for fruitful usage of analytics in various associations. Also, this investigation featured the utilizations of Predictive analytics crosswise over various ventures, for example, keeping money, monetary administrations, and protection, government, social insurance, retail, and vitality, among others. The paper additionally contended that associations ought to consider analytics a vital venture on the grounds that including new logical capacities influences an association's current applications, gadgets, administrations, and sites. Critical choices, for example, the most ideal approach to convey scientific substance and answer to clients and representatives, and guaranteeing that investigative substance is connecting with must be made. Business pioneers should likewise assess how a predictive analytics activity will influence clients (outer and inner), existing applications and interfaces, and multiple stakeholders such as executives, managers, marketing and sales personnel.

REFERENCES


Energy Efficient Minimum Spanning Tree for Wireless Sensor Network

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Abstract—A wireless sensor network (WSN) is consisting of a set of sensor nodes with a limited energy stored in their batteries. Generally, replacing or charging the battery is hard and inefficient. Further, the main critical aspect of applications based on wireless sensor networks is their lifetime. Therefore, judicious power management with optimized routing protocols can effectively optimize the energy consumption of sensor nodes and thus extend the network lifetime. In this paper, an optimized routing protocol for wireless sensor nodes is proposed. We are interested in constructing an efficient routing spanning tree that minimizes the energy consumption among all nodes in the network and fit for WSN with reduced energy for achieving a longer lifetime. The main idea of this algorithm comes from the Minimum Spanning Tree (MST) graph theory. This approach focuses on the minimal hop count of each node to reach the destination (sink node) within an optimal path.

Keywords—Wireless Sensor Networks; Network lifetime; Energy consumption; Routing protocols; Minimum Spanning Tree.

I. INTRODUCTION

Wireless Sensor Networks (WSNs) have been widely used in numerous real-life applications, such as health care, pollution monitoring, target tracking, fault detection, or environmental measuring (temperature, humidity, pressure, position, vibration, sound, etc). Every single node mainly includes various components such as a radio transceiver with an antenna, a microcontroller and an energy source typically a small battery difficult to recharge or replace due to the unattended and harsh environment, which makes it constrained in energy for long-term deployment. Routing in WSN is a very important task that determines how the routes are discovered and how to efficiently deliver data from source to destination even if the routes in between are broken, so as to establish a communication. So, many routing protocols have been proposed by researchers or industries in order to optimize the energy consumption and to maximize the network lifetime. Energy consumption, node deployment, scalability, connectivity, coverage and security are the main challenges of routing protocols for WSNs [1]. In this paper, an improved routing algorithm is proposed. It can effectively improve the network lifetime and ensure a minimal power consumption. The proposed protocol utilizes a “minimum hop distance to reach the destination” as path selection criteria in every node belonging to a minimum spanning tree (MST) network. As in [2], the path selection criteria is a measure used by a routing protocol for selecting the best path among all the possible paths between a pair of nodes (source and destination). The path selection criteria is usually based on weights, which can be either the sum of distances cost along the communication path, or the number of hop to reach the destination node. In this paper, we want to demonstrate the Performance of our proposed routing protocol by comparing two different path selection criteria’s in term of energy efficiency: distance-based and minimum hop count-based routing criteria’s. The rest of this paper is organized as follows: Section II proposes a global presentation of the multi-hop communication for WSNs, as well as the MST graph theory that our work is based on, and some related works. The proposed approach is presented in section III and the simulation results of the routing algorithm are provided. Finally, a conclusion and a discussion are presented in Section IV.

II. BACKGROUND

A. Multi-hop communication

Wireless sensor nodes can communicate in two ways: single-hop or multi-hop communication, as seen in Fig. 1. In multi-hop communication, a packet has to go through different nodes in order to reach its final destination address. In a Single-hop communication, all the sensors (blue circles in Fig. 1) can send the collected information, directly to the sink node (red circle in Fig. 1).
The design of each type of communication is based on energy conservation of the sensor node. In this paper, a multi-hop network topology has been adopted. Our purpose is to optimize the energy consumption of each sensor. To do so, we propose to find the shortest path of transmission that costs the minimal number of hops to deliver the packets between the source and its destination.

As a result, aggregated data is efficiently transmitted along the shortest path through multiple hops from nodes towards the sink, helping to reduce the number of individual transmissions.

B. Minimum Spanning Tree

The proposed WSN can be modelled as a connected graph $G = (VG, E)$, where $VG$ is the set of $N$ fixed sensors, and $E$ is the set of wireless links. This work is based on the minimum spanning tree (MST) concept of graph theory, for finding the shortest path to connect all the nodes in the network. By constructing the MST with a given set of nodes, we can route in an efficient manner the data from all sensor nodes to the sink with a minimum number of hops in a short time.

A MST of an undirected and connected graph is a sub graph that connects all the vertices of that tree with a minimal overall edge weight. A single graph can have many spanning trees. The overall weight of a tree is the sum of weights of its edges. Obviously, different spanning trees will have different weights or lengths [3]. The MST is constructed using either the Kruskal’s algorithm [4] or the Prim’s algorithm [5]. The location of the root node is not taken in consideration in these algorithms. In our work, the MST is constructed using the Prim’s algorithm.

C. State of art

With the purpose of optimizing energy consumption during communication, the metric of optimal hop number or corresponding individual distance is preserved as the main issue. Indeed, it influenced on many network metrics like energy consumption, latency, routing overhead, etc. [6]. In [7], the authors studied different energy models under general wireless network environment. The authors in [8] presented the selection of transmission manner from probability point of view. They presented a probability of $P_i$ to transmit data through multi-hop manner and a probability ($1 - P_i$) to transmit through single hop manner to sink node. Also, the energy consumption by using single-hop or multi-hop transmission is studied by authors in [9]. They confirmed that choosing multi-hop or single hop routing protocols is subject to the reception cost and the distance between source and sink. In [10], the author suggested a Multi-hop/Direct communication scheme to divide data traffic into two branches. He used in his work multi-hop transmission to optimize energy consumption and enhance the performance of the network lifetime. In [11], the authors proposed a Hop-based Energy Aware Routing (HEAR) algorithm in order to reduce energy consumption and prolonging network lifetime. Routing based on the Minimum Spanning Tree (MST) graph theory is frequently used by researchers for networks energy efficiency issues, but it doesn’t takes into account both the minimum cost of edges and the average of the residual energy of nodes during the construction of the spanning tree. In this work, we proposed a novel approach for constructing an energy efficient spanning tree based on the minimum hop-count to route the data from sensor nodes toward the sink node and the maximal residual energy of each node.

III. PROPOSED ENERGY-EFFICIENT ROUTING PROTOCOL

A. Network Model

Let a node $s \in VG$ a sink node $sk \in VG$. Let Path $(s1, sk)$ be the sequence: $s1, s2...sk$. We define Hopcount $(s1, sk)$ as the number of hops along the Path $(s1, sk)$. We recall that Hop count $(sk) = 0$. In this work, the energy model of the sensor network has been designed with only the communication energy. First order radio model is used for the calculation of energy consumption. In this simple radio model, it is assumed that the energy dissipated to run the transmitter circuitry $Eelec$ is the same as the receiver circuitry. An illustration of the first order radio model is shown in Fig. 2. Let $ETx$ and $ERx$ the energy consumed during the transmission and the reception respectively. In our work, we assume that all transmissions over the network have data packets of the same size.

B. Proposed Protocol description

Problem Statement: A network is composed of $N$ static nodes randomly deployed in an uncertain area, each node having a communication range.
of radius R. The N static nodes communicate data to a single sink node which has fixed coordinates in advance and presents the final recipient of all the sensed data. The aim is to transfer the data between nodes and the sink node, by calculating the shortest path using the minimum number of hops between the intermediate nodes and the sink node.

Assumptions: Sensors are assumed to be homogeneous (same computing capability, memory...) and know its fixed geographic location in advance. We also assume that location of the sink is fixed and known to all the nodes in the network.

Motivation: A set of 30 nodes, then 100 nodes randomly deployed over an area of 100x100 meters communicating with each other’s within a communication range of radius R=20 meters, as shown in Fig. 3 and Fig. 4 respectively. The sink node is located at (0,0). We provide an energy consumption and a Hop count parameters as the modification to the above classical Prim’s algorithm to form a minimum spanning tree (MST) as an energy efficient tree. Our algorithm generates a MST which is constructed from the sink taking as inputs, for the same topology, the residual energy of each node and either the minimal distance between nodes involved in the communication of data (distance-based routing as shown in Fig. 6 and Fig. 8) or the minimum number of hops within each path to route the data (hop-based routing as shown in Fig. 5 and Fig. 7), with respect to minimize the energy consumption per node as much as possible. Each iteration considers the lowest cost edge (minimum number of hops or minimal distance in addition to the minimal energy consumption for the transmission) within its communication range R to extend the tree with one more node. Based on the adjacent matrix that shows the number of hops of each node to reach the sink and on values of energy consumption per node, the algorithm calculates a cost for every edge connected to the sub tree, chooses the lowest cost edge and adds the node in the tree. Then, it determines all optimal routes between nodes and the sink within the tree. In order to ensure the establishment of an optimal path that minimizes energy consumption during data transmission, we aim to minimize the count of nodes involved in the N transmission (i.e. number of hops). The sink maintains a route table containing all the shortest routes, i.e. those with a minimum Hop count and maximal residual energy RES(s, r) per node, to all nodes in the network. In table I, the Example of RoutesSink table illustrates an example of routes between the sink (assuming that the ID of the sink is 1) and some network nodes by the hop-based routing and by the distance-based routing. After retrieving incoming messages from the sink, each sensor maintains a route table containing the optimal route to transmit data collected to the sink. We can conclude from the table I that the RoutesSink resulted from the hop-based routing is more simplified (i.e. minimal number of intermediate nodes in the path) comparing to that resulted from the distance-based routing. In this way, the number of hops and messages transmitted will be reduced which minimized energy consumption of nodes

IV. Result Analysis

MATLAB platform has been used to evaluate the results. Some assumptions are made to simulate the results as discussed:

- Starting energy of each nodes is equal
- Nodes are fixed
- Distribution of nodes is homogeneous in nature
- For energy dissipation, limited transmission range is used.
- Data is transmitting through nodes only.

The different parameters used in proposed work are given in table 1. The performance parameters are analyzed using MATLAB 2016a.

Table 1: Simulation Parameters for present work

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of sensor nodes</td>
<td>100</td>
</tr>
<tr>
<td>Starting node energy</td>
<td>0.1 J</td>
</tr>
<tr>
<td>Percentage of CH selection</td>
<td>0.05</td>
</tr>
<tr>
<td>Transmitter/Receiver electronics</td>
<td>50 nJ/bit</td>
</tr>
<tr>
<td>The energy for aggregation E_{DA}</td>
<td>5 n J/bit/signal</td>
</tr>
</tbody>
</table>

Figure 3 represents alive nodes during each round. Advanced LEACH MAC protocol for heterogeneous network having more no. of alive nodes as compared to traditional PIT protocols. Numbers of alive nodes are maximum from 100 to 400 rounds as shown in Figure. After this level alive nodes are decreases because of the enhancement in number of rounds. It has been observed from the results that the energy and the lifetime of proposed advanced LEACH MAC
 protocol are enhanced by the 40% in comparison to the traditional PIT.

Figure 4 Packet Sent to base Station

Figure 4 represent packet sent to base station. There are two methodology used to achieve packets transfer. Packet transfer is more in proposed methodology as compared to traditional PIT.

Figure 5 Packet Sent to base Station

Figure 5 represent packet sent to base station. There are two methodology used to achieve the packets transfer. The packet transfer is more in proposed methodology as compared to traditional PIT.

V. CONCLUSION

The proposed work offers priority to the higher energy node for the selection of cluster head. Simulation results show that LEACH-MAC improves the overall lifetime of the network. This approach has brought down the cluster head variations in the optimal range. Energy efficient algorithm has been proposed for enhancing the energy and lifetime of the network. Results of the energy efficient algorithm have been presented through the simulation using MATLAB platform. The results show that the energy and the lifetime of devised model have been enhanced by the 40% in comparison to the traditional LEACH protocol. In future, advanced LEACH can be applied to real time environment.

REFERENCES

Cloud Computing – Architecture
An Overview

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Abstract --- Resource sharing is one the key aspects being looked into in the field of computer networking application with its optimum utilization. In the time when cost cutting is one of the major focus areas along with the quality by the companies, cloud computing has the solution for them. To make the best use of cloud computing we need to understand the architectural aspect along with the security as there are more than one entity using the same resource simultaneously or at different times. Cloud computing has its applications in almost all possible fields due to its positive results in terms of cost cutting, efficiency, reliability, scalability. This paper discusses the various architectural models of different companies. It also gives an comparative insight view of different companies with respect to various cloud computing parameters.

I. INTRODUCTION

Cloud[1] computing is relatively new way of utilizing the shared resources and can be considered as an alternative to the private server based applications. Cloud computing considers a large number of servers along with other resources and allows users to utilize them, as and when required by them on their demand, as a chargeable service. The end users need not to worry about the physical location of the resources and these services can be used around the globe. Cloud Computing application development depended largely on its architect because the infrastructure used in cloud computing is demand oriented and releases as soon as the purpose is solved. With the greater advantages and utilization of cloud computing, we must not forget that the data/information is open to public domain and thus can be accessible to all. Thus security in terms of data & infrastructure is the major concern in cloud computing.

As shown in fig 1, number of applications like ERP, BI, CRM etc can be developed with cloud architecture. Conversion of word files to PDF, OCR to editable text, changing the size/resolution of images, websites are few applications that make use of cloud architecture.

II. ARCHITECTURAL CONSIDERATION

Architecture, be of any field, evolves over time. With the introduction of Personnel computers, the demand of network and infrastructure grew at a great pace leading to separation of the application tier and server tier. With the advancement in technology and passage of time services became more and more distribute, Cloud computing has become the distributed virtualized solution. There[2] are a number of reasons for effective architecture of cloud applications and networks as compared to traditional networks. Few of them are:
1. An application might require large number of machines which is very difficult to manage.
2. It is difficult to manage machines on time.
3. It is difficult to distribute large scale jobs on different machines.
4. For large scale infrastructure, it becomes underutilized after the completion of the job and is difficult to scale up.

The cloud architecture design must be simple and care must be taken to avoid complexity in design. The application preferably be split into different systems and must be loosely coupled. The splitting should be in the form of clusters as per specifications so that any change with respect to the cluster will not affect any other cluster. Also the design should be network based. The scalability factors of cloud computing adds to the complexity to the cloud architecture. Cloud computing have evolved with time from different states as discussed in fig 2. Different companies are providing different services like PaSS, SaaS, IaaS etc. Cloud computing has evolved from initial networking i.e grid computing through utility computing to its current stage. As shown in fig 2 Grid computing solved large problem with parallel computing. Utility computing offered the resources as a metered service. SaaS was introduced as a network based subscription to the application.
There are various architectural models that can be implemented for designing a cloud. For instance we can have multi-tier architecture

- **Presentation Tier**: This tier usually provides the user interface for any application. This interface can be with respect to software environment or software infrastructure.
- **Logic Tier**: This tier provides back end logic implementation of various cloud applications. This layer is mostly responsible for resource management, security and communications.
- **Data Tier**: This tier is basically responsible for data storage management.

The above said multilayered architecture can also be related to basic cloud architecture as displayed in fig 3. This basic architecture lacks security layer which is of very high concern.

![Diagram of multilayered architecture](image)

**Fig. 2**: Grid computing solved large problem with parallel computing

**A. Basic Cloud Architecture [6]**

<table>
<thead>
<tr>
<th>Google Apps, Rails One, Mosso, Amazon, Force.com</th>
<th>Salesforce, Gmail, Gliffy</th>
<th>Joyet, Amazon Web Service, Akamai, Nirmanix, Xcaliber, Window Azure, Rackspace, Gogrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>Saas</td>
<td>IaaS</td>
</tr>
<tr>
<td>Cloud Computing</td>
<td>Utility Computing</td>
<td>Grid Computing</td>
</tr>
<tr>
<td>Cluster Computing</td>
<td>Super Computing</td>
<td></td>
</tr>
</tbody>
</table>

![Diagram of basic cloud architecture](image)

**Fig. 3**

With this basic cloud architect, various companies have developed their own architecture to provide cloud services in the market. We will be discussing the architect of CISCO, AT&T and Oracle here.

**B. CISCO Cloud Architecture [7]**

![Diagram of CISCO cloud architecture](image)

The Architecture of CISCO Cloud is represented in fig 4. The hosting of services in the cloud for the users is done by the network/storage/compute blocks. The security is taken care by security layer and the resource mapping/service details are stored in orchestration layer. As compared to basic cloud architecture the SaaS layer is taken care by cloud service consumer, PaaS by Service delivery and management, IaaS/DaaS/CaaS by Network/Storage/Compute.

In addition to architecture with respect to hardware, service providers also implement service based architecture. Fig 5 and fig 6 displays the architecture of AT&T and IBM[8] respectively.

**C. AT&T Cloud Architecture**

![Diagram of AT&T cloud architecture](image)

As shown in fig 5, the user accesses the cloud service after passing through the security checks at the initial stage. This architecture helps in accelerating the communication
process. The user enjoys the services through virtual environment here PaaS, IaaS and DaaS are part of it.

D. IBM Cloud Architecture

IBM cloud architecture is self explanatory as shown in fig 6. AaaS, PaaS, IaaS are the IBM cloud delivered services and the platform supported by IBM are business and operational.

As shown in fig 7, Oracle provide services in the form of software, platform and infrastructure. The software service includes the user interface and applications. The platform service consists of data management and security. Hardware management is the part of infrastructure management. The policies, configuration in addition to the charges applicable to the user and charge-back are also dealt with extreme care.

III. CLOUD COMPUTING PARAMETERS

While designing any architect the following parameters are to be considered.

- **Services Used**: Various cloud services like SaaS, PaaS, IaaS etc that are provided to the customers.
- **Platform Supported**: The operating systems that would support the applications of the cloud service provider.
- **Integrated DB supported**: Various external database that a cloud service provider would support for backup.
- **SLA availability**: The service level agreement that would indicate the uptime for network and/or Service
- **Cloud services and tools**: Various tools supported /provided by the cloud service provider to its users
- **Maximum limits**: The amount of memory space that would be available to the user for the data storage.
- **Support Pricing, Policy**: The policies and pricing for the support to any of the users for the services enjoyed by them.
- **Support response Time**: Response time from the cloud service provider to the user.

- **Service credit for an outage**: The rebate to be given to the customers in case the uptime as per SLA is not met.
- **Data backup**: It is about the responsibility of backing up the user data, whether at user level or at service provider’s level.
- **Data security**: Security being the most critical aspect of cloud computing, here the security aspect is taken care of.
- **Virtualization**: Decoupling and separation of the business service from the infrastructure needed to run it

There are a number of cloud service providers in the market. Amazon, Google, Force.com, Go Grid, Windows Azure, IBM, Oracle, AT&T are to name a few. Services, platform, Database used, SLA, cloud tools, price, backup, security are certain parameters based on which the service providers can be compared.

IV. CONCLUSION

In the era when nothing can be thought of without computers and internet, we need such services that will suffice our needs with minimum cost and maximum output and reliability, cloud computing is the solution. With proper architecture and security measures, cloud computing has taken networking and internet to new heights and has made there right utilization. Keeping in mind the basic architecture of cloud, companies implement there own architecture depending on there service priorities and there perspective about the cloud. While analyzing the various architectures, both at service level and hardware level, a lot work can be done in almost all the areas of services, be it at software level, platform level or infrastructural level.

REFERENCES

[6] Lamia Youseff University of California, Santa Barbara Maria Butrico, Dilma Da Silva IBM T.J. Watson Research Center Yorktown, New York, Toward a Unified Ontology of Cloud Computing
Analysis of Clustering Algorithms for Gene Expression Data

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Abstract—With the growing demand for analyzing gene expression profiles with high dimensionality, clustering has become competent for splitting up the genes into different groups showing similar patterns with variation in expression level. Numerous techniques have been designed for clustering or categorizing genes to explore the expression data to provide solutions to real world problems. In this paper, we provide general orientation for selecting promising algorithm to cluster microarray data.

Keywords—Gene expression data, clustering, microarray data.

I. INTRODUCTION
Gene expression data is elementary for the study of genetics and bioinformatics. However, the study becomes challenging with the high dimensionality of gene expression data. Genome data could be analyzed using annotated genes. Key aspect is to effectively evaluate and analyze the gene expression data and thereby exploiting the information to provide solutions. Clustering is a powerful exploratory mechanism of learning from genomic test data based on the similarity of patterns. Clustering is the branch of unsupervised learning that is able to learn and predict information without feedback from training data. Innumerable clustering algorithms have been introduced to thoroughly assess and examine the fascinating gene patterns. Challenge lies in the fact to elect an algorithm that can quickly identify the existing patterns or clusters in the data under study. Disparate cluster formation by numerous clustering algorithms makes it a potential research area to define and scrutinize the best clustering algorithm [1]. Genomic data could be analyzed using algorithms like classical k-means clustering [2], Hierarchical clustering [3], Evocluster [4], Self Organizing Maps [5], Self Organizing Tree Algorithm [6] etc.

A. Applications of Clustering Gene Expression Data
Clustering algorithms have universally found its application to find new genetic information and utilize it in medical science. They are most prominent in mining microarray data. Gene expression data investigates cancer research provide assistance for identification of disease state and unveil the stage of disease by obtaining high quality clusters that can discriminate between diseased and healthy patients. Machine learning and data mining is evolving at a fast pace and will certainly find its new applications in coming future.

II. LITERATURE REVIEW
A huge collection of microarray data has laid down the requirements for mining valuable information from database. In recent years numerous techniques for analyzing gene expression data were proposed. Clustering algorithms have opened new avenues for analyzing Gene expression data [1]. Clustering biologically relevant patterns made it possible to understand the biological processes [7]. Conventional clustering algorithms [2][3] apply statistical approaches to partition data but they suffer from lack of robustness. Self-organizing algorithms [4][5] were introduced to overcome this problem. Further improvement in clustering algorithms resulted in a rich literature on gene expression data clustering. Ma et al. [5] presented a new approach for clustering microarray data. The method is called Evolutionary Clustering (Evocluster) which binds the data using a fitness function to reveal the hidden patterns. It is a robust technique that takes into account the global arrangement of clusters. The choice of a particular algorithm is governed by characteristics of data such as dimensionality, noise etc. In the next section we will discuss some of the clustering algorithms in details.

III. ALGORITHMS
A. Hierarchical algorithm
Hierarchical clustering algorithm works on the principle of distance between two clusters. It splits into two approaches that work in completely different ways. One approach involves clustering the data using agglomerative (bottom up) and other using divisive (top down) approach. Applications of the former approach include various variants which cluster biologically relevant data by computing distance or correlation between two clusters and using an appropriate linkage function. These variants are named as single linkage, average linkage and complete linkage build for minimum, average
and maximum distance respectively. In agglomerative approach, each data point is taken as different cluster and then smaller clusters with similar pattern are aggregated into a larger cluster successively until only one cluster is formed. The divisive clustering approach begins with a large cluster to dissociate into many smaller clusters forming a tree with child nodes. The total number of clusters at any point in the tree formation is the number of child nodes at that level.

Performance of hierarchical clustering depends on the appropriateness of selected proximity measure [8]. Proximity measure calculates the similarity or correlation between two objects. Several new measures perform more informative assessment of similarity [9]. Still, Euclidean distance is the most frequently used proximity measure which determines similarity between objects \( X_i \) and \( X_j \) using:

\[
D(i, j) = \sqrt{\sum (X_i - X_j)^2}
\]

**Advantages and Disadvantages:**
Hierarchical clustering is easy to implement and needs no prior information about the number of clusters. Although, graphical representation facilitates the researchers to get an initial idea of the distribution of data but the computational complexity and lack of robustness prevents the use of this conventional clustering algorithm. Moreover, a wrong decision at an early stage cannot be corrected later in the algorithm.

**B. K-means algorithm**

K-means is classical partition based clustering algorithm that requires a prior knowledge of the number of clusters which is the value of \( k \). The data points are associated to nearest centroid by calculating the minimum distance of a data point from its cluster centre and thus data results in \( k \) clusters.

\[
J = \sum_{m=1}^{k} \sum_{i=1}^{k_m} |X_m - \bar{X}_m|^2
\]

Where the number of is clusters, \( m \) is the centroid of \( m \)th cluster and \( m \) is the number of objects in \( m \)th cluster.

The algorithm iterates \( k \) times to compute the minimum distance \( J \). However if there is no prior knowledge about the actual number of clusters then iteration is done assuming different values of \( k \) each time and then comparing the results. Eventually the value of \( k \) that provides the desired result is chosen. A variety of variants [10-12]of the algorithm have been introduced to remove its drawbacks.

**Advantages and Disadvantages:**

K-means clustering algorithm is faster than Hierarchical but inconvenient to use because of unavailability of prior knowledge about the number of cluster in gene expression data. Additionally, the immensely large data set makes it difficult to crack the value of \( k \) through iterations. K-means algorithm is hypersensitive to noise which is commonplace in gene expression data.

**C. SOTA (Self Organizing Tree Algorithm)**

In contrary to unconstrained clustering SOTA is structurally constrained. Self organizing tree functions similar to divisive algorithm [4][13][14]. The splitting of node into two nodes occurs until a threshold of heterogeneity is reached. It results in a binary tree where the number of terminal nodes notifies the clusters at that level. It is a mixture of fundamental hierarchical tree structure and neural network’s self-organizing map. The algorithm has satisfactorily exhibited ability to cluster data of different nature. Self organizing tree algorithm can be customized to stop after specific number of iterations depending upon the distance.

**Advantages and Disadvantages:**

Computation time for the algorithm is linear which makes it suitable for large datasets. SOTA is insensitive to noise and cluster results are represented in the form of a tree. The crux of SOTA lies in the selection of appropriate distance measure.

**D. SOM(Self Organizing Map)**

Self-organizing map is an unsupervised neural network. The nodes are arranged as matrices or hexagon [15][16] with a vector of length equal to input data. Nodes have an initial value and these vectors are adapted through training process. Genes are clustered based on the similarity of gene with the vector. The algorithm performs well but the drawback is number of cluster should be fixed priori. Self organizing map is a topology preserving neural network. The clusters are characterized in terms of the properties of the expression profiles of the genes. A noticeable feature of SOM is that it generates perceptively appealing map of high dimensional data points.

**Advantages and Disadvantages:**

SOM performs efficiently with high dimensional and noisy datasets. It is more robust than other clustering algorithms due to its training process. However, it does not work well with gene expression data as it requires the user to input the number of clusters which is not known a priori due to inherent characteristics of genomic data.

**IV. COMPARATIVE ANALYSIS OF CLUSTERING ALGORITHMS**

In the earlier section, a brief of clustering algorithms have been given. This section focuses
on comparing these algorithms in a tabular form as depicted in Table 1 in Annexure I. Different parameters have been used to evaluate the performance of algorithms.

It is shown that for k-means and SOM to work well, the number of clusters must be preliminary known which is not the case with hierarchical and SOTA. Eventually, self organizing tree and hierarchical algorithm have tree topology which makes them superior as clusters can be graphically interpreted. Hierarchical algorithm is deterministic which denotes that if user input same data it will always produce same results. Contrary to hierarchical algorithm all other algorithms are non-deterministic. SOTA and SOM uses neural network that makes them robust to gene outliers. Hierarchical algorithm becomes complex with an increase in the expression data and does not achieve its desired performance goals so self organizing algorithms are used with highly dimensional data.

Although recent analysis of gene profiles is performed through Clustering algorithms [18] but for a novel researcher, conventional clustering algorithm are the basis for understanding and exploring the highly dimensional gene expression data. Moreover, base algorithm does not require definite programming environment which makes them convenient to use.

V. CONCLUSION

Pattern recognition in gene expression profiles provides motivation for designing clustering algorithm. Clustering algorithm helps in providing awareness about different clustering criteria. Reaching a consensus about the finest algorithm for clustering gene expression data is difficult. Therefore, it can be concluded that with no prior information, various algorithms could be applied to find the optimal solution. Also, behavior and type of information required for analysis also derives the algorithms to be chosen.

REFERENCES

IMPACT OF UPFC ON THE OPERATION OF DISTANCE REALY

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ABSTRACT

Distance Relays are widely used for the protection of the transmission lines. The accuracy of the distance relay is affected by many factors like pre-fault system conditions, fault resistance; short-circuit as well as remote-end a condition which is not measurable at relaying point. These FACTS devices affects the impedance measured at the relaying point, hence the trip characteristics of the relay is affected. In this paper, effects of the introduction of Unified Power Flow Controller (UPFC), one of the FACTS devices, on the trip characteristics of the distance relay is studied. A comparison of ideal tripping characteristics with the UPFC-affected tripping characteristics is shown. The variation of the tripping characteristics at different installation points of the UPFC is also shown.

Keywords: - Distance Relay, FACTS devices, Tripping Characteristics, UPFC.

I. INTRODUCTION

FACTS devices helps in controlling the reactive power in the power system and hence increasing the transmission capacity and provide the optimized utilization of system capacity. Wind farms are used as alternate source of energy in the grid. The great problem in using wind source is variations of wind speed throughout the day. It results in fluctuating output power, hence the system condition changes due to change in the wind speed. The dynamics of power system is greatly influenced on the introduction of FACTS devices, hence sub-systems are affected including the protection system. The distance relay works on the basis of impedance measured at the relaying point. Short circuit level, line load angle, fault resistance, voltage magnitude, source and grid impedances also affects the measured impedance at relaying point [1], [5]. Systems other parameter affects only in the presence of fault resistance. In the absence of fault resistance, power system parameters have negligible effect on the measured impedance. The quadrilateral characteristics of the distance relay is used here. The characteristics are subjected to mal-operation in the form of under-reaching and over-reaching the fault point in the presence of FACTS devices [2], [6], [7]. In this paper, impact of UPFC on the distance relay tripping characteristics is shown. The parameters of UPFC also affects the performance of distance relay.

II. MODEL OF UPFC

Unified Power Flow Controller, UPFC, consists of series and shunt converters to the transmission line, which have a common dc link via a dc storage capacitor. Both converters can operate independently. Equivalent circuit diagram is shown in fig. (1). Shunt branch has shunt impedance and shunt voltage while series branch contains only variable voltage source. By injecting a series voltage, the series branch of UPFC controls the real and reactive power of the transmission line and shunt branch controls the shunt reactive power and dc link capacitor voltage.

III. IMPEDANCE AT RELAYING POINT

System conditions affects the relay tripping characteristics. Here quadrilateral characteristics are considered. A two terminal transmission line model is considered as shown in Fig. 1. Single line to ground fault is considered at point F and the distance relay is initially installed at M is considered. Power flows from M to N in normal conditions. $E_{an}$ and $E_{am}$ are the equivalent voltages at the two ends; $E_{am}/E_{an} = h e^{j\beta}$, h is the voltage ratio and $\beta$ is the power transfer angle.

At fault point, $E_{af}$ is the fault voltage calculated as:

$$E_{af} = E_{am} - Z_{am}I_{f}$$

$$Z_{am} = Z_{sm} + Z_{Lm}$$

$$Z_{sn} = Z_{Lm} + Z_{Ln}$$

$$I_{f} = \frac{E_{af}}{Z_{af}}$$

The fault current $I_{f}$ is the ratio of the fault voltage and the total impedance seen from the fault point.

In this paper, impact of UPFC on the distance relay tripping characteristics is shown. The parameters of UPFC also affects the performance of distance relay.

$Z_{sm}$ and $Z_{sn}$ are the equivalent source impedances, $Z_{Lm}$ and $Z_{Ln}$ are the line impedances from M to F and N to F.
respectively. The measured impedance at the relaying point can be expressed by the following equations:

\[ Z_{1m} = Z_{1sm} + Z_{1Lm} \]  
\[ Z_{1n} = Z_{1sn} + Z_{1Ln} \]  
\[ Z_{0m} = Z_{0sm} + Z_{0Lm} \]  
\[ Z_{0n} = Z_{0sn} + Z_{0Ln} \]  

\[ \text{sumz} = 2 \frac{Z_{1m} Z_{1n}}{Z_{1m} + Z_{1n}} + \frac{Z_{0m} Z_{0n}}{Z_{0m} + Z_{0n}} \]  
\[ C_1 = \frac{Z_{1n}}{Z_{1m} + Z_{1n}} \]  
\[ C_0 = \frac{Z_{0n}}{Z_{0m} + Z_{0n}} \]  
\[ K_0l = \frac{Z_{0l} - Z_{1l}}{Z_{2l}} \]  
\[ K_d = \frac{1 - he^{-j\beta}}{Z_{1m} he^{-j\beta} + Z_{1n}} \]  
\[ C_d = (\text{sumz} + 3Rf)K_d \]  

\[ Z_a = Z_{1Lm} + \frac{3Rf}{Cd + 2C_1 + C_0(1 + 3K_0l)} \]  

The ideal tripping characteristics can be obtained by using Eq. (11) by setting the maximum Rf value and reach of the relay.

IV. IMPEDANCE MEASURED AT RELAYING POINT IN THE PRESENCE OF UPFC

When UPFC is introduced in the transmission line, Eq. (1) to (11) vary and hence the measured impedance. It can be introduced at any location on the transmission line. UPFC is installed at x per unit distance of the transmission line. Some new equations are introduced and some are modified as:

\[ C_{1s} = \frac{Z_{se}}{Z_{1l}} \]  
\[ C_{0s} = \frac{Z_{se}}{Z_{0l}} \]  
\[ Z_{1nf} = Z_{1sn} + (1 - p)Z_{1l} \]  
\[ Z_{1f1} = (1 - p + C_{1s})Z_{1l} \]  
\[ Z_{0nf} = Z_{0sn} + (1 - p)Z_{0l} \]  
\[ Z_{0f1} = (p - x + C_{0s})Z_{0l} \]  
\[ Z_{1m} = Z_{1f1} + \frac{Z_{sh} Z_{1m1}}{Z_{sh} + Z_{1m1}} \]  
\[ Z_{1n} = Z_{0f1} + \frac{Z_{sh} Z_{0m1}}{Z_{sh} + Z_{0m1}} \]  

\[ Z_{0n} = Z_{0nf} \]  

\[ Z_{1m} = Z_{1sm} + xZ_{1l} \]  
\[ Z_{1n} = Z_{1sn} + (1 - x + C_{1s})Z_{1l} \]  
\[ Z_{0m} = Z_{0sm} + xZ_{0l} \]  
\[ Z_{0n} = Z_{0sn} + (1 - x + C_{0s})Z_{01} \]  

\[ C_{1m} = \frac{Z_{sh}}{Z_{1sm} + Z_{sh}} \]  
\[ C_{0m} = \frac{Z_{sh}}{Z_{0sm} + Z_{sh}} \]  

\[ \text{den} = Z_{1m1}(Z_{1f1} * h * e^{-j\beta}) + Z_{1nf1} \left(1 + r * e^{j\theta}\right) \]  
\[ + Z_{sh} \left(\left(Z_{1m1} (1 + e^{j\theta}) + Z_{1f1} * h * e^{-j\beta}\right) + Z_{1nf1} \left(1 + r * e^{j\theta}\right)\right) \]  
\[ K_{\text{delta}} = Z_{1m1} \left(1 + r * e^{j\theta}\right) E_{sh} - (h * e^{-j\beta}) \]  
\[ - Z_{1n1} (1 - E_{sh}) \]  

\[ \text{sumz} = \left(\frac{2Z_{1m} Z_{1n}}{Z_{1m} + Z_{1n}} + \frac{Z_{0m} Z_{0n}}{Z_{0m} + Z_{0n}}\right) \]  
\[ C_d = (\text{sumz} + 3Rf)K_{\text{delta}} \]  
\[ C_0 = \frac{Z_{0n}}{Z_{0m} + Z_{0n}} \]  
\[ C_{1l} = \frac{Z_{1n}}{Z_{1m} + Z_{1n}} \]  
\[ K_0l = \frac{Z_{0l} - Z_{1l}}{Z_{2l}} \]  

\[ C_{sh} = Z_{1f1} \left(C_d + 2 * C_1 * (1 - C_{1m}) + C_0 (1 - C_{0m})(1 + 3 K_0l)\right) \]  
\[ K_{ve} = Z_{1m1} (Z_{1n1})(E_{sh}) + Z_{sh} \left((Z_{1m1} * h * e^{-j\beta}) + Z_{1n1}\right) \]  
\[ C_{ve} = \frac{-\left(\text{sumz} + 3Rf\right) - K_{ve} + r * e^{j\theta}}{\text{den}} \]  
\[ C_{ve} = (C_{0s} - C_{1s})C_0 (1 + 3 K_0l) Z_{1l} \]  

\[ Z_a = (p + C_{1s})Z_{1l} \]  
\[ + \frac{Z_{sh} + C_{ve} + C_{ve} + 3Rf}{C_d + 2C_1C_1m + C_0C_0m (1 + 3 K_0l)} \]
From Eq. (38) it is clear that impedance measured by distance relay is affected by the presence of UPFC. It can be seen that even if the fault resistance is zero, the impedance measured by the relay is not equal to the impedance of the transmission line at relay point.

V. EFFECT ON TRIP CHARACTERISTICS DUE TO UPFC

The effect of UPFC is studied on a system whose parameters are given as;

- \(Z_{1sm} = 20 \angle 85\)
- \(Z_{0sm} = 30 \angle 85\)
- \(Z_{1sn} = 10 \angle 85\)
- \(Z_{0sn} = 15 \angle 85\)
- \(Z_l = 36.8 \angle 86\)
- \(Z_0 = 111.8 \angle 83\).

The value of \(h=0.96\) and \(\beta=16\) is taken.

(a) Comparison with ideal characteristics

Fig (3) shows the comparison of ideal tripping characteristics with the characteristics in the presence of UPFC in the transmission line.

Values of \(h=0.96\), \(\beta=20\), \(r=0\) is taken. The UPFC is present at the 40% of the length of the line. Shunt voltage source takes the value 0.97. Characteristics with black line shows the ideal characteristics and with red shows the characteristics in the presence of UPFC. Figure clearly depicts that the trip region is increased in the presence of UPFC. This indicates the performance of the transmission line increases when UPFC is introduced. The impedance measured at the relay point has now increased.

(b) Variation in series injected voltage

Fig (4) shows the trip characteristics when series voltage injected is varied. Here \(r\) takes the values 0, 0.05, 0.1, 0.15. For zero value of \(r\), the series converter is inactive. As the value of \(r\) increases the characteristics shifts upwards.

On the increase of \(r\), reactance decreases for low values of fault resistance and vice versa for resistance. At higher fault resistances, resistance decreases with the increase in the values of \(r\).

(c) Variation in shunt injected voltage

Fig (5) shows the trip characteristics when shunt voltage injected is varied. Here \(E_{sh}\) takes the values 0.9, 0.97, 1.03, 1.1. As the value of \(E_{sh}\) increases, reactance decreases for low values of fault resistance as in the previous case. But for higher values, measured resistance and reactance is increased for increase in the values of shunt voltage. Characteristics shifts upward.

(d) Variation in load angle

Fig (6) shows the trip characteristics when \(\theta\) is varied. Here \(\theta\) takes the values 0, 45, 90, 135 degrees. As \(\theta\) increases resistance and reactance increases little bit for low value of fault resistances. For higher values of fault resistance, measured reactance decreases and measured resistance increases with the increase in values of \(\theta\).
CONCLUSION
Introduction of UPFC in the transmission line compensates for the reactive power in the transmission line. These FACTS devices greatly influence the power system dynamics. Due to this, the behavior of the protection devices changes. These changes due to introduction of UPFC on the distance relay are studied, and a comparison is also shown with the ideal characteristics. Results show that the trip region of the distance relay is increased. How various parameters of UPFC affect the distance relay operation is also shown.

REFERENCES
PERFORMANCE EVALUATION OF MIMO OFDM SYSTEM USING ADAPTIVE MODULATION AND CODING TECHNIQUE

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Abstract

The main idea behind AMC is to change the modulation and coding schemes dynamically within the subsequent frame and they have the purpose to adopt the overall spectral efficiency to the channel condition. The main judgment to select the correct MCS is being taken at the receiver end on the basis of observed channel condition under the information which is supplied to the transmitter in every time frame. There are several AMC methods that have been introduced in various literature studies. As there has been a significant work has been carried out on understanding the time adaptation aspect in AMC protocols, the challenges in these methods are occurred when we use the dynamic transmission techniques in the wireless networks which have multiple signal dimensions. The performance analysis is done using evaluation of LTE. In this work, the performance of AMC is evaluated by calculating probability of Bit Error Rate (BER) under the AWGN wireless channel models. For this work, Evaluation of LTE under AMC we will construct the AMC model in MATLAB under Gaussian (AWGN) to analyze performance that is in BER, Data Delay and Throughput.

Key Words: AMC, AWGN, Delay, LTE

I. INTRODUCTION

The need of wireless network is the faster data rates which is possible by employing MIMO because in MIMO we use multiple antennas at the receiver and transmitter side which makes the data transmission much faster by spatial diversity. In this way MIMO system are use for delivering high data rates on wireless communication. [1] we can enhance the capacity of an wireless network by the increasing the number of antenna. There are basically two reasons due to which we are using wireless communication over the wired communication system. First one the multi path fading which means the change in signal strength due to the various factor like buildings, loss of path because of attenuation and shadowing [2]. The second benefit of wireless transmission is that int hat the whole transmission median is in air and while in wired system the entire data is dependent on the transmission points which are at separate points. In MIMO system we are using multiple antennas which allow the spatial diversity by employing the multiple antennas in a narrow multipath fading medium that are situated at some distance. [3]. The main feature of MIMO is diversity gain or capacity gain by which we can remove the fading of signal. The main idea behind the development of MIMO is to improve the signal quality and the data rates by using multiple transmitter and receiver antennas [4]. The basic element of MIMO is space time coding. There are two basic features of space time coding which are: diversity and multiplexing. To attain the maximum performance we have to maintain a relationship between the diversity and multiplexing.

In MIMO system there are various coding method which we are using these coding methods are the methods by which we can attain the desired data rates over the wireless transmission systems [5]. The main concern in these systems is the problems that we are facing while implementing these kind of systems. There are some recent examples of such system in which we use MIMO system like WiMAX, IEEE 802.11n and 3GPP LTE etc.

II. LITERATURE SURVEY

AliyuBubaAbdullahiet.al This paper presented by the Aliyububa is showing an OFDM which is used in the signal
transmission and this is adopt for the downlink of famous LTE network which is 4G network. This methods is basically used to utilize the large bandwidth range in an effective manner it uses the large bandwidth and broken it into smaller range means which have narrow bandwidth range. An LTE network is basically used with the OFDM network means the MIMO is work with OFDM. This combination is basically work to improve the data rate speed. This paper shows that the downlink data is basically shown on the basis of MIMO and this system is evaluate on the basis receiver decoders.

Emmanuel Migabo et.al This paper show that the LE use various modulation scheme to different channels. The main aim of this is to develop targeted data rates. These modulation schemes are the QPSK, 16-QAM and 64-QAM. The present paper show that the LTE using an digital simulink model which is basically develop to observe the reaction of QPSK, 16-QAM and 64-QAM modulation schemes on the BER performance with an AWGN channel model. For an better performance there are various subsystems are present within the transmitter and receiver block which are implement in simulink. In addition to that LTE is using turbo channels which introduce a reliability terms for the users. When we select our required channel configurations for the form transmitter and receiver sides and select the modulation schemes the signal is set up.

AnjithaViswanath et.al As there are various natural phenomenon which effects the signal strength this paper shows such a problem which is atmospheric hindrance which results to various problem in performance related issues of free space optimal communication links. This paper shows that there are various technology available to reduce the affect of atmospheric turbulence but into these techniques aperture averaging is the most simple and effective techniques which gives satisfactory results. Bu the help experiment we can visualize the effect of this techniques on these phenomenon’s and by setting up different frequency combination we get the curious result of the transmission and then we analyze the effect of this technology over the network that from how much this technology help to mitigates the effect of atmospheric problems.

Swati Sharma et.al This paper is basically shown an comparison between the various modulation methods that are we using the LTE network, in OFDM AWGN channel. , BPSK, QPSK, 16QAM and 64QAM, so from that comparison we can get the best suitable modulation technique for our network on the basis of bit error ate and noise in signal. This is done because the signal modulation is played an very important role wireless communication. This paper giver the bit error ratio for the various techniques and facilitate the proper data rates of a LTE system.

Makrand N. Patilet.al This paper is basically show the BER rates for the various modulation techniques. There are various modulation techniques available some of which are Binary Phase Shit Keying (BPSK) and Quadrature Phase Shift Keying (QPSK). To choose from these techniques we first analyze the every techniques individually and then select the techniques which is best suited for our network. For the purpose of simulation we mostly use MATLAB. By analyzing the performance curve of the modulation techniques we observe BER rates from DFT based OFDM using various modulation techniques.

Leila Nasraoui et.al present a paper In which he discussed about the methods of synchronization in MIMO-OFDM system that use the space time coding and also present its use in IEEE 802.11 wireless network standards. The main aim behind this study is identification of starting phase and the fractional part of the frequency offset. For this method the Leila uses the method of Wang scheme. Here he analyze the correct detection rate and mean square error. In his paper he presents a method for the space time coding synchronization so that it may not need the channel estimation for the wireless networks.

Amir Hossein et.al presents a study in which he proposed a method for the channel estimation in MIMO system. Before that some examinations are performed for the STBC-MIMO and than the simulation results are computed from the different receiver and transmitter antennas. In his works he explain about the MISO and MIMO systems that use the wireless network environment. He also study about the performance of space time coding for the wireless multiple antennas.

AkanshaGautam et.al presents a study in which he analyze for estimating the channels by implementing Alamouti STBC code in MIMO. For the testing this model is implemented over the 16-PSK modulation. The system is tested in various configurations like 4xM and 2xM, here M shows that total number of receivers. From the results this is observed that for the 2xM and 4xM configuration the BER rates is better for the higher signal power range that maintain the number of receiver lowest or at least equal to the number of transmitters.

Mahdi Abdul Hadi et.al present a method to recover the data which is transmitted precisely, for that we must know about the channel effect at receiver. In present paper the author gives an overview about the estimation for STBC-MIMO-OFDM system by using the best method for the channel estimation which is least square and minimum mean error square both of these methods are mainly based on the channel effects at various pilot positions, and the channel interpolation among the pilot location by using the linear interpolations.

AzlinaIdris et.al discuss about the three kind of diversity methods: STBC, SFBC and STFBc in MIMO-OFDM system. STFBc method has been presented to use this technique in such conditions where the bit error ration performance factor in presence of diversity technique uses fast time varying channel with ICI-SC scheme that provides that maximum diversity order.

ParismitaGogoi et.al proposed the two different techniques which are being based on the artificial neural
networks architecture. The techniques which are being present in this paper are MLP and RNN’s for implementing in STBC-MIMO system Rayleigh Faded channel. To calculate the estimate for the channels in this method in terms of synaptic weights and bias values of the neural network.

Azlina Idris et al presents a new approach in which he gives a new idea for the subcarrier mapping technique that have ICI self cancellation method which use the collection of information from the space time frequency block codes (STFBC) MIMO-OFDM system. The main purpose of such kind of system is to get the highest diversity order and to prevent the effect of FO for ICI reduction in system.

A. I. Sulyman et al presents an overview about the selection of antennas in the performance of the MIMO system on the non-linear communication channels. From the result we comes to know that as the number of antennas available at the reliever are reduce that the performance of the system also decreases because the non linearity of the channel, that show some saving at SNR which is due to the non-linearity for the reduced complex system.

C. Wang et al presents a study about the MIMO system implementation in which he shows that by employing MIMO system we can increase the capacity without using any extra spectrum or without consuming much power. To attain the signal at the receiver in the MIMO system we use the zero forcing detection technique. In addition for this we also need the knowledge about the channel information, but for the practical use this is not possible to attain the CSI. Gerhard Bauch presents an analysis in which he discuss about the suitable orthogonal space-time block codes and space-frequency block codes in a 4G OFDM system. The main feature of such kind of space codes is that by employing these codes the data speed does not degreed even at the high speed of vehicle of the variation in signal, there are certain frequency selectivity that can limit the performance of space frequency block codes unless. Thus in broadband system we can exploit the frequency and spatial diversity by employing complex space time frequency codes.

III. ADAPTIVE MODULATION

Principle behind AMC is to:

- Present the definition for channel quality indicator and also for CSI which facilitates the information about the channel
- To make the adjustment in the number of signal transmission parameters to allow the variations in indicator over the signal dimension being explore like time, space, frequency or the combination of these.

At present there are several matrices has been used as CSI. Generally the signal to noise ration or the signal to noise interference ration is available at the physical layer. And in the link layer, generally PERs are commonly extracted from the CRC information. In some cases the bit error ration is also available. Thus in this section we provide the study about the use of such kind of CSI while designing the MAC protocols, with focus on time adaption and for a error rate constrain system. In this study first we take the conventional example of AMC by employing SNR measurement along with the perfect instantaneous feedback that has been introduce in earlier study. Here we also discus about the limitation of this scheme and thus find out the more refine kind of adaption scheme.

Adaptation Based on Mean SNR — to perform the implementation of adaptive transmission the CSI must be available. It can be available at the transmitter end or at the receiver end. Generally these kinds of information consist of SNR which is measure at the receiver. Thus here are some possible solution for AMC:

1. measurement of signal to noise ratio at receiver.
2. now for every mode candidate convert the NSR into BER information.
3. thus on the basis of aimed BER, for every SNR measurement select the mode which can provide the highest throughput and the further will be within the BER target bounds.
4. now provide the feedback of selected mode to the transmitter.

IV. RESULT ANALYSIS

Different parameters are used. The total no. of transmit antennas. Total no of subcarrier are 128. The different modulation schemes are used to achieve maximum throughput & min BER.

Fig 2 BER Evaluation of Adaptive Modulation, 16-QAM, 64-QAM over AWGN Channel SNR = [0:4:30] Simulation Frames 100, AMC outperforms all other modulation techniques

BER evaluation of Adaptive Modulation of 16-QAM, 64-QAM over AWGN Channel for 100 frames is shown in fig
BER evaluation of Adaptive Modulation of 16-QAM, 64-QAM over AWGN Channel for 1000 frames is shown in fig 3.

Fig 3 BER Evaluation of Adaptive Modulation, 16-QAM, 64-QAM over AWGN channel SNR = [0:4:30] Simulation Frames 1000, AMC outperforms all other modulation techniques

Throughput is achieved maximum using AMC algorithm. Throughput Evaluation of Adaptive Modulation, 16-QAM, 64-QAM over AWGN channel for 1000 frames is given by Fig 4.

Fig 4 Throughput Evaluation of Adaptive Modulation, 16-QAM, 64-QAM over AWGN channel SNR = [0:4:30] Simulation Frames 1000, AMC outperforms all other modulation techniques

V. CONCLUSION

In this paper we explore the several modes to capture the channel information and facilitates some policies on the designing of feasible solution for AMC. the implementation of a optimal AMC is a challenge because of its practical limitation, but here we can use the simulated performance of realistic broadband wireless MIMO-OFDM which is base on AMC. were very encouraging. In this work The performance of AMC is evaluated by calculating probability of Bit Error Rate (BER) under the AWGN wireless channel models. For this work Evaluation of LTE under AMC was constructed the AMC model in MATLAB under Gaussian(AWGN) to analyze performance that is in BER, Data Delay And Throughput. It is clear from the Results that AMC outperforms 16 QAM and 64 QAM in BER for all simulation orders. It can also be noted that AMC posses maximum Throughput of all.

References

Conference on Communication Systems and Networks (COMSNETS), pp 1-5, 2017.

11. Anjitha Viswanath, V. K. Jain, Subrat Kar “Experimental evaluation of the effect of aperture averaging technique on the performance of free space optical communication link for different intensity modulation schemes” IEEE International Conference on Computational Intelligence and Computing Research (ICICIC), pp 5-12, 2016.


Abstract - Graphene represents an emerging frontier that brings together multi-disciplines of physics, material science, electronics, photonics and terahertz plasmonic. It has uncovered exciting prospects in these fields, where novel technologies and solutions are still being developed. From the device and system viewpoint, graphene is a two-dimensional layered material with an intrinsically passivated surface. It is thus amenable to monolithic integration with conventional silicon-based benchmarks as well as other important functional materials, which makes graphene remarkably advantageous over bulk materials whose heterogeneous integration with other materials usually induces defects and deep level trapping centers at the interface.

Keywords - Graphene, THz, Modulator, Plasmon, Modulation

I. INTRODUCTION
Electron wavelength is much shorter than photon wavelength. Hence electronic devices exhibit compact sizes. Unfortunately, the electron transport is limited by its mobility or scattering events, which lowers its speed compared to photon transmission or propagation. On the other hand, the sizes of photonic devices are held back by the diffraction or half-wavelength limit. Surface Plasmon polariton, which is an entangled state of electron and photon, is a promising candidate to achieve high speed and small size simultaneously. Unfortunately, high ohmic loss of metallic plasmon devices creates a fundamental hurdle for their potential applications. Graphene, a conjugated carbon sheet arranged in a two-dimensional (2D) hexagonal lattice, allows multi-functions in signal emission, transmission, modulation, and detection, featured with the broad band, high speed, compact size, and particularly low loss. Compared to traditional materials such as silicon and III-V semiconductors, graphene demonstrates unique properties in its high electron mobility, large thermal conductivity, strong mechanical ductility, and high third-order optical non-linearities. There are many reviews in literature about graphene photonics and plasmonic. Here, we will present a brief review of graphene based functional devices at microwave, terahertz, and optical frequencies. The paper is organized as follows. The fabrication and relevant experimental results of graphene based functional devices at microwave frequencies will be introduced in Section 2. In Section 3, the application of graphene in dynamically altering the antenna characteristics is presented from terahertz to mid-infrared bands. Section 4 will present recent progresses on graphene modulators at terahertz and infrared bands. At the end, Section 5 will provide a brief summary for graphene based functional devices.

II. FABRICATION AND MICROWAVE DEVICES
Tremendous efforts have been made over the last decade towards the fabrication of graphene, which, in general, can be categorized into three groups: (1) mechanical cleavage (MC), (2) epitaxial growth (EG), and (3) chemical vapor deposition (CVD). MC is realized by mechanically splitting bulk graphite into atomically thin single layer graphene with the aid of an adhesive tape. The first in-lab fabrication of single layer graphene was demonstrated by Novoselov et al. in 2005 [25] and the ballistic mobilities of up to 106 cm2 V−1 s−1 were experimentally observed [26, 27]. Although MC is favorable for high-quality graphene fabrication, the very limited size (often coexists with other multiple atomic layers) and the time-consuming exfoliation process prevent the large-scale industrial production using this method. Therefore, the artificial synthesis of scaled-up single layer graphene has received great interests all over the world. EG, also known as growth on silicon carbide, utilizes high temperature (over 1000 °C) to thermally evaporate silicon (0001) from silicon carbide and leaves graphene films on the surface[28, 29]. The mobility ranging from 1×104 cm2 V−1 s−1 to 3×104 cm2 V−1 s−1 was reported on the EG-grown graphene surface measured at room temperature [30, 31]. Since silicon carbide has been widely used in high-speed electronics as a bottom substrate, the direct
growth of single layer graphene on silicon carbide circumvents the additional substrate transfer process and benefits the graphene-integrated silicon carbide devices such as high-frequency transistors [32] and light emitting diodes [33]. However, due to the non self-limiting nature of thermal decomposition, it’s difficult to generate pure single-layer carbon surface on silicon carbide surface and special care needs to be paid during the EG synthesis process. Furthermore, the high cost of silicon carbide wafers (more than 100 US dollar for a 4-inch wafer) limits the massivemanufacture of graphene. In order to fulfill the low-cost and large-scale single layer graphene fabrication, CVD steps onto the stage, which, in principle, decomposes carbon atoms from hydrocarbons (methane, for example) and nucleates them on certain kinds of metal surfaces such as copper and finally forms an uniform and large area single layer graphene. The first large area synthesis of single layer graphene using CVD was demonstrated in 2009 [34] and mobility at room temperature varying from 1.64×10^4 cm^2 V^−1 s^−1 to 2.5×10^4 cm^2 V^−1 s^−1 was obtained after the transfer of the single layer graphene from the copper foil to the insulated substrate [35, 36]. Different from EG, CVD is almost self-contained. It means that the growth procedure will automatically pause when the entire catalytic metal surface is covered with single layer graphene. As a result, large area (over square decimeters) and uniform single layer graphene can be efficiently synthesized using this method. However, by virtue of the difference in thermal expansion coefficient between copper and graphene [34], defective wrinkles could occur on the graphene surface. They significantly degrade this two-dimensional material’s quality, which can be seen from the much smaller mobility compared with the ones of MC-graphene. In order to provide cost-effective as well as high-quality single layer graphene for massive production, further optimization and improvement need to be done for the CVD method. Following the growth of graphene on copper foil in CVD chamber, the single layer graphene shall be transferred to the desired substrates with the aid of PMMA (Polymethyl Methacrylate) [37]. As illustrated in Fig.2(a), this transfer process is composed of four steps: (1) A PMMA layer is firstly spin coated on top of graphene layer; (2) The supporting copper is etched away using Cu etchant; (3) The PMMA/graphene membrane is then attached to the target substrate such as the high-resistivity silicon; (4) The PMMA adhesive layer is dissolved in organic solvent and the graphene is eventually left on the target substrate. A distilled water rinse is suggested to get rid of the chemical residues during the transfer process. The adhesiveness between graphene and substrate could be further enhanced with several hour’s baking so that the water molecules can fully evaporate. A graphene-integrated circuit is ready for manufacture after the successful transfer process. Here, we take the graphene-embedded coplanar waveguide as an example and introduce the fabrication technologies utilized for electrodes deposition and graphene patterning [38].

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**FIG. 2.** (a) Graphene transfer flow charts. (b) Fabrication process flow for metal deposition and graphene patterning. (c) Layout of the graphene-integrated coplanar waveguide. (d) Scanning electron microscope (SEM) images for the dashed red line region in (c), where the graphene flakes of 48 × 240 μm^2 are placed.
As shown in Fig. 2(b), the deposition of coplanar waveguide electrodes (Process I) includes three stages: (1) Photo-lithography is applied to form the coplanar waveguide pattern on the photoresist layer; (2) Bi-metallayer (20 nm Ti/100 nm Au) is then deposited on the graphene sheet using E-Beam (2) the graphene sheet that is not covered by photoresist is etched away by the oxygen plasma. Note that the plasma power cannot be too high to destroy the protection photoresist; (3) Photoresist is finally stripped with the acetone followed by distilled water rinse. Fig. 2(c) illustrates the layout of the graphene-embedded coplanar waveguide and the patterned graphene flakes can be clearly identified under scanning electron microscope (SEM) in Fig. 2(d).

The development of CVD enables the fabrication of large-area graphene with the size comparable to the wavelength of microwave frequencies and boosts the usage of graphene at microwave band. Before this, most of the works were focused on the simulation region, such as graphene antenna [39], orbital angular momentum modulator [40] and frequency selective surface [41]. The simulated graphene layer is normally treated as an impedance surface or an ultra-thin bulk layer based on Kubo formula [42]. Partial element electrical circuit, a derived circuit-level modeling method, has also been utilized for simulations [43]. However, as mentioned in the previous section, the quality of the CVD-graphene cannot reach the ideal expectation at this stage. It hinders the realization of many theoretical simulations which employ graphene as a conductive surface. Several works, on the other hand, take the advantage of the lossy characteristic of CVD-graphene and propose the graphene-embedded microstrip attenuator [44] and tunable transmission line from experimental results [45]. Tunable Graphene-Based Antennas from Terahertz to Mid-Infrared

The monolayer graphene allows to be p/n-doped under positive/negative electrostatic bias. The injection of charge carriers will shift the graphene chemical potential (Fermi level) away from the Dirac point resulting in the tunable surface conductivity. Due to the forbidden inter-band transitions by the Pauli blocking, the graphene monolayer reveals the metallic behavior and supports strong plasmonic effects from the terahertz to mid-infrared even to visible light regions. More importantly, the graphene monolayer with tunable chemical potential (through modulating the gated voltage) enables us to gradually engineer its surface conductivity and subsequently manipulate the graphene plasmon for realizing the tunable optical response of graphene-based antennas. In this section, we will discuss the graphene evaporation; (3) The unwanted metal is removed during lift-off. Graphene patterning (Process II) is also achieved by three steps: (1) A pair of 48× 240 μm2 Photoresist pattern cover on the graphene sheet between the signal line and the ground; monolayer as a key element for dynamically altering the antenna characteristics.

A. Manipulation of graphene absorption

Regarding the reciprocity theorem, the graphene based antennas are capable of receiving and transmitting electromagnetic waves. As the receiver, besides the radiation pattern, gain and impedance, the optical absorption plays an important role in converting the propagating wave into surface wave toward high responsivity and also in enhancing near-field. The modulation of the absorption of graphene-based antenna will offer in-depth insight on how to engineer the antenna characteristics.

As we know, the intrinsic value of optical absorption of undoped monolayer graphene is 2.3%, which is insufficient to realize strong light-matter interaction. The graphene plasmon and photonic modes, critical coupling effects, etc, have been utilized to improve the absorption of graphene antennas. For instance, through modulating the graphene chemical potential, the log-periodic toothed antenna made by graphene has delivered the multi-resonances with highly tunable intensity and spectral location [46]. The active tunable absorption has been demonstrated in the closely packed graphenenanano disk. arrays, in which the disk geometrical parameters, inter- particle spacing and voltage-driven electrostatic doping can be optimized to achieve 30% graphene absorption with one order of magnitude enhancement as compared to that of the planar un-doped graphene monolayer [47].

In a subsequent work, Halas et. al. also demonstrated the Plasmon energy and strength can be tuned in the nanostructured graphene monolayer disk array [48]. Theoretically, the critical coupling effect has been realized to attain the perfect absorption of graphene, the combined guided mode of supstrate dielectric grating and photonic band-gap of substrate Bragg grating cooperatively contribute to near-unity absorption of the graphene [49]. Besides, the integrations of graphene monolayer with various types of metallic structures also offer additional degrees of freedom for engineering the graphene absorption. Qin et al. designed the antenna designs to enhance the interaction between metallic structures and graphene layer. The graphene monolayer with 30% absorption has been achieved in an ultra-broadband spectral range from 780 nm to 1760 nm through integrating two types of the split cross antennas [50]. In addition to the absorption, the
Experimental results showed that the blackbody emission of graphene-based resonator can also be electrically modulated [51].

B. Modulation of optical characteristics
1. Utilization of tunable graphene conductivity
The electrostatic bias on graphene can gradually change its dielectric constant, which plays an important role in continuously modulating the antenna characteristics [52–54]. The remarkable modulation depth up to 90% of transmission has been demonstrated in the graphene-loaded silver ribbon antenna via turn on and off-resonance [55]. Yu and coworkers showed the large modulation of both the amplitude and phase in graphene-metal antenna. The intensity modulation ratio of 100 and phase modulation of 240° have been demonstrated through dynamically tuning the graphene surface conductivity [56]. The control of the magnetic resonance of diabolo antenna by integrating graphene mono-layer has been shown with the resonance tuning range up to 63% and intensity modulation up to 1460% in mid-infrared wavelength range [57]. Capasso and coworkers demonstrated the in situ control of graphene-loaded mid-infrared antenna through electrically tuning the applied gated voltage, the electrostatically gated graphene located at the antenna gap enables the change of wavelength range up to 600 nm with the modulation depth of the intensity more than 30% [20]. They further demonstrated a large tuning range of 1100 nm (80% of band-width) at the mid-infrared region by incorporation of metal-insulator-metal waveguide design in the graphene-based antenna [58]. In another work, they studied the electrically tunable absorber composed of Fabry-Perot antenna and graphene. The gated voltage applied on the graphene enables to modulate in and out of the critical coupling condition, the modulation depth up to 100% and speed of 20 GHz have been realized over a broadband wavelength range from the near-infrared to terahertz wavelength [59].

Yin et al. proposed the graphene-based two-dimensional (2D) leaky-wave antenna allowing both the frequency tuning and beam steering in the terahertz region. The proposed structure is shown in Fig. 3(a), in which the graphene is adopted as the high impedance surface. Through dynamically controlling the gated voltage, the concomitant change of the graphene conductivity not only can effectively alter the reflection phase and resonant frequency over a wide wavelength range but also enable modulation of the radiation pattern of 2D leaky-wave antenna (See Fig 3(b)) [60]. The in situ control of antenna polarization is also desirable in practical applications. Jiang and Sha et al. demonstrated the graphene-based polarizer, in which the graphene mono-layer is placed underneath the cross antenna that composed of two perpendicular dipole antennas (See Fig. 3(c)) [61]. The electrostatically tunable chemical potential of the graphene monolayer enables adjustment of the polarization state of the asymmetric cross antenna. The cross antenna at operational wavelength of 6 μm generates a perfect circular state of the reflected beam with the axial ratio of 0.3 dB. Moreover, the axial ratio could be significantly changed by 9 dB when the underneath graphene monolayer is electrostatically biased to achieve the doping level of 1 eV (See Fig. 3(d)).
graphene-loaded electrically tunable polarizer, (d) axial ratio of the reflected beam of the cross antenna with the chemical potential of 0 eV and 1 eV, (e) Stokes parameters calculated at 20 nm above the polarizer top surface focusing on the polarizer feed gap [61]. (f) The near field distributions of the doped graphene monolayer (μc = 1.1 eV) inserted in between 4 nm Al2O3 and 100 nm SiO2 (as shown in the inset) at the wavelength of 3000 nm, (g) the extinction cross section (ECS) of the metallic dipole antenna with and without the graphene monolayer, (h) the extinction cross section under different chemical potentials [74].

The modulations of the radiation pattern, directivity and efficiency of other type antennas such as the Fabry Perot cavity leaky-wave antenna [62], terahertz Yagi-Uda antenna [63], the split ring resonator based Fano antenna [64, 65] and gold nanorod pair antenna[66] have been demonstrated by shifting the graphene chemical potential under different electrostatic biases. Besides, the graphene has also been adopted as the photoconductive source of radio-frequency antenna and load of terahertz patch antenna. Their time-domain characteristics also show interesting capabilities under dynamic modulations [67–69].

III. UTILIZATION OF GRAPHENE PLASMON

The surface plasmon polaritons supported by the graphene monolayer can be dynamically controlled by the electrostatic doping level, which offer a platform to engineer its spectral resonant location and interaction with metal plasmon. The previous reports revealed that the plasmon of graphene and thin metal layer have the comparable performance [70]. Yao et al. numerically investigated the plasmon-induced transparency of the graphene dipole and monopole antenna [72]. The spectral location and lineshape have been tuned by dynamically controlling the destructive interference between graphene dipole and monopole antenna. Murphy et al. unveiled the anomalously high resonant transmission of graphene-metal antenna and showed the increment of graphene mobility resulting in the enhanced resonant transmission and narrowed bandwidth [73]. Choy and co-workers have demonstrated the strong mode coupling between the graphene plasmon and metal plasmon in graphene-based dipole antenna. The nearfield distribution, resonance frequency, bandwidth, radiation pattern, etc. have been dynamically tuned by the in-phase and out-of-phase couplings between the graphene plasmonic and metallic plasmonic [74]. The proposed structure adopted a thin metal oxide of Al2O3 inserted in between the graphene monolayer and metal dipole antenna for avoiding the quantum tunneling effect between the metal and graphene. The surface plasmon of graphene can be readily seen in the nearfield profile in Fig. 3(f). The results showed that appropriate chemical doping of graphene can induce a strongmode coupling between the graphene plasmonic and metalplasmon, which results in a resonance splitting of the graphene-based dipole antenna (See Fig. 3(g)). More interestingly, the switch on/off of the mode coupling can be controlled through tuning the graphene chemical potential with electrostatically applied voltage (See Fig. 3(h)).

IV. GRAPHENE-BASED ANTENNA

I. Terahertz and Microwave Antennas

The terahertz antennas such as the dipole antenna with the size from several to hundreds micrometers fit the small area of experimentally fabricated graphene, which is a suitable platform for extensive study of the graphene-based/modulated antennas [77–80]. For instance, the adoption of graphene nano ribbons as the terahertz antenna has been reported to modulate the mode compression factor of surface plasmon polariton and propagation [81]. Zhang and co-workers presented a dielectric grating with graphene as the leaky-wave antenna. The radiation pattern reconfigurability of the antenna has been realized by controlling the graphene plasmon through the modulation of the applied voltage on the graphene [82]. Galli et al. proposed the substrate-superstrate configured leaky-wave antenna with graphene as the load to tune the radiation properties [83]. Recently, Yakovlev and co-worker studied the coverage of the elliptically-shaped graphene monolayer on the two dipole antennas as the surface reactance. The mutual coupling between each dipole antenna can be modulated by the graphene chemical potential resulting in a dynamically controllable radiation pattern [84]. Chen and co-workers proposed the implementation of a circular antenna to control the beam direction, in which the graphene-metal loop acts as the reflector to dynamically manage the resonant location [85]. In the another work, the theoretical upper limits on the radiation efficiency and beam steering have been studied for the graphene-based terahertz nonreciprocantenna [86].

Besides the linearly polarized wave, the graphenemonolayer also exhibits capabilities to generate vortex waves. Jian and co-workers proposed the cross shaped antenna to generate the plasmon vortex on the coated graphene monolayer (See Fig. 4(a)). With the excitation of cross antenna under the linearly polarized light with the directions of 45° and −45°, the amplitude of electric field component Ez exhibits the sharp change along the rotation direction (Fig. 4(b)). The corresponding phase profiles as
shown in Fig. 4(c) readily revealed features of vortex waves. More importantly, the sign of topological charge of plasmon vortex on graphene can be controlled by the linearly polarized direction of incident light [87].

The change of the chemical potential and size of graphene monolayer enable the controllable reflection coefficients and generate the 0, ±1, and ±2 modes of vortex beam at 1.6 terahertz. The three-dimensional radiation patterns and phase fronts of the vortex beams for the modes of l = −1 and l = −2 are shown in Figs. 4(e) and 4(f), respectively. The graphene monolayer also shows potential applications as microwave antennas [89–92]. The metal-insulator reversible transitions of graphene via switch on the electrostatic bias for low surface resistance metal and switch off for high surface resistance insulator can efficiently control the microwave antenna’s radiation patterns [93].

2. Spatially Modulated Graphene For Antenna Applications

The resonant optical antenna with spatial conductivity pattern has been demonstrated to launch and control the graphene plasmon [94]. The spatial modulation of the applied bias on graphene has also been studied on various antennas. Perruisseau-Carrier and coworkers proposed the concept of designing a sinusoidal modulated graphene leaky antenna by spatially controlling the gated voltage [95]. Its configuration is shown in Fig. 4(g). The graphene surface reactance can be controlled by sinusoidally modulating the bias voltage applied on the graphene (See Fig 4(h)). It results in dynamically tuning the pointing angle and leakage rate of the antenna at a fixed frequency. The radiation pattern with different beam directions can be generated with different sampling points in one modulation period (See Fig 4(i)). Alu and coworkers proposed the graphene parallel-plate waveguide loaded with gating pads and demonstrated the spatiotemporal modulation of graphene conductivity. The structure serves as plasmonic isolators and leaky-wave antennas at terahertz frequencies, which allow independent, allow independent manipulation of graphene properties in both space and time toward the nonreciprocal device.

FIG. 4. (Color online) (a) Schematic view of the cross shaped metal antenna, (b) the normalized amplitude and (c) the phase profiles of electric field component E_z excited by the cross shaped antenna under 45° and −45° [87]. (d) Reconfigurable graphene reflectarray, the dark and bright gray colors correspond to different chemical potentials. The simulated three dimensional radiation patterns and phase fronts of the vortex radio waves with the modes of (e) l = −1 and (f) l = −2 [88]. (g) Schematic of the sinusoidally-modulated graphene surface reactance operating as a leaky-wave antenna. The polysilicon pads (yellow) are used to modify the graphene conductivity as a function of the applied DC voltage, (h) schematic representation of the relation between the DC bias voltage and graphene reactance, (i) radiation patterns for different values of sampling point N in one modulation period [95]. (j) Schematic
of the sinusoidally-modulated leaky-wave antenna with non-uniformly gapped graphene nanoribbon, the radiation patterns of the leaky antenna with the chemical potential of (k) 0.5 eV and (l) 0.9 eV [98]. They further extended the concept to design the infrared beamformer through modulating the graphene with elastic vibrations based on flexural waves. A fast on-off switching of infrared emission and dynamic tuning of radiation pattern, beam angle and frequency of operation have been realized [97]. Mao and coworkers demonstrated the dynamical tuning of beam scanning of a sinusoidal-modulated graphene leaky-wave antenna with only one biasing voltage [98]. They have realized the leaky-wave antenna through designing the graphenenano-ribbon with the non-uniform gap size, whose configuration is shown in Fig 4(j). The non-uniformly gapped graphene ribbons can achieve a sinusoidal modulated surface reactance to support the leaky-wave operation. With the change of chemical potential from 0.5 eV to 0.9 eV, the radiation beam can be turned from pointingangle of 0° to 15°. (See Figs. 4(k) and 4(l))

V. CONCLUSION
Graphene represents an emerging frontier that brings together multidisciplines of physics, material science, electronics, photonics and terahertz plasmonic. It has uncovered exciting prospects in these fields, where novel technologies and solutions are still being developed. From the device and system viewpoint, graphene is a two-dimensional layered material with an intrinsically passivated surface. It is thus amenable to monolithic integration with conventional silicon-based benchmarks as well as other important functional materials, which makes graphene remarkably advantageous over bulk materials whose heterogeneous integration with other materials usually induces defects and deep level trapping centers at the interface. Presently graphene has been suffering some demanding challenges that must be overcome before making an impact on industry-standard device applications. Among many others, the high quality synthesis of large-scale graphene is of paramount importance and will have the most positive impact on this field. Specifically, the improvements in graphene’s crystal quality (i.e., carrier mobility) can significantly prolong the lifetime of grapheneplasmons, which is strongly correlated with various device performance metrics, such as the light-matter interaction strength, absorbance, sensitivity, phase shifts, spectral resolution, modulation efficiency, detectivity, and so forth. In summary, the various physical and chemical properties of graphene make it well suited for integrated, multifunctional and compact devices and systems, yet its potential has not been fully reached. In this review, we offered a brief on graphene based transmission lines, antennas, modulators, and detectors covering from microwave frequency band to terahertz or infrared band. We believe that future progresses on graphene-based functional devices and microsystems will lead to proliferation in both fundamental investigations and applied technological products for imaging, communication, environmental monitoring, medical diagnostics, spectroscopic studies etc.

VII. References


A Review Paper on New VLSI technology

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Abstract - The first Integrated Circuit (IC) was proposed by Jack Kilby in 1957 which have two transistors on a single silicon wafer but now a day IC have billion of transistors on single silicon wafer. This all is possible due to continue growth in silicone manufacturing process. In this paper, I have given brief review on IC manufacturing technology.

Keywords - Integrated Circuit (IC); bipolar junction transistor (BJT); Metal Oxide Semiconductor Field Effect Transistor (MOSFET); Silicon dioxide ($\text{SiO}_2$); Silicon – on-Insulator (SOI); Fin-FET

I. INTRODUCTION

Initially vacuum tubes are invented as transistor which control flow of electrons in vacuum. But disadvantage of this device is its size. The circuit designed using vacuum tube is very complex. 1950, Shockley developed the first bipolar junction transistor (BJT). BJT have small size, consume less power and more reliable as compare to vacuum tube. BJT transistor has three terminals, first is emitter, second is base and third is collector. One of them acts as a controlled terminal. As shown in figure 1.1.

![Figure 1.1. Symbol of PNP transistor](image)

When we applied current to the collector terminal, then BJT act as closed switch otherwise it act as an open switch. First IC was manufactured by Jack Kirby in 1958 by using two BJT transistors. Early more than thousand of transistor can be fabricated on single chip. Main drawback of BJT is its static power loss. That is if circuit is in ideal state even though power will be loss. To overcome BJTs disadvantage MOS technology was developed. Initially NMOS technology becomes famous because it is simple in fabrication, less expensive and have more packing density. But when millions of transistors are packed on single IC then static power dissipation become serious issue. So we are skipping toward CMOS Technology, which have near about zero static power loss. In 1963 by Frank Wanlass design logic gates using CMOS technology in which static power loss is near about zero. Then designer are trying to scale down the CMOS technology to improving the circuit speed and packing density. But below the 32nm technology, designer face lot of limitation. So new structures are introduce likes Silicon-on-insulator (SOI) and Fin-FET. In this paper we will briefly discuses Bulk-Si CMOS Technology, importance of scaling, second order effects and briefly discuses SOI and Fin-FET structures.

II. MOSFET DEVICE

Basic structure of MOSFET is MOS (Metal Oxide Semiconductor). MOS is two terminal devices. It is like a capacitor which have one terminal is metal and other terminal is semiconductor and in between is Silicon dioxide ($\text{SiO}_2$). FET stand Field Effect Transistor means device can be turned on and off by passing electric field through gate terminal. MOSFET is two type 1) NMOSFET and 2) PMOSFET. We will discuss overview of NMOS transistor. MOS transistor has four terminals 1) Drain 2) Gate 3) Source 4) Substrate or Body. Figure 2.1 show the structure of NMOS transistor.

![Figure 2.1. Basic Structure of NMOS transistor](image)
N-channel MOSFET is fabricated on P-type substrate. It has two identical n⁺ region called source and drain. The region between source and drain is called channel. The length and width of channel is denoted by L and W respectively which are important parameter of MOS transistor. W/L is called aspect ratio. An oxide layer is present above the channel. When MOSFET is invented, gate terminal is made by metal (Aluminum) but in the early days Polysilicon is proffered as gate terminal. There are two main reasons for this transition. First is, in early MOS fabrication process, source and drain region are defined first. Then a gate mask was used for define gate oxide region. Then on the gate oxide region metal layer is formed which form MOS structure. The main drawback of this fabrication technique is to formation of input parasitic capacitance Cgs and Cgd which are created due to overlapping of gate electrode on source and drain respectively. As shown in figure 2.2.

![Figure 2.2. Input parasitic capacitance in MOSFET](image)

This all are possible due to misalignment of mask. These parasitic capacitances are very harmful. For avoid these parasitic a “self alignment gate process” technique is used. In this process first we create gate oxide then source and drain region is formed by ion implantation method. The region under SiO₂ remains unaffected by ion implantation because SiO₂ act as mask. In this method gate is self aligned so overlapping of gate source and gate drain is not possible as shown in figure 2.3.

![Figure 2.3. Result of self alignment gate process](image)

During the source and drain doping process, MOS is put at very high temperature. If metal is used on gate, it will melt at this high temperature because metal melting temperature is less than 600°C. That way only poly-silicon gate is possible in self alignment process. The resistivity of polysilicon is very high (10⁵ ohm/cm) so we will dope the polysilicon to increase conductivity. Second region is that threshold voltage of metal oxide MOSFET is very high (3V to 5V) because threshold voltage is depend on work function difference between metal and semiconductor. But if gate electrode is made up of poly-silicon then its work function is adjusted by doping the poly-silicon. So threshold voltage is reducing to less than 1V in MOSFET input voltage is applied to gate terminal which will decide that MOS is on or off. When gate to source voltage (Vgs) is less then threshold voltage (Vth) then MOS is off because no channel is formed. When Vgs is near about equal to threshold voltage then depletion region is created under the gate. All minority carrier are pushed down by Vgs voltage and they leave behind positive immobile charge. When Vgs is grater then Vth large number of electrons are collected from drain and source terminals not from body because depletion region charge repeal minority carrier of body. When we provide proper voltage to drain and source terminals, MOSFET start conducting.

III. MOTIVATION FOR TECHNOLOGY SCALING

Now day demands of portable devices are more and more. Portable devices should be designed so that they are occupying less area and consume less power. The issue of power consumption is important because battery capacity is limited and improvement in battery capacity is only 5% in every thirty years which is very slow growth rate. According to Moor’s law numbers of transistor on chip will double in every eighteen months. This is possible by making the transistor size less and less. Lesser the transistor size, more number of transistors can fabricate on same chip size. This technology is called scaling means scale down the dimension of transistor like .6um, 180nm, 95nm, 45nm etc. The size of transistor is reducing means capacitance of transistor is reducing. Dynamic power dissipation is directly proportional capacitance. So power dissipation is automatically reduced.

IV. SMALL DIMENSIONS EFFECTS

Long channel devices are based on some approximations called gradual channel approximation (GCA), like MOS channel is consider only in two dimensional, MOSFET current is controlled by gate voltage Electric field. But short channel devices are not based on these approximations. Those devices in which channel length and depletion region (source to body and drain to body) are in same order are called short channel devices. In short channel devices longitudinal electric field (due to drain to source voltage) comes in picture. That’s way second order effects are come in picture like Carrier Velocity Saturation, Drain Induced Barrier Lowering, Punch-through, Hot Carrier Effects.
V. NEW INNOVATIVE DEVICE STRUCTURES

For conventional MOS structure, as the channel length shrinks, the gate does not have full control over the channel which is not desirable. One of its effects is to cause more sub-threshold leakage from drain to source, which is not good from power consumption point of view. In conventional MOS, the gate cannot control leakage path which is far removed from the it. This can be improved using various MOS structures which allow the scaling of a transistor beyond conventional MOS scaling limit. In this section, we will discuss two new MOS structures, SOI and FinFET. The main objective of both the structures is to maximize gate-to-channel capacitance and minimize drain-to-channel capacitance.

A. Silicon-On-Insulator (SOI):

The main difference between conventional MOS structure and SOI MOS structure is that SOI device has a buried oxide layer, which isolates the body from the substrate. As shown in the Figure 5.1, SOI transistor is a planar device. The fabrication process of SOI MOS is similar to bulk MOS (conventional MOS) process except for the starting silicon wafer. SOI wafers have three layers; 1. Thin surface layer of silicon (where the transistors are formed). 2. An underlying layer of insulating material. 3. A support or “handle” silicon wafer.

![Figure 5.1. SOI Wafer](image)

The basic idea behind buried oxide layer is, that it will reduce the parasitic junction capacitance. And the smaller the parasitic capacitance, the faster will the transistor work. Giving higher performance. Due to BOX layer, there is no unwanted leakage paths which are far from the gate. This leads to lower power consumption. Depending on the condition of the thin body during operation, SOI devices are categorized as Partially Depleted (PD) SOI and Fully Depleted (FD) SOI. Compared to PD SOI, FD SOI have very thin body structures, hence the body is fully depleted during operation. This FD SOI also called Ultra-Thin-Body SOI. For PD SOI, body is 50 nm to 90 nm thick. While for FD SOI, the body is about 5 nm to 20 nm thick.

Advantages of SOI Devices:
- Owing to oxide layer isolation, the drain/source parasitic capacitances are reduced. So, the delay and dynamic power consumption of the device is lower compared to bulk CMOS.
- Due to an oxide layer, the threshold voltage is less dependent on back gate bias compared to bulk CMOS. This makes the SOI device more suitable for low power applications.
- Sub-threshold characteristics of SOI devices are better, so leakage currents are smaller.
- SOI devices have no latch-up problems.

Drawbacks of SOI Devices:
- One of the drawbacks of PD SOI device is that they suffer from history effect. In PD SOI, as the body becomes thicker, a floating body is evident. So, the body voltage is dependent on the previous state of the device. This floating body voltage can change the threshold voltage of the device. It could cause significant mismatch between two identical transistors.
- The other problem with an SOI device is self-heating. In SOI device, the active thin body is on silicon oxide which is good thermal insulator. During an operation, the power consumed by the active region cannot be dissipated easily. As a result, the temperature of the thin body rises which decreases the mobility and current of the device.
- One of the challenges with FD SOI is the difficulty in manufacturing thin body SOI wafers.

B. Fin-FET:

Former TSMC CTO and Berkeley professor Chenming Hu and his team presented the concept of Fin-FET in 1999 and UTB-SOI (FD SOI) in 2000. The main principle behind both the structures is a thin body, so the gate capacitance is closer to whole channel. The body is very thin, around 10nm or less. So, there is no leakage path which is far from the gate. The gate can effectively control the leakage.
The basic structure of FinFET which they proposed would be a channel controlled by more than one side of channel. One of the Double-Gate Structures is shown in Figure 5.3.

Modern Fin-FETs are 3D structures as shown in Figure 5.4 also called tri-gate transistor. Fin-FETs can be implemented either on bulk silicon or SOI wafer. This Fin-FET structure consists of thin (vertical) fin of silicon body on a substrate. The gate is wrapped around the channel providing excellent control from three sides of the channel. This structure is called the Fin-FET because its Si body resembles the back fin of a fish.

In bulk-MOS (planner MOS), the channel is horizontal. While in FinFET channel, it is vertical. So for FinFET, the height of the channel (Fin) determines the width of the device. The perfect width of the channel is given by Equation 4.

\[ \text{Width of Channel} = 2 \times \text{Fin Height} + \text{Fin Width} \] (Equation-4)

The drive current of the FinFET can be increased by increasing the width of the channel i.e. by increasing the height of the Fin. We can also increase the device drive current by constructing parallel multiple fins connected together as shown in the Figure 10. It implies that for a Fin-FET, the arbitrary channel width is not possible, since it is always a multiple of fin height. So, effective width of the device becomes quantized. While in planner devices, there is the freedom to choose the device's drive strength by varying channel width.

In conventional MOS, a doping is inserted into the channel, reducing the various SCEs and ensuring high \( V_{th} \). While in Fin-FET, the gate structure is wrapped around the channel and the body is thin, providing better SCEs, so channel doping becomes optional. It implies that Fin-FET suffers less from dopant-induced variations. Low channel doping also ensures better mobility of the carriers inside the channel. Hence, higher performance. One thing noticed over here is that both Fin-FET and SOI technologies have introduced Body Thickness as a new scaling parameter. Fin-FET technology provides numerous advantages over bulk CMOS, such as higher drive current for a given transistor footprint, hence higher speed, lower leakage, hence lower power consumption, no random dopant fluctuation, hence better mobility and scaling of the transistor beyond 28nm.

**VI. SOI VS FINFET**

As SOI technology is very close to planner bulk technology, it does not require much investment in Fab. So, existing bulk technology libraries can easily be converted to SOI libraries. Another advantage of SOI over Fin-FET is, that it has good back gate bias option. By creating back gate region below BOX, we can also control \( V_t \). This make it suitable for low power applications. The primary limitation of SOI technology is the cost of an SOI wafer which is higher than a bulk Silicon wafer because it is very difficult to control the tin silicon film throughout the wafers. Another stumbling block for SOI adoption is a limited number of SOI wafer suppliers. According to Intel, SOI wafer adds approximately 10% to the total process cost. In comparison to SOI, Fin-FET has higher drive current. Moreover in Fin-FET, the strain technology can be used to increase carrier mobility. One of the downsides of Fin-FET is its complex manufacturing process. According to Intel, the cost of Fin-FET manufacturing can increase by 2-3% over bulk.
VII. SOI-FINFET IN MICROELECTRONICS INDUSTRY

Intel introduced Trigate FETs at the 22 nm node in the Ivy-Bridge processor in 2012. Other foundries that are offering Fin-FET technology are TSMC, Global Foundry, and Samsung. In 2014, TSMC announced that it has produced its first fully functional ARM-based networking processor with 16nm Fin-FET technology. STMicroelectronics released its first FD-SOI chips for mobile processor at 28nm in 2012. Foundries that are offering FD-SOI technology are IBM, Global Foundry, and Samsung. Some of the products using SOI technology are AMD's processor, PowerPC microprocessor and Sony’s PlayStation.

VIII. FUTURE SCOPE

Both Fin-FET and SOI structure have better gate control and lower threshold voltage with less leakage. But, when we move to lower technology node say below 10nm node, the issue of leakage starts again. This leads to many other issues like threshold flattening, increase in power density, and thermal dissipation. FinFET structure is less efficient in terms of heat dissipations, as heat can easily be accumulated on the fins. These concerns can lead to a new class of design rule - Design for Thermal, unlike other design rule like Design for Manufacturability. As these devices are approaching their limitations, eInfochips is working with Academia to come with potential solutions which include modification in device structure, replacing existing silicon material with new materials. Among them, Carbon Nanotube (CNT) FET, Gate-All-Around Nanowire FET or FinFETs with compound semiconductors may prove as promising solutions in future technology nodes.

REFERENCES


FAULT DIAGNOSIS OF AN INDUSTRIAL GAS TURBINE USING SIMULINK

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Abstract: In this paper fault detection of an industrial gas turbine using Simulink models has been studied accordingly. First of all the combined data sheet is obtained for various parameters such as temperature and pressure control. The main and foremost purpose of fault diagnosis is to detect and estimate the magnitude of the faults occurring within the system and the system here is the gas turbine as already mentioned in the above said terminologies. To increase the profit levels of a power unit is to reduce the maintenance prices. If gas turbine reliability is improved then above said can be true. The controllers are used in this which can be proportional integral, proportional integral and derivative controls. The paper is concerned on how to obtain a fault classification mechanism.

Keywords: fault diagnosis, controllers, neural networks, PID controller, fault detection.

I. INTRODUCTION

Gas turbines are basically used in industries for power generation. They are the primary choice for many applications. The turbine might be a main part of an influence plant that produces an excellent quantity of power for its volume and load. The GT might be a system that gives torsion with adjustable speeds that may be accustomed rotate generators and it’s created of countless stationary and rotary elements that build the GT awfully complicated system with a high-powered performance. The turbine has established growing service within the past forty years within the power trade each among utilities and business person plants moreover because the organic compound trade, and utilities throughout the planet. With the deepening of the industrialization method, the revolution of trade four is raising in several trade areas. It derives power from a flow movement and converts it into helpful work. A wide spectrum of intelligent instrumentality and management technologies are created in this arena of modern spectrum. It works on the thought of brayton cycle.

The management devices presently use to boost the presentation of commercial processes involve each subtle digital system style techniques and sophisticated hardware (sensors, actuators, process units). The Quality implies that the chance of fault prevalence will be vital Associate in an automatic superior system have to be accustomed find and isolate abnormal operating conditions as early as potential. This study is driven by the challenge of developing diagnostic tools for turbine systems to point the onset of developing faults and supply a mechanism for prophetic maintenance necessities. Though the turbine might be a complicated phase space we have to show that the model-based approach to error finding and remoteness will work okay beneath realistic fault conditions. GT plays progressively necessary role in power generating and driving force systems. It had been stressed that numerous systems of the GT and notably the gas-path parts square measure subjected to degradations and faults throughout operation. There are square measures for many methods in which the designation of the degradation and fault occurs, some square measure either in use or square measure being projected.

II. DESCRIPTION OF THE SIMULATED MODEL OF GAS TURBINE

A simulated model has been shown below. It contains section of throttle and manifold. It is the process by which liquid flow is Regulated by the constriction or obstruction. an engine’s power will be exaggerated or weakened by the restriction of recess gases, however typically weakened. The manifold the most significant piece within it’s the throttle plate, which might be a valve that regulates the flow. It contains the subsystems. The valve behaves in a very non linear manner and is sculpturesque as a scheme.
with 3 inputs. Simulink outfits each equation, as already mentioned and operation is performed by various blocks.

A switch block determines whether or not the flow is sonic by examination the pressure magnitude relation to its switch threshold, flow might be a performance of throttle position solely. The path of flow is from higher to lower pressure as determined by the sign block.

1. **Intake and Compression**
   A measuring device accumulates the cylinder mass air flow within the ‘intake’ block (located within the throttle and manifold subsystem). The valve temporal order block problems waveform that refers to specific move positions so as to manage the intake and density temporal order. Control device Events occur at each and every rotation, or 180 degrees of rotation and every event triggers one implementation of the compression scheme.

2. **Combustion**
   Engine torsion might be a performing of 4 variables. The model uses a ‘mux’ block to mix these variables into a vector that has input to the ‘torque gen’ block. A block performs and computes the engine torsion. The torsion that hundreds the engine, computed by step functions within the Drag torsion block, is within the engine dynamics scheme. The distinction divided by the inertia yields the acceleration that is integrated to make the engine speed.

   ![Fig 1: Faulty subsystem](image1)

   ![Fig 2: compression subsystem](image2)

   Distinction within the inward and outward accumulation stream rates represents internet rate of modification of atmosphere with regard to time. This amount, reliable through the perfect gas law, is qualified to the instant spinoff of the fluid pressure. The mass flow of air that the model pumps into the cylinders from the manifold is delineated in equation three. This accumulation speed is performing of the manifold pressure and also the turbine torque. To locate the overall air charge tense into the cylinders, the Simulink models are used for integrating the heavy flow of viscous from the diverse unit and samples it at the tip of every intake hit experience. This determines the overall air weight that’s gift in every cylinder when the ingestion hit and before compression.

3. **Compression stroke**
   In an aligned four cylinder four stroke engine, 180 degrees shaft revolution split the ignition of every sequential cylinder. This leads to every cylinder sacking on each different crank revolution and during this model, the intake, compression and exhaust strokes arise at the same time.

4. **Torque generation**
   The end equations of the simulation model describe the torsion caused with the help of turbine. An experimental approach is established and is reliant on the weight of the air charge, the air/fuel combination magnitude relation, the timing and also the engine speed is employed for the torsion computation.

**Equation**

\[
\text{Torque engine} = -181.3 + 379.36 \cdot \text{ma} + 21.91 \cdot (\text{A/F}) - .85 \cdot (\text{A/F})^2 + .26 \cdot \sigma - .0028 \cdot \sigma^2 + .027 \cdot \text{N} - .000107 \cdot \text{N}^2 + .00048 \cdot \text{N} \cdot \sigma + 2.55 \cdot \sigma \cdot \text{ma} - .05 \cdot \sigma^2 \cdot \text{ma}
\]
\( ma = \) mass of air for combustion (g); \( (A/F) = \) air to gas ratio;
\( \sigma = \) timing

Torque engine = torsion made by the engine (Nm);

5. **Analysis of Craft reaction engine and numerical representation**

A rotary turbine engine may be an advanced system together with upstream rotating mechanical device joined to a downstream turbine, and a ignition chamber between these 2 components. Turbine is most ordinarily used for mobile driving force in vehicle and moveable machinery. The applications embrace jet craft, helicopters, giant ships and electrical generators.

The numerical model of one spool reaction engine is reviewed. The area unit has many representations of turbine which has all major elements within the engine specified the ensuing nonlinear model will capture the purposeful relations between the engine variables. Significantly rotor and volume dynamics area unit thought of so as to obtain a nonlinear dynamics for the system. The dynamics of this nonlinear model is drawn within the MATLAB Simulink.

6. **Modeling of turbine**

Mathematical models gift the depiction of the system behavior to a group of input values. They are a valuable tool to predict regarding the system performance while not conducting intensive experiments. The physical experiments could need loads of effort and time as compared with the mathematical models that may be engineered exploitation set of mathematical equations describing system Dynamics. The simulations obtained once conducting experiments on the models, area unit a consistent supply of investigation the system performance.

7. **Fault diagnosing and Isolation**

The turbine model may also be used for detection and isolation of the faults within the system. Fault diagnosing is a very important tool to recover the systems to traditional state before a serious loss or injury to the machines or masses. Therefore, mathematical models could lead towards prophetic maintenance of the system together with the preventive maintenance. Troubleshooting is a very important and effective tool once operators need to trick from preventive maintenance to prophetic maintenance to cut back the value of maintenance. The mathematical models area unit accustomed monitors the system performance to understand once a slip occurred specifically, what form of its gift, and wherever it's occurred within the system states.

8. **Identification of the system**

Due to the nonlinear and complicated nature of the system dynamics in turbine engines, the systems could continuously be tough to spot. The mathematical models of the turbine engines be capable of system identification purpose. Despite vital analysis conducted during this field over the past decades, there's still a necessity for turbine models with a bigger degree of accuracy and responsibility for system identification functions.

9. **Use of Simulink for Modeling**

Simulink could be a package that is employed for dynamic modeling, simulation and analysis of the dynamic systems. In surroundings of MATLAB Simulink provides graphical computer program for building models as block diagrams exploitation click and drag operations of mouse. Library browser of Simulink includes several operations like sinks, sources, linear and non-linear parts, mathematical operators, logical operators and connectors etc. together with these operations there's additionally associate choice to have user outlined and MATLAB performs to be employed in the Simulink model. Every block in Simulink incorporates a special
feature and should be used as building block for the model.

The Simulink browser library is employed to pick the desired block for the mathematical model designed during this project. The mostly used blocks in constructing the turbine engine model embrace mathematical operators, subsystems, gain, constant, scope, MATLAB function, space and sub-systems.

10. The concept of PID Controller

The basic control algorithm in control engineering is PID controller. Majority of the feedback systems are controlled by using this controller. It may be implemented in different forms like a distributed process control system. Idea of using feedback is quite simple but an influential tool to control a process. The principle of feedback is to control the process variable as compared to a set point/reference by manipulating its value. The feedback principle is illustrated by a block diagram in Figure 4. The feedback control system in above-mentioned figure is a simple on-off control. The term \( e = y_{rf} - y \) is the control error.

![Block Diagram of PID Controller](image)

III. Result Analysis

![Plot showing no. of revolutions (1/sec) against time (sec)](image)

![Plot showing total temperatures (K) Against time (sec)](image)

The output of combustor delay and exhaust delay is connected to a scope. Scope is used to see the actual output graphical parameters of...
combustion delay and exhaust delay. Throttle control is actually the input of manifold control system and 2nd input of manifold system is engine speed which is actually the speed of gas turbine. Whole output of the system is air charge. When fresh atmospheric air is burned in the combustion chamber then high temperature and pressure air charge is produced.

In this research study our aim is to obtain the control of number of revolutions per second without any steady state errors and overshoot in the response. For the same purpose, different values of gain (Kp) integral (Ki) terms are tested. It is found that, at Kp=0.0002 and Ki=0.003, the controller response is in desired limits and it generates the required number of revolutions while keeping the system stable. At a time constant Of 0.3 sec the system achieves the desired number of revolutions.

**IV. CONCLUSION**

In this analysis work, the simulation and fault diagnosing of a turbine has been experimented. The faults in gas turbines could result into significant losses for the upkeep and even cause injury to human lives yet. The mathematical models are employed in the turbine simulation and varied mathematical equations area unit designed consistent with the reference values. The simulation blocks were run in Simulink/Matlab. The controller was designed exploiting PI dominant techniques. The problem of the sensible work could also be useful within the complete performance of the system of the turbine. Computational fluid dynamics has contributed to substantial enhancements within the performance.

**References:**


Review on Microstrip Patch Antenna with Electromagnetic Band Gap Substrate

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Abstract— In this paper, we have reviewed the behavior of electromagnetic substrates to enhance the gain of antenna. In respect of all the research papers gain is improved up to 7.92 dB using hexagonal electromagnetic substrates that results in fluctuations in the bandwidth which improves the gain of the antenna. Secondly, we observed that for enhancing the gain of return loss should be minimum. Second factor is bandwidth that needs to be discussed.

Keywords— EBG (Electromagnetic Band Gap), PBG (Photonic Band Gap), HFSS (High Frequency Structure Simulator), Coaxial Feed Antenna

I. INTRODUCTION

In the present time, the enhanced technology of wireless communication is increasing day by day as per the requirements. In prospective to security point of view, wireless sensor network are used in automatic organization and company. Wireless communication systems are used to transmit images and videos with higher data rates [1]. Electromagnetic band gaps which works for both transverse electric field and transverse magnetic field can eliminate the surface waves along the same frequency band. Electromagnetic band gaps are the regular manner structure which are used to transmit electromagnetic waves in the space. Electromagnetic band gap structures can be designed in different dimensions and shapes according to the operating frequencies. Popular EBG structures are, rectangular, circular, fractal and mushroom shapes. EBG structures are formed on either substrate or ground, depending on the application of antenna. According to our survey, if we uses mushroom like structure of the electromagnetic band gaps, it will have half wavelength. This half wavelength structure can be used in microwave applications [2]. There are two important properties of electromagnetic band gap, one is reflection phase property and second one is surface wave suspension. First property is used for the applications having phase -180° to 180° and other one is used to improve the gain, minimization of backward radiation and reduction of mutual coupling [4]. Electromagnetic band gap acts as artificial magnetic ground plane. EBG design on the substrates so that it can create band gap around the operating frequencies. Due to this property it can avoid the radiations from radiated in the substrate surface. In this paper, we are reviewing the designing and operations of EBGs Structure. The effect of these shapes is much higher in the substrates as compared to the patches. The rest of paper is organized as follows. The overview of patch antenna & EBG is described in section II & III receptively. Performance parameters are defined in section IV. Related literature survey work is described in section V. Advantages & applications are described in section VI. The overall conclusion of review paper is described in section VII.

II. OVERVIEW OF PATCH ANTENNA

Microstrip patch antenna is small in size, light in weight, so preferred over conventional antenna. These are also known as patch antenna. As printed circuit technology is used in micro strip patch antenna, makes it easy to manufacture either as standalone elements or as elements of an array. There are two parts of micro strip patch antenna. One is substrate & other one is patch. The substrate is made of different material and patch is made of copper metal. Different Cad formulas are used to calculate the dimension of patch antennas. There are two types of substrates, thin and thick. For thin substrate, CAD formula is sufficient for final design of antenna [7]. On the other hand, for thicker substrates, CAD formula is used for only initial design but full wave simulation tool is used for final design. The patch antenna is easy to analyses using both transmission line and cavity models. These are most accurate thin substrates.

III. ELECTROMAGNETIC BAND GAP

In past decades, electromagnetic band gaps comes from the technology photonic band gap. Photonic band gap concept comes from the idea that when material is drilled, then electromagnetic radiation emits from that hole [7]. The energy emitted is in the form of photons. These band gap structures are known as photonic band gap and the regular manner of these structures known as electromagnetic band gap. In 80’s Photonic band gap are developed. These structures are able to pass the electromagnetic band gap. These structures are called photonic band gap structures. These are widely used in microwave applications. After using in electromagnetic waves, this technology became famous, termed as electromagnetic band gap [8]. There are five types of EBG structures that are discussed

(a) Mushroom (b) Cross Hair (c) Swastika
(d) Hexagonal patch (e) T Shape Above structures can be modified in accordance to microwave applications. The proposed substrates are of dimension 100 × 50 × 1.5. A rectangular patch antenna made of copper is employed on it. The dimension of patch is 30 × 20 (mm). The design of antenna is based on FDTD method where all the feeding process is assigned to the patch. The feeding point is given (0, -3.5, 0). The proposed antenna is given in figure 1.
IV. PERFORMANCE PARAMETER

The other parameters of antenna that needs to be improved are gain, directivity, bandwidth and return loss [8]. These parameter are as: Directivity is the ratio of the radiation intensity in a given direction from the antenna to the radiation intensity averaged over all directions.

\[ D = \frac{4\pi U}{P_{rad}} \]

Gain of an antennas is the ratio of the intensity, in a given direction, to the radiation intensity that would be obtained if the power accepted by the antenna were radiated isotropic ally.

\[ Gain = \frac{4\pi}{Total\ input\ (accepted)\ power} \]

The bandwidth of an antenna is defined as the range of frequency within the performance of the antenna. The bandwidth of narrow band and broadband antennas are defined as

Return loss or reflection loss is the reflection of signal power from the insertion of a device in a transmission line or optical fiber. The return loss is given by

\[ RL = 10\log \frac{P_{r}}{P_{i}} \]

V. LITERATURE REVIEW

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<td>Mushroom Shape EBG , specification h = 14.9 mm, g = 4 mm, w = 8 mm , = 4.4 , FR4 Substrate</td>
<td>Return loss : -40.12 db Resonant frequency : 2.42 GHz B.W : 948 MHz</td>
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<td>LalithendraKurrr, Mahesh P. Abegaonkar, AnanjanBasu, and Shiban K. Koul</td>
<td>FSS properties of a Uni-planar EBG and its Application in Directivity Enhancement of a Microstrip Antenna</td>
<td>GML 1000 substrate ( \varepsilon_r = 3.2 ) , h = 0.762 13 x 13 Cells d : 14.5 mm</td>
<td>Return Loss : -29.3 Gain : 6.95 B.W : 511 MHz</td>
<td>It is used for for aspect transmission as compared to reception.</td>
</tr>
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</table>
VI. ADVANTAGES & APPLICATION OF ELECTROMAGNETIC BAND GAPS

The main advantages of electromagnetic band gap are the package level and the board level. It includes the reduction of decoupling caps. In discrete system, radiated emission from PCB may be reduced. The data rates of these antennas are fast as compared to others [9].

The main applications of electromagnetic band gaps are in designing PCB used as Power distribution networks for high speed computer server, laptops, computer etc. On the other hand these are used as ceramic module used as microprocessor chips. Electromagnetic band gaps are used in RF IC Chips for decoupling of RF Amplifiers [10].

VII. CONCLUSION

In this paper, the studies of micro strip antenna with & without EBGs are defined. The study of effect of Electromagnetic band gap on gain, return loss & bandwidth. The Gain is improved and return loss is minimized with electromagnetic band gap. The net conclusion comes from survey is that EBG substrates are used to eliminate the surface wave and to transmit the transverse electric and magnetic waves

REFERENCES


| D.Helena Margaret, S.Suba , B. Manimegalai | Band Gap Analysis of a novel C Slot Electromagnetic Band Gap Structure | FR4 Substrate 3×3 EBG units , = 4.4 , h = 2.8 |
| | | Return Loss : - 45.3 B.W : 452 MHz |
| | | Return Loss : - 35.83 B.W : 1.25 GHz |
| | | Compactness increases its form fitness for recent wireless device. | It is used for 5 G Communication |
A Review on Low Power Low Noise Amplifier

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Abstract—In this paper, we are reviewing a fully integrated electrostatic discharge (ESD)-protected low-noise amplifier (LNA) for low-power and narrowband applications using a cascade inductive source degeneration topology, designed and fabricated in 130-nm CMOS silicon-on-insulator technology. The different designed LNA was operated from a range of 11-dB to 15-dB power gain at different frequencies. The Noise figure, input return loss, power consumption & protection level are the major parameter for analysis. An extensive survey of analytical models and experimental results reported in the literature is carried out to quantify the issue of excessive thermal noise for short-channel CMOS. Short channel effects such as channel-length modulation and velocity saturation effects are also accounted for in our optimization process.

Key Words: LNA, CMOS, Bandwidth, Power Gain

I. INTRODUCTION

With advancement in state-of-the-art electronic systems and a huge demand for low-cost high-speed mixed-signal integrated systems, a considerable effort has recently been made to migrate several high-frequency elementary circuit blocks from GaAs to the CMOS silicon process. Since CMOS silicon-on-insulator (SOI) devices present a very good high-frequency behavior and low-power consumption, it is of great interest to use them in RF circuit design [1].

Over the last decade, the MOS transistor channel length scaled down to deep submicrometer to improve device performance in terms of cutoff frequency. Recently, a 130-nm partially depleted (PD) SOI CMOS technology with a transit frequency of 243 GHz and maximum frequency of oscillation of 208 GHz has been reported [2]. Such transition frequencies well above 100 GHz offer a comfortable frequency margin for RF designers. Recently, many designs of different RF blocks such as low-noise amplifiers (LNAs), voltage-controlled oscillators (VCOs), and mixers have demonstrated the interest of this technology for low-voltage and low-power applications.

Power consumption is a major concern for high-performance digital systems and portable applications. The most efficient technological approach for reducing power consumption is power-supply voltage scaling. For this purpose SOI devices bring their unique inherent advantages over bulk devices: lower junction capacitance, lower junction leakage, no latch-up, lower sensitivity, and full dielectric isolation [1].

In a typical radio receiver, the LNA is one of the key components, as it tends to dominate the sensitivity. The LNA design involves many tradeoffs between the noise figure (NF), gain, linearity, impedance matching, and power dissipation. Generally, the main goal of LNA design is to achieve simultaneous noise and input matching at any given amount of power dissipation.

Electrostatic discharge (ESD) protection for RF device applications is becoming increasingly important. Traditional ESD protection structures, whether on or off chip, are often responsible for performance degradation of RF blocks. SOI ESD protection networks have already made considerable progress in achieving industry-acceptable ESD protection levels using gated diodes, gate-coupled MOSFETs, and Zener diodes [3]. Introduction of systematic characterization benchmark strategies and new testing techniques (e.g., transmission line pulse (TLP) testing) will allow better understanding of ESD robustness of advanced technologies [4].

With the decrease of gate-oxide thickness, CMOS circuits become more sensitive to stress from ESD phenomena. LNA constitutes one of the most critical building blocks in the RF frontend. It is usually connected to the outside world through the antenna and can be exposed to ESD stress. In this study, the performance of 2.4-GHz CMOS SOI LNAs with/without ESD protection, fully integrated on 130-nm RF SOI CMOS technology, is discussed.

The rest of the paper is design as follows. The designing challenges are described in section II receptively. Related literature survey work is described in Section III. Performance parameters...
are defined in section IV. The overall conclusion of review describe in section V.

II. DESIGNING CHALLENGES

Designing wideband LNAs for wireless applications presents two levels of challenges. In the first place, having fast and low noise transistors depends on the available technology. Traditionally, wideband microwave amplifiers relied on transistors realized with composite semiconductors, e.g., GaAs, because of the intrinsic superior frequency characteristics of such devices [51–[7]. Silicon technology, on the other hand, has been employed to design and fabricate amplifiers, even wideband ones, for particular applications, e.g., optical communications [8], [9], that require different specifications compared to wireless systems. In wireless mobile communications systems, silicon integrated circuits have been widely employed in narrow-band systems, where limited gain and increased parasitic are tolerable due to lower operating frequencies and the application of tuned networks. There are few examples of development of high-frequency wideband amplifiers employing silicon transistors, in particular in CMOS technology. In this case, it is remarkable that employed solutions (distributed amplifiers [10]–[12]) require high levels of power consumption, and they are not optimized for noise. This brings about the second challenge—finding a low-power topology that satisfies all the other design requirements, the most stringent one being the input match. Another possibility is balanced amplifiers. In this case, though, the input match is achieved by means of a resistive termination. This results in a degradation of the overall noise performance, as the minimum achievable NF is 3 dB. Moreover, balanced amplifiers require quadrature hybrid couplers that are either narrow band or, if they are wideband, they are multi sectional and very large. Thus, they are not amenable to integration.

- Power consumption is a very important criterion
- At the same time we need to have a cost effective solution for the problem of constructing RF circuits using non Si Ge technologies.
- We need a substitute that can provide the benefits of the Si Ge technology like low power and high gain.
- This is one of the reasons why the use of the CMOS technology is increasing in the design of the Low Noise Amplifiers of the RF Front end.

- There are certain CMOS designs that consume several tens of milli watts, this approach reduces the power consumption to just a few milli watts

In low noise amplifier, for achieving low noise high amplification is required for the amplifier in first stage. Therefore we required high electron mobility transistors which should be driven in a high current region, which is not a energy efficient and problem also occurring in input and output matching.

III. LITERATURE REVIEW

This section will provide the brief description and highlights the contribution, remarks and factors of the work done by the researchers. Many attempts have been made in the past to achieve low power consumption.

In this paper, author told about high pass pole can be formed by the feedback capacity and the pseudo resistance cell. Voltage, gain, noise and fabrication area was achieved upto 1.8 V, 39.98 db, 096 u and 0.065 [1].

In this paper, author told about A floating-gate based reconfigurable OTA-C filter has been designed and implemented. In the proposed power efficient linearized OTA, floating-gate transistors are employed for current bias and common-mode feedback implementation [2]. Biomedical recording Instrument and Bluetooth Serial plugin for performing serial communication with the HC-05 module. Gain Characteristics improves Frequency Response & Amplified output was evaluated. Peak to peak noise ratio & mean was getted up to 1.52, Mean: 2.40 Bluetooth module is positively paired with other Bluetooth enabled devices and is able to detect these devices within the 100 meter range. [3].

Designing of on chip low-noise and low-power FEA for various neural recording applications. TSMC 0.90nm technology Gain: 39 db, Noise Efficiency Factor: 2.89 and B.W: 5.2 – 540 KHz The designed amplifier not only reduces the input-referred noise but also improves the linearity of the circuit [4].

Proposed ultra-low power Bio amplifier with feedback circuitry, main concern is to design circuit with ultra-low power consumption, transistors are preferred to be operate in weak inversion region. Gain, Bandwidth and frequency range and power are 45.38 db , 2.9 KHz , 5.02 Hz – 2.927 KHz and 6.25 μ. The designed amplifier not only reduces the input-referred noise but also improves the linearity of the circuit. [5]
In this paper, Acquisition Front End Method is used. This work presents two ULP BSA front-ends, BSA I and BSA II. Gain: 39 db PSRR, CMRR, bandwidth was achieved up to 70 db, 74 db and 2-175 Hz. The circuit architecture presented in this work can serve as the basis for a highly miniaturized and ultra-low power brain signal acquisition unit for a future fully implantable BCI system [6].

The system has a pre-amplifier, a high pass function by means of feedback capacitors and resistors, a buffer, and a low pass filter. The Technology, gain, power, bandwidth and voltage was 0.18 µm, 89.9 db, 55.8 µW, 10-10.9 KHz and 2.19 µV. Although a more modern process has advantages, such as higher speed, lower power consumption, smaller area, etc, advanced process also inherits a larger noise floor.

Table 1. Literature Review

<table>
<thead>
<tr>
<th>Authors</th>
<th>Paper Title</th>
<th>Research Methodology used</th>
<th>Major Findings</th>
<th>Research prospects</th>
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<tbody>
<tr>
<td>Yali Su, Xuan Liu</td>
<td>Design of a Low Noise Low Power Preamplifier used for Portable Biomedical Signal Acquisition</td>
<td>A high pass pole can be formed by the feedback capacity and the pseudo resistance cell.</td>
<td>Voltage : 1.8, Gain : 39.98, Noise : 096 u, Area : 0.065</td>
<td>The designed preamplifier is suitable for biomedical signal acquisition circuit with low power consumption, low noise and high integration.</td>
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<tr>
<td>Sheng-Yu Peng, Yu-Hsien Lee, Tzu-Yun Wang</td>
<td>A Power-Efficient Reconfigurable OTA-C Filter for Low-Frequency Biomedical Applications</td>
<td>A floating-gate based reconfigurable OTA-C filter has been designed and implemented.</td>
<td>Input Voltage Range : 216 m Vpp, Gm Deviation &lt; 1.56 %, THD : 40 db, SFDR : 52.6 db for LPF, SFDR : 53.63 db for HPF, Power : 303 n W</td>
<td>In the proposed power efficient linearized OTA, floating-gate transistors are employed for current bias and common-mode feedback implementation.</td>
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<tr>
<td>Sayali Joshi, Asmita Wakankar, Dr. Niranjan Khambete</td>
<td>Design &amp; Implementation of Low Power Compact Amplifier Circuitry for Wearable Bio signal Device</td>
<td>Biomedical recording Instrument Bluetooth Serial plugin for performing serial communication with the HC-05 module.</td>
<td>Gain Characteristics improves Frequency Response &amp; Amplified output P-P : 1.52, Mean : 2.40</td>
<td>Bluetooth module is positively paired with other Bluetooth enabled devices and is able to detect these devices within the 100 meter range.</td>
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<tr>
<td>Richa Dubey, Anjan Kumar, Manisha Pattanaik</td>
<td>Design of Low Noise Bio potential tunable amplifier using Voltage Controlled Pseudo-resistor for Bio signal Acquisition Applications</td>
<td>Designing on chip low-noise and low-power FEA for various neural recording applications TSMC 0.90nm technology</td>
<td>Gain : 39 db, Noise Efficiency Factor : 2.89, B.W : 5.2 – 540 KHz</td>
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<tr>
<td>Pratyusha, Sanjeev Kumar and Anita Kumari</td>
<td>Low Power Amplifier For Bio potential Signal Acquisition System</td>
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<td></td>
<td></td>
<td>Gain : 45.38 db B.W : 2.9 KHz Frequency Range : 5.02 Hz – 2.927 KHz Power : 6.25 μ</td>
<td>Low power circuits are generally preferred for the safety of patients</td>
<td></td>
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<tr>
<td>Alireza Karimi-Bidhendi, Omid Malekzadeh-Arasteh</td>
<td>CMOS Ultralow Power Brain Signal Acquisition Front-Ends: Design and Human Testing</td>
<td>Acquisition Front End Method is used. This work presents two ULP BSA front-ends, BSA I and BSA II.</td>
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The other parameter of LNA with CMOS technology are Gain, noise figure and power respectively [8]. These parameter are as : 

\[
NF = 10 \log \frac{SNR_{in}}{SNR_{out}}
\]

Where 

NF= Noise figure  
\(SNR_{in}\)= Signal to Noise ratio at the input of a circuit or system  
\(SNR_{out}\)= Signal to Noise ratio of the circuit or system at output.

1. The ratio between the signal outputs of a system to signal input of a system is called gain. For LNA design there are three power gain definitions appears in the literature. 
   - Transducer power gain (GT) 
   - Operating power gain (GP) 
   - Available power gain (GA) 
2. Noise figure is commonly used to define extra noise generated by a circuit or system. It can also be said that, the ratio between [17] SNR at input to the SNR at output, and is expressed in decibels. It is expressed by following Equation 

IV. PERFORMANCE PARAMETER

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V. CONCLUSION

A fully integrated LNA with an on-chip ESD protection technique was studied. The protected LNA provide high gain & less reflection coefficient. ESD protection solution can be
applied to any sub-130-nm RF CMOS technology with thinner gate oxides.

REFERENCES


Graphene based Smart Antenna

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Abstract - We have analyzed two graphene-based antennas in which the radiation pattern of the antenna or the backscattering of a 10x10 reflectarray can be controlled by metal insulator reversible transitions of biased graphene monolayers. We have found that the radiation patterns of metallic antennas backed with graphene are reconfigurable, from omnidirectional to broadside, by changing the DC voltage. On the other hand, reflectarrays enhance the power of the backscattered field due to the same metal-dielectric transition. We report two configurations of smart graphene antennas, in which either the radiation pattern of the antenna or the backscattering of the periodic metallic arrays is controlled by DC biases that induce metal-insulator reversible transitions of graphene monolayers.  

Keywords - Graphene, THz, Modulator, Plasmon, Modulation

I. INTRODUCTION

The electromagnetic properties of graphene are intensively studied today at microwave, terahertz (THz), and optical frequencies. In particular, the microwave and millimeter waves propagation in graphene integrated in coplanar waveguides are known up to 110 GHz [1, 2]. Graphene as high impedance surface was recently investigated [3] and showed to enhance the gain of various antennas in large bandwidths by suppressing surface waves, which cause multipath interference and backward radiation. Although graphene antennas are studied in microwave and THz domains, [4, 5] the most developed area of high-frequency graphene applications is microwave graphene transistors [6]. The first integrated graphene receiver at 4.8 GHz has been recently reported, [7] while THz receivers up to 10 THz [8] or even 28 THz [9] could be fabricated using graphene ballistic rectifiers.  

So graphene devices are able to work in a huge bandwidth from RF up to tens of THz. In this context, graphene antennas deserve the same attention as transmission/receiver (T/R) circuits, since a T/R cannot be considered fully integrated without a small and possibly smart antenna integrated with the rest of the circuitry. Tunable optical antennas based on graphene are already fabricated and measured in mid-infrared [10] or visible [11]. Microwave graphene antennas are more problematic since the losses are much higher than in THz or optical domains, especially due to the high conductivity of unbiased graphene, which generates a large imaginary permittivity and in consequence relative high losses, of about 10 to 15 dB [1, 2]. To avoid these losses, which could induce relatively low radiation efficiencies, we avoid using graphene as an antenna, but use it instead as a tunable reflector. Biased graphene backing the substrate of small metallic antennas confers tensility, reconfigurability, and better directivity to antennas, via DC-controlled metal-insulator transition. In brief, biased graphene makes a metallic antenna smart. The paper is divided into two parts. In the first part, we analyze an electrical small dipole on high resistivity (HR) Si backed graphene, while in the second part we analyze a reflectarray with metallic patches backed by graphene and show that the reflection properties of this array change due to tunable reflections.

II. SMART SMALL METALLIC DIPOLES ON HIGH ELECTRICAL PERMITTIVITY DIELECTRICS BACKED BY GRAPHENE

The configuration of this smart antenna, depicted in Fig. 1(a), consists of a metallic dipole deposited on HR Si, which is used further as substrate to grow SiO2 and graphene (see Fig. 1(b)). The graphene on its turn is acting as a reflector for the metallic dipole. The real part of the intra band conductivity in graphene prevails over the imaginary part, which is very small up to few THz. We have, thus

$$\sigma(w) = -ie^2k_BT/\pi\hbar^2(w - i2\tau)(\mu/k_BT) + 2\ln(\exp(-\mu/k_BT) + 1)$$

$$\tau = 0.1 \text{ ps},$$

Where T is the temperature, τ is an energy independent scattering rate with $\tau = 0.1 \text{ ps}$,  

...
The dipole in Fig. 1(a), with dimensions: length of 4.18 mm, width of 0.42 mm, and distance between the metallic dipole and the graphene reflector of $\lambda_0/15$, is small compared to the wavelength $\lambda_0 = 15$ cm, which corresponds to a frequency of 10 GHz. In consequence, the electrical matching problem is difficult and low radiation efficiency is expected.

In order to find the resonant frequencies of the dipole in the case when the graphene is biased or not, it is needed first to know the input impedance of the antenna. All simulations in this paper are performed with the help of CST software.

The frequency dependence of the input impedance is represented in Fig. 2. From this figure it follows that the resonance frequency, which corresponds to $\text{Im}Z_m = 0$, shifts from 14.6 GHz when graphene has $R_S = 5$ kΩ to 10.8 GHz when $R_S = 5$ Ω. So biasing of the graphene reflector induces an important shift of the resonance frequency, with a maximum bandwidth of 4 GHz.

From the radiation patterns corresponding to these two extreme values of $R_S$, displayed in Fig. 3, it can be seen that the electromagnetic field behaves very differently in the two situations. When $R_S = 5$ kΩ and graphene is acting as a lossy dielectric, the electromagnetic field is uniformly distributed in all directions, and we have an omnidirectional radiation pattern, typical for dipole antennas, as is the studied dipole.

This means that the graphene plays no role in the dipole radiation, and the antenna directivity is low, of 2.2 dBi. However, when $R_S = 5$ Ω, the electromagnetic field is confined, the radiation pattern becomes broadside, and the directivity is doubled, reaching a value of 4.6 dBi. In this case, graphene acts as a reflector, enhancing the directivity of the antenna radiation. Therefore, the radiation pattern of the antenna is reconfigurable, i.e., is
tunable with the applied DC bias, and the antenna becomes “smart.” This property could have huge applications, because the antenna can be used to transmit in all directions if unbiased, while, when biased, the same antenna can be used as a receiver, to get more power at a certain direction. Many other applications, including an adaptive receiver, can be envisaged with such a reconfigurable antenna. Moreover, the antenna can be easily matched with LC circuits, the resulting simulations of the reflection coefficients being represented in Fig. 4. These simulations show good matching at the two frequencies, 10.8 GHz and 14.6 GHz, corresponding to the two values of surface resistance of graphene.

![Figure 4](image4.png)

**Fig 4.** The reflection coefficient S11.

### III. REFLECT ARRAYS

A reflectarray is a planar reflecting surface formed from elements with controllable impedance. When an incoming wave is directed towards this reflect array, a prescribed radiation pattern is obtained.

![Figure 5](image5.png)

**Fig 5.** (a) The cross-section of the reflectarray element, (b) top view of the radiating element.

The configuration of the reflect array element studied in this paper is represented in Figs. 5(a)–5(c). We have calculated first the reflection coefficient of the unit cell, depicted in Fig. 6, when the plane wave is incident at 45° with respect to the element of the reflectarray. We have computed the amplitude and the phase of the reflection coefficient in three situations: biased graphene, unbiased graphene, and only gold metal, in the absence of graphene. We found that the reflection coefficient of the reflecting element in the case of biased graphene is similar to that of the reflecting element made of gold with no graphene, except that no detrimental peaks in S11 phase jumps are observed for biased graphene. The peaks in reflection and the associated phase jumps are due to surface waves formed on gold and suppressed by a high conductive surface like graphene. The reflection for the unbiased case is lower than for the other cases, and, again, presents no resonances.

The geometry of the reflectarray composed of 10×10 reflection elements with the properties described above is illustrated in Fig. 7. Its dimensions make allow its fabrication on a 4.4 in. of chemical vapor deposition (CVD) grown graphene wafer. In Fig. 8, we have represented the backscattered electric field of the reflectarray at normal incidence of the plane wave. This field presents a maximum at h/40, for both cases of unbiased and biased graphene, but with
Important difference: when biasing the graphene, the maximum value of the electric field is -13.75 dB V/m, whereas the maximum value for unbiased graphene is about -20 dB.

The difference, of DE -6.25 dB, indicates that the backscattered power with biased graphene is 4 times greater than for unbiased graphene in the direction of reflection. This difference is even bigger if we consider the side lobes, where it reaches a value of almost 19 dB.

IV. CONCLUSIONS

We have analyzed two graphene-based antennas in which the radiation pattern of the antenna or the backscattering of a 10x10 reflectarray can be controlled by metal insulator reversible transitions of biased graphene monolayers.

We have found that the radiation patterns of metallic antennas backed with graphene are reconfigurable, from omnidirectional to broadside, by changing the DC voltage. On the other hand, reflect arrays enhance the power of the backscattered field due to the same metal-dielectric transition. These examples show that the physical properties of graphene confer to the electromagnetic structures analyzed in this paper new electromagnetic properties, such that this radiating devices based on graphene can be termed as “smart.” In particular, a smart phone, which has no antennas of the type described here, could become even smarter in the future, if it would integrate such devices able to adapt at various transmission or receiving working modes of the electromagnetic field.

VI. References


A Strategy for Elimination of Data Redundancy in Internet of Things (IoT) Based Wireless Sensor Network: A Review

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Abstract: With the development of Internet of Things (IOT), there are more and more concerns about the security of IOT. In terms of security of Internet, the security framework of Internet cannot provide a completely solution to solve all security problems in IOT. This paper describes the security structure of sensor layer, network layer and application layer in IOT. This thesis intends to analyze the security features of sensor layer and then presents dynamic variable cipher security certificate, a new method of ID authentication among node and node in sensor layer. This certificate provides a method of “one time one cipher” between communicating parties. It’s a lightweight encryption or decryption method, using time stamp technology, timeliness in the two communication partners is guaranteed. In general, dynamic variable cipher security certificate can be well applied to the communication among sensor nodes in IOT.

Key Words: - Cipher; Authentication; IOT.

I. INTRODUCTION

With the background of Internet, the Internet of Things (IOT) is an emerging technology combining RFID technology, wireless communications technology and EPC standard and so on [2]. In IOT, all things will share the real-time information from all over the world. With the development of IOT, its security problems become more apparent. The Internet is not safe, it could be worse, which will provide wide space and rich chances for cyber attackers in the random distribution sensor network and the whole wireless network. [3]The research and application of IOT is still in its early stages, many of these theories and key technologies should be breakthrough [4]. For security of IOT, Most security mechanism of present network security structure can provide some security mechanisms such as authentication mechanism, encryption mechanism. But it should be redesigned According to its characteristics in IOT. Dynamic variable cipher security certificate presented in this article is a safe variable key authentication protocol based on request-reply mechanism. It has characteristics like “one time one cipher”, real-time performance on timestamp, highly efficient data stores the computational burden is low. It can be widely used in the authentication process of Near Field Communications.

Nowadays, around two billion people around the world use the Internet for browsing the Web, sending and receiving emails, accessing multimedia content and services, playing games, using social networking applications and many other tasks. While more and more people will gain access to such a global information and communication infrastructure, another big leap forward is coming, related to the use of the Internet as a global platform for letting machines and smart objects communicate, dialogue, compute and coordinate. This has given rise to new opportunities for the Information and Communication Technologies (ICT) sector, paving the way to new services and applications able to leverage the interconnection of physical and virtual realms. In this paper we will discuss various IoT security issues and Cryptographic Services to solve such issues. The paper is arranged as follows: The second section mainly introduced the security framework of IOT and security problems of sensor layer. The third section mainly expounds the design idea of dynamic variable cipher and the authentication process of dynamic variable cipher security certificate. The fourth section described an application of dynamic variable cipher security certificate, then We analyzed the test results. The fifth section is the summary of this paper.

II. SECURITY OF IOT

2.1 Security framework of IOT

Summarized in nature, IOT can be reflected in the following three aspects. Firstly, any object in the world is connected to Internet; it means that nodes
will communicate easily with each other. Secondly, all around sensing, It means that any object in IOT could be identified automatically. The third is intelligent processing, these are characterized by automation, self-feedback, intelligence control etc. The second and the third are kernel contents of IOT. Seeing from the entire security system of the Internet of Things, there can be three layers, including the Sensor Layer Security, the Network Layer Security and the Application Layer Security. The core of IOT security includes safely information sensing, reliable data transfer and safely information control. As you can see from the diagram Figure 1.

**Figure 1 Security framework of IOT**

In this layered architecture, the security mechanism of IOT must be designed based on key technologies possibly adopted in each layer and which security threats it faces.[5] The Sensor Layer is at the most frontent of information collection, which plays a fundamental role in the IOT security.

### 2.2 Security issues in sensor layer

On contrast with traditional network sensor nodes in IOT deployed in an unattended environment, there are some new characteristics in sensor network.

1) Wireless link signal is very weak
Sensor nodes transmit data to each other mainly by wireless network [6], and most of them are work in low power and long time environments. During the wireless communication, it’s signal usually affected easily by the disturbing waves [7]. So it is not safe to transfer information by wireless network.

2) Node is exposed
As wireless channel is an open and shared channel, there are hidden terminal and exposed terminal problems in the wireless data communication [8]. For example, when use RFID technology in sensor layer, the object which embedded a RFID chip will be censored not only by its owner but also by others, then the sensor node is the best place for attackers.

3) Network topology is dynamic
Positions of IOT node often change from one place to another place. Compared with traditional TCP/IP network, all network monitoring technologies or cyber defense technologies have to face more complex network data, more strictly real-time demand [9]

4) Limited computing capacity, storage capacity energy
Usually, IOT node is a product of low power consumption, its computing capacity, storage capacity energy are limited [10]. So security technologies of traditional network can not transplant to IOT smoothly .

### 2.3 Security technology in sensor layer

1) Encryption mechanism
Cryptosystem is the foundation of information security. In traditional network, there are two uppermost forms of cryptographic applications. Point to point encryption and end to end encryption. As we know from the IOT framework. Generally, the node of sensor layer is low speed CPU such as single chip system [11]. Encrypt and decrypt programs can not use large storage and high power. So Encryption mechanism in IOT should be lightweight.

2) Access control
In IOT, some new connotations are added to access control mechanism. In TCP/IP network, the role who should be authorized to access the system is “person”, but in IOT, it is “machine” [12]. So it need to assign and transfer sharing data self-determine between node and node.

3) Authentication mechanism of nodes
Authentication mechanism is used in receiver to ensure the true identity of sender, and ensure whether the data is changed during the transmission. From the point of IOT architecture, It is very necessary that deploy an authentication mechanism in sensor layer. Authentication can ensure the true node is working, Encryption mechanism can keep the data confidential by encode the data, it can prevent intruder from stealing and tampering crucial information by applying data encryption [13].

### III. DYNAMIC VARIABLE CIPHER SECURITY CERTIFICATE

#### 3.1 The design idea of dynamic variable cipher
Dynamic variable cipher security certificate is a variable key security authentication protocol based on request reply mechanism. As shown in Figure 2,
you can see its principles; there is the same key matrix in all communication parties.

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<td>5e5</td>
<td>546</td>
<td>4e5</td>
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<td>5d6</td>
<td>56d</td>
</tr>
<tr>
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<td>45a</td>
<td>45e</td>
<td>56g</td>
<td>54b</td>
<td>5a5</td>
<td>576</td>
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<tr>
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<td>5ef</td>
<td>65g</td>
<td>56a</td>
<td>6e6</td>
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<tr>
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<td>4fe</td>
<td>43e</td>
<td>56e</td>
<td>54e</td>
<td>545</td>
<td>45e</td>
<td>45e</td>
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</table>

**Figure 2** Key matrix

The storage space of the key matrix are 8*8*8=256 Bytes. The communicating parties will randomly generate a coordinate from 1 to 16 bit length. Then according this coordinate, we will get a random password, and its length can be 4Bytes to 256Bytes, so there are be 64!=1.26*10^89 password in theory. It is realizes truly “one time one cipher”. The communicating parties only transfer its key coordinate and not the key itself. All it’s work provides security for the communicating parties through “one time one cipher” which dynamically composed by random coordinate and key matrix.

### IV. THE AUTHENTICATION PROCESS OF DYNAMIC VARIABLE CIPHER SECURITY CERTIFICATE

The authentication process of dynamic variable cipher security certificate is shown in Figure 3. A and B are two nodes of communication. Their clients and servers are relative.

![Figure 3](image)

**Figure 3** The authentication process of dynamic variable cipher security certificate

The process are as follows:
1. $A \rightarrow B: Pos_{x,y,z}, E(K_{ab:1}, ID_a, Cmd, Ta1)$
2. $B \rightarrow A: Pos_{x,y,z}, E(K_{ab:2}, ID_b, Cmd_{xy}, Ta1, Tb1)$
3. $A \rightarrow B: E($

Where $ID_a$, $ID_b$ means ID number of node A and node B, $Cmd$ means connection request, $Pos_{x,y,z}$ means coordinate of key matrix, $Ta$ and $Tb$ means timestamp of node A and node B. $E(kab:m)$ means using password $kab$ to code message $m$. $Text$ means message constant. As we can see from the description above, client A send an encrypted information of $ID_a$, a connection request and timestamp $Ta1$, at the same time client A start a timer waiting for some feedback from server B. If no echo reply is received, then A will cancel this session.

When some information arrived server B, it will verify the $ID_a$ from node A. If A is validity, then server B send an encrypted information to A which include $ID_b$, coordinate of key matrix, timestamp $Ta1$, timestamp $Tb1$, at the same time client B start a timer waiting for some feedback from client A. If no echo reply is received, then B will cancel this session.

When some information arrive client A, it will verify the $Ta1$ from node B. If B is validity, then A gets a communication password $Kab$ according coordinate of key matrix. Next, A generates a new timestamp $Ta2$, combine with $Tb1$ and sending message constant. All these data will be sent to server B. Up to this point, we have set up a channel between communicating parties. The data transferring should use fixed password or one time one cipher.

### V. ENCRYPTION MECHANISMS

In the traditional network layer we adopt by-hop encryption mechanism, in this way the information is encrypted in the transmission process, but it needs to keep plaintext in each node through the decryption and encryption operations. Meanwhile in the traditional application layer encryption mechanism is end-to-end encryption, that is, the information only is explicit for the sender and the receiver, and in the transmission process and forwarding nodes it will be always encrypted.

In the IoT network layer and application layer connect so closely, so we should choose between by-hop and end-to-end encryption. If we adopt by-hop encryption, we can only encrypt the links which need be protected, because in the network layer we can apply it to all business, which make different applications safely implemented. In this way, security mechanism is transparent to the business applications, which gives the end users convenience. In the meantime this brings the features of the by-hop full play, such as low latency, high efficiency, low cost, and so on. However, because of the decryption operation in the transmission node, using by-hop encryption each node can get the plaintext message,
so by-hop encryption needs high credibility of the transmission nodes.

Using the end-to-end encryption, we can choose different security policy according to the type of business, thus it can provide high level security protection to the high security requirements of the business. However, end-to-end encryption cannot encrypt the destination address, because each node determines how to transmit messages according to the destination address, which causes it cannot hide the source and the destination of the message being transmitted, and bring about malicious attacks.

Through the above analysis, we can draw a conclusion: when the security requirement of some business is not very high, we can adopt by-hop encryption protection; when the business needs high security, then end-to-end encryption is the first choice. So, according to the different requirements we choose alternative encryption mechanism.

Currently, IoT is developing in its primary phase, and the research of safety mechanism is in the blank in the practice, so we have a long way for the research of this domain.

Cryptographic Algorithms
So far there is a well-known and widely trusted suite of cryptographic algorithms applied to internet security protocols such as table 1.

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced encryption Standard (AES)[8]</td>
<td>Confidentiality</td>
</tr>
<tr>
<td>Rivestshamiradelman (RSA)/ Elliptic curve cryptography (ECC)[9][10]</td>
<td>Digital signatures key transport</td>
</tr>
<tr>
<td>Diffie-hellman (DH)[11]</td>
<td>Key agreement</td>
</tr>
<tr>
<td>SHA-1/SHA-256[12]</td>
<td>Integrality</td>
</tr>
</tbody>
</table>

Usually the symmetric encryption algorithm is used to encrypt data for confidentiality such as the advanced encryption standard (AES) block cipher; the asymmetric algorithm is often used to digital signatures and key transport, frequently-used algorithm is the rivestshamiradelman (RSA); the diffie-hellman (DH) asymmetric key agreement algorithm is used to key agreement; and the SHA-1 and SHA-256 secure hash algorithms will be applied for integrity. Another significant asymmetric algorithm is known as elliptic curve cryptography (ECC), ECC can provide equal safety by use of shorter length key, the adoption of ECC has been slowed and maybe be encouraged recently.

To implement these cryptographic algorithms available resources are necessary such as processor speed and memory. So how to apply these cryptographic techniques to the IoT is not clear, we have to make more effort to further research to ensure that algorithms can be successfully implemented using of constrained memory and low-speed processor in the IoT.

VI. CONCLUSION
Application and principle of dynamic variable cipher security certificate is proposed in this paper. This protocol realized a “one time one cipher” method of communication based on key matrix. Both its encryption and decryption process are lightweight. Timestamp technology used in communicating parties, which can guarantee their real-time. Through the technology of timeout, we can ensure its uniqueness of the communicating data, from what I have mentioned above, we can see clearly that the dynamic variable cipher security certificate is a very good application in sensor layer in IOT.

References


Cloud Computing Key Issues and Challenges: A Survey

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Abstract - Cloud computing is proposed to enable computing without delay at the brink of the network that may supply new packages and offerings particularly for the destiny of Internet. For example, commercial edge routers are advertising processor velocity, range of cores and built-in network garage. Those routers have the capacity to become new servers. In Cloud computing, facilities or infrastructures which could offer resources for services at the threshold of the community are referred to as Cloud nodes. They may be resource-negative devices including set-pinnacle containers, get right of entry to points, routers. Despite the growing utilization of cloud computing, there are nonetheless troubles unsolved because of the inherent problem of cloud computing such as unreliable latency, lack of mobility help and place-awareness. Cloud computing, additionally termed area computing, can cope with the ones problems via supplying elastic sources and services to end users at the brink of community, even as cloud computing are extra about supplying resources dispensed inside the core network. This survey discusses the dentition of Cloud computing and similar concepts, introduces representative utility situations, and ideates various factors of problems we may additionally stumble upon whilst designing and enforcing Cloud computing systems. It additionally highlights a few possibilities and challenges, as course of potential destiny paintings, in related techniques that want to be taken into consideration in the context of Cloud computing.

Keywords: Cloud computing, edge computing, mobile cloud computing, cloud computing

I. INTRODUCTION

In the angle of Cisco, Cloud computing [1] is taken into consideration as an extension of the cloud computing paradigm from the center of community to the threshold of the community. It is a surprisingly virtualized platform that offers computation, garage, and networking offerings between give up gadgets and traditional cloud servers. While within the desire of labor, Cloud computing is deemed as a state of affairs where a huge wide variety of heterogeneous (Wi-Fi and every so often independent) ubiquitous and decentralized gadgets speak and potentially cooperate among them and with the network to perform storage and processing obligations without the intervention of 1/3 events. These duties can be for assisting fundamental community capabilities or new services and applications that run in sandboxed surroundings. Users leasing part of their gadgets to host these offerings get incentives for doing so.” Although this definition continues to be controversial, we strongly agree that we need a definition to differ Cloud computing from related technology on account that each person of those underlying techniques may also provide us a false view on Cloud computing.

Similar Concepts There are comparable ideas inclusive of cellular cloud computing (MCC) and mobile-aspect computing (MEC) that have overlap with Cloud computing. MCC refers to an infrastructure in which each the information garage and the statistics processing occur out of doors of the cellular gadgets [2]. Mobile cloud programs flow the computing power and records garage from cellular telephones to the cloud, supplying programs and cellular computing to no longer most effective Smartphone users however additionally a miles broader variety of cell subscriber. MEC can be visible as a cloud server jogging at the threshold of a cell community and appearing specific tasks that couldn't be completed with conventional community infrastructure. Cloud computing looks like the mixture of MCC and MEC, while it distinguishes itself as an extra promising and well generalized computing paradigm within the context of Internet of Things [2].

II. APPLICATIONS SCENARIOS

Augmented Reality (AR) and Real-time video analytics Augment truth applications are famous on Smartphone, tablet and clever glasses through overlaying an informative view on the real international (regarded at the tool show gadget) [3]. Recent famous merchandise or initiatives consist of Google Glass [4], Sony Smart Eyeglass and Microsoft HoloLens [5]. AR packages usually need excessive computation power to method video streaming and excessive bandwidth for data transmission. For instance, normal AR software needs to manner real time video body using computer imaginative and prescient algorithm and on the same time procedure other inputs such as voice, sensor and finally output well timed informational content material on shows. However, human are very touchy to delays in a series of
**Consecutive interactions:** A processing postpone of greater than tens of milliseconds will smash the person enjoy and results in bad user comments. AR gadget supported by Cloud computing can maximize throughput and reduce latency in each processing and transmission. K. Ha, et al. Design and implement a wearable cognitive assistance spanning on Google Glass and Cloudlet [6], that can offer the wearer tips for social interaction via actual-time scene analysis. The device achieves tight give-up-to-stop latency constraint by means of offloading computation-intensive mission to close by Cloudlet. Network failure and unavailability of remote Cloudlets are also taken into consideration and furnished automated degrade services.

**Content Delivery and Caching:** Traditional internet content material shipping technology cannot adapt to the requests from person after the net performance is optimized at server facet. However little information can simplest are regarded at the consumer aspect or near the purchaser's network including nearby community conditions or trace facts, which can be leveraged to optimize the internet performance. J. Zhu, et al [7].

Recall net optimization from this new attitude within the context of Cloud computing. The Cloud server can provide dynamic customizable optimization based on patron gadgets and nearby community conditions. And due to the fact Cloud server is in customer's vicinity, it can gather customer side expertise and user revel in, to optimize the rendering of net page. Similarly, caching approach can be better carried out within the Cloud nodes to similarly shop the bandwidth and decrease latency for content delivery.

**Mobile Big Data Analytics:** Big data processing is a hot topic for huge data architecture inside the cloud and cell cloud. Cloud computing can provide elastic sources to large scale statistics method system without laid low with the drawback of cloud, high latency. In cloud computing paradigm, event or data might be transmitted to the facts center interior center network and end result might be dispatched again to stop user after a sequence of processing. A federation of Cloud and cloud can deal with the massive statistics acquisition, aggregation and preprocessing, decreasing the statistics transportation and garage, balancing computation energy on statistics processing. For instance, in a big scale surroundings tracking device, local and nearby statistics may be aggregated and mined at Cloud nodes offering timely remarks especially for emergency case inclusive of toxic pollutants alert. While detailed and thorough analysis as computational-intensive responsibilities can be scheduled in the cloud facet we trust facts processing inside the Cloud could be the key technique to tackle analytics on massive scale of data generated with the aid of applications.

**III. NEED OF CLOUD COMPUTING**

In the past few years, Cloud computing has provided many possibilities for organizations via providing their customers a number of computing services. Current “pay-as-you-move” Cloud computing version will become a green alternative to owning and handling personal records facilities for customers facing Web applications and batch processing. Cloud computing frees the corporations and their cease users from the specification of many information, along with garage resources, computation drawback and network conversation fee. However, this bliss becomes

![Cloud computing in smart grid](image)

**Fig. 2. Cloud computing in smart grid**

A trouble for latency-touchy applications, which requires nodes within the place to meet their put off necessities. When strategies and devices of IoT are becoming extra involved in people’s lifestyles, contemporary Cloud computing paradigm can infrequently satisfy their requirements of mobility aid, area consciousness and coffee latency.

Cloud computing is proposed to deal with the above trouble. As Cloud computing is carried out at the threshold of the network, it offers low latency, vicinity recognition, and improves great-of-services (QoS) for streaming and real time packages [8]. Typical examples encompass commercial automation, transportation, and networks of sensors and actuators. Moreover, this new infrastructure helps heterogeneity as Cloud devices include quit-user gadgets, get entry to factors, side routers and switches. The Cloud paradigm is well positioned for real time big data analytics, supports densely allotted information series factors, and affords advantages in enjoyment, marketing, non-public computing and other programs.

**IV. ISSUES IN CLOUD COMPUTING**

**Cloud networking**

Due to located at the threshold of Internet, Cloud network is heterogeneous. The duty of Cloud community is to attach each factor of the Cloud. However, managing this sort of community, keeping connectivity and providing offerings upon that, particularly inside the situations of the Internet of Things (IoT) at big scale, aren’t smooth. Emerging techniques [9], which includes software defined networking (SDN) [10] and network
characteristic virtualization (NFV), are proposed to create exile and easy preserving network environment. The employment of SDN and NFV can ease the implementation and management, boom community scalability and reduce costs, in lots of components of Cloud computing, along with useful resource allocation, VM migration, trace monitoring, utility-aware manage and programmable interfaces.

**Quality of Service (QoS)**

QoS is an important metric for Cloud carrier and may be divided into 4 components,
1) connectivity,
2) reliability,
3) capability, and
4) Put off.

Connectivity In a heterogeneous Cloud community, network relaying, partitioning and clustering provide new possibilities for reducing price, trimming records and expanding connectivity. For instance, an ad-hoc Wi-Fi sensor community may be partitioned into numerous clusters because of the coverage of wealthy-resource Cloud nodes (cloudlet, sink node, effective Smartphone, and so forth.). Work proposes an internet AP affiliation approach that no longer simplest achieves a minimum throughput, however efficiency in computational overhead. Similarly, the choice of Cloud node from stop user will heavily impact the overall performance [9]. We can dynamically choose a subset of Cloud nodes as relay nodes for optimization desires of maximal availability of Cloud offerings for sure vicinity or a single user, with constraints inclusive of postpone, throughput, connectivity, and electricity intake.

Reliability Madsen et al. Assessment the reliability requirement of clustering computing, grid computing, cloud and sensor network closer to a discussion of reliability of Cloud computing [11]. Normally, reliability may be advanced via periodical test-pointing to renew after failure, rescheduling of failed tasks or replication to make the most executing in parallel. But check pointing and rescheduling won't in shape the tremendously dynamic Cloud computing environment due to the fact that there can be latency, and can't adapt to modifications. Replication seems extra promising but it is predicated on a couple of Cloud nodes to paintings together.

Capacity has two folds: 1) network bandwidth, 2) storage potential. In order to acquire high bandwidth and efficient garage usage, it is important to analyze how facts are positioned in Cloud network on the grounds that statistics locality for computation may be very essential. There are comparable works inside the context of cloud, and sensor network. However, this problem faces new demanding situations in Cloud computing. Delay Latency-sensitive programs, which include streaming mining or complicated event processing, are traditional programs which need Cloud computing to offer real-time streaming processing in place of batch processing. K. Hong et al. Recommend a Cloud-based totally opportunistic spatio-temporal occasion processing device to fulfill the latency requirement [12]. Their machine predicts future query region for moving purchasers and begins the occasion processing early to make well timed information available while customers reaches the destiny places. Work proposes RECEP, which exploits overlapping pastimes in facts and proper inaccurate results to reuse computation and decrease resource requirement. RECEP increases the scalability and amortizes the put off of mobile CEP systems.

**Interfacing and programming version**

In order to ease the effort for developers to port their programs to Cloud computing platform, we want unified interfacing and programming model. The reasons are

1) utility-centric computing can be a vital Cloud computation version, in which additives within the environment might be utility-conscious and permit appropriate optimizations for different forms of applications,

2) It is hard for developer to orchestrate dynamic, hierarchical, and heterogeneous sources to construct compatible programs on various structures.

Hong et al. suggest an excessive-level programming version for destiny Internet programs with on-demand scaling, which can be huge-scale geospatially allotted and latency sensitive. However, their scheme is devoted on a tree-primarily based network hierarchy in which Cloud nodes have locations. Therefore, we can also need greater popular schemes for numerous networks where Cloud nodes are nodes with dynamic mobility.

**Computation Offloading**

Computation offloading can overcome the useful resource constraints on cellular gadgets in view that a few computation-intensive responsibilities can gain from offloading in performance of packages, saving storage and battery lifetime. Existing paintings of computation offloading for cellular cloud computing can be categorized into six metrics: goals, granularity, scheme, model, dispensed execution and verbal exchange. While there are masses of seek in computation offloading inside the context of cloud computing and cellular computing, we evaluation some of them on this paper. MAUI advocate code offloading and profile offloaded technique to make choices on future invocations adapting to the exchange of network connectivity, bandwidth and latency. It calls for the developers to manually annotate strategies that can be offloaded. Cloud use static code analyzer to automatically mark viable migrate/merge point in software byte code. The foremost demanding
situations in offloading in Cloud computing are how to address dynamic. The dynamic has 3 fold
1) radio/Wi-Fi community get admission to is tremendously dynamic
2) nodes in the Cloud community are incredibly dynamic
3) Assets inside the Cloud are particularly dynamic.

The federation of Cloud and cloud sincerely present us a three-layering production: tool Cloud cloud. Computation offloading in such infrastructure faces new challenges and opportunities. There are questions such as which granularity to pick for offloading at one-of-a-kind hierarchy of Cloud and cloud, how to dynamically partition application to dump on Cloud and cloud, and how to make off-loading choices to adapt dynamic adjustments in community, Cloud gadgets, and assets and many others.

**Accounting, billing and monitoring**

Cloud computing cannot be wealthy without a sustainable enterprise version. According to cutting-edge researches and recommendations, the Cloud computing carriers can encompass the subsequent events:
1) Internet carrier vendors or wireless companies, who can assemble Cloud at their infrastructures.
2) Cloud carrier carriers, who want to enlarge their cloud carrier to the threshold of the network.
3) End users, who need to trade their spare computation, storage in their neighborhood personal cloud to reduce the cost of ownership.

Therefore, to be able to do “Pay-as-you-cross”, we need to remedy many problems. For example in terms of billing, we need to determine out a way to set the price for extraordinary assets and a way to set the fraction of the charge is going to extraordinary events of Cloud. To put into effect the ones pricing guidelines, we want accounting and tracking the Cloud in specific granularity. It is likewise thrilling that how we dynamically do pricing in Cloud computing services to maximize revenue and utilization, just like what conventional industrialize do in airline ticketing, vehicle condominium and inns.

**User Incentives**

An interesting commercial enterprise version to boost up the deployment of Cloud computing is “Join Cloud computing with private neighborhood cloud at the edge”. Local private clouds also are deployed at the threshold of Internet, with computation and storage potential. Though private cloud is aiming at provide cloud service to private celebration best. From the method angle of cloud computing and virtualization, it’s far viable to rent spare computation and garage to Cloud provider company and they will pay the proprietor of private cloud to reduce value.

**Provisioning and aid control**

Cloud provisioning and resource control are nonetheless exciting topics in Cloud computing surroundings.

Application-aware provisioning the challenges lies in the mobility of end node for the reason that metrics such as bandwidth, garage, computation and latency may be modified dynamically. For example, in a related vehicle situation, we are able to song an in-duty ambulance and tune smart trace light to make certain inexperienced site visitors wave and supply caution to the entire close by vehicles to clean the road. In order to satisfy the QoS requirement which includes delay, we need to do provisioning with a purpose to put together assets to provide carrier mobility. By making plans operator migration ahead, it guarantees give up-to-give up latency regulations and reduce community usage. We experience like with Internet of Things, Cloud computing will play a critical function in cellular crowd-sourcing/sensing packages by means of providing utility-conscious provisioning.

Resource discovery and sharing Resource discovery and sharing is essential for software overall performance in Cloud. Work endorse technique dynamically pick out centralized and offloading techniques to shop energy in heterogeneous networks, at the same time as there are more constraints to think about in Cloud computing, such as latency, density and mobility. N. Takayuki, et al. Propose a framework for heterogeneous aid sharing in Cloud computing by way of mapping heterogeneous assets which includes CPUs, communiqué bandwidth, and garage all to “time” resources. The resource sharing optimization issues may be formulated for maximizing the sum or product of service-oriented application capabilities. However, the utility characteristic is handiest approximately service latency which may be similarly extended to encompass metrics together with provider availability, power consumption or even sales.

**Security and Privacy**

Currently, there are few works that specialize in protection or privateers issues in Cloud computing. However, some topics have been studied drastically inside the context of digital system and hypervisor, and cloud computing.

**Authentication**

As the emergence of biometric authentication, which include fingerprint authentication, face authentication, contact-based or keystroke-based authentication and so on, in mobile computing and cloud computing, making use of biometric based authentication in Cloud computing will be beneficial.
Access control Access manipulates has been a reliable tool on smart devices, and cloud, ensuring the safety of the gadget. To increase get entry to manipulate of information proprietor into the cloud, achieve this via exploiting techniques of several encryption schemes collectively to construct a green ne-grained records access control within the context of Cloud Computing. Work proposes a coverage-based useful resource get right of entry to manage in Cloud computing, to aid comfy collaboration and interoperability among heterogeneous sources. In Cloud computing, we also can enhance questions like a way to layout get entry to manage spanning client-Cloud-cloud, to satisfy the dreams and useful resource constraints at different degrees.

Intrusion detection Intrusion detection techniques were implemented to cloud infrastructures to mitigate assaults along with insider assault, offloading assault, port scanning, attacks on VM or hypervisor. Those intrusion detection structures may be deployed on host system, VM and hypervisor to detect intrusive conduct through tracking and analyzing log le, access control policies and person login statistics. They also can be deployed at network aspect to come across malicious sports which include denial-of-service (DoS), port scanning and so forth. In Cloud computing, it offers new opportunities to analyze how Cloud computing can help with intrusion detection on both purchaser side and the centralized cloud side.

Privacy Users are concerned approximately the risk of privateers leakage (facts, area or usage) at the Internet these days. Privacy-preserving strategies had been proposed in lots of scenarios which include cloud, clever grid, wireless community, and on-line social network. In the Cloud community, privateers-maintaining algorithms may be run in between the Cloud and cloud because computation and garage are enough for both aspects while those algorithms are typically resource-prohibited at the cease gadgets. Cloud node at the brink generally collects statistics generated via sensor and stop gadgets. Techniques which include homomorphic encryption may be applied to allow privacy-retaining aggregation at the neighborhood gateways without decryption.

Data deduplication Whenever facts are converted, worries arise approximately ability lack of data. By definition, records deduplication structures store information differently from how it become written. As an end result, users are involved with the integrity in their information. The diverse techniques of deduplicating [13] data all hire slightly special strategies. However, the integrity of the statistics will in the long run rely upon the design of the deduplicating device, and the great used to put in force the algorithms. As the generation has matured over the past decade, the integrity of most of the important merchandise has been nicely demonstrated.

One approach for deduplicating information relies on the usage of cryptographic hash functions to identify replica segments of statistics [14]. If two distinctive portions of data generate the identical hash fee, this is referred to as a collision. The chance of a collision relies upon upon the hash characteristic used, and even though the chances are small, they are always non 0. Thus, the concern arises that statistics corruption can occur if a hash collision occurs, and additional method of verification aren't used to confirm whether or not there's a distinction in data, or not. Both in-line and submit-manner architectures can also provide bit-for-bit validation of authentic facts for guaranteed statistics integrity. The hash features used encompass requirements which include SHA-1, SHA-256 and others [15]. The computational useful resource depth of the procedure can be a drawback of statistics deduplication. However, this is rarely a trouble for stand-on my own gadgets or home equipment, because the computation is completely offloaded from different structures. This can be a difficulty when the deduplication is embedded inside devices providing different offerings. To improve overall performance, many systems make use of each vulnerable and robust hash. Weak hashes are a good deal faster to calculate however there's an extra danger of a hash collision. Systems that utilize weak hashes will subsequently calculate a sturdy hash and will use it because the determining aspect to whether or not it's far truly the identical information or no longer. Note that the device overhead associated with calculating and looking up hash values is in the main a characteristic of the deduplication workflow. The reconstitution of documents does now not require this processing and any incremental overall performance penalty related to re-meeting of statistics chunks is not likely to affect software overall performance. Botta, Alessio et al. [16] they recognize the attention on the mixing of Cloud and IoT, that's what we name the Cloud IoT paradigm. Many works in literature have surveyed Cloud and IoT one after the other hand, extra precisely, their predominant properties, capabilities, underlying technologies, and open problems. However, to the high-quality of our understanding, those works lack a detailed evaluation of the new Cloud IoT paradigm, which entails completely new packages, demanding situations, and research troubles. To bridge this hole, in this paper they provide on the mixing of Cloud and IoT. Starting with the aid of reading the fundamentals of each IoT and Cloud Computing, we speak their complementarily, detailing what is presently driving to their integration. Roman, Rodrigo (2016) [17] found numerous paradigms,
which include Cloud computing, cellular edge computing, and cellular cloud computing, have emerged in latest years. While those side paradigms share several features, most of the present research is compartmentalized; no synergies were explored. This is specifically real within the field of safety, where maximum analyses recognition handiest on one facet paradigm, at the same time as ignoring the others. The primary aim of this examine is to holistically examine the security threats, challenges, and mechanisms inherent in all area paradigms, while highlighting capability synergies and venues of collaboration. In our outcomes, we are able to display that all part paradigms must recollect the advances in other paradigms.

Table 1: Survey of Various Deduplication Mechanisms in Cloud Computing

<table>
<thead>
<tr>
<th>Approach</th>
<th>Encryption Scheme</th>
<th>Deduplication Strategy used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message-locked encryption and secure deduplication</td>
<td>Message locked encryption</td>
<td>File level</td>
</tr>
<tr>
<td>BL-MLE: Block-Level Message-Locked Encryption for Secure Large File Deduplication</td>
<td>Block Level Message locked encryption</td>
<td>Dual level: File level and Block level</td>
</tr>
<tr>
<td>HEDup: Secure Deduplication with Homomorphic Encryption</td>
<td>Homomorphic encryption</td>
<td>File level</td>
</tr>
<tr>
<td>DupLESS: Server-Aided Encryption for Deduplicated Storage</td>
<td>Enhanced Message level encryption to support security against Brute force attack</td>
<td>File level</td>
</tr>
<tr>
<td>ClouDcdup: Secure Deduplication with Encrypted Data for Cloud Storage</td>
<td>Convergent encryption with added access control mechanisms</td>
<td>File level</td>
</tr>
<tr>
<td>Secure Deduplication with Efficient and Reliable Convergent Key Management</td>
<td>Convergent encryption</td>
<td>Block level</td>
</tr>
<tr>
<td>Twin clouds: An architecture for Secure cloud computing</td>
<td>Convergent encryption</td>
<td>File level</td>
</tr>
<tr>
<td>A hybrid cloud approach for Secure authorized deduplication</td>
<td>Convergent encryption</td>
<td>File level</td>
</tr>
<tr>
<td>Secure Data Deduplication</td>
<td>Convergent encryption</td>
<td>File level</td>
</tr>
<tr>
<td>A secure data deduplication scheme for cloud storage</td>
<td>Symmetric encryption on data categorized based on popularity</td>
<td>File level</td>
</tr>
<tr>
<td>Secure Distributed Deduplication Systems with Improved Reliability</td>
<td>Deterministic secret sharing scheme</td>
<td>File level and fine grained block level</td>
</tr>
<tr>
<td>SecDep: A User-Aware Efficient Fine-Grained Secure Deduplication Scheme with Multi-Level Key Management</td>
<td>User aware convergent encryption</td>
<td>File level and chunk level</td>
</tr>
</tbody>
</table>

V. CONCLUSION AND FUTURE SCOPE

Despite the compelling advantages of deduplication, security troubles surrounding outsourced facts have also received near attention. Data owners cannot assure the at ease management because they lose control on their outsourced statistics in far off storage systems after outsourcing. Thus, end customers try to outsource encryptions of their contents whilst helping deduplication consisting of convergent encryption (CE). In this context, server-facet deduplication, which lets in repetitive uploads of reproduction statistics however eliminates them on the server side, is more suitable to communications between the Cloud and cease customers (at the intra-community) because it prohibits illegitimate customers from gaining knowledge of facet data such that duplicate content resides in far flung storage or now not. Considering cozy deduplication collectively with storage and bandwidth performance within the Cloud storage systems, we gift a hybrid relaxed deduplication protocol. By applying client-facet deduplication at inter-community degree and server side counterpart at intra-network stage, the proposed scheme
achieves best-effort bandwidth with applicable security ensures. Specifically, our protocol satisfies the subsequent houses:

(i) End users can add their contents without earlier key settlement while preventing side facts leakage.

(ii) Cloud garage and cloud garage cannot analyze any facts about outsourced facts besides occurrences of deduplication.

(iii) Throughput will increase through adaptively adopting client and server-aspect deduplications in step with network circumstance.

(iv) Storage usage ratio will increase in Cloud garage and cloud garage with the aid of exploiting multi-tier hierarchy in Cloud storage device.

In future we are able to endorse an answer that is nontrivial because preceding server-facet deduplications with interactive key settlement require robust assumption that as a minimum one end consumer, who has formerly uploaded the equal content, is supposed to be usually on-line. Server-aspect deduplication without key settlement usually can’t permit the semi-sincere Cloud storage to carry out deduplication due to the fact it’s far difficult to perceive duplication with out information of the encryption key.

REFERENCES


Abstract: Being the most critical input about 85% for agriculture, judicious use of water is important to ensure sustainable agriculture development which could only be achieved with Mantra “Per Drop More Crop”. In Haryana arable lands are being irrigated through tertiary Canals i.e. brick lined open water courses/field channels with quite low water use efficiency. Now, State is in process of paradigm policy shift to provide water distribution system capable of installing Micro Irrigation Systems. This can be accomplished by integrated approach in water management by increasing the available supply with reduction in conveyance losses and by increasing the field application efficiency with use of Micro Irrigation Systems. This purpose has been served by installing community based Solar/Grid Powered Micro Irrigation Infrastructure System in the Canal Commands to boost the reach of Micro Irrigation technologies among the farmers. The Solar Power System is proposed to be connected with the utility power grid through bidirectional meter. Micro Irrigation potential has been established in Rice Crop on experimental basis in which appreciable results were obtained as yield was increased by 11.65% in drip irrigation by saving 42.03% water.

Key Words: Solar/Grid, Micro Irrigation, Canal Command, Irrigation Efficiency, Paddy, Yield

I. INTRODUCTION

The problem of growing groundwater scarcity and persistent groundwater resource degradation can only be tackled by two folds in India. The first is the supply side management practices like water resources development through major, medium and minor irrigation projects, etc. The second is through the demand management by efficient use of the available water. This includes micro irrigation and other improved water management practices. The micro irrigation in general and drip irrigation in particular has received considerable attention from policy makers, researchers, economists etc. for its perceived ability to contribute significantly to groundwater and surface water resources development, agricultural productivity, economic growth, and environmental sustainability. In this paper, the impact of drip irrigation in rice has been studied on farming system in Haryana. The drip method of irrigation has been found to have a significant impact on resources saving, cost of cultivation, yield of crops and farm profitability. Now it is becoming the common policy agenda particularly in India being a developing economy. Rice is the main grain that is in demand in India and South Asian countries. Although conventional total water requirement is 1200–1400 mm per season according to the literature, but in practice, farmers use much more water (up to 2000 mm) in many areas rice fields either transplanting or direct seeding are always flooded with 5-10 cm of water throughout the growing season.

II. METHODOLOGY

Solar/Grid Powered Micro Irrigation Infrastructure in the Canal Commands has been installed by providing Community based water storage tank near outlet head, Pumping Unit (Grid/Solar Powered), Filtration units, HDPE pipe network/Hydrant/Outlet assembly, Valves etc. in the command area of canal outlet, as shown in layout plan Figure-1. Drip/Sprinkler irrigation sets will be installed by the individual farmers in their farm holdings by availing the benefits of subsidy. It is proposed to take water from canal outlet through underground pipeline with gravity and to store the same in the tank of appropriate size for construction of which the land shall be made available by the WUA of the shareholders of the canal outlet. Solar/Grid powered pumping system connected through net metering has been installed nearby the tank with proper filtration systems to avoid any chocking. Water has been carried to entire area of the chak of the outlet through HDPE pipe line network under pressure. The entire pipe network has been buried under
ground at 3 feet deep to avoid land acquisition. Water with the requisite pressure for running of the drip/sprinkler set has been made available to each shareholder at his farm holding through the common infrastructure to be operated & maintained by the Water User’s Associations.

A. DESIGN PARAMETERS

Modified penman method has been used to find out crop water requirement and computed the peak water requirement in rabi & kharif season. In this scheme average water requirement of 2mm/day has been considered. Design of this scheme is based on actual culturable command area (CCA), approved discharge normally 2.4 cusecs/000 acres and schedule of running of canal outlet by collecting the authenticated data from the Canal Authorities. Each component of this scheme shall be designed in such a manner that minimum operating pressure of 2.5Kg/cm² available to the farmers on their farm gate. Size of the storage tank has been designed by considering discharge of the outlet and volume of water accumulated in 24 hours. A feeder pipe of required size in appropriate length has been provided from canal outlet to the storage tank by gravitational flow. Solar pumping system is a vital part of this scheme and in this scheme grid connected solar powered pump has been considered to reduce the cost of electricity of appropriate size. At least one pump is provided in a block of area 40 to 50 Hectare. Solar pumps of the capacity up to 10 to 20HP is preferred with average working of 14 hours/day. The HP of pump set required is based upon design discharge and total operating head. The total operating head is sum of total static head, friction loses worked out with hazen-williams equation in pipeline network and losses in filtration unit. Pipes in main line and sub-main shall not be below 110 mm (OD) and the size shall be decided based on the criteria to limit the friction loss in the main & sub main keeping the minimum flow velocity in the pipeline as 0.6m/sec.

\[
\text{HP of pump set} = \frac{Q \times H}{75e}
\]

\(Q = \text{discharge (in LPS)}\)
\(H = \text{head (in meter)}\)
\(e = \text{Pumping efficiency}\)

Solar PV array of at least 1100wp capacities has been installed per HP rating of pumping sets and total capacity of the Solar pv array for operation of solar pumping sets has been worked out in such a manner that total annual solar energy generation from the PV power system in no case be lesser than the total energy requirement to run the Micro Irrigation System and there is no net import of energy from the utility grid on annual basis. For working out the total annual energy requirement of the Micro Irrigation System likely days of running of canal outlet in a year has been considered based on the actual schedule of canal running, but total running days of the canal in year shall not be any case be less than 180.

The output power of SPV would be fed to the inverters for conversion of the DC produced by SPV array to AC for operation of motor pump sets and feeding the same into the nearest electricity grid through 11KV, 24 hours energised HT independent line after synchronisation when in excess of requirement. A hydrant assembly has been provided with minimum 110 size for the land holding of every shareholder with provision of at least one hydrant for every 04 acres or less.
B. DEMONSTRATION PLOT

Despite the fact farmers across Haryana are well aware of the situation of ground water which is principal source of water for irrigation is running out however indiscriminate use of ground water for the water guzzling paddy crop is going on. According to the analysis of agriculture experts, 3000 to 4000 liters of water is required to produce 1 kg of rice which is a major crop in Haryana. State Government has tried best to motivate farmers towards diversification of crop instead of paddy but farmers are adamant and area under paddy grew manifold within few years. Now even in the districts, where drinking water is also a serious problem, farmers are growing paddy crop. Taking in to the account of the merciless use of water in paddy a demonstration plot of Paddy crop on experimental basis had been set up in paddy bowl District Kurukshetra in village Dera Fateh Singh (Gumthala Garu) to motivate the farmers towards Micro Irrigation Technology. Irrigation was done in one acre through flood irrigation and in two acres with micro irrigation. Although Micro irrigation technology for rice production was being demonstrated in farmers’ fields since 2009 where irrigation systems were installed by the companies and operated by farmers but here in this case after providing necessary training on operation and maintenance to the farmers regular monitoring was done by Command Area Development Authority Haryana, Agronomist of Jain Irrigation system ltd., Scientists and farmers of nearby area till harvesting. This on farm trial was conduct on VAR–PR 126 in the fields of Sardar Karanjeet Singh of village Gumthala Garhu (Dera Fateh Singh) district Kurukshetra, Haryana.

<table>
<thead>
<tr>
<th>Table 1: Cost of Cultivation /Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>1- Land Preparation</td>
</tr>
<tr>
<td>2- Transplanting cost</td>
</tr>
<tr>
<td>3- Fertilizers cost (dose/acre)</td>
</tr>
<tr>
<td>a- Urea 100 kg(Rs. 5.90/kg)</td>
</tr>
<tr>
<td>b- SSP 150 kg (Rs. 7/kg)</td>
</tr>
<tr>
<td>c- MOP 25kg(Rs.10.8/kg)</td>
</tr>
<tr>
<td>d- Zink 10 kg (Rs. 30/kg)</td>
</tr>
<tr>
<td>4- Seed + seed treatment</td>
</tr>
<tr>
<td>5- Weedicide (Butachlor) Pre-emergence</td>
</tr>
<tr>
<td>6- Insecticide/fungicide</td>
</tr>
<tr>
<td>TOTAL (A)</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>7- Total cost of Drip/Sprinkler system</td>
</tr>
<tr>
<td>8- Subsidy given to the farmer(1Acre) 85% of total cost</td>
</tr>
<tr>
<td>9- farmer share</td>
</tr>
<tr>
<td>10- Cost of Drip/Sprinkler system for 7 year(2crop/year) @ Rs.</td>
</tr>
<tr>
<td>11- Total cost(Crop+Drip/Sprinkler cost of one season A+B) Rs.</td>
</tr>
</tbody>
</table>

Field experiment was conducted using PR 126 variety of rice. Two irrigation systems Micro Irrigation and traditional flood were used. Drip Irrigation was done through pressurised pipe system after passing the water through designed filters connected by 15 hp submersible motor installed in community water storage tank. Further from the sub-mains, in-line 16mm laterals were laid at a spacing of 40 cm and emitters of size 0.6 mm with 2.4 litre per hour discharge. Flood irrigation was maintained at 5.0 cm water depth. The total rain received during cropping period was 363 mm and effective rainfall is 192 mm.

C. AGRONOMY PRACTICES

The urea as nitrogen and muriate of potash (MOP) as potash source of fertilizers were applied through fertigation under micro
Irrigation systems whereas Single Super Phosphate (SSP) and Zinc fertilizers were applied through soil application during the sowing time. In flood irrigation method, all fertilizers had been applied by broadcasting; in which, half dose of N, full dose of P and K fertilizers were applied through basal application and remaining half dose of N fertilizers applied through top dressing.

Table 2. Fustigation Schedule Followed for Experimental Transplanted Rice Under Drip and Sprinkler Irrigation Method

<table>
<thead>
<tr>
<th>Description</th>
<th>Micro Irrigation</th>
<th>Flood Irrigation</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of cultivation</td>
<td>10415</td>
<td>9880</td>
<td>-</td>
</tr>
<tr>
<td>Yield</td>
<td>2.78 ton/acre</td>
<td>2.49 ton/acre</td>
<td>0.29 ton/acre</td>
</tr>
<tr>
<td>Water Savings</td>
<td>2400000/1.94</td>
<td>4140000/3.35</td>
<td>42.02%</td>
</tr>
<tr>
<td>Net Income</td>
<td>33787</td>
<td>29711</td>
<td>4076</td>
</tr>
</tbody>
</table>

IV. RESULTS
Rice yields under transplanted rice in flood & Micro Irrigation systems are 2.4 qtl & 2.78 qtl respectively. The drip irrigation method resulted in a higher yield than flood method. Drip irrigation produced 11.65% more yield as compared to flood irrigation. Table-II shows that use of water in flood irrigation is 4140000 litre and in Micro Irrigation system it is 2400000 litre. Appreciable saving of water i.e. 42.03% has been noticed.

Table 3. Shows That Use of Water in Flood Irrigation and in Micro Irrigation System

Table 4. Comparison of Fertigation and Fustigation Methods

<table>
<thead>
<tr>
<th>Description</th>
<th>Micro Irrigation</th>
<th>Flood Irrigation</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea (kg)</td>
<td>0</td>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>SSP (kg)</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>MOP (kg)</td>
<td>3.5 kg urea/day</td>
<td>2.08 kg urea/day</td>
<td></td>
</tr>
<tr>
<td>Zn (kg)</td>
<td>650 gram urea/day</td>
<td>750 gram urea/day</td>
<td></td>
</tr>
<tr>
<td>Fertilizer rate per day</td>
<td>500 gram urea/day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

V. CONCLUSION
Significant irrigation from tube wells are being done in various districts of Haryana. Canal water use efficiency is very poor and ground water wastage in shape of flood irrigation is being over exploited. It also causes wastage of electricity. Use of micro irrigation infrastructure will reduce the use of tube wells by which ground water will be saved. More area can be brought under canal command, which was otherwise either rain fed or irrigated by tube wells. Hence, by installation of Solar/Grid Powered Micro Irrigation Infrastructure in the Canal Commands through integrated approach of supply management and demand management, yield & net sown area will increase, dependency of tube well & overexploitation of ground water will decrease, saving of highly subsidised electricity and above all change of the mindset of the farmers towards the use of available water judiciously.

REFERENCES
[1] Raphael Saulter, Jim Watson, Strategies for the deployment of micro generation: Implications for social acceptance
[5] Drip Irrigation from Rice Cultivation : Jain’s Experiences:
Public-Private Partnership in Road Sector

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Abstract: The road network in India is over 4.6 Million kilometers, the second largest road network in the world consisting of expressways, national highways, state highways, major district roads and other roads. Highways in India are around 2% of the total road network in India, but carries nearly 40% of the total road traffic. The roadways includes 79,116 km of national highways and expressways, 155,716 km of state highways, and 4,455,010 km of other roads. This seemingly large road network, however, is inadequate to meet the accessibility and mobility requirements of a country of India’s size and population. India in its past did not allocate enough resources to build or maintain its road network, with major efforts currently underway to modernize the country’s road infrastructure.

I. INTRODUCTION

In a competitive environment, governments of India focusing on new ways to finance projects, build infrastructure and deliver services. Public-Private Partnerships (PPP’s or P3’s) are becoming a common tool to bring together the strengths of government and private sector. In addition to maximizing efficiencies and innovations of private enterprise, PPPs can provide needed capital to finance government programs and projects, thereby freeing public funds for core economic and social programs.

Public private partnership means a contract between a government and private sector for the provision of public services. The cost of providing the service is borne wholly or in part by the government.

II. MODELS OF PPP ADOPTED IN INDIA

The two models of PPP adopted in India for the development of National Highways are Build-operate-transfer (Toll) and Build-operate-transfer (Annuity).

A. BOT (Toll) Model

In the BOT (Toll) model, the Concessionaire recovers his investment by charging toll from the users of the road facility. This model reduces the fiscal burden on the government while also allocating the traffic risk to the Concessionaire. This is the model used for most of the projects and can be regarded as the default model for highway projects.

B. BOT (Annuity) Model

Under a BOT annuity model, the Concessionaire is assured of a minimum return on his investment in the form of annuity payments. The Concessionaire does not bear the traffic risk and the Government bears the entire risk with respect to toll income.

Table 1. BOT (Toll) and BOT (Annuity)

<table>
<thead>
<tr>
<th>Year</th>
<th>No of Projects</th>
<th>Length (km)</th>
<th>No of Projects</th>
<th>Length (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>8</td>
<td>1,109</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td>2008-09</td>
<td>8</td>
<td>643</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2009-10</td>
<td>34</td>
<td>3,085</td>
<td>3</td>
<td>177</td>
</tr>
<tr>
<td>2010-11</td>
<td>28</td>
<td>3,057</td>
<td>20</td>
<td>1,577</td>
</tr>
<tr>
<td>2011-12</td>
<td>47</td>
<td>6,231</td>
<td>2</td>
<td>247</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
<td>14,126</td>
<td>26</td>
<td>2,037</td>
</tr>
</tbody>
</table>

III. NATIONAL HIGHWAYS AUTHORITY OF INDIA (NHAI)

The National Highways Authority of India was constituted by an act of Parliament, the National Highways Authority of India Act, 1988. It is responsible for the development, maintenance and management of National Highways. It is mandated to implement India’s Largest highways project National Highways Development Project (NHDP) The Government of India has been implementing this project through various phases.

- Phase I: The Golden Quadrilateral (GQ) connecting the four major cities of Delhi, Mumbai, Chennai and Kolkata.
- Phase II: North-South and East-West corridors comprising National Highways connecting four extreme points of the country.
- Phase III: 4-laning of National Highways on BOT basis, which connect state capitals via NHDP Phase I and II, and connectivity to centres of economic importance.
- Phase IV: Upgradation of existing single lane highways into two lanes.
- Phase V: Upgradation of four lane Highways into six lanes.
Table 2. Status Of The Different Phases of NHDP as on 31ST OCT, 2013

<table>
<thead>
<tr>
<th>Phase</th>
<th>Total length (km)</th>
<th>Already 4/6 Laned (km)</th>
<th>Under implementation (km)</th>
<th>Balance Length for Award (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase VI</td>
<td>5,846</td>
<td>5,846</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Phase VII</td>
<td>7,142</td>
<td>6,177</td>
<td>593</td>
<td>372</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Phase VI: Construction of expressways that would connect major commercial and industrial townships.
- Phase VII: Improvements to city road networks.

IV. PUBLIC PRIVATE PARTNERSHIP PROJECT IN INDIA

Table 3. Status of The Different Phases of NHDP (31ST OCT, 2013)

<table>
<thead>
<tr>
<th>State</th>
<th>Total Number of Projects</th>
<th>Based on 100 crore</th>
<th>Between 100 to 250 crore</th>
<th>Between 251 to 500 crore</th>
<th>More than 500 crore</th>
<th>Value of Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>96</td>
<td>1,484.6</td>
<td>2,197.8</td>
<td>7,062.3</td>
<td>56,173.7</td>
<td>66,918.3</td>
</tr>
<tr>
<td>Assam</td>
<td>4</td>
<td>54.0</td>
<td>337.2</td>
<td>-</td>
<td>-</td>
<td>391.2</td>
</tr>
<tr>
<td>Bihar</td>
<td>6</td>
<td>77.6</td>
<td>-</td>
<td>769.6</td>
<td>1,246.7</td>
<td>2,093.8</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>2</td>
<td>75.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>75.0</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>4</td>
<td>70.0</td>
<td>304.0</td>
<td>464.0</td>
<td>-</td>
<td>838.0</td>
</tr>
<tr>
<td>Delhi</td>
<td>13</td>
<td>95.0</td>
<td>109.4</td>
<td>738.2</td>
<td>10,374.0</td>
<td>11,316.6</td>
</tr>
<tr>
<td>Goa</td>
<td>2</td>
<td>30.0</td>
<td>220.0</td>
<td>-</td>
<td>-</td>
<td>250.0</td>
</tr>
<tr>
<td>Gujarat</td>
<td>63</td>
<td>304.1</td>
<td>2,013.2</td>
<td>4,138.9</td>
<td>33,181.0</td>
<td>39,637.2</td>
</tr>
<tr>
<td>Haryana</td>
<td>10</td>
<td>125.0</td>
<td>180.0</td>
<td>270.0</td>
<td>10,588.1</td>
<td>11,163.1</td>
</tr>
<tr>
<td>Jammu and Kashmir</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6,319.8</td>
<td>6,319.8</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>9</td>
<td>131.0</td>
<td>550.0</td>
<td>398.0</td>
<td>625.1</td>
<td>1,704.1</td>
</tr>
<tr>
<td>Karnataka</td>
<td>104</td>
<td>1,080.4</td>
<td>1,942.6</td>
<td>13,136.3</td>
<td>28,499.6</td>
<td>44,658.9</td>
</tr>
<tr>
<td>Kerala</td>
<td>32</td>
<td>338.7</td>
<td>206.3</td>
<td>1,250.0</td>
<td>20,501.5</td>
<td>22,281.5</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>86</td>
<td>1,977.6</td>
<td>3,930.3</td>
<td>3,397.2</td>
<td>5,678.3</td>
<td>14,983.4</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>78</td>
<td>742.3</td>
<td>2,988.4</td>
<td>2,433.7</td>
<td>39,427.6</td>
<td>45,592.0</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>2</td>
<td>-</td>
<td>226.1</td>
<td>-</td>
<td>-</td>
<td>762.1</td>
</tr>
<tr>
<td>Orissa</td>
<td>27</td>
<td>235.1</td>
<td>211.0</td>
<td>1,473.0</td>
<td>11,430.6</td>
<td>13,349.7</td>
</tr>
<tr>
<td>Puducherry</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>419.0</td>
<td>2,947.8</td>
<td>3,366.8</td>
</tr>
<tr>
<td>Punjab</td>
<td>29</td>
<td>732.8</td>
<td>1,552.7</td>
<td>572.0</td>
<td>705.0</td>
<td>3,562.5</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>59</td>
<td>633.9</td>
<td>783.8</td>
<td>1,100.8</td>
<td>12,508.8</td>
<td>15,027.3</td>
</tr>
<tr>
<td>Sikkim</td>
<td>24</td>
<td>175.6</td>
<td>558.0</td>
<td>2,669.0</td>
<td>13,708.0</td>
<td>17,110.6</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>43</td>
<td>267.9</td>
<td>355.6</td>
<td>8,905.2</td>
<td>9,100.0</td>
<td>18,628.6</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td>1,458.6</td>
<td>25,137.2</td>
<td>26,595.8</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>2</td>
<td>43.0</td>
<td>-</td>
<td>478.0</td>
<td>-</td>
<td>521.0</td>
</tr>
<tr>
<td>West Bengal</td>
<td>30</td>
<td>638.0</td>
<td>965.7</td>
<td>1,714.4</td>
<td>3,299.1</td>
<td>6,617.1</td>
</tr>
<tr>
<td>Inter State</td>
<td>14</td>
<td>160.5</td>
<td>195.0</td>
<td>2,474.4</td>
<td>6,738.0</td>
<td>9,567.8</td>
</tr>
<tr>
<td>Total</td>
<td>758</td>
<td>9,471.9</td>
<td>19,826.9</td>
<td>55,307.5</td>
<td>298,725.8</td>
<td>383,332.1</td>
</tr>
</tbody>
</table>

As per database both central & state agencies put together there are 758 projects in various stages from bidding to completion. The total value of PPP project is 383,322.1 crores. Karnataka has maximum no. of project 104 followed by Andhra Pradesh, Madhya Pradesh, Maharashtra & Gujarat. All other central & state has less than 60% of share in total number of
According to the value of projects, the state of Karnataka tops the list with 104 projects.

V. CHALLENGES OF PPP IN INDIA

The challenges faced by PPP by analyzing it at state level.

- Regulatory environment: There is no independent PPP regulator in India currently. In order to attract more domestic and international private funding of infrastructure, a more robust regulatory environment, with an independent regulator, is essential.

- Lack of information: The PPP program lacks a comprehensive database regarding the projects/studies to be awarded under PPP. An online database, consisting of all the project documents including feasibility reports, concession agreements and status of various clearances and land acquisitions will be helpful to all bidders.

- Project development: The project development activities such as, detailed feasibility study, land acquisition, environmental/forest clearances etc., are not given adequate importance by the concessioning authorities. The absence of adequate project development by authorities leads to reduced interest by the private sector, mispricing and many times delays at the time of execution.

- Lack of institutional capacity: The limited institutional capacity to undertake large and complex projects at various Central ministries and especially at state and local bodies level, hinder the translation of targets into projects.

- Financing availability: The private sector is dependent upon commercial banks to raise debt for the PPP projects. With commercial banks reaching the sectoral exposure limits, and large Indian Infrastructure companies being highly leveraged, funding the PPP projects is getting difficult.

VI. CONCLUSION

National highways play a key role in the economic growth of the country. The Union Government of India has taken various measures to upgrade the capacity and quality of the National Highways network. PPP routes have been adopted by the government to meet the funding gap and use techno-managerial efficiencies of the private sector to obviate the inefficiencies in the traditional public procurement system. Various reforms have been introduced by the Union Government of India to create an enabling environment for participation of the private sector in the development of the road projects through the PPP route. Model concession agreements have been developed to facilitate standardization of terms and conditions and ensure uniformity in the various agreements for PPP road projects.

REFERENCES

[1] Public Private Partnership in India www.pppinindia.com


Pedestrian Responsible Behaviour for Their Safety While Crossing A Road At Mixed Traffic Condition

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Abstract: Walking is perhaps, one of the oldest among all other available modes but is totally discriminated for being considered as a mode of transportation. This may be because of the fact that it is a fundamental or natural means of transport for a person to move from one place to another and needs no vehicles for such. But for the trips of fewer distances it is very much efficient as well as effective mode of transportation than any other. Pedestrian movement may be possible for many purposes like from home to market, office, school, colleges etc. Moreover walking also assist the outgoings of all other modes. On Indian roads, due to less awareness about the complex traffic system the pedestrian are usually seen confused while walking besides or crossing the road. Also some Emotional and psychological factors affects the pedestrian while taking immediate decisions which may decrease their reaction time in case of critical situations. On Indian Roads susceptibility of the pedestrian compared to other road users is very high, and also they become the victims of large number of road accidents every day. Giving sufficient awareness to the Pedestrian about their safety, security and their duties as pedestrian on the road is a practical solution of these problems. This can be achieved by considering a pedestrian as an important part of the traffic system while planning and providing some guidelines, rules and regulations for the pedestrian flow by justifying their reaction.

Key Words: Walking, Pedestrian, Modes, Transportation, Accidents, Behavior, Regulations

1. INTRODUCTION

In Transportation System Walking is perhaps, one of the Oldest among all other available modes. It is basic and necessary mode of transportation chain which is used by each and every person on this planet. Walking also assist the outgoings of all other modes, that is whatever is the mode one like to choose for travel, the Initial and final mode will be walking. It is the cheapest mode available for the Transportation of people which have minimum disturbance to the surrounding environment. Pedestrian is defined as a person who uses to walk from one place to another which includes Person with physical disabilities also, like those who use wheel chairs or any other kind of assisting devices. As per the demography, India is on the 2nd place in the list of Population, having 1.27 billion people. The contribution of this number to the world is about 1/6th which is about 17.6% of the total population of the world.

In Previous decades because of extemporization of social and economic conditions in India, a large number of vehicles mobility has been witnessed at urban centers. With the fast growth rate of population and crowded on the roads, the need of the adequate pedestrian facilities is also increasing in the urban centers. Design and Planning of such facilities is also very important to provide sufficient Space for free movement of the Group of people. There are number of points which have reasonable effect on influencing the walking demand. Few of them are Vehicle ownership, Quality of Facilities, Safety and Security Provisions, Local Activities etc.

Vehicle Ownership: The number of private vehicles available in the locality also affects walking. More number of private vehicles minimizes the amount of pedestrian.

Quality of Facilities: A better quality of facilities maximizes the demand of walking.

Safety Provisions: It is Significant that the facilities provided should be safe and secure from any clash between vehicle - walker and have less risk for any kind of personal attacks.

Local Activities: It is an important factor which influences the rate of demand of walking. For Short trips walking is more frequently a choice of people, such as for local origins and destinations.

Nature of People: It has been observed the community with maximum number of young person’s has more frequency of walking demand.

With the fast growth of the vehicles in the whole world Environmental problems are raising rapidly, walking is an alternative to reduce such problems. Physical health is also an influencing factor for walking. Walking play a great role in keeping the one physically fit. While planning a facility for walking, Safety and security of pedestrian is a big issue at poor visible points where vehicle- pedestrian could clash with each other, such as at intersections. A poor facility may result in more accident circumstances. A lot
of problems are being faced by pedestrian and a car driver on busy roads. Dashing is one of such problem which reflects sudden appearance of pedestrian in front of vehicle. Dashing is another problem refers to running Pedestrian. According to a study children having age group less than 14 years are the one forming a list of more number of accident victims who have highest rate of injury. The fatality rate of the older group is more because of less chances of recovery from such injuries. Also the Behaviour of pedestrian may be affected by alcohol or any kind of intoxicating drugs. Seeing all this it is significant to have a better Facility System Which should fulfill the purpose of backing a pedestrian both in physiological and psychological manner and assure them against any overexertion or mischance. This is the reason because of which in recent decades a lot of research and study has been started in this area of Transportation System. Samples are usually taken at such locations where volume of walkers is more in numbers against the density. The point like Business locations, Group of people coming out from theatres and stadium doors at same time, malls etc.

II. LITERATURE REVIEW

Corol Holland and Ros Hill (2010) observed in their research that age and Gender of a pedestrian are the factors which may affects the variations in the accidental Injuries and Casualties. They did their study on 218 different adult Pedestrians age group from 17 to 90 years. They used Methods of Simulation Study by using Filmed real traffic situations. They observed with increasing age , the women makes unsafe decisions more while Crossing a Road, Leaving small safety margins and estimates poor about walking speed. Men of the same age were not a big factor in Predicting unsafe crossing decisions. The male who drives looks both sides while crossing a road in comparison to those who don’t drive.

Tiwari and Chatterjee (2013) did a research on the pedestrian and comes to the conclusion that they are at high risk on the roads of Delhi. This is due to the fact that while planning part the needs of walkers were not recognized by the planning department. Also the rapid increase in the 2 or 4 wheeler vehicles on the roads is forcing to built a large number of expressways, flyovers etc for their free flow, which exposes the pedestrian to the high risk on the road. They prepared a statistical analysis on pedestrian’s behavior towards risk taking while crossing the roads and in beginning and after the grade separator was provided there. It has been seen an important part of the pedestrian number was willing to take risk in both conditions that is before and after the facilities construction. Because of the construction of the grade separators the speed of all type of vehicle was increased on the road, these increases the waiting time of the pedestrian in the capital of the country. The study also revealed that when no signals where provided the behavior of the pedestrian becomes independent which results in the increase in risk taking behavior.

Satish Chandra, Rajat Rastogi et al (2014) studiedparametric analysis of pedestrian gap acceptance in mixed traffic conditionsand come to the conclusion that there are three different ways of crossings used by pedestrian. First is single stage, second type is two stages and third is rolling gap. Acceptance of single stage gap was found to have less deviation from critical gap. Two stage crossings were less in number and people preferred rolling gap crossing as compared to the other two types of crossing. The minimum gap was accepted for Young pedestrians while for the old pedestrians it was maximum. It was found that the older pedestrians exhibit a higher level of deviation in their accepted gap from critical gap than the other two categories. Based on age, it was found that young pedestrians take higher risk while crossing the roads. The critical gap at four locations was between 5.90 and 7.60 s and it decreases with increasing road width. It suggests that crossing speed of pedestrian increases with road width. Considering the safety aspect, a general value of 8 s is recommended for design of crossing facilities (like signal) and a higher value of 12 s are recommended at locations where female or old pedestrians are substantial.

Asaithambi, O. Kuttan and S Chandra (2016) studied the behavior of pedestrian on the road while crossing under mixed traffic conditions. They studied the intersections points in the beginning and after the execution of the control measures at those points. They studied different parameters that involve gender, age, crossing time, speed, crossing pattern, waiting time etc. by videography. They concluded a large number of pedestrians while crossing a road likes to cross it in one step, after the execution of signals pedestrian had as much space while crossing road at the red signals for Cars and other vehicles. The pedestrian waiting time was increased after the signal installation. They also concluded 15% of Pedestrian Crossing Speed was reduced in both Scenarios than the recommended IRC (103) Crossing Speed of 1.2m/s. Because of Decreasing Speed, the critical space between the pedestrian was also reduced.
III. METHODOLOGY AND DATA COLLECTION

The Location that was selected for collecting data was Vikram Chowk, which is Center Place of Jammu City, Jammu and Kashmir, India. Thousands of pedestrian daily passes from this location and have high chances of vehicle-walker interaction. This Chowk is an uncontrolled intersection of three legged T-Intersection. A sample of about 110 pedestrian of different age group is used for conducting the research work. The Data was collected by using Video graphic technique on the winter days when Jammu has peak amount of population. The day selected for shooting Video was 4 February 2019, between 3 Pm to 4 Pm. The Video grapy was done by using Smartphone camera 13 mega pixel of Samsung J7 Model. It has the resolution of 1080P at 30 Frames per second. Total length of the video was 30 minutes covering large area of the road both longitudinally and laterally. It has been observed that more than 85% of pedestrian were violating the traffic rules. Pedestrian were not caring about the Signals while crossing road. So there were high chances of conflicts between pedestrian and Vehicles. The Pedestrians were violating the rules because of the reasons like mixed traffic conditions, Less awareness to the pedestrians about rules, Poor traffic management, no enforcement rules for Pedestrians, jay walking behavior, etc. The pattern of crossing was different for every Pedestrian and depends upon the space available on road. The data was extracted from the video by playing it using VLC software. Jpeg image was obtained by using Snapshot Wizard software.

IV. DATA EXTRACTION AND ANALYSIS

The data extracted from the video grapy technique is used to obtain the useful information of the Pedestrain walking individually or walking in a group. The information like Age, Gender, their pattern while walking, walking speed, density, Pedestrian behaviour at intersections etc.

Fig 3 shows pedestrian’s Age groups. The figure 4 is a bar chart plotted between Pedestrian age and Pedestrian Number. There were 9 age groups of the pedestrian on which
the study has been conducted. As the location was near most of the educational institutes of the city, hence the pedestrian group consists of a large number of Students age varying between 21-25 and 26-30. The pedestrian of age group 21-25 has maximum number in the available data and Age group of lesser than 20 has minimum number of Pedestrian. Other age groups in the Pedestrians list were 31-35, 36-40, 41-45, 46-50, 51-55 and 55-60. The figure 5 is bar chart comparing the gender of pedestrian to its number.

![Bar Chart](image1)

**Fig 4. Gender of Pedestrian**

In the above bar charts, it has been observed that the Males were maximum in number than the females out of total pedestrians. The total males were 68 and females were 43 in number.

**A. ANALYSIS OF CROSSING BEHAVIOR**

From the available data, an attempt was made to understand the behavior of the pedestrian on his/her priority towards safety. We have categorized the walking behavior in two ways.

- **Tactful Behaviour**: Tactful pedestrian where those who were showing active and thoughtful behaviour on the road while crossing. They were very careful and safety concern and crossing the road while waiting for safe space to walk.

- **Perilous Behaviour**: Perilous Behaviour was careless behaviour of the pedestrian who took risky decisions on the road while crossing it. They were not much safety concern and showing hurry in every reaction.

![Cones Chart](image2)

**Fig 6. Comparison of Tactful and Perilous behavior**

Figure 6 shows a bar chart in which Tactful and Perilous behavior of the Pedestrian is shown on the basis of number. It has been observed that most of the Pedestrian were showing tactful behavior while crossing the road while other pedestrian was showing Perilous Behavior. In this study it has been observed that 75/ 110 pedestrian were tactful on the road while
crossing it and 35/110 pedestrian were showing Perilous Behavior. Further when the data was studied on the basis of the gender and the age group of the pedestrian, it has been concluded that females of all age group are more tactful than the males of that age. The figure 8 shows the bar chart on Perilous behavior on Road on the basis of gender. Here the blue color represents the male pedestrian and brown color represents the Female pedestrians. From the data it has been studied that the females gives more priority to the safety on the road and males of all age groups are less safety concern than the females of that age group.

V. CONCLUSION

While crossing road safety is an important factor for the smooth functioning of the traffic system. In this research paper an attempt is made to understand the priority towards safety in comparison to speed, by the pedestrian on the basis of their age group and gender. This data can be used while designing the various facilities for assisting pedestrian movement. It has been concluded that the females of all age group are more concern about their safety on the road while crossing. They take wiser decisions on the road in such situations. While the male has quite careless behavior and are less safety concern than them. Also the pedestrian waking with their families was more tactful and safety concern than an individual pedestrian, especially the pedestrian with the children were showing very careful reaction while crossing the road.

REFERENCES


Experimental Investigation of Rice Husk Ash and Waste Paper Sludge Ash as Partial Replacement of Cement

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Abstract: Concrete and cement mortar are widely used now a days by construction industry. Keeping the environment in mind we have to manage the waste (industrial waste), in the industry as a raw material. In this research waste rice husk ash and waste paper sludge is used. The paper sludge production is a by product of paper making in the paper mill and rick husk is obtained from the processing of rice. By adding these components into the cement it increases the strength, flexural and compressive strength of concrete. The rice husk ash (RHA) and waste paper sludge were added to the concrete at varying percentages (15%, 10%) and (15%, 20%). Cubes of 150*150*150 mm and cylinders of 150*300 mm with varying percentage of RHA and WPSA. The various test were conducted on specimens like Split Strength Test, Compressive Strength, flexural Strength Test, normal consistency test, setting time test and water absorption test etc. And after conducted various tests on the specimens it was concluded that with the utilization of rice husk ash and waste paper sludge can contribute in the partial replacement of cement in concrete.

I. INTRODUCTION

Concrete is one of the most widely used construction products in the world. It is mixture of cement, fine aggregate, coarse aggregate and water. The durability of concrete depends upon proportioning, mixing and compacting of the ingredients. Agricultural waste (rice husk ash) and industrial by – product (silica fume) (waste paper) have been widely used as partial replacement materials or cement replacement materials in concrete works. The advantages by incorporating these supplementary cementing materials include energy consumption saving (in cement production), low cost, engineering properties improvement, and environmental conservation through reduction of waste deposit. Addition of a pozzolanic material to concrete mix may lead a considerable improvement in the quality of the concrete and its durability. At ordinary temperature and with the presence of moisture it chemically reacts with calcium hydroxide (lime) to form compounds possessing cementitious properties. Rice husk ash (RHA) and silica fume (SF) waste paper sludge ash (WPSA)are considered as rich-silica materials or pozzolanic materials used to replace a portion by mass basic of Portland cement in order to modify the physical and engineering properties of cement and concrete.

When these materials blended with cement and in the presence of water, they can react with Calcium Hydroxide (Ca(OH)$_2$) which forms in hydrated Portland cement to produce additional Calcium Silicate Hydrate (C-S-H). With the addition of the these pozzolanic materials, many aspects of concrete properties can be favorably influenced, some by physical effects associated with small particles which have generally a finer particle size distribution than ordinary Portland cement and others by pozzolanic and cementitious reactions resulting in certain desirable physical effects. Concrete mix proportion and rheological behavior of plastic concrete are caused by the physical effects associated with the particle size and morphology of pozzolans. Strength and permeability of hardened concrete are the main effects associated with the pozzolanic and cementitious reactions.

Several studies in developing countries, including Guyana, Thailand, Pakistan and Brazil, have shown that rice husk ash (RHA) can be used as a partial replacement for cement in concrete. The ability to use an agricultural waste product to substitute a percentage of Portland cement would not only reduce the cost of concrete construction in these countries, but would also provide a means of disposing of this ash, which has little alternative uses. Additionally, cement manufacturing is an energy-intensive process, so in addition to reducing the cost of concrete construction and providing a means for disposing of an agricultural waste product, incorporating RHA into concrete as a partial substitute for Portland cement would also stand to reduce the amount of energy
associated with concrete construction. The rapid industrialization has resulted in generation of large quantities of wastes. Most of the wastes do not find any effective use and create environmental and ecological problems apart from occupying large tracts of valuable cultivable land. It has been observed that some of these wastes have high potential and can be gainfully utilized as raw mix / blending component in cement manufacturing. The utilization of the industrial solid wastes in cement manufacture will not only help in solving the environmental pollution problems associated with the disposal of these wastes but also help in conservation of natural resources (such as limestone) which are fast depleting. The other benefits to cement industry include lower cost of cement production and lower greenhouse gas emission per ton of cement production. This may also enable cement industries to take benefits of carbon trading.

II. MATERIAL

A. RICE HUSK ASH

Rice husk ash (RHA) is a by-product from the burning of rice husk. The husk of the rice is removed in the farming process before it is sold and consumed. It has been found beneficial to burn this rice husk in kilns to make various things. The rice husk ash is then used as a substitute or admixture in cement. Therefore the entire rice product is used in an efficient and environmentally friendly approach. Rice husk ash is a natural pozzolan, which is a material that when used in conjunction with lime, has cementitious properties. Several studies have shown that due to its high content of amorphous silica, rice husk ash can be successfully used as a supplementary cementitious material in combination with cement to make concrete products. According to the Food and Agricultural Organization of the United Nations, global production of rice, the majority of which is grown in Asia, totaled 746.4 million tons in 2013. This means that the volume of unused rice husks amounted to 150 million tons. Due to their abrasive character, poor nutritive value, very low bulk density, and high ash content only a portion of the husks can be used as chicken litter, juice pressing aid, animal roughage and pesticide carrier. The remaining husks are transported back to field for disposal, usually by open field burning. RHA is obtained by burning of rice husk. When RH is properly brunt, it has high silica content and can be used as an admixture in mortar and concrete. India produces about 122 million tons of Paddy every year. About 20-22% rice husk is generated from paddy and 20-25% of the total husk becomes a Rice Husk ash after burning. The RHA is used as Pozzolanic material for making concrete.

B. PROPERTIES OF RHA

The physical and chemical properties of silica in RHA are strongly influenced by the temperature and the duration of thermal treatment, the yield of a highly reactive ash requires a burning method that can remain a low firing temperature and a short retention period in order to give ash with low carbon content and a high surface area.

Fig 1. Before Burning Rice Husk

Fig 2. After Burning Rice Husk Ash
C. ADVANTAGES OF USING RICE HUSK ASH IN CONCRETE

Due to its different properties with cementitious material like increase compressive and flexural strengths, Reduced permeability, Increased resistance to chemical attack, Increased durability, Reduced effects of alkali-silica reactivity, Reduced shrinkage due to particle packing, making concrete denser, Enhanced workability of concrete therefore it reduces heat gain through the walls of buildings and considerably reduces use of super plasticizer.

D. WASTE PAPER SLUDGE ASH

![Image of Waste Paper Sludge Ash]

Fig 3. Waste Paper Sludge Ash

India produces over 300 million tonnes of industrial wastes per annum by chemical and agricultural process. These materials create problems of disposal, health hazards and aesthetic. Paper fibers can only be recycles a limited number of times before they become too short or weak to make high quality paper. Paper sludge behaves like cement because of silica and magnesium properties which improve the setting of the concrete. Paper mill sludge can be used as an alternative material applied as partial replacement of fine aggregates in manufacturing fresh concrete intended to be used for low cost housing projects. About 300 kg of sludge is produced for each tone of recycled paper. This is a relatively large volume of sludge produced each day that makes making landfill uneconomical as paper mill sludge is bulky. The raw dry paper sludge mainly contains silica and calcium oxide, followed by alumina and magnesium oxide. The paper mill sludge consumes a large percentage of local landfill space for each and every year. Worse yet, some of the wastes are land spread on agricultural land or running off into area lakes and streams. Some companies burn their sludge in incinerators, contributing to our serious air pollution problems. To reduce disposal and pollution problems emanating from these industrial wastes, it is most desire to develop profitable materials from them. Keeping this in view, investigations were undertaken to produce low cost concrete by blending various ratios of cement with hypo sludge. Pulp and paper mill residual solids (also called sludge) are composed mainly of cellulose fibers, moisture, and papermaking fillers (mostly kaolinite clay and/or calcium carbonate) Utilization of the widely spread industrial wastes in the civil construction practice may lead to a real possibility of significant decrease in the environment pollution by paper and lime production wastes and perceptibly economize the price of civil construction.

Table 1. Effect of Compressive Strength of Concrete Containing various % of Mix (RHA+ WPSA)

<table>
<thead>
<tr>
<th>Mix</th>
<th>Percentage of Cement Replacement</th>
<th>Cube Compressive Strength N/mm²</th>
<th>7 Days</th>
<th>14 Days</th>
<th>28 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td>0%</td>
<td>20.4</td>
<td>25.23</td>
<td>30.93</td>
<td></td>
</tr>
<tr>
<td>MIX (RHA+WPSA)</td>
<td>5%</td>
<td>19.84</td>
<td>24.10</td>
<td>28.89</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>18.82</td>
<td>23.36</td>
<td>27.66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15%</td>
<td>18.6</td>
<td>21.45</td>
<td>24.52</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20%</td>
<td>16.03</td>
<td>17.23</td>
<td>18.82</td>
<td></td>
</tr>
</tbody>
</table>
The results from the table represent that 10% replacement with Mix (RHA+WPSA) the compressive strength are comparatively equal to Control Mix strength, and further increase in % replacement the strength decreases.

Table 2: Split Tensile Strength of Mix (RHA+ WPSA) Concrete

<table>
<thead>
<tr>
<th>Mix</th>
<th>Percentage of Cement Replacement</th>
<th>Splitting Tensile Strength (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>M20</td>
<td>0%</td>
<td>1.94</td>
</tr>
<tr>
<td>MIX (RHA+WPSA)</td>
<td>5%</td>
<td>1.96</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>1.86</td>
</tr>
<tr>
<td></td>
<td>15%</td>
<td>1.71</td>
</tr>
<tr>
<td></td>
<td>20%</td>
<td>1.65</td>
</tr>
</tbody>
</table>
As per the results given from table, split tensile strength of 5% replacement of cement with Mix(RHA+WPSA) has higher value than the control mix and 10% replacement has comparatively equal split tensile strength to Control Mix. For the 15% and 20% the split tensile structure decreases gradually.

III. CONCLUSION

The compressive strength and split tensile strength increased up to 20% with 5% replacement of WPSA. Further increase in WPSA decreases the strength gradually and up to 10% replacement it can be used as a supplementary material in M20 grade of Concrete.

• The above results shows that it is possible to design M20 grade of concrete incorporating with RHA content up to 10%.
• As test results shows the Mix (RHA+WPSA) can also be used as a replacement of cement.
• Control mix with 5% WPSA showed higher Compressive Strength than Control mix, RHA concrete and Mix(RHA+WPSA) concrete.
• The study showed that the early strength of RHA, WPSA and Mix (RHA+WPSA) concrete was found to be less and the strength increased with age.
• The workability of RHA,WPSA and Mix(RHA+WPSA) concrete has been found to decrease with the increase in replacements.
• Based on the results of Split Tensile Strength test it is convenient to state that there is substantial increase in Tensile Strength due to the addition of RHA, WPSA and Mix (RHA+WPSA).

REFERENCES


Laboratory Study of Dense Bituminous Concrete Mix for Surface courses using zycotherm

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Abstract- Flexible pavements with bituminous surfacing are widely used in India. The huge traffic flow in terms of commercial vehicles, overloading of trucks and significant variations in daily and seasonal temperature of the pavement have been responsible for early development of distress symptoms like raveling, undulations, rutting, cracking, bleeding, shoving and potholing of bituminous surfacing. A factor which causes further concern in India is very high and low pavement temperatures in some parts of the country. Under these conditions, flexible pavements tend to become soft in summer and brittle in winter. Investigations in India and countries abroad have revealed that properties of bitumen and bituminous mixes can be improved to meet requirements of pavement with the incorporation of certain additives or blend of additives. In this work zycotherm is used as an additive and various tests are performed to check the quality of the mixture.

Key words: DBC, zycotherm, penetration test, Marshall Stability test, Flow value, voids.

I. INTRODUCTION

Modified bitumen with polymer offers a combination of performance related benefits the physical properties of the bitumen are improved without changing the chemical nature of it. King et al. (1986) also carried out a test for testing the rutting resistance and it was found that the PMB was able to withstand 4-10 times more loading cycles before ruts of various specified depths. Terrel and Walter (1986) have shown that polymers provide considerable improvement in the physical properties of binder – aggregate combinations. However, the improved properties of the PMB should be made use of in order to have increased service life and the thickness should not be reduced on the pretext of using PMB.

II. LITERATURE

Valkcring et al. (1990) reported that the utility of the dynamic creep test for better prediction of the strain rate in polymer modified bituminous mixes. The rut depths were calculated under the wheel loading in the laboratory test track tests. It has been shown that satisfactory correlation between the rate of residual strain and rutting rate exists. Collins et al. (1991) reported that selection of appropriate asphalt is essential to obtain a blend with optimal properties. Improved compatibility leads to many advantages. Further, it has been proved that the effectiveness of the added polymer in terms of elastic recovery dropped from a soft to a hard binder. Lenoble and Nahas (1994) showed that the addition of polymer not only increases the application temperature range of asphaltic binders but also increases the traffic resistance. Further, it was also discussed that the thermal cracking resistance of a pavement is controlled by the temperature at which the binder reaches a modulus close to its glassy modulus.

III. METHODOLOGY

As per IS CODE 73 the requirements and the observed values of bitumen for Dense Bituminous Concrete mix are:

Gradation of materials for Dense Bituminous Concrete layer

Therefore, as per the gradation and as per the specified limits of MORTH the contents used in the mix have following proportions:

a) 20 mm nominal aggregate size = 0%
b) 10 mm nominal aggregate size = 41%
c) Fine aggregate, sand = 22%
d) 4.75 mm down & dust = 35%
e) Filler, cement (53 grade) = 2%

Further, the samples are prepared with bitumen VG 10 binder and are further modified with the nano material Zycosystem. The binder content is changed with different percentages (5.5%, 6%, 6.5%) and the zycosystem percentage is also varied (0.1%, 0.125%, 0.15%) of the binder content.

In this study, we investigate the effect of a Nanomaterial with the trade name of zycotherm and we compared simple bitumen and bitumen with additive.
Mixing of Bitumen and Additive: As according to its manufacturer company, the mixing dosage of Zycotherm is 0.05 to 0.15 of weight percent of bitumen, we selected the mixing does of 0.1, 0.125, 0.15 percent for manufacturing of bitumen with additive. We measured and calculated specific gravity, air void, Marshall Resistance and Plastic Flow of samples after producing them.

MIX SAMPLES
As per MORTH the requirements and the observed values for the dense bituminous concrete mix are for 5.5% bitumen content and 0%, 0.1%, 0.125 and 0.15% Zycotherm content:

IV. TEST RESULTS OF MODIFIED DESIGN

The graphs are plotted between bitumen content (%) and Marshall stability values (KN), Voids filled with mineral aggregate (%), Voids filled with bitumen (%), air voids (%) and Flow value (mm) for different percentages of binder and with no addition of Zycotherm and with addition of 0.1, 0.125 and 0.15 percent of Zycotherm. The different Marshall properties are calculated and compared, the result is discussed later. The Optimum bitumen content is also calculated further. From the above results it can be concluded that using Zycotherm by weight of binder will improve and enhance the properties of hot mix asphalt concrete to a great extent and rutting and fatigue problems which mostly arise from moisture exposure and existence inside the asphalt will be decreased. It can also be concluded that the Zycotherm which is added as additive can be fuel efficient i.e., it can reduce the fuel cost by 11 – 14% to the conventional fuel cost. Also 0.15% of Zycotherm is optimum additive content that to be mixed in the mix. Thus, it is clearly reflected that utilization of 0.15% expansion of Zycotherm as Warm blend at 130°C temperature in development of Bituminous Concrete is eco-accommodating, cost effective and useful under precise supervision.

Fig 5: Graph between Marshall stability values(KN) and bitumen content(%) with addition of 0% Zycotherm
Fig 6: Graph between VFA (%) and bitumen content (%) with addition of 0% Zycotherm

Fig 7: Graph between VMA and bitumen content(%) with addition of 0% Zycotherm

Fig 8: Graph between Flow value(mm) and bitumen content (%) with addition of 0% Zycotherm
Fig 9: Graph between Vv(%) and bitumen content(%) with addition of 0% Zycotherm

Fig 10: Graph between Marshall stability values (KN) & bitumen content(%) with addition of 0.1% Zycotherm
Fig 11: Graph between VFB (%) & bitumen content (%) with addition of 0.1% Zycotherm

Fig 12: Graph between VMA (%) & bitumen content (%) with addition of 0.1% Zycotherm

Fig 13: Graph between Flow value (mm) & bitumen content (%) with addition of 0.1% Zycotherm
Fig 14: Graph between Vv(%) & bitumen content(%) with addition of 0.1% Zycotherm

Fig 15: Graph between Marshall Stability values (KN) & bitumen content (%) with addition of 0.125% zycotherm

Fig 16: Graph between VFB (%) & bitumen content (%) with addition of 0.125% zycotherm
V. CONCLUSIONS

The Zycotherm applied in asphalt pavement engineering with their specific properties are categorized in the next points:

1. The physical properties were conducted on the aggregates and the binder used in the present studies satisfies the requirements as per the MORT&H specifications.

2. Increasing percentage of additive dosage to rate of Marshall Properties also increases and satisfies the MORT&H specifications.

3. The Marshall properties of HMA in the present studies satisfies the MORT&H specifications.

4. The optimum bitumen content was found to be 6% for HMA mix at 160⁰c temperature.

5. The maximum stability for 60/70 grade bitumen is achieved at 160⁰c temperature with the additive dosage rate of 0.15% of Zycotherm by the weight of binder.

6. The addition of additive of Zycotherm improves bulk density of the mix. The percentage air voids in the mix were found to decrease with the increase of HMA additive and 0.15% of Zycotherm at 160⁰c was lowest when compared to the conventional mix.

7. Residual water in aggregate at lower temperature helps to promote reactivity with the aggregate and can withstand boil tests lasting over six hours with an over 95% retained coating.

8. Captures sticky asphaltenes in nano cages of Zycotherm for improved free flow and reduced stickiness to trucks or paver and compaction rollers.

9. Wets & spreads even better at lower bitumen content to give a blacker looking mix.

10. Captures all odorous compounds in nano cages of the Zycotherm lowers mixing temperature by 95° C, saves fuel by 20-25% OR Helps in longer hauls OR Allows paving in cold conditions 32 - 41ºF.

REFERENCES


[2] Elsa Sanchez-Alonso(2012),"Evaluation of compactability and mechanical properties of bituminous mixes with warm additives Department of Transport, Projects and Process Technology, School of Civil Engineering (E.T.S.I.C.C.P.), University of Cantabria (UC), Avenida de los Castross/n,39005Santander,Cantabria,Spain


[4] Liantong mo,Xun li ,Xing fang M.Huurman ,Shaopeng w(2012)," laboratory investigation of compaction characteristics and performance of warm mix asphalt containing chemical additives”, state key laboratory of silicate materials for architectures, wuhan university of technology, wuhan 430070, chinab technology & development, bam wegen bv, utrecht 3500 gk, the netherlands

Study of Pavement Sub-Base by Use of Stabilized Moorum

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Abstract: High quality aggregates that meet the details or specifications are getting progressively rare and costly in numerous areas in India. Conventional flexible pavement specifications require high quality aggregates in both base and sub base course. By and large locally accessible aggregates are not fulfilling the particulars and the totals that meet the details must be pulled in long separations. This demonstration fundamentally expands the cost related with the development and ensuing upkeep and recovery of them. Consequently, the utilization of locally accessible marginal aggregates in flexible pavement construction is one of the conceivable responses to high asphalt development expenses and absence of value totals sources in an immense nation like India. An expansive meaning of a marginal aggregate is “any aggregate not in completely accordance with the details utilized as a part of a nation for ordinary road aggregates yet can be utilized effectively either in unique conditions, made conceivable on account of climatic qualities or late advance in road procedures or subsequent to subjecting to specific treatment”. So if we use large amount of locally available materials in the road construction the economic benefit is there. Our principle goal of the study is to enhance the properties of the locally accessible gravel soil/marginal aggregate (Moorum) by including cement and bitumen emulsion. An endeavour has been made to utilize cement for increasing the strength of the gravel and emulsion for increasing the water resisting capacity. The entire work includes increasing strength of gravel soil (Moorum) and expressed in terms of CBR and UCS value.

Keywords: Bitumen Emulsion, Marginal aggregate, CBR, UCS

1. INTRODUCTION

Roads are the way to the advancement of an economy. A decent road organize constitutes the essential foundation that quickens the advancement procedure through network and opening up of the regressive locales to exchange and speculation. Roads additionally assume a key part in between modular transport improvement setting up joins with airplane terminals, railroad stations and ports. Likewise, they have a vital part in advancing national mix, which is especially essential in a substantial nation like India. A huge number of kilometers of roads are being built each year crosswise over India in the state of either urban roads (under National Highways Development Programme) or rural streets (under Pradhan Mantri Gramin adakYojna).

A. Background

High quality aggregates are winding up progressively rare and costly in numerous localities. Conventional flexible pavement specifications require high quality aggregates in the flexible pavement base course materials and asphalt concrete mixtures. In an expanding number of cases, locally accessible aggregates are not meeting pertinent details, and aggregates that meet the determinations must be transported in to the site at extensive cost. The utilization of marginal aggregates in flexible pavement construction is extraordinary compared to other responses to high asphalt development costs and an absence of quality aggregate sources. An expansive meaning of a marginal aggregate is “any aggregate that isn't typically usable on the grounds that it doesn't have the qualities required by the determination, yet could be utilized effectively by altering ordinary pavement design and construction procedures.” The materials used in this research is basically a locally available material know as moorum. Its use at large scale depends upon the thorough study of its different materials present in it. This study will endeavour to characterize in engineering terms the effect of utilizing marginal aggregates in flexible pavements. Techniques for enhancing the execution of negligible totals to level with that of standard totals will be assessed. The significant accentuation will be on marginal aggregates for flexible pavements.
B. Need for present research

With a specific end goal to choose whether to utilize minimal materials in the two points of interest and hindrances ought to be weighed. This isn't straightforward judgment since a few perspectives included can’t be evaluated in financial terms. An assessment of peripheral materials for utilize ought to be founded on specialized. Efficient and natural factor, and due thought ought to be given to them. The marginal materials should be accessible in sufficient amounts and at helpful areas (or to be monetarily transported to the locales) to legitimize the advancement. Technical ampleness: - reasonable physical, mechanical and chemical properties are required with a specific end goal to keep up suitable standard of value and execution in road development. Every one of the materials utilized as a part of pavement must not be possibly hurtful amid the development and for the duration of the existence time of the pavement. The utilization of marginal materials in sub base and road base level speaks to an esteem included application contrasted and their incessant waste nature that may speak to a critical commitment in making these totals focused against traditional materials and lessen the significance of pulling cost over long separations. For this reason a portion of the adjustment might be important to enhance their execution.

C. Objective and scope of work

This research focused essentially on the lacunae discussed above. The primary focus is to madea stabilised gravel so that only a certain quantity of aggregates are used. The various aggregates found in India, in this research I used Moorum with different proportions of silt and clay. It is one of low bearing material used for road construction. It is found in various places of our country with quite variation in its quality from place to place. So the purpose of this research is to utilize moorum by focusing on the following features.

1. To enable the most appropriate use of moorum in pavement construction (in base/sub base course) by ensuring adequate performance result in the field of strength and shear value.
2. To study the characterization of moorum using cement and bitumen emulsion as additives.

D. Importance and Benefits

The fundamental advantages from this investigation are relied upon to be twofold. As a matter of first importance this outcome will add to expand the current information in the field of marginal aggregates, particularly concerning their lab execution under C.B.R. what's more, U.C.S. test. At the appointed time, this learning should add to future changes in the Indian particulars for rural road development and accordingly it will prone to enlarge the market for marginal aggregates.

Secondly, from a more general use of materials further benefits will result, such as the reduction of demand for conventional aggregates, allowing preservation of finite resources. The reduction of energy cost related to extraction and transportation of conventional aggregates. The reduction in environmental cost related to conventional aggregates quarrying. Thereduction in environmental and economic problem associated with waste storage and dumping. Conservationof conventional aggregates by releasing land that would otherwise be used for quarrying aggregates.

II. LITREATURE REVIEW

This chapter is centered around a broad writing audit on some field and research facility and laboratory studies that were led in the ongoing past to watch effectiveness of marginal aggregates to use in base/sub-base course of
roads. It likewise explains distinctive stabilizer for enhancing the quality of marginal aggregates.

A. Past Examinations and Studies on Various Marginal Aggregates and different Stabilizer for enhancing its Quality and Strength

Al-Abdul Wahab and Asi (1997) used direct setting emulsified dark best and medium relieving decreasing dark best to settle both marl and rise sand. Lime and Portland bond (2% and 4%) were added to the settled soils to stimulate the relieving technique and to decrease quality adversity in view of water hurt. It was discovered that offset administrators improved both shear quality and impenetrability to the separated soils to water hurt. It was watched that Portland concrete was more convincing than lime. Evans and Hicks (1982) attempted brilliant basalt, two low quality marine basalts, and a fine grained slope sand. The mix properties evaluated which consolidate polar adaptable modulus and a polar shortcoming life for both as compacted illustration and case shaped by clamminess presentation. Layered flexible framework standard were used with the dynamic test results to make layer equivalencies for emulsion treated Results of Pycnometer (Specific gravity)

Test:
Specific gravity of moorum at 29° C = 2.61

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Observations and Calculations</th>
<th>Determination No.</th>
<th>Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Number of blows (N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>33</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>Water content can No.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mass of empty can (M₁)</td>
<td>9.5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Mass of can + wet soil (M₂)</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Result of Liquid Limit Test:

The observations and calculations for Liquid Limit Test are given in Table below

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Observations and Calculations</th>
<th>Determination No.</th>
<th>Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Mass of can + dry soil (M₂)</td>
<td>22</td>
<td>22.5</td>
</tr>
<tr>
<td>6</td>
<td>Mass of water = M₂ – M₃</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>7</td>
<td>Mass of dry soil = M₃ – M₁</td>
<td>12.5</td>
<td>13.5</td>
</tr>
<tr>
<td>8</td>
<td>Water content = ( w = \frac{(6)}{(7)} \times 100 )</td>
<td>24</td>
<td>24.33</td>
</tr>
</tbody>
</table>
IV. CONCLUSION
Sub-layer may be characterized as a compacted soil layer, for the most part of normally happening neighborhood soil, thought to be 300 mm in thickness, only underneath of the asphalt hull. It gives a suitable establishment to the asphalt. So it is imperative to enhance quality of sub-evaluation oil, it might be by supplanting great soil or by adjustment of existing soil. So a study has been done to enhance the quality of Moorum by adding cement and bitumen emulsion to it to make it suitable for utilization in sub-base course of low volume roads. The accompanying conclusion has been drawn from the above studies. Adjustment utilizing cement and bitumen emulsion builds the bearing limit of Moorum adequately. This reasons extensive increment in number of suitable proportionate standard axle load (ESAL) and therefore, the lifetime of the road will increment separately. Thus, it is clear that this kind of adjustment may be relevant in low volume road for enhancing its quality. This adjustment is able for high point of confinement of stacking in the area with absence of conventional material.

REFERENCES
[3] Ahlrich, R.C., &Rollings, R.S., “Marginal Aggregates in Flexible Pavements: Background Survey and Experimental Plan” US Army Engineer Waterways Experiment Station Geotechnical Laboratory 1993
Improvement of Clayey Soil Using Rubber Scrap and Marble Dust

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Abstract: This work presents the result of laboratory study undertaken to investigate the effect of marble dust on strength of highly plastic clay soil. In the present study, we added Marble Dust & Rubber Scrap to improve the properties of clayey soil. Locally available expansive soil is used in this study. Main aim of this research work is all about improving the properties of clayey soil. In this work we have prepared 20 different samples to study the various properties of soil by adding 0%, 5%, 10%, 15% and 20% of Marble Dust with 3%, 6%, 9% and 12% Rubber Scrap in each of the above sample. In this work two soil tests are used which are Standard proctor test and unconfined compressive strength test to obtain the optimum moisture content (OMC), Maximum dry density (MDD) and compressive strength of soil mixture.

I. INTRODUCTION

Soil stabilization is the process in which we apply different techniques to remolding the soil properties to make it fit for the construction of various civil structures. It is required when soil available for construction is not suitable for the intended purpose. In the broad sense, stabilization includes compaction, pre-consolidation, drainage and many other such processes. Stabilization is the process of blending and mixing materials with a soil to improve certain properties of the soil. The process may include the blending of soils to achieve a desired gradation by the mixing of commercially available additives that may alter the gradation, texture or plasticity, or act as a binder for cementation of the soil. Soil stabilization is used to reduce the permeability and compressibility of the soil mass in earth structures, to reduce the swell in case of expansive soils and to increase its shear strength. Soil stabilization is required to increase the bearing capacity of foundation soils. In some situations clay soil is present in small areas and avoidable but if it is present in large areas then it cannot be avoided and we have to search new options to make this soil fit for construction and for this many firms are trying different waste materials to mix in clay soil to control its swelling and shrinking properties. World over, many case studies of failed structures built on expansive soils have been reported. In India clay soil coverage is almost one fifth of the geographical land area. Suitable site conditions are not available everywhere due to wide variations in the subsoil specially the presence of expansive soils pose a challenge to the civil engineers. To put the infrastructure in position, there is no other-go but to improve the sub soil for expected loads and make them suitable for the type of construction planned. Clayey soil causes more damage to structures, particularly light buildings and pavements, than any other natural hazard, including earthquakes and floods. To understand the soil stabilization and its various methods to be applied on different soils we need to understand to the type of soil, its origin and the type of mixing agent to stabilize the soil to make it suitable for the present construction work.

A. CLAYEY SOIL

For this research work the clayey soil was taken from a local site in karnal, Haryana and was taken to the laboratory in GIMT, KANIPLA.KURUKSHETRA. The soil was oven dried before determining any geotechnical properties. The various geotechnical properties of the procured soil are as follows:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameters</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Light Compaction Test</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MDD (gm/cc)</td>
<td>1.61</td>
</tr>
<tr>
<td></td>
<td>OMC (%)</td>
<td>24.2</td>
</tr>
<tr>
<td>2.</td>
<td>Liquid Limit (%)</td>
<td>49.67</td>
</tr>
<tr>
<td>3.</td>
<td>Plastic Limit (%)</td>
<td>20.69</td>
</tr>
<tr>
<td>4.</td>
<td>Plasticity Index (%)</td>
<td>28.98</td>
</tr>
<tr>
<td>5.</td>
<td>Specific Gravity</td>
<td>2.66</td>
</tr>
<tr>
<td>6.</td>
<td>Indian Soil Classification</td>
<td>CI</td>
</tr>
</tbody>
</table>

Table 1. Physical Properties of Soil
B. TYRE RUBBER

The Rubber Scrap was brought here from the Tyre Industry, Kurukshetra. The rubber scrap was mixed with parent soil in percentage of 3%, 6%, 9%, 12%, 15% and 18%.

![Fig.1 Tyre Rubber](image)

Table 2. Properties of Rubber

<table>
<thead>
<tr>
<th>Principal Components</th>
<th>Silica, Alumina, Iron Oxide, Carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Black</td>
</tr>
<tr>
<td>Cleavage</td>
<td>Non Perfect</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>2.21</td>
</tr>
<tr>
<td>Diagnostic Properties</td>
<td>Cleavage, Specific Gravity, Low Hardness</td>
</tr>
</tbody>
</table>

C. MARBLE DUST

Marble dust was purchased from Distt. Kurukshetra for experimental research and was mixed with parent soil in percentage of 5%, 10%, 15% and 20%. Angular crushed stone is used for macadam road construction which depends on the interlocking of the individual stones’ angular faces for its strength. Crushed natural stone is also used similarly without a binder for riprap, railroad track ballast, and filter stone. It may also be used with a binder in a composite such as concrete, tarmac, or asphalt concrete.

![Fig.2. Marble dust](image)

Table 3. Physical Properties of Marble Dust

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Liquid Limit</td>
<td>Non Plastic</td>
</tr>
<tr>
<td>2</td>
<td>Plastic Limit</td>
<td>Non Plastic</td>
</tr>
<tr>
<td>3</td>
<td>Specific Gravity</td>
<td>2.87</td>
</tr>
<tr>
<td>4</td>
<td>Color</td>
<td>white</td>
</tr>
</tbody>
</table>

D. MARBLE DUST

In the following section graphical representation for different combination of soil with marble dust and rubber scrap is given. It is clearly seen in Fig.9 that as the amount of Rubber Scrap increases the value of dry density decreases in different percentage, but as we increases the percentage of Marble Dust, it (dry density) is increasing from **1.54 gm/cc to 1.678 gm/cc**. Now about Moisture Content, we can clearly study in Fig.10, that the value increases first with increase in percentage of Rubber Scrap but then starts creasing and with increase in percentage of Marble Dust value of Moisture Content decreases continuously.

![Fig 4. Graph Showing Moisture-Density Relationship of Parent Soil with](image)
Fig 5. Graph Showing Moisture-Density Relationship of Parent Soil with different percentage of Rubber and 5% Marble Dust

Fig 6. Graph Showing Moisture-Density Relationship of Parent Soil with different percentage of Rubber and 10% Marble Dust

Fig 7. Graph Showing Moisture-Density Relationship of Parent Soil with different percentage of Rubber and 15% Marble Dust

Fig 8. Graph Showing Moisture-Density Relationship of Parent Soil with different percentage of Rubber and 20% Marble Dust
Fig 10. Comparison of OMC of Parent Soil with different percentage of Rubber and Marble Dust

Fig 11. Comparison of MDD of Parent Soil with different percentage of Marble Dust and Rubber

Fig 12. Comparison of OMC of Parent Soil with different percentage of Marble Dust and Rubber

Fig 13. Graph Showing Stress-Strain Relationship of Parent Soil with different percentage of Rubber

Fig 14. Graph Showing Stress-Strain Relationship of Parent Soil with different percentage of Rubber and 5% Marble Dust

Fig 15. Graph Showing Stress-Strain Relationship of Parent Soil with different percentage of Rubber and 10% Marble Dust
I. CONCLUSION

In this, we have studied the improvement in the behavior of clayey soil using different percentage of Rubber Scrap and Marble Dust. On the basis of this research work we in the laboratory we concluded the following result:

1. As we add Marble Dust in the soil and increase its percentage the maximum dry density of soil starts increasing and attain a value from 1.54 gm/cc to 1.678 gm/cc. But as we start addition of Rubber Scrap in the soil the maximum dry density starts decreasing continuously.

2. With the addition of Marble Dust in soil-Rubber mixture the optimum moisture content value decreases but on the other hand with addition of Rubber Scrap in the soil the optimum moisture content starts increasing.

3. In UCS, the strength of soil-Rubber mixture first increases and then decreases. Further with the addition of Marble Dust in the mixture the compressive strength increases suddenly.

4. Marble Dust in this case also reduces the plasticity of the soil.

5. Soil-Rubber Scrap-Marble Dust specimen fails by formation of vertical cracks.

REFERENCES


Characterization of Subgrade Soil Mixed with Recycled Asphalt Pavement

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Abstract-Recycled aggregates consist of crushed, graded inorganic particles processed from the material that have been used in the constructions and demolition debris. The target of the present work is to determine the strength characteristic of recycled aggregates for the application in concrete pavement construction. The investigation was carried out by using workability test, compressive strength test, flexural strength test and sulphate resistance test. A total of five mixes with replacement of coarse aggregates with 0%, 10%, 20%, 30% and 40% recycled coarse aggregates were studied. The water cement ratio was kept constant at 0.38. It was observed that workability of concrete was decreased with the increase in recycled aggregates in concrete.

I. INTRODUCTION

In the era of construction, concrete has been the leading building material since it was discovered and found viable for future due to its durability, easy maintenance, wide range of properties and adaptability to any shape and size. Concrete is the composite mix of cement, aggregates, sand and water. Concrete have high compressive strength and low tensile strength. To overcome this shortcoming, steel reinforcements are used along with the concrete. This type of concrete is called reinforced cement concrete (RCC). Concrete structures that are designed to have service lives of at least 50 years have to be demolished after 20 or 30 years because of deterioration caused by many agents. Old buildings require maintenance for better and higher economics gains. The rate of demolition has increased and there is a shortage in dumping space and also increase in cost of dumping. Instead of dumping this demolished concrete, use of demolished as recycled concrete would not only reduce the cost but also will conserve the non renewable energy sources. The use of demolished concrete will further result in reduction in use of natural aggregates.

II. EXPERIMENTAL PROCEDURE

Mix design is done to select the mix material and their required proportions. There are a lot of methods to determine the mix design. The methods used in India are in compliance with Bureau of Indian Standards (BIS). The motive of mix design is to determine the proportion in which concrete ingredients like cement, water, fine aggregates and coarse aggregates should be mixed to provide specified strength, workability, durability and other specified requirements as listed in standards such as IS: 456-2000. The designed concrete mix must define the material and strength, workability and durability to be attained. Concrete mix design guidelines are given in IS: 10262-1982. In the study, 5 batches of mixes were prepared. These batches were designated as m0, m1, m2, m3 and m4. Batch m0 was taken as control mix. The natural coarse aggregate was replaced by recycled aggregate in proportion of 0%, 10%, 20%, 30% and 40% in m0, m1, m2, m3 and m4 respectively as given in table 1.

TABLE 1 PROPORTION OF NATURAL AND RECYCLED AGGREGATES IN BATCHES

<table>
<thead>
<tr>
<th>Type of Mix Used</th>
<th>Recycled Aggregate (%)</th>
<th>Natural Aggregate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>m0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>m1</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>m2</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>m3</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>m4</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>
III. MATERIAL PROPERTIES

The physical and mechanical properties of all ingredients like sand, natural coarse aggregates, cement and demolished coarse aggregates are per IS: 2386-1963 were determined.

Cement
OPC (Ordinary Portland Cement) of grade 43 was used which conformed to IS: 8112-1989. Testing of cement was done per IS: 4031-1968.

Natural Fine Aggregates
Natural coarse sand was used as fine aggregate. The sand conformed to zone II as per IS: 383-1970.

Natural Coarse Aggregates
Coarse aggregates of size 10mm and 20mm were used.

Water
Properties of water used were as per clause no. 5.4 of IS 456-2000. It was free from deleterious materials. Water was used for mixing and curing of concrete. Portable water is generally taken for mixing and curing of concrete.

Mix Proportion
As per design of concrete mix M40, the ratio of cement, fine aggregate and coarse aggregate was taken as 1:1.23:2.52 respectively.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Moulds</th>
<th>Size(mm×mm)</th>
<th>Specimen Casted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cube</td>
<td>150×150×150</td>
<td>Compressive Strength</td>
</tr>
<tr>
<td>2.</td>
<td>Beam</td>
<td>100×100×500</td>
<td>Flexural Strength</td>
</tr>
<tr>
<td>3.</td>
<td>Cube</td>
<td>150×150×150</td>
<td>Sulfate Resistance</td>
</tr>
</tbody>
</table>

TABLE 3 NUMBER OF SAMPLES CASTED

<table>
<thead>
<tr>
<th>Type of Mix</th>
<th>For Compressive Strength</th>
<th>For Flexural Strength</th>
<th>For Sulphate Resistance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>m0</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m1</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m2</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m3</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m4</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>45</td>
<td>30</td>
<td>135</td>
</tr>
</tbody>
</table>

IV. RESULTS AND DISCUSSION

Testing of sample was done at 7, 28, 56 and 90 days for compressive strength. For flexural strength testing of samples was done at 7, 28 and 90 days. Testing for sulphate resistance was done at 7, 28 and 56 days. In this chapter, results of these tests are discussed along with the results of workability.

Natural Coarse Aggregates
Coarse aggregates of size 10mm and 20mm were used.

Workability
Workability varied with change in proportion of demolished aggregates. The slump values and compaction factor values did not show a uniform pattern as the percentage of demolished aggregates was uniformly varied. Figure 1 gives the variation of slump values versus type of mixes. Figure 2 gives the variation of compaction factor versus type of mixes.
Variation of Compressive Strength with Age
Table 4 gives the test results of compressive strength at 7, 28, 56 and 90 days. Water cement ratio was kept as 0.38 for all mixes. Super plasticizer used was 0.6% of cement. Table 5 gives the percentage reduction in compressive strength for all mixes at different number of days.
Table 6 gives the test results of flexural strength at 7, 28, and 90 days. The results of flexural strength are the average of 3 beams. Table 7 shows the percentage reduction in flexural strength for all mixes at different ages. Figure 4 shows the comparison of flexural strength at ages of 7, 28 and 90 days.

Sulphate Resistance of RCA Concrete
In this section of study, effect of sulphate solution on compressive strength of RCA concrete was investigated. Concrete cubes were kept in MgSO₄ (magnesium sulfate) solution for 7, 28 and 56 days after normal curing for 28-days. Compressive strength of cubes was checked by using CTM. Table 8 gives the test results at age of specified number of days. Table 9 gives the details of percentage reduction in
compressive strength at the age of specified number of days.

**TABLE 4 TEST RESULTS FOR COMPRESSIVE STRENGTH**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>W/C</th>
<th>Compressive strength (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>1.</td>
<td>m0</td>
<td>0.38</td>
<td>42.43</td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>0.38</td>
<td>42.47</td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>0.38</td>
<td>41.84</td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>0.38</td>
<td>42.60</td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>0.38</td>
<td>40.27</td>
</tr>
</tbody>
</table>

**TABLE 5 PERCENTAGE REDUCTION IN COMPRESSIVE STRENGTH AT DIFFERENT AGES.**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Age (in days)</th>
<th>%age Reduction in Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>m0</td>
</tr>
<tr>
<td>1.</td>
<td>1:1.23:2.52</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>1:1.23:2.52</td>
<td>28</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>1:1.23:2.52</td>
<td>56</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>1:1.23:2.52</td>
<td>90</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 3 shows the comparison of compressive strength of different mixes at 7, 28, 56 and 90 days.
Variation of Flexural Strength with Age

### TABLE 6 RESULTS OF FLEXURAL STRENGTH

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>W/C</th>
<th>Flexural strength (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>1.</td>
<td>m0</td>
<td>0.38</td>
<td>4.20</td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>0.38</td>
<td>4.31</td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>0.38</td>
<td>4.10</td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>0.38</td>
<td>4.12</td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>0.38</td>
<td>4.22</td>
</tr>
</tbody>
</table>

### TABLE 7 PERCENTAGE VARIATION OF FLEXURAL STRENGTH AT DIFFERENT AGES.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Age (in Days)</th>
<th>% age Reduction in Flexural Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>m0</td>
</tr>
<tr>
<td>1</td>
<td>1:1.23:2.52</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>1:1.23:2.52</td>
<td>28</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>1:1.23:2.52</td>
<td>90</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 4 Comparison of Flexural Strength of all Mixes at 7, 28 and 90 days.
### Table 8 Test Results for Sulphate Resistance

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Type Of Solution</th>
<th>Compressive Strength(MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>1.</td>
<td>m0</td>
<td>5% of MgSO₄</td>
<td>41.75</td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>5% of MgSO₄</td>
<td>41.79</td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>5% of MgSO₄</td>
<td>38.8</td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>5% of MgSO₄</td>
<td>41.8</td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>5% of MgSO₄</td>
<td>39.53</td>
</tr>
</tbody>
</table>

### Table 9 Percentage Reduction of Compressive Strength Due to Sulphate Attack

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Type of solution</th>
<th>% age reduction in compressive strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>1.</td>
<td>m0</td>
<td>5% of MgSO₄</td>
<td>98.42</td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>5% of MgSO₄</td>
<td>98.4</td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>5% of MgSO₄</td>
<td>92.73</td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>5% of MgSO₄</td>
<td>98.2</td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>5% of MgSO₄</td>
<td>98.17</td>
</tr>
</tbody>
</table>

Figure 5 gives the comparison of compressive strength of all mixes kept in MgSO₄ solution at the age of 7, 28 and 56 days.

![Figure 5: Comparison of Compressive Strength of All Mixes Kept in MgSO₄ Solution at the Age of 7, 28 and 56 Days.](image-url)
IV. CONCLUSIONS

Following conclusions can be drawn from results and discussion of results from the study:

1. The compressive strength of all mixes exceeded at the age of 28 days. Compressive strength of control mix i.e. of m0 is 50.05 MPa which is greater than the target strength of 48.25 for M40 concrete. Compressive strength of m1 is slightly increased to 50.36. So the compressive strength increases by 0.5%. For m2, compressive strength is increased to 50.20 MPa, it also showed an increase in compressive strength by 0.3%. Compressive strength of m3 is decreased to 49.11 MPa that showed a decrease in compressive strength by 1.9%. But in case of m4, there is sudden increase in compressive strength that raises the compressive strength to 52.36 MPa. Compressive strength is increased by 4.5%. So the results of test show that compressive strength does not follow a regular trend from m0 to m4. But from the results it is also concluded that compressive strength never went below the target strength for 28 days. This indicates that RCA can be used as replacement aggregates for compressive strength.

2. Flexural strength also followed the same pattern as of compressive strength. Flexural strength of control mix is 5.32MPa at age of 28 days. Flexural strength of mix m1 increased to 5.60 MPa. It shows that the increase in flexural strength is 5% for m1. For m2 flexural strength at age of 28 days is 5.40MPa, which shows an increase in flexural strength by 1.5%. Flexural strength of mix m3 is 5.38 and the flexural strength increased by 1 %. For the mix m4, flexural strength is 5.40 MPa. It shows that the flexural strength increased by 1.5 % at the age of 28 days. From the results and discussion of the results it is found that the flexural strength of RCA concrete is comparable to the natural aggregate concrete which is a positive point. So the RCA concrete can be used for flexural strength by adjusting W/C ratio.

3. Use of 5% of MgSO₄ solution caused the reduction in compressive strength. The compressive strength of RCA mixed concrete reduced up to 7%. Effect of sulphate solution increased when quantity of demolished concrete aggregate increased. This study showed that the strength of m4 at 56 days was most affected. So with increase in sulphate caused reduction in compressive strength of concrete.

4. It was found that the RCA concrete have relatively lower bulk density, specific gravity and high water absorption as compared to natural concrete. This was due to the presence of mortar in present on recycled coarse aggregates.

5. In this study, trial castings were done to arrive at water content and desired workability. So it was advisable to carry out trial castings with demolished concrete aggregate proposed to be used in order to arrive at the water content and its proportion to match the workability levels and strengths requirements respectively.

6. From this study it was observed that the demolished concrete was viable source for construction of concrete pavements. Economical and environmental pressures justify suitability of RCA concrete as alternative to the natural concrete. Where there is non-availability of natural aggregate from new rocks RCA can be a good or viable replacement option for natural coarse aggregate in pavement construction.

From above conclusions it can be said that it is eco-friendly and creative to use demolished concrete in construction of concrete pavements.

REFERENCES


Affected by Admixtures in Original Concretes,”


Use of SISAL Fiber as Stabilizer in Stone Mix Asphalt and as an Additive an Bitumen

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Abstract— The flexible pavements play an important role in the country especially in India. The initial and maintenance cost of these pavements are very less as compared to the rigid or semi-rigid pavements. The main constituent of flexible pavements bitumen which is complex mixture of coarse and fine aggregates. And sometimes binders and fillers are also used in it. There are various types of bitumen mixes in which Hot Mix Asphalt is one of them. If HMA is dense graded then it is called Bituminous Concrete (BC) and if it is gap graded then called Stone Matrix Asphalt (SMA). In SMA stabilizing additives are used to avoid defunct in the bitumen mixture. The additives used may be polymer, mineral or cellulose fibbers etc.

In the present work, an effort has been made to study the special impact of fibre called SISAL, as stabilizer additive in SMA and in BC. Mixing aggregate gradation is maintained as per MORTH specification, the percentage of fibre ranges in between 0 to 0.5 and that of binder ranges between 4 to 7 of entire mixture. Optimum Binder Content percentage ranges in 5.0 and 5.21 for BC and SMA respectively. And Optimum Fibre Content percentage remains 0.31 for both SMA and BC. Both the mixes are The BC and SMA mixtures are built up at OBC and OFC and are tested to estimate the special impact of adding fibre on mixture performance. And it was found that use of this fibre enhance the properties of the mixture.

Keywords—: Key Words: Bituminous Concrete (BC), Stone Matrix Asphalt (SMA), Sisal Fibre, Marshall Properties, Static Indirect Tensile Strength, Static Creep

I. INTRODUCTION AND LITERATURE REVIEW

The purpose of this study is to enhance the properties of the Bituminous Concrete and Matrix Asphalt by using the essential additives. The additive used in this work is Sisal fibre. Sisal fibre is attained from the leaves of tree called “agave Sisalana” which was invented from Mexico and nowadays cultivated in several countries. Sisal Fiber is outstandingly durable with a small preservation with nominal wear and tear, long lasting and is easily Recyclable. They have done a comparative study on SMA and DGM by victimization two sort combination and conjointly used cellulose and mineral fibre in SMA and did totally different take a look at like Marshall test, Drain down check, Indirect tensile strength check, resilient modulus. They found that in SMA mixture the high quantity of coarse combination forms a skeleton sort structure providing a higher stone-on-stone contact between coarse combination particle, which supply high resistance to rutting. SMA has shown sensible resistance to plastic deformation underneath significant traffic masses with high tire pressure, conjointly show sensible low temperature properties. Further, SMA incorporates a rough texture that provides sensible friction properties when surface film of the binder is removed by the traffic. (Brown and Manglokar)

He studied on SMA use totally different sort of filler, stabilizer and ended that Drain down in SMA is accomplished by kind of filler, form of stabilizer, quantity of stabilizer(higher the quantity of stabilizer lower the drain down). OBC of SMA mixtures is larger than DGM.(Brown)

They studied use of unwanted fibres in SMA. They recycled and utilized carpet fibre and polyester fibres and waste tires to boost the strength and stability of mixture compared to cellulose and other fibres. They found that waste tire and carpet fibre are unit effective in avoiding unnecessary drain down of SMA mixture conjointly found that tensile strength quantitative relation of mixes over 100 percent, it means that fibre don’t weaken the mix once uncover to wetness. Addition of the both tire and carpet fibre will rise toughness of SMA. They found that no distinction in permanent deformation in SMA combine having waste fibres as compared to SMA combine containing cellulose or mineral fibre.(Bradely et al.)

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (gm/cm²)</td>
<td>1.51</td>
</tr>
<tr>
<td>Elongation (%)</td>
<td>2.01-2.50</td>
</tr>
<tr>
<td>Tensile Strength (MPa)</td>
<td>511.0-635.0</td>
</tr>
<tr>
<td>Young Modulus (MPa)</td>
<td>9.41-2.01</td>
</tr>
</tbody>
</table>
They did laboratory study by utilizing natural rubber powder with 80/100 bitumen in SMA by using wet process as well as DGB mixture using cellulose fibre and lime stone and stone dust as filler and establish that, its appropriateness as SMA mix through several tests.( Kamaraj et al.) They did a work of SMA with ACM using retrieved polythene in the form of LDPE carry bags as stabilizing element. The test results shows that the mixture properties of SMA and AC mix are improved by the adding reclaimed polythene as stabilizer agent shows better results.( Punith et al.) They utilized Crumb Rubber (CR) attained from rejected tire with 80/100 penetration grade bitumen in SMA and decided that it increases fatigue and permanent deformation, higher resistance against moisture damage than usual mixes.( Reddy et al.) He did different test on both SMA and DGM. He determined that however DGM has high compressive strength and tensile strength; SMA have higher durability, high resilience property, high rutting resistance when compared to DGM. (Ibrahim M.asi) They used unwanted marble dust gained from shaping process of marble and lime stone as filler and OPC was calculated by Marshall test and shows decent result.( Mustafa and Serdal)

Tests on Mixes
The different types of tests that are done during the work on the bituminous mixtures with variants of binder form and amount, and fiber concentration in the mixture are as:

- Marshall Test
- Drain down test
- Indirect Tensile Strength Test
- Static Indirect Tensile Test
- Static Creep Test

II. RESULTS AND CONCLUSION

Results obtained from various tests on SMA and BC, are concluded below:

**BC with different type of filler**

1. MORTH Specification mixture design necessities of bituminous mixture is mentioned below
2. If BC fulfills all the above requirements we can use.
3. As cement as filler is costly so we may stone dust and fly ash as a replacement of cement as filler.
4. fly ash is supportive in reducing the industrial waste.
5. The percentage of OBC is 5.0,and percentage OFC comes out as 0.30.
6. Adding fibre up to 0.3 percent, the value of Marshall Stability increases and on more adding of fibre it declines. But on adding of fibre stability value is not amplified as high as SMA.
7. By adding fiber flow value likewise declines as relate to mixture without fibre, but adding of fibre of about 0.5 percent, flow value rises.
8. percentage of binder requirement of SMA without fibre is 5.8%, the value is decreased on addition of 0.3 percent of sislal fibre to SMA , value declines to 5.2 percent. and on more addition of fibre it rises to 6.0 that leads to extreme drain down.
9. SMA Stability value rises on addition of fibre 0.3 percent and on more adding of fibre , stability reduces.
10. By addition of 0.3 percent fibre to SMA flow value declines and on more adding flow value rises.
11. Reduction of air voids are found by the usage of fiber.
12. Drain down of binder declines.OFC and its assumptions are as under.
13. without fibre Drain down seems more in SMA as that in BC drain down of binder is drops at OFC .
14. it was found that Tensile Strength of SMA is extra than BC.
15. From Static Creep Test it is determined that adding of fibre to BC and SMA mixtures deformation decreases. MORTH specifies that permanent deformation may not be more than 0.50 mm. with fibre SMA displays deformation of about about 0.451 mm that is better.

III. CONCLUDING REMARKS

The mixture i.e. SMA and BC is prepared where 60/70 penetration grade bitumen is used as binder. Also a naturally existing fibre called sisal fibre is used with variable concentration (0 to 0.5%). OBC and OFC is originate out by Marshall Method of mix design. Generally by addition of 0.3% of fibre properties of Mixture is enhanced, it is determined that SMA with using sisal fibre provides very decent result and is used in flexible pavement.

REFERENCES


[22]. Kumar Pawan, Chandra Satish and Bose Sunil (2007), 'Laboratory Investigations on SMA mixes with Different Additives', International Journal of Pavement Engineering, Volume 8, Issue1, pp 11-18


[27]. Yongjie Xue, Haobo Hou, Shujing Zhu and Jin Zha (2009),

[28]. Yongjie Xue, Haobo Hou, Shujing Zhu and Jin Zha (2009),
Geometric and Structural Design for Upgradation of A Road

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Abstract- Geometric and structural design of highway deals with designing of physical visible features of highway those comprise of cross-sectional elements, sight distances, alignment, curves, super elevation, and other allied features. India is one of the country having population increases progressively causes traffic volume more. In addition to that sanctioning of funds from government for transportation infrastructure development is not satisfactory. So that it is preferable to plan and design the geometric and structural elements of the road during the initial alignment stage itself by considering future traffic growth. And it is very difficult to improve geometric elements after construction and cause to unwanted capital investment.

Key words: Geometrical design, pavement design, drainage of roads

1: INTRODUCTION

Boulevard road is one of the prestigious roads in the Srinagar city. The notability of the road lies in the fact that the entire road lies on the banks of Dal Lake. Major tourist spots like Chashmshahi, Parimahal, tulip garden, botanical garden etc are situated on the road. The economy of the people living here greatly depends on tourism. Due to heavy rush of tourists, this road remains quite busy. In a bid to provide better road communication facilities to tourists, the Jammu and Kashmir government has initiated process of widening the famed Boulevard road along the Dal Lake. Since this road is the main attraction of Srinagar city there is heavy vehicular as well as pedestrian movement. Also this road attracts various cycling events, thus requires a track for cycles. The less width of carriageway of boulevard road usually irks the users. Hence, there should be sufficient carriageway width to avoid traffic menace and also sufficient space for on street parking of vehicles. In view of the proposed work, it is desired to redesign the pavement, including cycle track and conduct soil/material investigation and traffic survey. This had become necessary due to high level of water table, weak subsoil strata and due to requirement of detailed traffic survey. Thus keeping above mentioned things in mind, we have come up with the idea of providing geometric and structural design for its upgradation. We will also try to solve the drainage problems encountered at this road during past. Samples of sub-grade soil were collected from the field at various RDs of the road, for the determination of their various characteristics. We conducted geotechnical investigation and pavement analysis at the site and collected information and data on site- specific conditions. We conducted field soil sampling at the proposed site by excavating test pits at regular intervals along the existing road.

Also, as a part of scope of this work, it was required to get the detailed classified traffic data on this road stretch & on the Habak - Dalgate (via Hazratbal) Road to determine the likely shift of traffic from this road stretch after the subject project is complete and analyze the same for working out parameters required for the structural design of the proposed road pavement. To calculate the likely shift of traffic from Habak - Dalgate (via Hazratbal) Road to Boulevard road, a Stated Preference (SP) survey was also conducted. Boulevard road is one of the busiest road in the Srinagar city; there is heavy vehicular as well as pedestrian movement. Need of this study arises due to various reasons:

- Heavy vehicular traffic causing traffic congestion on prestigious road,
- Various cycling events take place on this road, thus need for cycle tracks,
- Less width of carriageway of boulevard road usually irks the users. There are frequent traffic jams due to less width and heavy movement of vehicles and
pedestrians,

- Pedestrian traffic is much more, thus need for sufficient footpaths for the same.
- Post winter period the alignment gets inundated due to high level of water table and rain and snow-melt water from hill catchment. This makes it necessary to raise the level of the pavement proposed towards the hill side, conduct detailed soil/material investigation, carry out detailed traffic survey and design the pavement giving due considerations to drainage and such other site-specific special conditions.

A. FIELD SURVEYS AND DATA COLLECTION

Various surveys like engineering surveys, traffic surveys, questionnaire survey and collection of the soil sample are to be done. After that longitudinal survey was done. The levels were taken along the traverse at 50m intervals. The cross-sections were taken inter-related covering the selected corridor. In addition, the levels were also taken for getting correct slope of the road corridor and contours. The cross sections along water channel of cross drainage structures were also taken longitudinally on upstream side and also transversely as per the site requirement. The longitudinal section and cross sections (after every 50m) of proposed road widening were generated after the fixing of final road alignment in CAD.

- Total quantity in filling = 51164.98
- Total quantity in cutting = 741.14
- Net earthwork required in filling = 50423.85

II. SOIL SAMPLING

Samples of sub-grade soil were collected from the field at various RDs of the road for the determination of their various characteristics. It was required to test the sub-grade samples for Gradation, Consistency limits and indices, compaction and CBR characteristics. Samples of sub-base and base material were also tested for determining their required parameters.

A. COLLECTION OF TRAFFIC DATA

The traffic data was collected for 7 days with 24-hour traffic counts in both directions. The results of survey were converted homogeneous and then used to find total axel load.

B. ANALYSIS AND RESULTS

The results of the work were obtained by the recommendations from the references prescribed by our guides and from the general specifications on the basis of the calculations obtained from the laboratory testing and on filed calculations. The description of results, thus obtained is:

<table>
<thead>
<tr>
<th>RD 0000</th>
<th>CL (clay of medium compressibility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD2000</td>
<td>CL (clay of medium compressibility)</td>
</tr>
<tr>
<td>RD 2050</td>
<td>MI, OI (silt of medium compressibility with organic matter)</td>
</tr>
<tr>
<td>RD 4050</td>
<td>MI, OI (silt of medium compressibility with organic matter)</td>
</tr>
</tbody>
</table>

Table 1: Sample

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sample</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optimum Moisture Content (RD 0, RD 2000, RD 2050, RD 4050)</td>
<td>(1.57, 0.85, 15.71, 15.7) respectively</td>
</tr>
<tr>
<td>2</td>
<td>Maximum dry density (RD 0, RD 2000, RD 2050, RD 4050)</td>
<td>(1.83, 1.71, 1.67, 1.67) respectively</td>
</tr>
<tr>
<td>3</td>
<td>Liquid limit (RD 0, RD 2000, RD 2050, RD 4050)</td>
<td>(40.04, 38, 38.9, 38.9) respectively</td>
</tr>
<tr>
<td>4</td>
<td>Plastic limit (RD 0, RD 2000, RD 2050, RD 4050)</td>
<td>(24.25, 27, 35, 35) respectively</td>
</tr>
<tr>
<td>5</td>
<td>Plasticity index (RD 0, RD 2000, RD 2050, RD 4050)</td>
<td>(15.79, 11, 3.9, 3.9) respectively</td>
</tr>
<tr>
<td>6</td>
<td>CBR value (RD 0, RD 2000, RD 2050, RD 4050)</td>
<td>(1.57, 0.85, 15.71, 15.7) respectively</td>
</tr>
</tbody>
</table>

Borrow Pit

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sample</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optimum Moisture Content</td>
<td>9.3%</td>
</tr>
<tr>
<td>2</td>
<td>Maximum dry density</td>
<td>1.98 g/cc</td>
</tr>
<tr>
<td>3</td>
<td>Liquid limit</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Plastic limit</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>Plasticity index</td>
<td>11 CL (silty clay of low plasticity)</td>
</tr>
<tr>
<td>6</td>
<td>CBR value</td>
<td>6%</td>
</tr>
</tbody>
</table>

Sub-Base

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sample</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optimum Moisture Content</td>
<td>9.2</td>
</tr>
<tr>
<td>2</td>
<td>Maximum dry density</td>
<td>2.03</td>
</tr>
<tr>
<td>3</td>
<td>Liquid limit</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>CBR value</td>
<td>29</td>
</tr>
</tbody>
</table>
The seepage and capillary rise in the sub-grade deteriorate the pavement layers and decreases its life. For the seepage flow to need to give a concrete drain having depth more than that of the total thickness of the pavement.

For capillary restriction, we need to raise the proposed road by about 1 meter for the section having water table higher than 1.2m.

GEOMETRIC AND STRUCTURAL DESIGN FOR UPGRADATION OF A ROAD

The proposed section of pavement for widened portion of boulevard road from Nehru Park to Kralsangri is shown below:

<table>
<thead>
<tr>
<th>40 mm BC</th>
</tr>
</thead>
<tbody>
<tr>
<td>105 mm DBM</td>
</tr>
<tr>
<td>250 mm Base Course</td>
</tr>
<tr>
<td>260 mm GSB (Well graded Granular Sub-base Course)</td>
</tr>
<tr>
<td>150 mm Capillary Cut off layer (of coarse to medium sand above sub-grade)</td>
</tr>
<tr>
<td>400 mm Soil filling after 300 mm excavation of the existing strata</td>
</tr>
</tbody>
</table>
GEOMETRIC AND STRUCTURAL DESIGN FOR UPGRADATION OF A ROAD

Existing

Proposed Carriage

450 mm Soil Filling after 300mm excavation of the existing strata (Borrow Area)

27.35

12.95

Cycle

Footpat

2.0

2.0

30 X 20 cm Kerb

1.0 m High Green Stone Wall

Footpat

3.0

Existing Carriage

150

150
GEOMETRIC AND STRUCTURAL DESIGN FOR UPGRADE OF A ROAD

A Typical Representative Cross Section of Pavement for Widening/Lanning of Boulevard Road Incl.
Cycle Track from Karpura Shrine to Kralsangri, Length 900 M
(RD 4100 to RD 5000) (Not to Scale)
III. CONCLUSION

We started the project work with site visit of the road stretch from Nehru park to Kralsangri. The soil samples were taken from four RDs namely, RD 0120, RD 1990, RD 2050, RD 4050; wherein Nehru park was taken as the reference point having RD (Reduced Distance) of 0. Tests were conducted on each soil sample viz. Gradation test, consistency limits, compaction and the CBR test, the test results were analysed, and the necessary information was worked out. The soil at RD 0120 is classified as clay of medium compressibility whilst the soil at the rest of three RDs is classified as silt of medium compressibility. The soil for filling was taken from Balham and it was tested for the above-mentioned tests. Then the value of CBR for design was taken as 6%.

The topographical survey was conducted with the help of auto level. The levels were taken along the traverse at 50m intervals. The cross-sections were taken inter-related covering the selected corridor. The L-section and the cross sections were plotted with the help of Auto- CAD.

For the purpose of traffic volume count the road reach between Nehru park and Kralsangri was divided into four sections namely mid block section -1, 2, 3 & 4 respectively and this included four intersections. Then classified traffic data was collected on each of these mid-block sections for seven days between 5am to 11 pm and the results were tabulated. The total number of PCU of each day was calculated by considering the equivalency factor for each class of vehicle. It was found that the Average traffic intensity in terms of vehicles (laden weight ≥ 3 tonnes) per day for mid-block-4 was greatest and half of this was taken for the structural design of the pavement. The classified seven day traffic data was collected on Habak to Dalgate road (via Hazratbal), 10% of it was taken for the design purpose. A SP survey was also conducted on the same road stretch and it was concluded that only 5% of this traffic is expected to take the boulevard route after the project is complete and this component of traffic was also considered in the structural design of pavements. After considering all the above mentioned factors, the design traffic came out to be as 25.37 msa. The pavement was designed as per the IRC guidelines and the total thickness was taken as 655mm (40 mm BC + 105 mm DBM + 250 mm GB + 260 mm GSB).

The geometric design of the road is given as per the IRC codes considering all the relevant factors which include vehicle, human, traffic, environment, economy, etc. The design speed was taken as 60kmph. From the IRC specifications and the determined PCU, we provided 4 lane, 2 way carriage way width with kerb, 2 meter wide footpath on one side of proposed roadway, 2 meter wide cycle track, camber of 2%; i.e. 1 in 50, SSD is equal to 80m and transition length & super elevation are not provided.

REFERENCES

[9] IS: 2720 - IV
Analysis of Safety Measures at Construction Sites
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Abstract—Safety is an important aspect in relation to construction works. Construction work involves risk of fatal injuries or even death. Safety is a major concern and can be ensured with proper equipments, safety precautions and education about risks involved. Even the country’s government can play significant role by issuing strict rules and regulations to be followed at construction sites. In my view, workers must also be provided with minimum life cover according to their human value. Thus, the research work has been done to ensure the safety of masons, laborers, project managers and everybody related to construction work.

Keywords—Construction technologies, Safety measures, Government control

I. INTRODUCTION

Safety is the preservation of the lives, property and environment by taking preventive reserves to prevent accidents, destruction and pollution, through accident prevention programs. It is the state of being "safe", the condition of being protected against physical, mental, spiritual, social, financial, political, emotional, psychological, educational or other types or consequences of damage, failure, error, accidents, harm or any other event which could be non-desirable. Safety can also be defined as the control of known hazards to achieve an acceptable level of risk. This can take the form of being protected from the event or exposure to something that causes health or economical losses or damages. It can include protection of people or of their possessions. Safety is the condition of a “steady state” in an organization or place, doing what it is supposed to do. “What it is supposed to do” is defined in terms of public codes and norms, associated architectural and engineering designs, corporate insight and mission statements, and operational scheme and personnel policies. For any organization, place, or function, large or small, safety is a normative concept. It collates with situation-specific definitions of what is expected and acceptable.

Fig 1: Picture showing workers working with safety equipments, which are helmet and gloves.

Fig 2: Pictures showing workers at construction site

Fig 3: Pictures showing hoarding with cautious message.
II. RESULT AND DISCUSSION

As per the above table, the highest average safety score of large building is 74.84, which has a good rating and the lowest is 59.88, which has poor rating. The highest score of critical parameters of large building is 92.85, which has safe rating and the lowest is 50.00, which has unsafe rating. The highest score of other parameters of large building is 78.64, which has good rating and the lowest is 53.18, which has poor rating. The highest average safety score of medium building is 66.60, which has fair rating and the lowest is 50.00, which has unsafe rating. The highest score of critical parameters of medium building is 82.85, which has safe rating and the lowest is 62.85, which has unsafe rating. The highest score of other parameters of medium building is 72.85, which has good rating and the lowest is 52.85, which has poor rating. The highest average safety score of small building is 77.60, which has good rating and the lowest is 59.20, which has poor rating. The highest score of critical parameters of small building is 87.60, which has safe rating and the lowest is 67.60, which has unsafe rating. The highest score of other parameters of small building is 78.60, which has good rating and the lowest is 58.60, which has poor rating.
lowest is 64.48, which has fair rating. The highest building is 85.71, which has unsafe rating and the lowest is 71.42, which has unsafe rating. The highest score of critical parameters of medium buildings is 77.14, which has unsafe rating and the lowest is 57.14, which has unsafe rating. The highest score of other parameters of medium buildings is 65.28, which has fair rating and the lowest is 63.69, which has fair rating.

The highest average safety score of small building is 70.06, which has a fair rating and the lowest is 62.17, which has fair rating. The highest score of most critical parameter of small building is 85.71, which has unsafe rating and the lowest is 78.57, which has unsafe rating. The highest score of critical parameters of small buildings is 71.42, which has unsafe rating and the lowest is 65.71, which has unsafe rating. The highest score of other parameters of small buildings is 65.14, which has fair rating and the lowest is 59.55, which has poor rating.

III. CONCLUSION

Accidents are taking place at construction sites and some are fatal. The workers get permanently disabled and fight for this menace. This study was taken in hand to find solution of the problem i.e. safety a construction sites in States of North India except Ladakh. Keeping in mind the predetermined objectives the following conclusion can be drawn from the analysis of data.

1. The Four divisions of safety: “Fire fighting at construction site”, “Use of Personal protective equipments”, “Hazards Due to Fall from Height at Construction Site”, “Falling material Hazard” and “Provisions of Walkways and Passages at Construction Site” need immediate attention due poor rating at most of the construction sites.

2. The overall scenario of safety in all such buildings in States of North India is miserable and requires immediate attention.

3. Most of the sites observe safety regulations for “Most Critical” and “Critical” parameters but ignore the “Other” parameters which are equally important form safety point of view.

The adaptability of safety measure also depends upon the awareness and motivation level of workers at site.

IV. RECOMMENDATION

1. There is urgent need to implement and monitor the safety provision at all sites.

2. There should be sufficient quantity of Personal Protective Equipments which must also be used at site.

3. The provisions of fire fighting must be strictly complied.

In order to implement the safety provision a clause of safety must be added to the existing clauses of tender.

Heavy penalty must be enforced on violating the safety norms.

REFERENCES


Adoption of Molasses as an Additive to Make Materials Eco-Friendly along with Durability

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Abstract—This study introduced the extensive use of molasses in a number of industrial applications because of its binding and beneficial biological properties. The Introduction of molasses in various industries will not only help in the better waste management, it also creates Eco-Friendly Environment. Based on literature studies we have concluded that the molasses can be used as an additive in paper, paints and primer etc and use of molasses as an additive increase Toughness with decreasing Toxicity and it also gives remarkably Tinting Strength, higher water repellent value and Stain blocking property. Literature studies shown that incorporating the cell wall microstructure of cellulose fibres with various materials greatly enhanced Opacity and water repellent property. In few cases, it has been studied that using gums (in addition to the starch) as an add-on increases staying power. Molasses is a waste product of the sugar industry and is available at small cost than its major product i.e. sucrose.

Keywords—Toughness, Toxicity, Tinting Strength, Molasses, Additives, Repellent Property.

I. INTRODUCTION

Molasses or Treacle as the UK consummated product is commonly used for the concentrated syrup which is obtained from sugarcane after fluctuating amount of the sucrose that have been eliminated. It is an important by-product of sugar from sugar cane in which syrup is separated from the crystals. In the manufacture of sugar from cane, about 8% of the sugar present in cane is lost in the Molasses and is the principal reason for the studies that have been performed on the beneficial use of this cherished by-product. High grade Molasses is a brew which is obtained by fixate analysed joy-juice to proximately 85º brix, it is partially capsized with either acid or invertase enzyme. Candy floss is collected and its juice is extracted usually by crushing, grinding and by the pulverisation methods. The juice is boiled to reduce and to speed up the crystallisation of sugar. As a result, First syrup formed due to this boiling, it has the highest sugar content. The crystals are then separated from the Mother Liquor called Molasses. Depending upon the boiling of the juice different molasses are produced. The First syrup is of light golden or yellow colour. The Second boiling point produced the Second Molasses and is slightly bitter in taste and colour becomes dark golden. The liquid ejected by the process of centrifugals in the last stage of transforming, after which no more sugar can be detached from the cane juice by usual secret methods, is called Final dressed molasses. Or Blackstrap maple syrup. It is a dark brown, viscous known for its Robust flavour which comprise of sucrose, which cannot be retrieved by remunerative methods. Sulphured sorghum is produced as a by-product of unpasteurized sugar in which sulphur dioxide has been combined in molasses to etiolate its colour, but has higher ash-content due to irresolvable sulphate salts. Molasses are the strongly flavoured coloured syrup containing 70-80% solid of which sucrose content may vary from approximately from 50-70% and invert sugar. Glucose and Fructose are other reducing sugars which are present in molasses. The composition of reducing sugars ranges roughly between 10% to 15%. The fundamental value of molasses as a commercial salvages lies in its proportion of fermentable sugars, which is nearly 50% by weight. Gums (as well as starch) are also found to be reported in molasses and range from 3% to 5% by weight. Salt content is approximately 2-8%.

II. TYPES OF MOLASSES

‘Molasses’ is the final product obtained while preparing sugar by the process of repeated crystallization. The sacked, before washing begins, is labelled as heavy molasses and when diluted with wash water it is called light molasses. This molasses eventually removed from the process is called as waste. are final molasses.
III. PROPERTIES OF MOLASSES

The Molasses which is obtained from the various manufacturing plants are vary in their physical and chemical properties. Each type of Molasses possesses different viscosity, density and chemical composition. These differences are not only due to nature of cane ground, but also due to the methods and equipments used for the extraction of sugar from cane. It can also be act as a dyeing agent from golden to dark brown. Viscosity can be lessened by lowering dry matter.

Depending upon the inorganic and polysaccharide consonance and temperature, viscosity can alter over the several degrees. Cane molasses has an acid whose pH value ordinarily lies amid 5-7. 2-8 %Salts content can furnish buffering retention, which helps to counterpoise astringency and restrain hydrolysis, and can also equip flavors for feed use.

Tincture and zest are the major properties exceeding nutriment that molasses subsidize to food processing. A part of Sweetness moreover proffer by Molasses but to a certain severity which practically falling-off as color darkens. There is a vast panorama of gusto, starting from caramel, cane flavor in light and high-test molasses, to heavy, bitter taste occasionally with licorice diagnostic. Comprehensive experimentation has proved that molasses flavor is a complex mixture.

Viscosity depends upon
- Temperature
- Dry matter
- Gums

 Molasses has an infrequent superiority as a paint additive. It embrace sucrose and gums (inclusive starch), and, as an adjunct of the sugar industry, procure at a bargain than sucrose. The properties of Molasses are listed below.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Constituents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Water (H2O)</td>
<td>21.0</td>
</tr>
<tr>
<td>2.</td>
<td>Sugars</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sucrose</td>
<td>32.0</td>
</tr>
<tr>
<td></td>
<td>D-(-)-Glucose</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>L-(-)-Fructose or Inverted sugar</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Raffinose (C18H32O16)</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Non-Sugars</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nitrogenous materials, free and bound acids, soluble gummy substances</td>
<td>9.4</td>
</tr>
<tr>
<td>4.</td>
<td>Inorganic Composition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Silica) SiO2</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>(Potassium Oxide) K2O</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>(Calcium Oxide) CaO</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>(Magnesium Oxide) MgO</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>P2O5</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Na2O, Fe2O3, Al2O3</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Sulphate Residues (AsSO3)</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>Chlorides (Cl-)</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>100</td>
</tr>
</tbody>
</table>
TABLE 2 PROPERTIES OF MOLASSES

<table>
<thead>
<tr>
<th>Properties</th>
<th>Values</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffering capacity</td>
<td>due to Salt content</td>
<td>To stabilize flavours and prevent hydrolysis</td>
</tr>
<tr>
<td>Viscosity</td>
<td>70.5 DM</td>
<td>Providing thickness and viscous</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.3-1.5</td>
<td>Increase durability</td>
</tr>
<tr>
<td>Boiling point</td>
<td>&gt; 105°C</td>
<td>Water repellent</td>
</tr>
<tr>
<td>Moisture content</td>
<td>5.41%</td>
<td>Water repellent</td>
</tr>
<tr>
<td>Degree of polymerization (DP)</td>
<td>98.00</td>
<td>Used in Paints</td>
</tr>
<tr>
<td>Odour</td>
<td>Caramel</td>
<td>Sweetening agent</td>
</tr>
<tr>
<td>pH</td>
<td>5 &amp; 7</td>
<td>Used to create acidic condition</td>
</tr>
<tr>
<td>Solubility</td>
<td>Soluble in water</td>
<td>Easily used in water soluble compound</td>
</tr>
<tr>
<td>Gummy property</td>
<td>-</td>
<td>Used also as Water proofing</td>
</tr>
<tr>
<td>No sugars</td>
<td>10%</td>
<td>Used as an antioxidants and colorants and pigments</td>
</tr>
</tbody>
</table>

IV. APPLICATIONS OF MOLASSES

Due to various physical and chemical properties of molasses, it can be used in eco-friendly paints particularly due to the different colour variation from golden to dark brown.

- as a primer (due to water repellent and gummy nature) and
- as a buffering agent
- as an edible additive as a source of starch.
- Used in paper making.
- Used in dyes.
- Stain-Blocking Paint & Primer In One
- Water proofing materials
- Dirt resistant Materials

V. ECONOMIC BENEFITS

In the manufacture of sugar from cane, two important by-products, the bagasse and the molasses are formed. Both these products are sold or otherwise employed at a price much lower than that of sugar. As it is a ruin blend of sugar industry. So by using it, can reduce the waste and help in create Green Environment.

Molasses is one of the major by product of sugar and needs proper management. Due to the cheaper price and of many important properties, it was chosen as a new additive to study. The one “BEHR Premium Plus Ultra Exterior Paint and Primer “will change the way you paint and extricate your time. This astonishing product, starring NANO GUARD technology, which implement an extra-vigilant shell that guards against bruise from sunlight, moisture, stains and dirt. It is well suited in all climates, even for the utilization Low as 35°F (2°C) which is ideal for fitly painting corroded metals, tannic woods and for exorbitant color changes.

- It is befitting for usance on wood, vinyl, stucco, aluminum, metals, steel, doors, windows, trim, shutters, garage doors and outdoor furniture.
- A pearl-like unveiling is endeavor by Satin enamel sheen.
- It adds Magnificent mask as it covers up to 2000 sq. ft. rely on employment, its color and the surface porosity.
- On semi-smooth exterior, it is also imitate as a high quality 3/8” - 1/2” nap roller umbrella. And as well as nylon/polyester brush or an airless sprayer (.015 - .021” spray tip, 60 mesh filter). On rough superficial, it used as a blue ribbon ¾” - 1” nap roller canopy.
- By using BEHR PREMIUM PLUS ULTRA Paint as a primer for refurbished or uncoated periphery, in conjunction with woods accommodate tannins and heavily stained areas.
- Bolt it with the first primer layer and apply the second layer of this BEHR PREMIUM PLUS ULTRA Paint, if necessary.
- Anoint these products on dry reactants when air and periphery’s temperatures lies ‘twixt 35°-90°F (2°-32°C) and will remain between 35°-90°F (2°-32°C) for at least 4 hours after applying.
- Extra-protective shell guards against damage from sunlight and moisture for a long-lasting freshly painted look with minimal maintenance.
- With advanced NANO GUARD Technology, this product creates a STAYS LOOKING NEW LONGER Finish.
- It adds dual aspects by their task of Stain-Blocking Paint & Primer In One
- It heighten the mildew resistant finish.
- Sweet Molasses is a dark espresso brown with a warm undertone. Confided on the light source or time of day, it may appear as a brownish black on the walls.
- It is Stain and dirt resistant. And fits the exquisite persistence and it mask in fewer coats.
Forged for easy washing with soap and water at home.

GREENGUARD Certified products are certified to GREENGUARD standards for low chemical emissions into indoor air during product usage. For more information, visit ul.com/gg

Genuine paint colors may swerve from on-screen and printer adumbrations.

VI. CONCLUSION
Among all the by products of the sugar industry, use of molasses is cheaper as an additive in different material like paint, water repellent etc. Nowadays, molasses, although considered as a waste, and its use increases day by day in a wide number of areas. The results of these various studies show that molasses can be used as a substrate for primer, paper, buffer, coloring agents, in edibles paints, bio ethanol production, SCP and citric acid. It would no longer be considered as a waste but as a further resource. It is concluded that sugarcane is an inexhaustible, natural arboricultural means because it impart sugar, contiguous to bio-fuels, fibres, fertilizers and myriad of derivative with pecuniary sustainability. Organic wastes are fetched from the sugar industries, and it disputed the chemical, physical, and anatomical properties of the soil as well as promotes crop yield and quality. It can be boosted to use these havoc with inorganic chemical humus under various cropping setup to elevate the nutrient availability to plants.

REFERENCES


Role of Cement in Rigid Road Pavements:
A Review

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Abstract: This article presents a study on role of cement in rigid road pavements. The study is review based and presents various test results analysis. This paper investigates the effect of fineness and replacement levels of fly ash on the fluidity of cement paste, mortar, and concrete. The compressive strength of all mixes is tabulated.

Key words: cement, pavement, compressive strength, workability, water absorption, abrasion test.

I. INTRODUCTION

Urban planning, motor vehicles, or even wheel, first roads that appeared on landscape thousands of years before. First roads were impulsively formed by humans walking common paths over & over to find water & food like molecules coalesced into cells & cells into more complicated organisms. The transportation of larger, heavier loads showed many limitations of dirt paths which turned into muddy bogs on the time of raining and followed introduction of wheel 7,000 years ago. The ancient stone paved roads was found about 4,000 B.C in Indian subcontinent & Mesopotamia. Recent road-construction techniques might be traced into a process developed by Scottish engineer John McAdam in early 19th century. McAdam excelled multi-layer roadbeds with soil & crushed stone that was then settled down with heavy rollers. Modern day asphalt roads are able to support vehicles that emerged in 20th century. It was built upon McAdams' methods with adding tar as a binder.

The role of cement & concrete in transportations & especially in road construction is important. Bridges, concrete roads tunnels, safety barriers, & sound barriers are several examples of successful cement application. The use of cement in above mentioned applications elongates the service life of structure together with small maintenance cost. Highway pavement is powerful outside material which is laid down on pasture with intention of sustained vehicular or base traffic, like a road or path in past, gravel road surfaces, cobblestone & granite sets were importantly used, but these surfaces have been replaced by asphalt or concrete due to compacted base course. Road surface are often marked to lead traffic. Present permeable paving method is beginning to be used for low down -impact roadways & walkways.

A. MATERIAL USED IN PAVEMENTS SYSTEM

- CONCRETE

Concrete is made of three basic components: water, aggregate & Portland cement. Cement which is usually in powder form, acts as a binding agent when it is mixed with water & aggregates.

There are three basic ingredients in concrete mix:

1. Portland Cement
2. Water
3. Aggregates (rock & sand)

- **Portland cement** - The cement & water makes a paste which coats aggregate & sand in mix. The paste hardens & binds aggregates & sand.

- **Water** - Water is essential for reacting chemically with cement & also provides workability with concrete. The amount of water mix in pounds compared with amount of cement is called water/cement ratio. The lesser will be the water cement ratio leads to stronger concrete.

- **Aggregates** - Sand is a fine aggregate. Gravel or crushed stone is used as a coarse aggregate in most mixes.

B. BOTTOM ASH

Bottom ash is part of non-combustible residue of combustion in a furnace or incinerator. In an industrial context, it usually refers to coal combustion & comprises traces of combustibles embedded in forming clinkers & sticking to hot
side walls of a coal-burning furnace during its operation.

The portion of ash that escapes up chimney or stack is, however, referred to as fly ash. The clinkers fall themselves into bottom hopper of a coal-burning furnace & cooled down.

Fly ash is finally a divided residue arises from combustion of powdered coal & transported by flue gases & collected by electrostatic precipitator. ASTM broadly classify fly ash into two classes Class F: Fly ash normally produced by burning anthracite or bituminous coal, usually has less than 5% CaO. Class F fly ash has pozzolanic properties only.

Class C: Fly ash normally produced by burning lignite or sub bituminous coal.

Some class C fly ash may have CaO content in excess of 10%. In addition to pozzolanic properties, class C fly ash also contains cementitious properties for improving engineering properties like strength, workability, plasticity, water absorption tightness.

C. OBJECTIVE OF RESEARCH

1. To evaluate properties of fly ash & bottom ash mixtures.
2. To identify workability & durability of Highway pavement.
3. To investigate optimal use of bottom ash & fly ash for pavement.
4. To check compressive strength by replacing aggregate with bottom ash & fly ash at different percentage i.e. 0%, 5%, 10%, 15%, 20%.
5. To check suitability of reuse of bottom ash & fly ash in a useful manner.
6. To minimize overall environmental effects of production using these materials as partial replacement.
7. To perform Following tests

A. Water Absorption of Bottom ash/ fly ash
B. Abrasion Test of Bottom ash / Fly ash
C. Impact Test Bottom ash / Fly ash
D. Crushing strength Test Bottom ash / Fly ash
E. Soundness test of Bottom ash / Fly ash
F. Compressive strength after using Bottom ash /fly ash

II. LITERATURE REVIEW

With view to carry out this study in a successful way, literature/reports from national & international journals have been referred to understand present status, identify gap areas & emerging issues to make this study more fruitful. Much research has already been undertaken by research scholars Doughnut world. Abstract of most of related & latest literatures are summarized here. Hence an attempt is made to review literature to know latest development in this study area.

Li Yijin, Zhou Shiqiong(2002) “The effect of fly ash on the fluidity of Cement paste, mortar, and concrete”, International Workshop on Sustainable Development and Concrete Technology[1]. The addition of ultra-fine fly ash to cement paste, mortar and concrete can improve their fluidity, but some coarse fly ash can't reduce water. This paper investigates the effect of fineness and replacement levels of fly ash on the fluidity of cement paste, mortar, and concrete. The fly ash is collected by electrostatic precipitators and airflow classing technology. Three different finenesses were chosen, and their replacement levels were 20%, 30%, and 40%, respectively. The experiment results show that particle size distribution, Zeta potential, density and particle morphologies of fly ash are the major factors affecting their fluidity. Syed Afzal Basha, P.Pavithra, B.Sudharshan Reddy “Compressive Strength of Fly Ash Based Cement Concrete” [2014][12]

In this paper an attempt is made for assessment of compressive strength of Fly ash based cement concrete. Concrete mixes M25, M30, are designed as per the Indian standard code (IS-10262-82) by adding, 0%, 10%, 20%, 30% and 40% of fly ash. Concrete cubes of size 150mm X 150mm X 150 mm are casted and tested for compressive strength at 7 days, 14 days, 21 days and 28 days curing for all mixes and the results are compared with that of conventional concrete.
The compressive strength of all mixes is tabulated. Concrete is a vital ingredient in infrastructure development with its versatile and extensive applications. It is the most widely used construction material because of its mouldability into any required structural form and shape due to its fluid behavior at early ages. However, there is a limit to the fluid behavior of normal fresh concrete. Thorough compaction, using vibration, is normally essential for achieving workability, the required strength and durability of concrete. Inadequate compaction of concrete results in large number of voids, affecting performance and long-term durability of structures. Since due to the vast construction in the urban development programs there is a high demand of concrete in bulk and for achieving the requirement of concrete in bulk, fly ash is being used as a mineral admixture in concrete.


The paper attains the highest possible strength for LECA concrete while noting the advanced technology in producing light weight concrete. The results show that 5% replacement of cement with fly ash, fine aggregate with bottom ash, and coarse aggregate with light expanded clay aggregate (LECA) was found to be good performance in compressive strength, split tensile strength, and flexural strength of beams in 56 days when compared with 28 days strength. At the same time 28 days strength also approximately equals normal conventional concrete; that is, 0% replacement and dry weight of specimen have been reduced. In future, soft computing techniques will lead with core areas us to attain better performance in short interval of time as the time is the major factor involved in this research work.

A. Sumathi*1, K. Saravana Raja Mohan (2015) “Compressive Strength of Fly Ash Brick with Addition of Lime, Gypsum and Quarry Dust”, International Journal of ChemTech Research, Vol.7, No.01, pp 28-36.[13] Based on the experimental study, following conclusions can be drawn regarding the strength behavior of flyash brick; The study was conducted to find the optimum mix percentage of flyash brick. However the brick specimen of size 230mm x 110mm x 90mm were cast for different mix percentage of Flyash (15 to 50%), Gypsum (2%), Lime (5 to 30%) and Quarry dust (45 to 55%). However the specimens have been tested for seven mix proportions. The mechanical properties such as compressive strength were studied for different mix proportions, at different curing ages. From the results it was inferred that, among the seven proportions the maximum optimized compressive strength is obtained for optimal mix percentage of Flyash-15% Lime-30% Gypsum-2% Quarry dust-53% as 7.91 N/mm².


This study reviews the characteristics of Concrete incorporated with Bottom Ash as partial replacement for fine aggregates, with a main focus on the mechanical properties such as Compressive strength, splitting tensile strength, flexural strength etc. Ten different research papers are reviewed. The practical use of Bottom ash shows a great contribution to waste minimization as well as resources conservation.


Bottom ash is a hazardous by-product from coal based thermal power plants. In this study fine aggregate in concrete mix has been replaced with bottom ash and Polypropylene fibre is additionally used to enhance the strength characteristics of concrete. The concrete mix design is done for M25 grade concrete. The mix is prepared for different combinations of 0%, 10%, 20% and 30% of replacement of sand by bottom ash with 0.5% of polypropylene fibre by total weight of the Cube. The mechanical properties were compared with control mix and it was found that the optimal combination as 30% bottom ash and 1.0% polypropylene fibre. Flexural strength was compared by testing beams of size 1.5 x 0.25 x 0.15m under two point loading. Results showed that there was no degradation of strength for beams with bottom ash as replacement for fine aggregates.

Mamta Mishra (2016) “Use of Industrial Waste Materials in Road Construction”[17]

The proposed has developed of Industrial Waste Materials in Road Construction. There are many types of waste material found in India like industrial, building, household, agricultural etc. it includes coal ash, stone quarry, plastics, glass, recycled aggregate, geo-naturals, fibers & polythene bags etc. One of best solutions to use
waste material to improve strength of sub grade soils is by using any one or composite material of lime, fly ash, coir fiber etc. In this paper we describe use of industrial waste material in road construction.

A waste material is not good for society & environments then produce minimum waste produce society. A maximum use of waste materials may be applied to businesses, communities, industrial sectors, schools, homes & road constructions. Also utilization of waste materials like solid waste, hazardous waste would protect environment & lead to a much more productive, efficient, & sustainable future. Objective of road constructions & others structure is to contain waste material in a manner that is protective to human health & environment. On basis of above discussion we also observed that Blast furnace slag could be used in soil stabilization due to its hardening property when exposed to moisture, Blast furnace slag provides a great potential for profitable use of this waste material & produces alternate binder to cement, Coal fly ash Light weight, could be used as binder in base course in stabilization to pozzolanic property. Fly ash is an effective agent for chemical and/or mechanical stabilization of soils & Recycling & reuse of waste materials are found to be an appropriate solution to problems of dumping hundreds of thousand tons of waste on natural soil, which would result in consumptions natural materials required for all construction activities.

Sabelo N.F Zulu(2017) “optimizing the usage of fly ash in concrete mixes”[22]

After evaluating the performance of FA concrete, by performing various tests on fresh and hardened concrete of different grades and varying levels of FA content, it was noted that FA affects the properties and characteristics of concrete.

The results from the slump tests for the 35 MPa FA mixes showed that the mixes with higher FA content had higher slump than the control, 30% FA, mix. The 40% and the 50% mixes attained equal slumps of 85 mm, compared to the 70 mm achieved by the 30% FA mix. This proves that the addition of FA does improve the workability and consistency of the concrete mixes. This would be due to the spherical shape of FA particles, which creates a ball-bearing effect thus making the concrete more workable. Concrete with high FA volume can be beneficial for pump mixes as the desired slumps can be achieved with lesser water and plasticizers.


In our present research paper we are investigating to determine the optimum mixture percentage of fly ash building bricks for varying material composition with three different particle sizes of fly ash and coarse aggregate dust i.e. 425 micron, 600micron, and 825micron, which prepared at three different curing time under solar radiation i.e. 7 Days, 14 Days, and 21 Days, so that we achieve the optimum mixture percentage for fly ash building bricks of high compressive strength, which we will further use for the different applications also.


The challenge for civil engineers in the future is to design the project using high performance materials within reasonable cost and lower impact on environment. Large quantities of waste materials are produced from the manufacturing industry, service industry and municipal solid waste incinerators. The sense of using waste materials not only helps in getting them utilized in cement, concrete, and other construction materials, it helps in reducing the cost of cement and concrete manufacturing, but also has numerous indirect benefits such as reduction in land-fill cost, saving in energy, and protecting the environment from possible pollution effects. Coal is primarily used as a solid fuel to produce electricity and heat through combustion. It is one of the world’s most important sources of energy, fuelling almost 41% of electricity worldwide. In India, over 70% of electricity generated is by combustion of fossil fuels, out of which nearly 61% is produced by coal-fired plants.

III. MATERIALS AND METHODOLOGY

Bottom Ash. Fly ash is a variable material. It is not practical to expect that characteristics of a concrete pavement mix could be identically replicated on a consistent basis. One of main reasons for variability in concrete pavement is because of variability in materials used to make concrete pavement.
A. CHOSEN TESTS

Each mix underwent a series of tests. These tests were chosen to assess individual characteristic of aggregates as well as strength testing, baby & durability indicators of Pavement A complete list of tests is given below

1. Strength Test
2. Particle Size Distribution
3. Specific Gravity
4. Water Absorption
5. Abrasion Resistance Test
6. Impact Value Test
7. Soundness Test
8. Workability Test
9. Compressive Strength

B. MIX DESIGN METHODOLOGY

Pavement is an extremely versatile road material because; it could be designed for strength is ranging from M25 & workability ranging from 0 mm slump to 160mm slump. In all these cases basic ingredients of Pavement are same, but it is their relative proportioning that makes difference.

C. Basic Ingredients of Pavement -

1. Cement – It is basic road material in Pavement
2. Fly Ash – It is basic road component of Pavement
4. Water – Water from such sources should be avoided since quality of water could change due to low water or by intermittent tap water is used.

G. Particle Size Distribution

In this project Particle size distributions were carried out for all fine & Fly ash in accordance with IS 383-1970 with Specification for Coarse for casting.

D. PROPERTIES DESIRED FROM PAVEMENT IN PLASTIC STAGE: -

1. Workability
2. Cohesiveness
3. Initial set retardation

E. MIX DESIGN OF CONCRETE PAVEMENT FOR PRESENT RESEARCH

To ensure repeatability of concrete pavement detailed steps on mix design procedure have been included.

The mix design was based on method concrete pavement mix proportioning – guidelines (10262:2009). For using this method, certain data is necessary, water absorption rates of bottom ash & percentage passes 600 micron sieve. The mix design based on this method has following stages:

1. Target mean strength for mix proportioning
2. Selection of water cement ratio
3. Selection of water content
4. Calculation of cementation material content
5. Estimation of Fly Ash proportion
6. Combination of different Fly Ash fraction
7. Estimation of Bottom Ash proportion
8. Combination of Different Bottom Ash fraction

F. TEST PROCEDURES AND METHODOLOGY

This testing was done according to applicable Indian Standards. Due to equipment, resources & other restrictions, Indian Standards could not be followed. There are also several tests that are not represented by an Indian Standard. This chapter presents, in detail, procedures for each test to ensure repeatability & Bottom Ash from Natural Sources for Pavement.

This section has methodology for conducting a sieve analysis.

Procedure for Bottom Ash Sieving
For sieve analysis about 2 kg of oven dried Bottom Ash is required. Eight sieves of 20 cm in diameter were stacked in order, from largest to smallest with smallest sitting on bottom.

The sieves aperture sizes used were 4.75mm, 2.36 mm, 1.18mm, 600 μm, 300 μm, 150 μm. The sand sample was then kept in top sieve & it is shaken by hand until less than 1% of particles left on each sieve were able to fall. Then sand left on sieves having extra material o must be divided into smaller allowable portions & re-sieved by hands.

Fig 1. Sieve analysis of bottom Ash
(B.K. Satish & Ganesh 2014)

Then the volume retained on each sieve was measured & shown as a percentage of total samples. The total percentage was then compared with grading requirements given in IS 383-1970, Specification for Coarse & Bottom Ash from Natural Sources for Pavement.

Procedure for Fly Ash Sieving

The procedure for Fly Ash sieving is same as for Bottom Ash. There is only one exception that it is done on a larger scale. The measures of the sieves used for Fly Ash sieving are 30 cm in diameter & sieve aperture sizes used are 40mm, 20mm, 10mm, 4.75 mm. The pan are shown in (Figure 3.4). A bigger mechanical shaker was operated for 10-15minutes, a little longer than for Bottom Ash sieving; and same methodology is followed as for Bottom Ash sieving.

Fig 2 Sieve analysis of Fly Ash
(encrypted-tbn0.gstatic.com/images)

H. GRAVITY

These types of tests have been made in order to find specific gravity. Determined & recorded weight of empty clean & dry pycnometer is W1. One third of a Bottom ash sample has been placed in pycnometer. Determine & record weight of pycnometer containing bottom ash, W2. Then distilled water is added to fill about full of pycnometer. After that sample has been soaked for ten minutes & partial vacuum has been applied to contents for ten minutes, in order to remove entrapped air. Vacuum has been stopped after that. CA vacuum line has been removed from pycnometer.

Fig 3 Specific gravity of Bottom Ash pycnometer

Pycnometer would be filled with distilled water and clean the exterior surface of pycnometer with a dry and clean cloth. Weight of pycnometer & contents that is W3 would be determined. Make the pycnometer empty to clean it. It would be filled with distilled water to mark. Clean exterior surface of pycnometer would be cleaned with dry and clean cloth. Weight of pycnometer & distilled water, W4 would be determined. Empty the pycnometer & clean it. This test is conduct under specification

Where

\[ W_1 = \text{Weight of empty clean & dry pycnometer} \]
\[ W_2 = \text{Weight of pycnometer containing dry soil} \]
\[ W_3 = \text{Weight of pycnometer, soil & water} \]
\[ W_4 = \text{Weight of pycnometer & distilled water} \]

Formula used in specific gravity = \[
\frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)}
\]

Specific Gravity of fly ash:-

Such types of tests have been made in order to find specific gravity of fly ash. Determined & recorded weight of empty clean & dry pycnometer is \( W_1 \). One third of a fly ash soil sample has been placed in pycnometer. Determine & record weight of pycnometer containing fly ash, \( W_2 \). Then distilled water is added to fill about full of pycnometer. After that sample has been soaked for ten minutes & partial vacuum has been applied to contents for ten minutes, in order to remove entrapped air. Vacuum has been stopped after that. CA vacuum line has been removed from pycnometer.

Specific gravity and water absorption of Coarse aggregate

The test is significant to determine the porosity of road aggregates. It is indirect measure to check strength and stones quality. Road stones that are absorbing more water have been considered unsuitable in case of road making. Water absorption has been expressed as percent water absorbed by aggregate in terms of oven dried weight of aggregate.

Procedure:-

Sample of approximately 2000 gram of the aggregate would be washed in order to remove dust and finer particles, drained and then located in wire basket and immersed in distilled water at a temperature between 22°C to 32°C with a cover of at least 5 centimeter of water above top of basket. Immediately after immersion entrapped air would be removed from sample by lifting basket containing it 25 mm above base of tank and allowing it to drop 25 times at rate of about one drop per second. Basket and aggregate would stay completely immersed at the time of operation and for a period of 24 ± 1/2 hours afterwards. The basket and the sample shall then be jolted and weighed in water at a temperature of 22°C to 32°C (weight \( A_1 \)).

The basket and the aggregate would be removed from water and allowed to drain for a few minutes, after which the aggregate would be emptied from basket on to one of dry clothes, and empty basket would be returned to water and weighed in water (weight \( A_2 \)). Aggregate placed on dry cloth would be surface dried with help of cloth, transferring it to second dry cloth when first would eliminate no further moisture. Aggregate would then be weighed (weight \( B \)). Aggregate would be placed in oven in shallow tray, at a temperature of hundred to hundred and ten °C and maintained at this temperature for 24 ± 1/2 hours. It will be removed from oven, cooled in airtight container and weighed (weight \( C \)). Such test is performed under the specification of IS: 2386 (part V) – 1963.

Specific gravity and water & absorption shall be calculated as

Specific gravity = \[
\frac{C}{A-B}
\]

Water absorption = \[
\frac{100 (B-C)}{C}
\]

\( A = \text{Weight of saturated aggregate in water} = (A_1-A_2) \)
\( B = \text{Weight of saturated surface dry aggregate in air.} \)
\( C = \text{Weight of oven dried aggregate in air.} \)
Hardened Concrete Tests

Compressive Strength Test (IS: 516 – 1959):-

This test is conducted on cube specimens (150mm x 150mm x 150mm) for determining compressive strength at various ages:-

Apparatus:-

Testing Machine:- A reliable type testing machine should be used or it should have sufficient capacity for tests & should be capable of applying load at specified rate. Only ± 2% of Maximum load error is permissible. The testing machine will be equipped with two steel bearing platens which have hardened faces. A platen would be fitted with a ball seating in form of a portion of a sphere, its centre coincides with central point of face of platen. Other compression platen would be plain rigid bearing block. The bearing faces of both of the platens should be as large at least & larger than nominal size of specimen to which load is applied.

Age at Test Tests would be made at recognized ages of specimens, usually being 7 & 28 days. A test at an age of 56 days may also be performed. If tests are required at greater ages, then ages of 13 weeks & one year are done. If it is necessary to obtain early strengths, tests should be done at ages of 24 hours & 72 hours. Ages are calculated on the basis of time of addition of water to dry ingredients.

Number of Specimens:-

At each selected age, at least three specimens should be taken for testing which are from different batches.

Procedure:-

Specimens stored in water would be tested immediately after removing from water & still in wet condition. Surface water & grit would be wiped off of specimens & any projecting fins removed. After drying specimens shall be kept in water for 24 hours before they are taken for testing. Specimens dimensions should be nearest 0.2mm & their weight should be noted before testing.

Calculation:-

The compressive strength of specimen which was measured earlier would be calculated by dividing maximum load applied to specimen by cross-sectional area calculated from mean dimension during test. As representative of batch provided individual average of three values shall be taken and variation is not more than ±15 percent of average.

Report:-

On each test specimen following information shall be included in report:-

1) Date of test, identification mark, & age of specimen.
2) Curing conditions, including date of manufacture of specimen in field.
3) Weight and dimensions of specimen, cross-sectional area, maximum load, compressive strength, & appearance of
fractured faces of concrete & type of fracture, if these are unusual.

Fig. 7. Compression Testing

**Flexure Strength Test (IS: 9399-1979)**:

This test is performed on beam specimen (100mm x 100mm x 500mm) to measure its flexure strength at various ages.

**Apparatus:**

- *Testing machine:* The testing machine may be of any dependable type of sufficient capacity for tests, it is capable of applying load at specified rate. Permissible errors should not be more than ± 0.5% of applied load because it requires a high degree of accuracy. It should not be greater than ±1.5% of applied load for commercial type of use.

  - *Bed of testing machine:* The bed of testing machine is provided with two steel rollers which are 38 mm in diameter, for which specimen is to be supported, & these rollers would be so mounted that distance from centre to centre is 60 cm for 15 cm specimens or 40 cm for 10 cm specimens.

  - *Load*: The load would be applied through two similar roller, placed at third points of supporting span, that is, spaced at 20 or 13.3 cm centre to centre. This load would be divided equally between two loading rollers, & all rollers would be placed in such a way that load is applied axially & without giving the specimen any torsional stresses or restraints.

**Procedure:**

- *Before testing,* test specimens are stored in water at a temperature of 24º to 30ºC for 48 hours. If the specimen are still in a wet condition, it would be tested immediately on removal from water. The dimensions of each specimen would be noted before testing of surfaces, no preparation is required.

Fig. 8. Flexural Testing Machine

**Calculation:**

The calculation of equivalent cube strength of specimen would be calculated by dividing maximum load by area of contact of bearing plates.

**Report:**

- On each specimen following information shall be included in report:
  1. Date of test, Identification mark, age of specimen & curing conditions.
  2. Also span length, maximum load, size of specimen, position of fracture, modulus of rupture & appearance of concrete & type of fracture in case of their unusuality.

Fig. 9. Flexural Testing
Testing for concrete workability (SLUMP TEST)

The workability of concrete could be measured by using various methods like Vebe test, Compaction factor test, Ball-penetration test & Slump test. In this study the slump test was performed to determine workability of concrete mixes. It determines consistency of freshly mixed concrete in accordance with ASTM C 143/C 143M-15a (2015) & SANS 5862-1:2006 (2006) specifications.

Preparation of Material

Saturated surface dry (SSD) condition:

The most important aspect of casting concrete was to ensure that aggregates should be in suitable moisture condition named as saturated surface-dry (SSD). Its reason is that if aggregate is too wet it will add free water to mix, increasing free-water / cement ratio for mix and it would result in a reduced strength. The aggregate will absorb free-water in mix, If it is too dry .It results in a reduced free-water / cement ratio for mix and reduces workability. The SSD condition will be in a state when the aggregate will not give off any water & will not absorb any water. In this state the internal pores of aggregate are full of water but surface of aggregate is dry.

Weighing of material

Another critical element in casting of a batch of concrete is measuring out of materials. A weight batcher is used in this work, before starting work ,its level & calibration should be checked daily. The checking can be done by preparing sand bags of 25Kg & 5 Kg.

Preparation of Concrete

A 100 liters capacity tilting drum was used to mix mate rials. The mixing procedure was carried out as described in SP 23-1982 Hand Book on Concrete Mixes. Prior to first batch of each mix pan was moistened so that free-water was not lost to pan. The mixer was also thoroughly cleaned out between mixes.

All loading of mixer was done by hand & it will follow the following sequence:

1. All coarse aggregate was loaded and it will follow by fine aggregate;
2. The aggregates are mixed for a short period of time;
3. Then the cement is added ;
4. After this the cement is mixed in with aggregate;
5. Water is added while mixing for a period of 1-2 minute period;
6. The batch was then mixed for approximately 2 minutes, to thoroughly combine everything;
7. A slump measurement was taken in accordance with SP 23-1982 Hand Book on Concrete Mixes.

The concrete from slump test again added to mix & concrete was mixed for 2 minutes. For concrete mixes, with exception of commercial mix, slump readings were in targeted range of 80-120 mm so there is no need of adjustments to water content.
Casting & Compaction of Concrete Samples
After mixing, concrete mix is casted into cube moulds of 15×15×15 cm for compressive strength. The cube is coated with a thin layer of a water-based release agent from inside to facilitate demoulding of samples after curing. The compaction of fresh concrete was carried out by using sixty hits per layer with a rod. Fresh concrete was placed in three layers in each cube & cylinder. Each layer was compacted by tamping rod for compaction.
To prevent the loss of moisture, the moulds are covered in plastic sheets. The covered moulds are then transferred to curing room for 24 hours which was preset before start of curing at elevated temperatures.

Demoulding & Curing Details
The time of demoulding was set between 18 to 24 hours from mixing. To prevent damage of specimen proper care was taken. Once samples had been demoulded they were placed in curing tanks filled with water.
Curing means keeping concrete moist & warms enough so that hydration of cement could continue. The demand of Curing is increasing as demand for high quality concrete is increasing.

REFERENCES
Case Study of Different Types of Speed Breakers on Speed of Vehicles

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Abstract—Controlling of speed of vehicles is one amongst the foremost necessary issue in Republic of India. Hence, regulation transport speeds is additionally a crucial issue in traffic engineering. The best thanks to steering driver speed is through traffic management. A method of regulation speed is that the use of static speed regulation devices like bumps that yields discomfort that driver expertise whereas crossover it.

Key words: speed humps, speed bumps, radar gun, spot speed, graphs, speed reduction

I. INTRODUCTION

Speed bumps area unit elevated sections of route planned to limit the speed of cars. They're typically four meters long, in between seventy six to a hundred millimeter tall. A speed bumps mechanism is by transmittal associate degree upward force to a vehicle and it inhabitants, because it crosses the bump. The force encourages a front-to-back diving acceleration in vehicles. The acceleration reduces with higher speeds because of immersion of the result by the vehicle suspension.[1] Numerous investigations are done on encumbrance casing the standards or the guideline for the geometrical bump styles, optimisation for the styles, potency of the bump, distinction of the speed over bump, factors that impact bump styles, etc.

II. LITERATURE REVIEW

For a bump style a convinced procedure needs to be charted and to possess these guideline a study was done by Sahoo P.K.[2] Wherever a laptop model was established to simulate among geometric options of speed bumps and also the speed of the vehicles. On the idea of the study the steps were, initial choose specific style eighty fifth centile bump-crossing speed then ascertain the essential A/W magnitude relation from a equation then by choosing a bump shape: circular, parabolic surface shapes to be used, a bump breadth and cypher bump height that adequate the A/W magnitude relation bump height is to be found and its acceptableness is to be tested. Supported the remark obtained from the review done, Bump-crossing speed was expected supported space to breadth magnitude relation by means that of various geometric styles of the encumbrance and also the result earned was R2 equals to Road bumps play a necessary role in implementing speed limits, thereby avoiding over dashing of vehicles. It considerably pays to the overall road safety objective through. This work aims to put onward the results of a study, on the performance of road bumps used in India in declining vehicle speed zero.56 for 2 wheelers and R2 equals to zero.6 for traveler Cars.

Likewise Henry county, U.S. state of Georgia, includes a specific henry county code[3] compromising the whole recommendation for construction of speed bumps in Henry County comprising of its purpose, criteria for installation, request for study & public hearing, preparation of petition, filling of petition, no of signature needed, construction of speed bump and warning posts, etc. For installation, study conducted by dept. should notice that dashing drawback exists on a regular eighty fifth centile of a minimum of eleven miles per hour the announce ordinance. Specification of encumbrance is 4inch most vertical rise, 22ft in horizontal length, and incline flattop-decline and most time allowed for installation is 3months.

The geometric route style planned by Weber Philip A.(1998)[4] options the aim of swiftness traffic in residential neighborhoods. Purpose of this study was to figure towards the event of encumbrance style standards for North American nation with announce speeds of 30-50 km/h whereas keeping within the mind the appropriate level of discomfort, no vehicle harm, road safety, minimizing the noise & displacement caused, and minimizing the installation & maintenance price. Many cross-country & on-road tests were meted out on existing bump & on wood
created speed bumps duplicated from existing on-road speed bumps. Accelerations were recorded on a check subject and compared to discomfort criteria determined by recording speeds over existing bumps. A multiple correlation model was developed to estimate the accelerations measured victimisation Root total of Squares (RSS) acceleration and optimum factorial styles were fashioned that created acceleration levers up to the discomfort criteria. From the model styles, speed bumps lengths and heights were suggested. On streets spent to hold vehicle traffic solely, 5.2 m by a hundred millimeter, 7.9 m by a hundred millimeter and nine.1 m by seventy five millimeter speed bumps were suggested for desired speeds of thirty, forty and fifty km/h severally. On bus routes, 6.1 m by one00 millimeter and eight.8 m by a hundred millimeter speed bumps were suggested for desired speeds of thirty and 40km/h severally.

For a encumbrance, correct breadth needs to be thought of for its style as variable the breadth effective of the bump additionally, thus a case study was done by Daniel Basil David(2012)[5] wherever over one,239 vehicle speeds were recorded on total twenty one Watts profile road bumps on 9 residential streets in city, New island. Speed information were collected employing a Pro-Laser III lightweight detection and travel (LIDAR) speed gun. The device operative speed Vo, was taken because the eighty fifth centile speed of all speeds recorded across the road bumps. multivariate analysis was performed to relate Vo to the bump breadth to road breadth (WH/WR ) ratios. 2 perform S-curve and Power functions were elect on the idea of response variable, and S-curve was pointed out to be higher suitable represent the link. The device operative speeds was between twenty one.9 km/h to thirty three.9 km/h with a mean of twenty nine.1 km/h with the observation; Smaller WH/WR ratios the more practical in manufacturing lower speeds and also the use of smaller bump widths on wide streets is additional pragmatic, and it's not necessary to put in slim bumps on already slim streets because the reduction in speed achieved isn't considerably totally different from bumps made absolutely across the road.

While coming up with a encumbrance, major issue long-faced is that the optimisation of encumbrance with length, width, and height. one amongst the researches was meted out in Malaysia Residential Streets by Zainuddin Nor Izzah et al., Akram Adnan Md et al. (2012)[6] wherever there purpose was to develop the eighty fifth centile speed reduction in reference to encumbrance geometric style with parameters like bump height, length . The speed information was obtained from spot speed information at specified location victimisation professional optical maser III-Laser Gun Meter Detector. the information was ready and analyzed victimisation Minitab v16.0. The analysis flow started with web site choice criteria, encumbrance geometric information assortment, spot speed information assortment, model development and model validation. when many analyses were conducted, one model with R-Sq. worth of eighty.6% was developed victimisation multiple linear regressions.

The major concern whereas putting in the speed bumps is that the effectiveness in dominant the speed of the vehicles passing over it. to examine the effectiveness Ponnlurri rule V, And Groce Paul W.(2005)[8] conducted a survey by having the speed variation before and when the installation of the speed bumps i.e. this case study options the outline for assortment and analysis of comparison pre- and post-installation traffic volume and speed measures. The study phase was Dorman Road in United States President County, central American state concerning a pair of600 feet long consisting of five bumps having a ordinance of 25mph. Speed information were collected in 15-minute increments over a consecutive a pair of weekdays. The pre- & post-installation information were collected one month before preparation of speed bumps. Traffic volume share distributions charts were ready and from many iterations it absolutely was found that interrogatory regression model provided the most effective work by examination it with the R2 values. R2 values indicating the potency of bumps in achieving the raised consistency of travel behavior was obtained to be zero.89 & .86 for pre- & pro-installation.

However, ton of considerations has been voiced concerning speed bumps, notably their effectiveness and their potential to make unwanted noise and vibration. numerous studies are meted out and one them was the study within the The Netherlands and Australia carried by Zaidel D. et al.(1992)[9] wherever they need shown that well-designed speed bumps manufacture terribly low levels of unwanted noise and small vibrations except on passing vehicles. Impact to adjacent buildings or people has been negligible.

Once the speed bumps area unit made correct maintenance and traffic linguistic communication is additionally needed, thus Tchemou Gilbert et al.(2012)[10] conducted a study on the important speed bumps designed throughout the Triangle Yaounde-Douala-Yaounde-Bafoussam concerning the issues long-faced each in terms of style materials used,
and also the location of traffic linguistic communication. the essential meaning was to draw the eye of the authority concerning the matter long-faced because of improper maintenance in speed bumps. Study was done by traversing the Triangle and collection the sphere information to spot every retarder by its location, type, geometry. during this study, 310 speed bumps were known essentially of 4 types: audio recording, speed bumps, quadrangle and receptacle. Out of that 288 had issues of fabric style and signal. Over five hundredth of asphalt concrete materials were either folded or the road to the launch of those is soft. Over seventieth wasn’t up to the several customary dimensions. sixty two of the issues with speed bumps were due either to the absence of signs or dangerous signs.

III. METHOD ADOPTED

- 10m distance was considered on both left and right hand side of the bump with different marking at 10m, 7m, 5m and 2m on left and 3m, 5m, 8m, and 10m on right.
- Vehicles speed were measured at the different marking on the road using the radar gun.
- Two radar gun was used and distance between two consecutive readings by a particular radar gun was kept 5m apart.
- marking distance for 1st radar gun was -10,-5,0,5,10 and the 2nd radar gun was -7,-2,3,8.
- For each site 20 vehicles reading were noted across the 20m range.

IV. DATA COLLECTION SITE

- Three cities were selected for the collection of data: 90 feet road srinagar, Bulward road , and ganderbal road.
- In 90 feet road srinagar 3 location of bump height of 75mm where selected
- For all the 3 location speed variation of 4-wheelers were done speed variation of 2-wheelers was also done.
- In Bulward road 2 location of bump height 100mm were selected.
- For both location speed variation of 4-wheelers were done including study of 2-wheelers and study of vehicles >4-wheelers was also done.
- In ganderbal road 3 location of bump height 100mm were selected At this location study of buses was done whereas for other location study of 4-wheelers were done.

Reduction due to bump height w.r.t vehicles:
Reduction due to the type of vehicles:

<table>
<thead>
<tr>
<th>TYPEOFVEHICLES</th>
<th>REDUCTION AT THE BUMP (in %)</th>
<th>REDUCTION AT 10m AWAY FROM BUMP (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-wheelers</td>
<td>61.791</td>
<td>30.31</td>
</tr>
<tr>
<td>2-wheelers</td>
<td>61.231</td>
<td>32.011</td>
</tr>
<tr>
<td>&gt;4-wheelers</td>
<td>57.741</td>
<td>19.091</td>
</tr>
</tbody>
</table>

Reduction at various locations:

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>REDUCTION AT THE BUMP (in %)</th>
<th>REDUCTION AT 10m AWAY FROM BUMP (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuttack</td>
<td>67.331</td>
<td>35.561</td>
</tr>
<tr>
<td>Rourkela</td>
<td>57.451</td>
<td>25.151</td>
</tr>
<tr>
<td>Kolkata</td>
<td>60.831</td>
<td>30.821</td>
</tr>
</tbody>
</table>

4.3.3 DISTRIBUTION OF VEHICLES AGAINST SPEED REDUCTION

Cumulative distribution of the vehicles for the different reduction in speed intern of percentage w.r.t to the forth coming speed at the distance of 10m from the bump is shown in figure 6. Almost over 80% of vehicles speed was reduction by 65% w.r.t to their approaching speed.
GRAPHICAL COMPARISONS:

FOR 4-wheelers comparison with bump height:

- For cars across 100 mm height bump the speed reduction at bump is 63.93% where as 75 mm height bump its 57.02%.
- For cars 100mm height bump the speed reduction at distance 10m is 33.46% where as 75mm height bump its 25.15%.

FOR bikes comparison with bump height:

- For bikes across 100 mm height bump the speed reduction at bump is 62.01% where as 75mm height bump its 60.42%.
- For bikes across 100 mm height bump the speed reduction at distance 10m is 31% whereas 75mm height bump its 33%.
FOR comparison between 4-wheelers and bikes:

![Graph showing speed reduction for 4-wheelers and bikes](image)

Fig- 9. Reduction due to 2 and 4-wheelers

- For cars across bump the speed reduction at bump is 63.78% whereas for bikes its 61.22%.
- For cars across bump the speed reduction at distance 10m is 33% whereas for bikes its 32%.

FOR comparison between 4-wheelers and vehicles > 4-wheelers:

![Graph showing speed reduction for vehicles > 4-wheelers](image)

Fig-10. Reduction due to 4 and > 4-wheelers

- For vehicles > 4 wheelers across bump the speed reduction at bump is 57.74% whereas for 4-wheelers its 61.79%.
- For vehicles > 4 wheelers across bump the speed reduction at distance 10 m is 19.09% whereas for 4-wheelers its 30.3%.

FOR comparison between bikes and vehicles > 4-wheelers:
Fig-11. Reduction due to 2 and >4-wheelers

- For vehicles > 4 wheelers across bump the speed reduction at bump is 57.74% whereas for bikes its 60.4%.
- For vehicles >4 wheelers across bump the speed reduction at distance 10m is 19.09% whereas for bikes its 33%.

FOR comparison between different cities w.r.t 4-wheelers

- Forg and erbala cross bump the speed reduction at bump is 67.33% whereas for bulv ardits 57.45% and for 90 feet its 60.83%.
- For gander bala cross bump the speed reduction at distance 10 m is 35.56% whereas for bulvardits 25.15% and for 90 feet road its 30.82%.

V. CONCLUSION
Based on the experiments on hump height and hump-crossing speeds of 2 wheelers, 4-wheelers and vehicles >4-wheelers in several location this investigation have shown that
statistically the reduction of the speed at hump and at the departure distance of 10m w.r.t to the approaching distance i.e. 10m from left aspect of bump. It had been found that nearly over eightieth of vehicles speed was reduction by sixty fifth at the bump w.r.t to their approaching speed. Reduction being least for vehicles >4-wheelers and most for the 4-wheelers. It had been additionally seen that additional reduction was there because the hump height is raised from 75mm to 100mm.

REFERENCES


STUDY ON UTILIZATION OF RECYCLED MATERIALS IN SMA MIX

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Abstract:

The development SMA (stone matrix asphalt or stone mastic asphalt) was first seen in European and German. But now a day it is used in the whole world. It is made up of two parts, a coarse aggregate and a binder mortar. It is prepared by a blending of coarse, fine aggregates, stabilizer like fibers or polymers, cement etc. In this work, study of the properties of SMA with cellulose fiber and recycled pavement material and slag as partial replacement of stone aggregates as coarse and fine aggregate grades. In this work, marshal stability value and flow values was studied along with additional properties of mixes. For aggregate gradation IRC-SP-79 specification is used for stone matrix asphalt. Binder in this study is 60/70 penetration grade bitumen. The Percentage of Content of binders is mixed as 4, 5, 5.5, 6, and 7 by weight of aggregates and fiber used is optimum fiber content at 0.3 percent by weight of aggregate.

1. INTRODUCTION

Aggregates are used worldwide with bitumen for construction of flexible pavements. It is not sometimes possible to make denseness of aggregates during the construction of road. In that situations, bituminous mixture known as stone matrix asphalt (SMA) is used which is gap graded. Zichner of Straubag –Bau studied the SMA in central laboratory in Germany (1960), to test its resistance against tire damages. It displayed good resistance to deformation at great temperatures.

Recycle Asphalt Pavement (RAP)

Recycle Asphalt material is a detached material comprises of aggregates and asphalt. The use of RAP in roads, decreases wastes, conserves environment, improved performance.

II. LITERATURE REVIEW

Yue Huang and Roger N.Bird studied on construction and maintenance of United Kingdom roads consumes massive amounts of quarried aggregates, the employment of secondary (recycled), instead of primary (virgin), materials helps easing lowland pressures and reducing demand of extraction. However, issues over inferior road performance and extra prices have hindered the widespread use of secondary aggregates in such applications. This is often particularly the case in surface layers of asphalt pavements that will represent a worth application for recycled solid waste materials (SWM).

Waste glass, steel slag, tires and plastics square measure designated for technical necessities, furthermore because the performance of asphalt pavements created mistreatment such recycled materials. Waste arising and management indicates that though there's an outsized potential for provision secondary materials, many factors have effectively depressed such usage activities. Such barriers square measure represented and should additionally apply to the secondary use of alternative SWM when distinctive and quantifying such barriers a short discussion suggests ways that of their removal.

Kandhal, P S (1997) studied on temporary summary of the usage of asphalt pavements. 5 usage ways square measure present: (1) cold planning; (2) hot recycling; (3) hot in-place recycling; (4) cold in-place recycling; and (5) full depth reclamation. methods for choosing associate applicable usage methodology and additionally performance of various usage processes are explained. Economics, legislation/specification limits, and structural style related to usage of asphalt pavement square measure explained.

Brown and Haddock (1997) has remarked that, because of the very fact that the strength of SMA relies totally on the stone-on- stone mixture skeleton, steps ought to be taken on style the combination and place it with a powerful coarse mixture skeleton that may offer the specified strength and stability to the combination.

Kumar Pawan, Chandra Satish associated Bose Sunil (2007) tried to use an autochthonic fiber in SMA combine by taking low consistence binder coated jute fiber rather than the historically used fibers and compared the result with the foreign polyose fiber, mistreatment 60/70 grade hydrocarbon and located optimum fiber proportion as zero.3% of the mixture. Jute fiber showed equivalent results to foreign proprietary fibers as indicated by Marshall stability check.
permanent deformation check and fatigue life check. Aging index of the combination ready with jute fiber showed higher result than proprietary fiber.

Bradely et.al. (2004) studied on Utilization of waste fibers in stone matrix asphalt mixtures. They used carpet, tire and polyester fibers and alternative materials to boost the strength and stability of mixture compared to polyose fiber. They found no distinction within the wet status and permanent deformation in SMA combine containing waste fibers as compared to the SMA combine that contains polyose or mineral fiber.

Punith V.S., Sridhar R., Bose Sunil, Kumar K.K., Veeraragavan A (2004) adopted Marshall combine style at 600C, mistreatment fifty blows of compaction per facet and did a comparative study of SMA with asphalt concrete combine utilizing saved synthetic resin within the variety of LDPE carry baggage as stabilising agent (3 millimetre size and zero.4%). The check results indicated that the combination properties of each SMA and AC mixture are becoming increased by the addition of saved synthetic resin as stabilizer showing higher rut resistance, resistance to wet injury, rutting, creep, aging and higher drain-down properties furthermore.

Yongjie Xue, Shaopeng Shanghai dialect, Haobo Houa, Jin Zha (2006) used basic chemical element chamber scoria in situ of mixture in asphalt mixture. By testing and analyzing, BOF steel scoria was found to be appropriate to be used as asphalt mixture mixture in main road construction.

Bindu C.S. et. al.(2010), Plastic coated hierarchal aggregates were used for the SMA combine and also the Marshall Stability worth of stabilised SMA combine was found to be above the prescribed worth beside the values of preserved stability. Excessive drain-down too was reduced by a good issue.

II MATERIALS USED

- RAP (recycle asphalt pavement), SLAG, STONE as coarse and fine aggregate.
- Binder (Bitumen of penetration grade 60/70)
- Mineral filler-Stone Dust
- Stabilizers (TOPCEL cellulose fiber)

III. COMPARISON OF RESULTS

FIG 1 STABILITY VALUE COMPARISON

FIG 2 FLOW VALUE COMPARISON

FIG 3 AIR VOID COMPARISON

IV. CONCLUSIONS

Marshall Stability:-

In this work RAP displays well stability value when associate with with slag and stone aggregate. The extreme stability value is attained for RAP as coarse aggregate i.e. 17.77 KN at 5.5 percent bitumen content when matched with slag and stone as coarse aggregate.

Flow Value:-

With increase in bitumen Flow value increases Generally increase is gentle, but with time increase in bitumen flow value increases. SMA Mixture with RAP displays less flow value in comparison with SMA combination with slag and stone aggregate.

Air Voids:-

While preparing the samples, due to improper compaction and heating air voids are formed between the samples. With increase with bitumen air voids. The reason is that due to increase in bitumen air
voids become filled. Air voids with RAP displays extra value than 2 types.

Voids in mineral aggregates:

The VMA worth, for a given combination ought to in theory stay constant. However, during this case, it’s generally determined that, at low bitumen, VMA gradually declines with the rise in bitumen content, then remains constant over a variety, and eventually will rise at high bitumen content. The initial fall in VMA worth is because of the re-orientation of the aggregates within the presence of bitumen. At terribly high bitumen content, due to a thicker bitumen film, the aggregates slightly moves apart leading to a rise in VMA.

OPTIMUM BINDER CONTENT:

The OBC of the SMA combine, supported the results of Marshall check taking 3 PERCENT air voids

![Graph](image)

because the main criteria determined to be increasing with the rise in stiffness of the binder. RAP shows OBC of 5.5 percent that is same as that of SMA samples with slag wherever as SMA combine with solely stone aggregates provides optimum binder content of 5 percent

REFERENCES

[2] Chakraborty Partha, Das Animesh, Principals of transportation engineering, PHI 2003,
[7] MORTH, Specifications for Road and Bridge Works, upgradation of Third Revision, Ministry Of Road Transport and Highways.
Dredged material properties and its use as soil subgrade

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Abstract

This study presents the results of experimental study carried out to investigate the Subgrade geotechnical properties of dredged material from Wularlake, one of the largest fresh water lakes in Asia and largest flood basin of Kashmir in the northern Bandipora district 34 km north of Srinagar. Every year thousands of tons of silt is deposited in the lake which is constantly decreasing its depth and water holding capacity. Dredging the heavily silted Wularlake is a key to save it from dying. Its dredging operations generate a large quantity of dredged material posing serious health and environmental problems. Concern over environmental effect of dredging, disposal of dredged material and the increasing unavailability of suitable disposal sites has put pressure for characterization of this material as a resource for various beneficial applications. Its mineralogy and geotechnical properties qualify it for various uses. Therefore, comprehensive laboratory and field investigations were conducted to determine the engineering properties of the dredged material. The results show that dredged material can be effectively used in bulk as a resource for various applications. Thus our study aims at to determine the properties of the material and is this material suitable for subgrade of roads.

Key words: dredged material , subgrade soil testing, water content, CBR, etc

I. INTRODUCTION

Wular lake is one the largest fresh water lakes in Asia. It is sited in the Bandipora district. Wular Lake is located 34 km northwest of Srinagar city at an altitude of 1,530 m AMSL between 34°20’ N latitude and 70°24’ E longitude. It is elliptical in shape with a maximum length of 16 km and breadth of 7.6 km. The lake is surrounded by high mountainous ranges on the northeastern and northwestern sides, which drain their runoff through various Nallahs, prominent being Erin and Madhumati. On the eastern and southern sides are the low lying areas of Sonawari which used to get inundated almost every year until numerous criss-crossing embankments were constructed along River Jhelum.

1.4 OBJECTIVES OF THE WORK:-

Our Project Objectives may be summarized as:-

• To study the various geotechnical parameters of the dredged material from Wular Lake to check whether it is suitable for road subgrade.

• To determine the suitability of the material dredged from Wular-lake for different uses like filling and foundations.

• To determine the feasibility of the material dredged from Wular-lake for use in road construction.

II. LITERATURE REVIEW

DREDGED MATERIAL AND ITS SOURCES:-

Dredging is simply the removal of sediments from a body of water that have accumulated due to upland erosion in order to maintain a desired depth, as in a reservoir, lake, dam, shipping berth, navigation channel. Dredged materials exhibit properties similar to those of undisturbed native soil and rock materials in a subaqueous environment, but when excavated, removed, remoulded, or redeposited, the properties change accordingly as the original material structure changes. High water contents, low dry densities, and low shear strengths typify remoulded and deposited fine-grained dredged materials. Dredged material is categorised into various...
sediment types such as: Rock, gravel and sand, consolidated clay, silt or soft clay and a mixture of rock, sand silt and soft clay. Rock may range from soft marl like sandstone and coral to hard rock like granite and basalt. Depending on its size and quantity rock can be a valuable construction material. Gravel and sand are perhaps the most valuable resource and are routinely used for beach nourishment, wetland restoration and many other purposes.

Consolidated clay, if the water content is low, can be used for engineering purposes. Silt and soft clay usually come from maintenance dredging, are rich in nutrients and thus are good for agricultural purposes such as topsoil and for wildlife habitat development. Mixed materials are somewhat more restricted in use options but may still be used for filling, and improvement and topsoil. Using dredged material as a resource is important, one could almost say urgent, because use – rather than disposal has broad societal, environmental and financial benefits. It contributes to global sustainability. The potential uses for dredged material depend on the type of dredged material, where it is dredged, how it is dredged and its overall acceptability. Two broad categories of proposed uses are often distinguished: Engineering uses and environmental uses.

Engineering uses of dredged material include: Construction including landfill and foundation materials; Isolation of contaminated sites; Flood and coastal protection, such as beach nourishment; Land improvement; and Placement on riverbanks. Environmental enhancement using dredged material includes: Habitat creation and improvement; Water quality improvement; Aquaculture; Agriculture; Recreation; Sustainable relocation; and pit filling. In both cases, criteria are to be established that ensure that extensive testing is done for suitability of materials, that the potential use site is in reasonable proximity to where the dredging is planned and that a thorough physical and chemical evaluation is done. Beneficial use of dredged material is an integral and necessary part of the dredge material management process. Dredged material can be beneficially used in upland, wetland, and aquatic environment.

RESULTS AND DISCUSSIONS

4.1 IN-SITU WATER CONTENT:

In-situ water content of each sample was determined as per the relevant Indian Standards. All necessary precautions were taken while performing the tests. Complete set of observations for each test are given in Appendix.

**Figure 4.1** In-situ water content of three samples

Specific Gravity:

This property was determined by the Pycnometer method. The values are tabulated as under.

**Figure 4.2** Specific gravity of three samples

4.2 ATTERBERG LIMITS:

The test results are tabulated in bench as under...
<table>
<thead>
<tr>
<th>Properties</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Limit</td>
<td>38.71</td>
</tr>
<tr>
<td>Plastic limit</td>
<td>31.25</td>
</tr>
<tr>
<td>Plasticity index</td>
<td>7.46</td>
</tr>
<tr>
<td>Flow Index</td>
<td>46.90</td>
</tr>
<tr>
<td>Toughness Index</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Figure 4.3 Flow curve

Liquid limit, (%) = 38.70

**PARTICLE SIZE DISTRIBUTION**

Sieve analysis was carried out for coarser particles and hydrometer analysis for finer particles (less than 75 microns). Oven-dried sample was taken for the same. The results obtained and the consequent inferences are drawn in table 4.5 as under.

**Fig 4.5 soil properties**

<table>
<thead>
<tr>
<th>Properties</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel Size (%)</td>
<td>0</td>
</tr>
<tr>
<td>Sand size (%)</td>
<td>73.5</td>
</tr>
<tr>
<td>Silt (%)</td>
<td>23.87</td>
</tr>
<tr>
<td>Clay, (%)</td>
<td>1</td>
</tr>
</tbody>
</table>

**COMPACATION CHARACTERISTICS**

Light compaction test was performed in order to determine the maximum dry density and optical moisture content. Air dried samples were taken.

The results are as under:

**Figure 4.5 Compaction characteristics**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum moisture content (%)</td>
<td>22.5</td>
</tr>
<tr>
<td>Maximum dry density(g/cc)</td>
<td>1.57</td>
</tr>
</tbody>
</table>
Fig 4.5 compaction characteristics

UNCONFINED COMPRESSION TEST:

Unconfined compressive strength = 93 KN/m²

**Figure 4.6(A) stress strain curve**

Unconfined compressive strength = 86.8 KN/m²

**Average unconfined compressive strength = 89.9 KN/m²**

**4.7 DIRECT SHEAR TEST:**

Direct shear tests were conducted on in situ samples and the results are

1. Angle of internal Friction, \( \phi \) (degrees) = 21.45° (slope = .392)
2. Cohesion, \( C \) (N/cm²) = 74 KN/m² (intercept = 74)

**Figure 4.6(B) stress strain curve**

Unconfined compressive strength = 89.9 KN/m²

**Figure 4.7 Shear Stress vs Normal Stress plot**
CBR VALUE DETERMINATION

CBR value at 2.5mm penetration, (%) = 5.24
CBR value at 5mm penetration, (%) = 4.56

Table 5.1 Different properties of Soil sample

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil type</td>
<td>Silty Sand</td>
</tr>
<tr>
<td>Moisture content, (%)</td>
<td>30.48</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>2.07</td>
</tr>
<tr>
<td>Liquid limit, (%)</td>
<td>38.71</td>
</tr>
<tr>
<td>Plastic limit, (%)</td>
<td>31.25</td>
</tr>
<tr>
<td>Plastic index</td>
<td>7.46</td>
</tr>
<tr>
<td>Insitu dry density, (g/cc3)</td>
<td>1.33</td>
</tr>
<tr>
<td>OMC (%)</td>
<td>22.5</td>
</tr>
<tr>
<td>MDD (g/cc3)</td>
<td>1.57</td>
</tr>
<tr>
<td>Undrained shear strength (KN/m2)</td>
<td>89.9 KN/m2</td>
</tr>
</tbody>
</table>

In the light of the visual observation and the index properties of the materials based on specific, classified and strength tests (various values are given in relevant tables and figures), the following comments and conclusions are made:

1. For any civil engineering project the soil and site investigations are inevitable, for proper design and construction of the structure. The cost, stability and durability of the structure depends on the site conditions and the type of materials. The civil engineering structures are made of soil, constructed under the soil or built over the soil.

2. In any situation the detailed soil investigation are essential to confirm the suitability of the material or foundation bed before arriving at safe design and taking up the construction. As a first step the basic soil properties and strength characteristics of the soil has to be determined to have an idea of the soil type. For soil classification various classification tests have to be performed to evaluate the index properties before taking detailed investigations required for determination of other properties such as strength parameters, permeability, consolidation, bearing capacity, compaction behavior etc.

3. In the present case the necessary index properties have been evaluated which include gradation, atterberg limits, specific gravity and organic content. The index properties confirm the soil classification as *silty sand* with nominal clay content and 7.34%.
4. The soil is practically saturated at site and has low to medium density.

5. The strength characteristics (shear parameters C and Ø) and unconfined compressive strength qu on undisturbed samples have low to medium values which may indicate low bearing capacity of the foundation bed if no improvement measures are taken.

6. The maximum dry density ($\gamma_{d,max}$) is also low and as such the material may not be recommended for construction of high embankments and earthen dams without proper treatment.

7. The soil can be used as a subgrade material for low intensity traffic loads and low embankments not exceeding 4 metres height. However soil can be made suitable by soil stabilization, use of geotextiles, use of stone columns or preloading methods. These measures may be essential particularly in case of building structures and heavy traffic loads.

8. Even though the sand content is quite high, the strength parameters and maximum dry density have low to medium ranges perhaps due to presence of organic matter. The maximum dry density in the present case is based on standard proctor and it’s going to increase if modified (heavy compaction) is used which is recommended for all important structures.

9. As a final conclusion the soil can be used for any type of construction if proper improvement measures such as soil stabilization, extensive compaction, preloading at site, use of stone columns, are included. The soil is quite as a fill material and as a land reclamation which may provide a good agricultural land due to presence of all soil ingredients that is sand, silt, clay and organic matter.

References


Abstract—In this study, I examined the properties of the geo-textile. In this investigation I used geo-textiles with and without cement concrete pavement. Jute Geo-textiles (JGT) is a natural form of geo-textiles which is derived from plants called Geo-synthetics. Geo-textiles are used for filtration and isolation in road construction, in which water is not interrupted. As we know concrete is feeble in stress and has fragile character. In all natural fibers, jute fiber is an ideal material for changing synthetic fibers due to its high tensile strength and special microstructure. The highest production quantity jute is the cheapest natural fiber which is easily available and which is also cheaper than plain concrete. In the experimental study, I found that jute fiber delays the concrete hardening and improves the counteraction of the concrete when there is a crack. In experimental studies, I found that jute fiber delays the concrete hardening and improves the counteraction of the concrete when there is a crack. In all natural fibers, jute fiber is an ideal material for changing synthetic fibers due to its high tensile strength and special microstructure.

Keywords: Geo-textiles, Jute Fibers, Compressive strength, Concrete, Plain Concrete

I. INTRODUCTION

Concrete is a combination of binding materials, coarse aggregate, fine aggregate, and water. Concrete is hard and strong like stone, this is caused by the chemical reaction which takes place between water and cement. We can use fiber to overcome the shortcomings of plain concrete which is very effective. Fiber can ensure post-cracking obstruction, high-energy absorption facilities and increasing fatigue resistance of cement-based composites. Between two different types of fibers i.e., natural fibers and artificial polymer-based fibers, natural fibers are promising to use as reinforcement to overcome the inherent deficiencies in fiber reinforced concrete (FRC) with polymer-based fiber. Natural fibers, which are biodegradable, inexpensive, environmentally friendly, easy availability, are produced from naturally available resources, for instance, coconut tree, banana tree, cotton, jute, etc. Composites are fabricated by combining reinforcing material with concrete which enhances the structural properties of concrete and it is commonly known as fiber reinforced concrete. In this study, an effort is made to evaluate the compressive strength characteristics by adding jute fibers in plain cement concrete. As a process of waste management, the jute fibers that are produced in large scale are used as a reinforcing agent with concrete so that there is a significant increase in the structural properties of concrete. Normally a composite material such as fiber reinforced concrete comprises of a variety of fibers which may be natural or artificial. The addition of these natural fibers is more economical compared with artificial fibers. We use these fibers to remove the brittle behavior of concrete. Because jute is easily found in India and it is also cheap. In India, jute is used quite a lot, such as making ropes, carpets, doormats, foam-backed carpets and other decorative objects. Jute is applied in many places with fiber, which gives good results. Jute has an inferior density, high specific properties, less abrasive character to the equipment technology, good dimensional durability, and harmlessness.

Jute geo-textile is a very cheap and environmentally friendly product, it is abundant available, easy to transport and has the ability to maintain moisture. It is used as a natural choice for plant mulching and rural road pavement construction. An attempt to identify the optimum percentage of jute fibers which are to be used with concrete in order to achieve the maximum compressive strength is reported in this article.

II. MATERIALS

A. Cement

Cement is a material used for construction works. It works as a binder, which simultaneously sets up other materials and hardens. Cement is used to tie sand and gravel (aggregate) together. Sand and gravel are known as fine aggregate and coarse aggregate. If the cement is added with sand only then it makes mortar which is used for masonry works and if mixed both sand and gravel with cement then it
makes concrete used for RCC works. Cement is of various types but mostly used cement is OPC which is known as Ordinary Portland cement. It has three grades which are 33, 43 and 53. Ordinary Portland Cement of grade 53 from IS-269:1989, IS-8112:1989, IS-12269:1987 is used with an initial setting time of 30 minutes and the final setting time of 600 minutes.

B. Aggregate
Aggregates used in the concrete matrix increase the soundness and impact absorbing properties of the concrete. Aggregates with same nominal size and grading induce the concrete with satisfactory workability. Aggregates are mainly of two types: Fine & Coarse Aggregate. The fine aggregate used is the M-sand passing 4.75 mm sieve and coarse aggregate is used for greater than 4.75mm is taken for the mix. The values of the specific gravity for fine aggregates and coarse aggregates are found to be 2.55 and 2.76 respectively and the values of fineness modulus for coarse aggregate and fine aggregate are 3.215 and 4.285 respectively.

C. Jute Fibers
Jute fibers are of silky texture. These fibers are biodegradable and eco-friendly. The common structural properties of the jute fibers are very high tensile strength and low extensibility. In the present study, raw jute fibers cut to a length of 10 mm are used. The content of jute fibers is determined with respect to the weight of cement. The various percentages of jute fibers that used to cast the specimen are 0.2 %, 0.4 %, 0.6 %, 0.8 %, 1 %, 1.2 %, 1.4 %, 1.6 % and 1.8 %.

III. FUNCTIONS OF GEO-TEXTILES
Geo-textile basically do six identical functions. These functions are filtration, sealing, separation, drainage, reinforcement and protection and can do one or more tasks at a time.

A. Separation
The inducement of a malleable fiber to be placed between decomposed soil sub-grade is such that the behavior of both the sub-grade material will remain undamaged which is called separation. The basic work of separation in geo-textile is to prevent the mixing of two surrounding soil. For example, fine sub-grade soil can be separated from the aggregates of the base course by separation.

B. Filtration
Geo-synthetic is a fiber that is placed between two unequal materials, which maintains integrity and functionality. Figure 3.2 shows the filtration. The geo-synthetic allows the fluid flow across its plane while retaining fine particles on its upper side. It may also involve providing long-term stress relief.

C. Transmissivity
Transmissivity is known as the potential of a broad non-woven geo-textile, whose 3-D framework provides a route for the flux of water through geo-textile. In this process, the geo-textile stimulates a slanting flow, resulting in the
wastage of the kinetic energy of capillary growth of groundwater.

![Fig. 5 Filtration & Transmissivity](image)

**D. Reinforcement**

Reinforcement is the integrated development in the total structural strength generated by the addition of a geo-textile into a soil. This is formed essentially by the following three mechanisms: First, the lateral abstinence of abrasion between geo-textile and soil / aggregate. Secondly, it focuses on the potential of bearing surface failure plane to develop further shear strength surface and the third point is its support of the wheel loads.

**E. Sealing Function**

A non-woven geo-textile performs its function when there is abundant with asphalt or some other synthetic blends which performs relatively in the plane and cross-plane flow. Liquid blockades in paved road reformation are the definitive application of geo-textile. It is shown in Figure 3.3. In this function, firstly an asphalt tack coat is applied on the current pavement after that nonwoven geo-textile is placed on this. Water is absorbed by the asphalt outcome in the composition of waterproofing covering, which minimizes vertical water flow into the pavement structure.

**IV. GEOTEXTILE CONSCIOUSNESS IN INDIA**

Since the demands and applications of geo-textile have become very high, some manufacturers of Geo-textile believe that development in geo-textile within India is a big challenge. It could be improved by giving proper attention. Jeevan product is one of the sound and famous company, which is building non-woven geo-textile in India from the last 2000 years but the main problem is that the present-day expertise will be suitable for climate or not because deficiency is seen in the geo-textiles which is a major impulse. As the climatic and geographical weather condition is different, it might be possible that the American and European specifications won't work in Indian climatic conditions and existing soil strata. For this certain hit and trials are going on different soil strata in India. Since India has faced a high level of soil loss each year due to its monsoon seasons, so geo-textiles are progressively being implemented for restricting the problems of soil erosion on embankments and hillsides of geo-textile.

**V. CONCLUSION**

According to our study, we came to know that when the chemical treatment of jute is done then its depletion decreases. It was seen that the compressive strength of the concrete cube increases when raw jute is added to the concrete. We assume that the improved substitution proportion is beneficial to use as it gives workable concrete with more compressive strength. To protect the aggregate layer from shrinking into the soil, geo-textiles are being used in form of separator between the aggregate layer and subsoil. From the studies, it is clear that it's the time to take a big step towards the use of geo-textiles in Indian road construction. If all the industries collaborate together, we will definitely get practical specifications so that the potential of the geo-textile can be acquired. Tensile strength is the only deficiency in the concrete. It can be improved by using jute fiber which is easily available fiber and being wasted in large quantity. Using of jute fiber material in the overall cost of a project will be cheaper in comparison to the plain concrete rigid pavement. As for rigid pavement, the flexural and compressive strength is important and this also can be enhanced by using jute fiber. Only 0.5% of jute fiber with respect to cement content can give optimum results. So, at last, we assume that cost and compressive strength of rigid pavement will be cheap and durable.

**VI. REFERENCES**


Geometric design of highway can be carried out into various stages; Collecting survey data, Horizontal alignment design, vertical alignment design & cross-section of road, which combines to give a 3D layout of Corridor.

Survey data is needed to be collected from the site by means of various survey techniques which is further used to create a detailed terrain model in Infraworks 360/ Civil3D Horizontal alignment is defined and located in the plan view. It defines the top view of our highway, which includes three important elements namely; Tangents, Circular Curves & Transition curves.

Vertical alignment is the longitudinal view of the highway displaying the important components; summit curves, valley curves & the gradient connecting these curves along the levels of the highway. Highway cross-section shows the details of the roadway such as the number of lanes, width of road and thicknesses of the layers of the carriageway, Drains and the right of way (ROW) of highway.

These tasks were performed using manual drawings & mathematical techniques and manually performing these tasks is very time consuming and can be highly susceptible making very costly errors. Autodesk summarized all the importance of road designing and developed tools for designing like Civil 3D and Infraworks providing us more designing options & increasing our performance. These tolls help us to work on ore realistic environment with higher accuracy enabling the realistic models.

Autodesk Infraworks 360 is a civil engineering designing software developed by the Autodesk, it is also the part of Building Information Modelling (BIM) which enable engineering professionals to perform a
specifications instructed by the IRC design standards.

2. DESIGN METHODOLOGY

A. Survey and Data Collection.

Various Surveys like Reconnaissance survey, Preliminary survey, map study, traffic studies are carried out before starting the project. Site is visited and the main features of the area are observed. The existing ground surface data is required to carry out the design procedure for which the Co-ordinates (Northing, Easting) and the ground elevations are collected during topographical survey in form of a point cloud or a point file in Excel sheet which is further imported inside the Infraworks and Civil 3D.

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Fig.-1 coordinates of points

B. Design criteria

The design criteria which is based on the Indian Road Congress design standard IRC SP 73-2015 are assigned to complete the geometric design of highway which are as follows:

i. Design speed = 80 km/h
ii. Super-elevation rate = 5%
iii. Lane width = 3.5
iv. Ruling gradient = 2.5%
v. Desirable Minimum Radius = 400 m
vi. Transition Curve calculation

$L_s = \frac{0.0215 \times V^3}{CR}$ and $L_s = \frac{2.7V^2}{R}$

We must take the higher value from the above two formulas

Where,

$L_s$ is the Length of transition curve,
$V$ is the design Speed,
$R$ is the Radius of curve,
&C can be calculated as $80/(75+V)$.

vii. Stopping Sight Distance (SSD) = 120 m
viii. Overtaking Sight Distance (OSD) = 470 m
ix. Paved Shoulder width = 2.0 m
x. Earthen Shoulder width = 1.5 m
xi. Carriageway width = 7 m

C. Flow chart of the Design Procedure for Infraworks & AutoCAD Civil 3D

D. Designing Horizontal alignment of highway.

Draw an alignment of the highway needed to be design using design tab and component roads in Infra works and export the designed alignment into civil 3D. The improvements in the alignment are done keeping in mind that the alignment should be fluent as it must not have too many curves. Ideal alignment must be chosen avoiding the sharp, the curves must have appropriate length. We must avoid the broken back curves and the reverse curves. The curves must have transition providing smoothness to the curve. The distortion in appearance of the horizontal alignment and
vertical alignment must be coordinated carefully for proper denotation of data.

The superelevation is restricted to 7% where the radius of curve is less than desirable minimum radius and which superelevation is restricted to 5% where the radius of curve is more than desirable minimum radius. The Desirable minimum radius is taken as 400 m whereas Absolute minimum radius is taken as 250 m.

E. Designing vertical alignment of highway

In the first step we need to create the existing ground profile using profile view option from the ribbon. After generating the existing profile, we need to create a new profile with the help of the profile creation tool, this new profile will be our finished grade of the highway. The length of the valley curve must be determined using the HSD and the length of summit curves must be determined using the SSD and the ‘K value’ must be calculated for the safety purpose.

We can calculate length of vertical curve by using the formula

\[ L = KA \]

Where \( L \) = length of curve.
\( K \) = difference of intersecting grades known as k value.
\( A \) = difference in grades.
Frequent change in the grades must be avoided to overcome Profile’s visual discontinuity.

3. DESIGN OUTPUT

A. Horizontal alignment
The horizontal alignment produced in Infraworks and AutoCAD civil 3D is presented in Fig. 3 & 4. Where Fig. 5 & 6 are representing the horizontal curve and super elevation schematics.

B. Vertical alignment
The Vertical alignment produced in AutoCAD civil 3D is presented in Fig. 7.
C. Assemblies
Fig. 8 represents the assemblies and cross-section used in designing the highway.

![Fig.8 assemblies and cross-section](image)

D. Corridor views
Fig. 9 & 10 are representing the realistic corridors generated after completion of design

![Fig.-9 Output Infraworks](image)

![Fig.-10 Output Civil 3D](image)

4. CONCLUSION

After performing the complete design of the highway, we can conclude by saying that these designing tools helped a lot in designing and the efficiency of work has been increased drastically, which makes the completion of work much faster reducing errors and increasing accuracy. This collision of civil 3D and Infraworks 360 is found to be much accurate as compared to other methods.

REFERENCES

Traffic Congestion Charging Based on tenable Advancement

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Abstract— Walking is perhaps, one of the oldest among all other available modes but is totally discriminated for being considered as a mode of transportation. This may be because of the fact that it is a fundamental or natural means of transport for a person to move from one place to another and needs no vehicles for such. But for the trips of fewer distances it is very much efficient as well as effective mode of transportation than any other. Pedestrian movement may be possible for many purposes like from home to market, office, school, colleges etc. Moreover walking also assist the outgoings of all other modes. On Indian roads, due to less awareness about the complex traffic system the pedestrian are usually seen confused while walking besides or crossing the road. Also some Emotional and psychological factors affects the pedestrian while taking immediate decisions which may decrease their reaction time in case of critical situations. On Indian Roads susceptibility of the pedestrian compared to other road users is very high, and also they become the victims of large number of road accidents every day. Giving sufficient awareness to the Pedestrian about their safety, security and their duties as pedestrian on the road is a practical solution of these problems. This can be achieved by considering a pedestrian as an important part of the traffic system while planning and providing some guidelines, rules and regulations for the pedestrian flow by justifying their reaction.

Keywords—Walking, Pedestrian, Modes, Transportation, Accidents, Behavior, Regulations

I. INTRODUCTION

In Transportation System Walking is perhaps, one of the Oldest among all other available modes. It is basic and necessary mode of transportation chain which is used by each and every person on this planet. Walking also assist the outgoings of all other modes, that is whatever is the mode one like to choose for travel, the Initial and final mode will be walking. It is the cheapest mode available for the Transportation of people which have minimum disturbance to the surrounding environment. Pedestrian is defined as a person who uses to walk from one place to another which includes Person with physical disabilities also, like those who use wheel chairs or any other kind of assisting devices. As per the demography, India is on the 2nd place in the list of Population, having 1.27 billion people. The contribution of this number to the world is about 1/6th which is about 17.6% of the total population of the world. In Previous decades because of extemporization of social and economic conditions in India, a large number of vehicles mobility has been witnessed at urban centers. With the fast growth rate of population and crowded on the roads, the need of the adequate pedestrian facilities is also increasing in the urban centers. The Design and Planning of such facilities is also very important to provide sufficient Space for the free movement of the Group of people. There are number of points which have reasonable affect on influencing the walking demand. Few of them are Vehicle ownership, Quality of Facilities, Safety and Security Provisions, Local Activities etc.

A. Vehicle Ownership: The number of private vehicles available in the locality also affects walking. More number of private vehicles minimizes the amount of pedestrian.

B. Quality of Facilities: A better quality of facilities maximizes the demand of walking.

C. Safety Provisions: It is Significant that the facilities provided should be safe and secure from any clash between vehicle - walker and have less risk for any kind of personal attacks.

D. Local Activities: It is an important factor which influences the rate of demand of walking. For Short trips walking is more frequently a choice of people, such as for local origins and destinations.

E. Nature of People: It has been observed the community with maximum number of young person’s has more frequency of walking demand.

With the fast growth of the vehicles in the whole world Environmental problems are raising rapidly, walking is an alternative to reduce such problems. Physical health is also an influencing factor for walking. Walking play a great role in
keeping the one physically fit. While planning a facility for walking, safety and security of pedestrian is a big issue at poor visible points where vehicle-pedestrian could clash with each other, such as at intersections. A poor facility may results in more accident circumstances. A lot of problems are being faced by pedestrian and a car driver on busy roads. Darting is one of such problem which reflects sudden appearance of pedestrian in front of vehicle. Dashing is another problem refers to running Pedestrian. According to a study children having age group less than 14 years are the one forming a list of more number of accident victims who have highest rate of injury. The fatality rate of the older group is more because of less chances of recovery from such injuries. Also the Behaviour of pedestrian may be affected by alcohol or any kind of intoxicating drugs. Seeing all this it is significant to have a better Facility System Which should fulfil the purpose of backing a pedestrian both in physiological and psychological manner and assure them against any overexertion or mischance. This is the reason because of which in recent decades a lot of research and study has been started in this area of Transportation System. Samples are usually taken at such locations where volume of walkers is more in numbers against the density. The point like Business locations, Group of people coming out from theatres and stadium doors at same time, malls etc.

II. LITERATURE REVIEW

A. Corol Holland and Ros Hill (2010) observed in their research that age and Gender of a pedestrian are the factors which may affects the variations in the accidental Injuries and Causality. They did their study on 218 different adult Pedestrians age group from 17 to 90 years. They used Methods of Simulation Study by using Filmed real traffic situations. They observed with increasing age, the women makes unsafe decisions more while Crossing a Road, Leaving small safety margins and estimates poor about walking speed. Men of the same age were not a big factor in Predicting unsafe crossing decisions. The male who drives looks both sides while crossing a road in comparison to those who don’t drive.

B. wari and Chatterjee (2013) did a research on the pedestrian and comes to the conclusion that they are at high risk on the roads of Delhi. This is due to the fact that while planning part the needs of walkers were not recognized by the planning department. Also the rapid increase in the 2 or 4 wheeler vehicles on the roads is forcing to built a large number of expressways, flyovers etc for their free flow, which exposes the pedestrian to the high risk on the road. They prepared a statistical analysis on pedestrian’s behavior towards risk taking while crossing the roads and in beginning and after the grade separator was provided there. It has been seen an important part of the pedestrian number was willing to take risk in both conditions that is before and after the facilities construction. Because of the construction of the grade separators the speed of all type of vehicle was increased on the road, these increases the waiting time of the pedestrian in the capital of the country. The study also revealed that when no signals where provided the behavior of the pedestrian becomes independent which results in the increase in risk taking behavior.

C. Satish Chandra, Rajat Rastogi et al (2014) studied parametric analysis of pedestrian gap acceptance in mixed traffic conditions and come to the conclusion that there are three different ways of crossings used by pedestrian. First is single stage, second type is two stages and third is rolling gap. Acceptance of single stage gap was found to have less deviation from critical gap. Two stage crossings were less in number and people preferred rolling gap crossing as compared to the other two types of crossing. The minimum gap was accepted for Young pedestrians while for the old pedestrians it was maximum. It was found that the older pedestrians exhibit a higher level of deviation in their accepted gap from critical gap than the other two categories. Based on age, it was found that young pedestrians take higher risk while crossing the roads. The critical gap at four locations was between 5.90 and 7.60 s and it decreases with increasing road width. It suggests that crossing speed of pedestrian increases with road width. Considering the safety aspect, a general value of 8 s is recommended for design of crossing facilities (like signal) and a higher value of 12 s are recommended at locations where female or old pedestrians are substantial.

D. Asaithambi, O. Kuttan and S Chandra (2016) studied the behavior of pedestrian on the road while crossing under mixed traffic conditions. They studied the intersections points in the beginning and after the execution of the control measures at those points. They studied different parameters that involve gender, age, crossing time, speed, crossing pattern, waiting time etc. by videography. They concluded a large number of pedestrians while crossing a road likes to cross it in one step, after the execution of signals pedestrian had as much space while crossing road at the
red signals for Cars and other vehicles. The pedestrian waiting time was increased after the signal installation. They also concluded 15% of Pedestrian Crossing Speed was reduced in both Scenarios than the recommended IRC (103) Crossing Speed of 1.2m/s. Because of Decreasing Speed, the critical space between the pedestrian was also reduced.

III. METHODOLOGY AND DATA COLLECTION

The Location that was selected for collecting data was Vikram Chowk, which is Center Place of Jammu City, Jammu and Kashmir, India. Thousands of pedestrian daily passes from this location and have high chances of vehicle-walker interaction. This Chowk is an uncontrolled intersection of three legged T-Intersection. A sample of about 110 pedestrian of different age group is used for conducting the research work. The Data was collected by using Video graphic technique on the winter days when Jammu has peak amount of population.

IV. DATA EXTRACTION AND ANALYSIS

The data extracted from the video graphy technique is used to obtain the useful information of the Pedestrian walking individually or walking in a group. The information like Age, Gender, their pattern while walking, walking speed, density, Pedestrian behaviour at intersections etc.

Figure 4: Pedestrian’s age group

The Figure 4 shows pedestrian’s Age groups. The figure 4 is a bar chart plotted between Pedestrian age and Pedestrian Number. There were 9 age groups of the pedestrian on which the study has been conducted. As the location was near most of the educational institutes of the city, hence the pedestrian group consists of a large number of Students age varying between 21-25 and 26-30. The pedestrian of age group 21-25 has maximum number in the available data and Age group of lesser than 20 has minimum number of Pedestrian. Other age groups in the Pedestrians list were 31-35, 36-40, 41-45, 46-50, 51-55 and 55-60. The
A. Analysis of Crossing Behaviour: From the available data, an attempt was made to understand the behavior of the pedestrian on his/her priority towards safety. We have categorized the walking behavior in two ways.

1. Tactful Behaviour: Tactful pedestrian where those who were showing active and thoughtful behaviour on the road while crossing. They were very careful and safety concern and crossing the road while waiting for safe space to walk.

2. Perilous Behaviour: Perilous Behaviour was careless behaviour of the pedestrian who took risky decisions on the road while crossing it. They were not much safety concern and showing hurry in every reaction.

Figure 7 shows a bar chart in which Tactful and Perilous behavior of the Pedestrian is shown on the basis of number. It has been observed that most of the Pedestrian were showing tactful behavior while crossing the road while other pedestrian was showing Perilous Behavior. In this study it has been observed that 75/110 pedestrian were tactful on the road while crossing it and 35/110 pedestrian were showing Perilous Behavior. Further when the data was studied on the basis of the gender and the age group of the pedestrian, it has been concluded that females of all age group are more tactful than the males of that age. The figure 8 shows the bar chart on Perilous behavior on Road on the basis of gender. Here the blue color represents the male pedestrian and brown color represents the Female pedestrians. From the data it has been studied that the females gives more priority to the safety on the road and males of all age groups are less safety concern than the females of that age group.
V. CONCLUSION

While crossing road safety is an important factor for the smooth functioning of the traffic system. In this research paper an attempt is made to understand the priority towards safety in comparison to speed, by the pedestrian on the basis of their age group and gender. This data can be used while designing the various facilities for assisting pedestrian movement. It has been concluded that the females of all age group are more concern about their safety on the road while crossing. They take more wise decision on the road in such situations. While the male have quite careless behavior and are less safety concern than them. Also the pedestrian waking with their families was more tactful and safety concern than an individual pedestrian, especially the pedestrian with the children were showing very careful reaction while crossing the road.

References

[1]. Holland, Carol, Hill, Ross (2010) Gender differences in factors predicting unsafe crossing decisions in adult pedestrians across the lifespan: A simulation study, Accident Analysis & Prevention, 42(4), 1097-1106.


Strengthening of Subgrade Soil by Using Crushed Concrete

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Abstract - Recycled aggregates consist of crushed, graded inorganic particles processed from the material that have been used in the constructions and demolition debris. The target of the present work is to determine the strength characteristic of recycled aggregates for the application in concrete pavement construction. The investigation was carried out by using workability test, compressive strength test, flexural strength test and sulphate resistance test. A total of five mixes with replacement of coarse aggregates with 0%, 10%, 20%, 30% and 40% recycled coarse aggregates were studied. The water cement ratio was kept constant at 0.38. It was observed that workability of concrete was decreased with the increase in recycled aggregates in concrete.

I. INTRODUCTION

In the era of construction, concrete has been the leading building material since it was discovered and found viable for future due to its durability, easy maintenance, wide range of properties and adaptability to any shape and size. Concrete is the composite mix of cement, aggregates, sand and water. Concrete have high compressive strength and low tensile strength. To overcome this shortcoming, steel reinforcements are used along with the concrete. This type of concrete is called reinforced cement concrete (RCC). Concrete structures that are designed to have service lives of at least 50 years have to be demolished after 20 or 30 years because of deterioration caused by many agents. Old buildings require maintenance for better and higher economics gains. The rate of demolition has increased and there is a shortage in dumping space and also increase in cost of dumping. Instead of dumping this demolished concrete, use of demolished as recycled concrete would not only reduce the cost but also will conserve the non-renewable energy sources. The use of demolished concrete will further result in reduction in use of natural aggregates.

II. EXPERIMENTAL PROGRAMME

General

Mix design is done to select the mix material and their required proportions. There are a lot of methods to determine the mix design. The methods used in India are in compliance with Bureau of Indian Standards (BIS). The motive of mix design is to determine the proportion in which concrete ingredients like cement, water, fine aggregates and coarse aggregates should be mixed to provide specified strength, workability, durability and other specified requirements as listed in standards such as IS: 456-2000. The designed concrete mix must define the material and strength, workability and durability to be attained. Concrete mix design guidelines are given in IS: 10262-1982. In the study, 5 batches of mixes were prepared. These batches were designated as m0, m1, m2, m3 and m4. Batch m0 was taken as control mix. The natural coarse aggregate was replaced by recycled aggregate in proportion of 0%, 10%, 20%, 30% and 40% in m0, m1, m2, m3, and m4 respectively as given in table 1.

<table>
<thead>
<tr>
<th>Type of Mix Used</th>
<th>Recycled Aggregate (%)</th>
<th>Natural Aggregate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>m0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>m1</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>m2</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>m3</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>m4</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

Table 1. Proportions Of Natural And Recycled Aggregates In Batches
MATERIAL PROPERTIES
The physical and mechanical properties of all ingredients like sand, natural coarse aggregates, cement and demolished coarse aggregates are per IS: 2386-1963 were determined.

Cement
OPC (Ordinary Portland Cement) of grade 43 was used which conformed to IS: 8112-1989. Testing of cement was done as per IS: 4031-1968.

Natural Fine Aggregates
Natural coarse sand was used as fine aggregate. The sand conformed to zone II as per IS: 383-1970.

Natural Coarse Aggregates
Coarse aggregates of size 10mm and 20mm were used.

Water
Properties of water used were as per clause no. 5.4 of IS 456-2000. It was free from deleterious materials. Water was used for mixing and curing of concrete. Portable water is generally taken for mixing and curing of concrete.

Mix Proportion
As per design of concrete mix M40, the ratio of cement, fine aggregate and coarse aggregate was taken as 1:1.23:2.52 respectively.

Table 2. Sizes of Molds

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Moulds</th>
<th>Size(mm×mm)</th>
<th>Specimen Casted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cube</td>
<td>150x150x150</td>
<td>Compressive Strength</td>
</tr>
<tr>
<td>2.</td>
<td>Beam</td>
<td>100x100x500</td>
<td>Flexural Strength</td>
</tr>
<tr>
<td>3.</td>
<td>Cube</td>
<td>150x150x150</td>
<td>Sulfate Resistance</td>
</tr>
</tbody>
</table>

Table 3. Number of Samples Casted

<table>
<thead>
<tr>
<th>Type of Mix</th>
<th>For Compressive Strength</th>
<th>For Flexural Strength</th>
<th>For Sulphate Resistance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>m0</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m1</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m2</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m3</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>m4</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>45</td>
<td>30</td>
<td>135</td>
</tr>
</tbody>
</table>

II. RESULTS AND DISCUSSION OF RESULTS
Testing of sample was done at 7, 28, 56 and 90 days for compressive strength. For flexural strength testing of samples was done at 7, 28 and 90 days. Testing for sulphate resistance was done at 7, 28 and 56 days. In this chapter, results of these tests are discussed along with the results of workability.

Workability varied with change in proportion of demolished aggregates. The slump values and compaction factor values did not show a uniform pattern as the percentage of demolished aggregates was uniformly varied. Figure 1 gives the variation of slump values versus type of mixes. Figure 2 gives the variation of compaction factor versus type of mixes.
Variation of Compressive Strength with Age
Table 4 gives the test results of compressive strength at 7, 28, 56 and 90 days. Water cement ratio was kept as 0.38 for all mixes. Super plasticizer used was 0.6% of cement. Table 5 gives the percentage reduction in compressive strength for all mixes at different number of days. Number of Samples Casted
Table 6 gives the test results of flexural strength at 7, 28, and 90 days. The results of flexural strength are the average of 3 beams. Table 7 shows the percentage reduction in flexural strength for all mixes at different ages. Figure 4 shows the comparison of flexural strength at ages of 7, 28 and 90 days.
Table 4. Test Results for Compressive Strength

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>W/C</th>
<th>Compressive strength (MPa)</th>
<th>7 Days</th>
<th>28 Days</th>
<th>56 Days</th>
<th>90 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>m0</td>
<td>0.38</td>
<td>42.43</td>
<td>50.06</td>
<td>51.20</td>
<td>51.8</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>0.38</td>
<td>42.47</td>
<td>50.36</td>
<td>50.89</td>
<td>51.23</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>0.38</td>
<td>41.84</td>
<td>50.20</td>
<td>50.68</td>
<td>50.80</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>0.38</td>
<td>42.60</td>
<td>49.11</td>
<td>50.68</td>
<td>51.4</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>0.38</td>
<td>40.27</td>
<td>52.36</td>
<td>53.24</td>
<td>53.26</td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Percentage Reduction in Compressive Strength at Different Ages.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Age (in days)</th>
<th>% age Reduction in Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>m0</td>
</tr>
<tr>
<td>1.</td>
<td>1:1.23:2.52</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>1:1.23:2.52</td>
<td>28</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>1:1.23:2.52</td>
<td>56</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>1:1.23:2.52</td>
<td>90</td>
<td>-</td>
</tr>
</tbody>
</table>

Fig- 3 shows the comparison of compressive strength of different mixes at 7, 28, 56 and 90 days.

Fig 3. Comparison of Compressive Strength of all Five Mixes with Age of 7, 28, 56 and 90 Days
Table 6. Results of Flexural Strength

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>W/C</th>
<th>Flexural strength (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>1.</td>
<td>m0</td>
<td>0.38</td>
<td>4.20</td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>0.38</td>
<td>4.31</td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>0.38</td>
<td>4.10</td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>0.38</td>
<td>4.12</td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>0.38</td>
<td>4.22</td>
</tr>
</tbody>
</table>

Table 7. Percentage Variation of Flexural Strength at Different Ages.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Age (in Days)</th>
<th>% age Reduction in Flexural Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>m0</td>
</tr>
<tr>
<td>1.</td>
<td>1:1:23:2.52</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>1:1:23:2.52</td>
<td>28</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>1:1:23:2.52</td>
<td>90</td>
<td>-</td>
</tr>
</tbody>
</table>

Sulphate Resistance of RCA Concrete

In this section of study, effect of sulphate solution on compressive strength of RCA concrete was investigated. Concrete cubes were kept in MgSO$_4$ (magnesium sulfate) solution for 7, 28 and 56 days after normal curing for 28-days. Compressive strength of cubes was checked by using CTM. Table 8 gives the test results at age of specified number of days. Table 9 gives the details of percentage reduction in compressive strength at the age of specified number of days.
Table 9. Test Results for Sulphate Resistance

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Type Of Solution</th>
<th>Compressive Strength(MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>1.</td>
<td>m0</td>
<td>5% of MgSO₄</td>
<td>41.75</td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>5% of MgSO₄</td>
<td>41.79</td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>5% of MgSO₄</td>
<td>38.8</td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>5% of MgSO₄</td>
<td>41.8</td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>5% of MgSO₄</td>
<td>39.53</td>
</tr>
</tbody>
</table>

Table 9. Percentage Reduction of Compressive Strength Due to Sulphate Attack

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Mix</th>
<th>Type of solution</th>
<th>% age reduction in compressive strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>1.</td>
<td>m0</td>
<td>5% of MgSO₄</td>
<td>98.42</td>
</tr>
<tr>
<td>2.</td>
<td>m1</td>
<td>5% of MgSO₄</td>
<td>98.4</td>
</tr>
<tr>
<td>3.</td>
<td>m2</td>
<td>5% of MgSO₄</td>
<td>92.73</td>
</tr>
<tr>
<td>4.</td>
<td>m3</td>
<td>5% of MgSO₄</td>
<td>98.2</td>
</tr>
<tr>
<td>5.</td>
<td>m4</td>
<td>5% of MgSO₄</td>
<td>98.17</td>
</tr>
</tbody>
</table>

Fig- 5 gives the comparison of compressive strength of all mixes kept in MgSO₄ solution at the age of 7, 28 and 56 days.

![Figure 6 Comparison of Compressive Strength of all Mixes Kept in Mgso₄ Solution at the Age of 7, 28 And 56 Days.](image-url)
IV. CONCLUSIONS

Following conclusions can be drawn from results and discussion of results from the study:

1. The compressive strength of all mixes exceeded at the age of 28 days. Compressive strength of control mix i.e. of m0 is 50.05 MPa which is greater than the target strength of 48.25 for M40 concrete. Compressive strength of m1 is slightly increased to 50.36. So the compressive strength increases by 0.5%. For m2, compressive strength is increased to 50.20 MPa, it also showed an increase in compressive strength by 0.3%. Compressive strength of m3 is decreased to 49.11 MPa that showed a decrease in compressive strength by 1.9%. But in case of m4, there is sudden increase in compressive strength that raises the compressive strength to 52.36 MPa. Compressive strength is increased by 4.5%. So the results of test show that compressive strength does not follow a regular trend from m0 to m4. But from the results it is also concluded that compressive strength never went below the target strength for 28 days. This indicates that RCA can be used as replacement aggregates for compressive strength.

2. Flexural strength also followed the same pattern as of compressive strength. Flexural strength of control mix is 5.32MPa at age of 28 days. Flexural strength of mix m1 increased to 5.60 MPa. It shows that the increase in flexural strength is 5% for m1. For m2 flexural strength at age of 28 days is 5.40MPa, which shows an increase in flexural strength by 1.5%. Flexural strength of mix m3 is 5.38 and the flexural strength increased by 1 %. For the mix m4, flexural strength is 5.40 MPa. It shows that the flexural strength increased by 1.5 % at the age of 28 days. From the results and discussion of the results it is found that the flexural strength of RCA concrete is comparable to the natural aggregate concrete which is a positive point. So the RCA concrete can be used for flexural strength by adjusting W/C ratio.

3. Use of 5% of MgSO₄ solution caused the reduction in compressive strength. The compressive strength of RCA mixed concrete reduced upto 7%. Effect of sulphate solution increased when quantity of demolished concrete aggregate increased.

This study showed that the strength of m4 at 56 days was most affected. So with increase in sulphate caused reduction in compressive strength of concrete.

4. It was found that the RCA concrete have relatively lower bulk density, specific gravity and high water absorption as compared to natural concrete. This was due to the presence of mortar in present on recycled coarse aggregates.

5. In this study, trial castings were done to arrive at water content and desired workability. So it was advisable to carry out trial castings with demolished concrete aggregate proposed to be used in order to arrive at the water content and its proportion to match the workability levels and strengths requirements respectively.

6. From this study it was observed that the demolished concrete was viable source for construction of concrete pavements. Economical and environmental pressures justify suitability of RCA concrete as alternative to the natural concrete. Where there is non-availability of natural aggregate from new rocks RCA can be a good or viable replacement option for natural coarse aggregate in pavement construction.

From above conclusions it can be said that it is eco-friendly and creative to use demolished concrete in construction of concrete pavements.

REFERENCES


Study the Role of Digitalization in Banking Sector as Compared to Traditional Banking

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Prof. (Dr.) Sudhinder Singh Chowhan, NIMS University, Jaipur, Rajasthan, India

ABSTRACT - The process of Computerization got the popularity with the opening of the economy in 1991-92. It was a major element which was there to drive for this change was influenced by rising competition from private and foreign banks. Several commercial banks started to provide services in different manner by moving towards digital customer services to remain competitive and relevant in the race. Digitalization is providing lots of benefits and digitalization in on service to customer which is going to reduce the time to provide better services to customer in a way to give maximum value and satisfaction. This review paper is going to reflect the role of digitalization in banking sector as compared to traditional banking.

I. INTRODUCTION

In banking sector in late 1980s, in order to improve the customer service, book-keeping it was felt that there is a need for computerization. The necessity was also felt for proper MIS reporting which was suffering from so many loopholes. So in order to do that in 1988, Reserve Bank of India set up a Committee on computerization in banks headed by Dr. C. Rangarajan.

In the beginning banks started to use Information Technology by introducing standalone PCs and migrated to Local Area Network (LAN) connectivity. To do more advancement, the Core Banking platform was adopted by banks. There was the conversion of traditional branch banking changed to Advance banking. Banks were enabled to increase the comfort feature to the customers as a promising step towards enhancing customer convenience through Anytime and Anywhere banking through Core Banking Solution (CBS). Now there was the great popularity of Different Core Banking platforms such as Finacle designed by Infosys, BaNCS by TCS, FLEXCUBE by i-flex. The process of Computerization got the popularity with the opening of the economy in 1991-92. It was a major element which was there to drive for this change was influenced by rising competition from private and foreign banks. That was the time when several commercial banks started moving towards digital customer services to face the competition and exist in the race.

There was a drastic change in banking industry because Banks in India have seen a radical change from 'conventional banking to convenience banking'. Today, they are moving for 'digital banking' at a rapid pace. With the effect of the convenience in 'Anywhere Banking' the number of customer base has also increased. Human error was reduced due to Digitalization. It is more impactful to access and analyze the data anytime enabling a strong reporting system. Now a days, banks are aiming at provide fast, accurate and quality banking experience to their customers. Today, the topmost agenda for all the banks in India is digitization.

There are 2,22,475 Automated Teller Machines (ATMs) and 25,29,141 Point of Sale devices (POS), according to the RBI Report in 2016-17. There is a wide acceptance of Implementation of electronic payment system such as NEFT (National Electronic Fund Transfer), ECS (Electronic Clearing Service), 'RTGS (Real Time Gross Settlement), Cheque Truncation System, Mobile banking system, Debit cards, Credit Cards, Prepaid cards in Indian banks. These are proved as remarkable landmarks in the digital revolution in the banking sector.

Latest technologies used by banking sector include Innovation in payments, banking and shopping. Sending money through Non banking features such as movie tickets, split bills, gift vouchers, SMS, Email, WhatsApp, Google+ Amongst the top 4 wallet apps in terms of time spent on the app1Only bank app to figure in the top wallet apps
A. M Visa
On debit cards for enabling in-store payments by just scanning a QR code using from the customers mobile phone camera M Visa is used by existing debit cardholders. It is the upgraded version in pockets app, which was released for existing debit cardholders. It is mobile payment solutions which can be used through smartphone to use the debit and credit cards.

B. Unified Payments Interface (UPI)
UPI is the platform which is helpful to transfer the fund from one account to another account as well as one person to another person who’s not using the account in same bank, all the transaction is based on Virtual payment Address. UPI is mobile banking applications which offered UPI in ‘Pockets’ and ‘iMobile’.

C. NRI services
By the demand from NRI’s customers, bank has now started to provide mobile remittance service; largest online presence which enabled instant transfers from US, Canada and UK
Bank also provide the 24x7 toll free customer care accessible from all geographies. NRIs customer also using the facilities of Video banking, internet banking & available for all services.
If we are talking about the paperless account opening it is available for only, NRI customer in US.

D. Banking services on social media
In the present scenario banking has changed the platform for services and they are providing the latest platform for banking such as Facebook banking, transfer the funds on twitter and other mobile based payment app. This platform is also used for to make the telecom bill payment and recharges, fixed deposits and e-statements.
•Hashtags used for transactions: #pay, # reg, # top up, # I bal

II. LITERATURE REVIEW
The main aim or objective of this literature review is to study and analyze literature pertaining to digitalization with respect to banking service quality, consumer satisfaction, consumer behavior, adoption of technology, trust, customer loyalty, brand preference and etc.

Ibrahim, Mohd Taufik, Mohd Adzmir, & Saharuddin (2016) tested the current level of TMs service quality at one of the main ATM service points of a Malaysian bank. According to the research results, to maximise customer satisfaction three out of four elements of service quality dimensions (consistency, dependability and timeliness) are the major important factors

Laukkanen (2016) posited that all advancements meet purchaser resistance, and beating this restriction must happen preceding reception of item. They concluded from their research that the most grounded inhibitor of internet and different ways of using the account defines the level of customer value and satisfaction It was distinguished that selection and dismissal choices can be fundamentally estimated through demographic classifications like sexual orientation and age.

Uppal (2015) in his study concluded that in the post-LPG (Liberalization, Privatization and Globalization) era and Information Technology (IT) era, transformation in Indian banks is taking place with different parameters and the contours of banking services are dynamically altering the face of banking, as banks are stepping towards e-banking from traditional banking. According to researcher with different statistical tools it can be
concluded that customers of e-banks are satisfied with the different e-channels and their services, but the lack of awareness is a major obstacle in the spread of e-banking services.

Mishra & Kiranmai (2014) in their study concluded that information technology is considered as the key driver for the changes taking place around the world. The rise in e-commerce and internet in enhancing online security transformation and sensitive information has been the core reason for the penetration of online banking in everyday life. The shift towards the involvement of the customers in the financial service with the help of technology, especially internet, has helped in reducing costs of financial institutions as well as clients/customers who use the service at any time and from virtually anywhere with access to an internet connection.

Nandan et.al (2013) in his paper discusses the concept of Internet Banking, perception of Internet bank customers, non-customers and issues of major concern in Internet banking. In order to have a clear and focused insight about the perceptions of users (and non-users) about Internet banking a survey was conducted. The findings of the survey provide valuable insights that main concern of customer is for security, reasons for lower penetration, and likelihood of adoption, which have been used to make useful recommendations.

(Gupta & Gupta, 2013) suggested through his research that giving Internet managing an account is progressively turning into a "need" than a "decent to have" benefit. Saving money is currently no longer kept to the outskirt of branches were one needs to approach the branch face to face, to pull back money or store a check or demand an announcement of records.

(Agarwal, 2012). Today, any house PC is capable of carrying out banking and shopping via internet. Remote banking has significant advantages for the service providers, achieves greater efficiency internally and helps to provide its customers an improved level of service, and opens up intelligent marketing options.

III. RESEARCH METHODOLOGY
Research is known as scientific investigation. Research is also called scientific and systematic search for reliable information on a specific topic. Research methodology is taken into consideration because one can have knowledge about the method and procedure adopted for achievement of objectives of the research. By adopting research Methodology research can evaluate the results also. Main Purpose of research methodology is to keep the researchers on the right track.

In this research paper research uses the most recent available published secondary data. Secondary data is collected from E magazines, E-books, Journals, published materials articles, previous studies, and internet sources. In order to achieve the objectives and obtain enough data to find out how people react towards digitalization in comparison to traditional banking system, data was collected through reference books related to Banking Service Quality, E-Commerce, M-Commerce, Information Technology, Marketing, Banking, Finance, Commerce, Management etc.

Research GAP
This study is conducted to assess the information of how people react towards digitalization in comparison to traditional banking system in special reference to private sector banks, and to study the aspects of internet banking, its introduction, its development, adoption by the customers, consumers perception about this service, its success and security related issues. But a very few researchers had studied the net banking service with respect to specific private sector bank. This gap had been identified and it had led to the present research being undertaken.

IV. OBJECTIVES OF STUDY
1. To find out the pace rate of growth in modern banking system.
2. To study response of customers using digital banking service.
3. To know about the digital Banking service provided by Private banking sector.
4. To study the challenges for modernization of traditional banking system.

V. RESEARCH DESIGN
The researcher has used Descriptive as well as Exploratory research design in this research paper. Descriptive research reflects surveys and fact-finding enquiries of different field. The main objective of descriptive research is to describe the state of affairs as it exists at present. Exploratory research reflects the research which is conducted to solve a problem that has not been studied in more precise manner, intended to create priorities, develop operational definitions and improve the final research design.
A. Hypothesis

By considering the objectives of the study, it is intended to test the following hypotheses:

1. \((H_0)\): Thereis positive attitude of customer towards conversion of traditional banking system to digitalization

2. \((H_1)\): There may not be positive attitude of customer towards conversion of traditional banking system to digitalization

B. Research Analysis Tools

Researcher has used different statically tools to analysis the collected data as per there requirement of the study like Chi square t-test, Z-test, Correlation analysis, Ratio Analysis would be used for proper analysis and interpretation. Other statistical tools would be used as per the requirement of the study

C. Sources of Data Collection

Secondary data is used, in this research paper research uses the most recent available published secondary data. Secondary data is collected from E magazines, E-books, Journals, published materials articles, previous studies, and internet sources. In order to achieve the objectives and obtain enough data to find out how people react towards digitalization in comparison to traditional banking system, data was collected through reference books related to Banking Service Quality, E-Commerce, M-Commerce, Information Technology, Marketing, Banking, Finance, Commerce, Management etc.

VI. CHALLENGES

Risks of Security – There are External threats such as spoofing sniffing and hacking, expose banks to security risks. There are also internal risks exposed to bank especially frauds by employees in collusion with customers

- **Customer Unawareness** – People are not having much knowledge to use e-banking facilities is the major constraint in India.

- **Fear** - One of the biggest problem in online banking is preference to conventional banking method by older generation and mostly people who belongs from the rural areas. The fear of losing money in the digital transaction is a hurdle to use e-banking.

- **Lack of Training** - Lack of adequate Training and skills is a major hurdle for employees to deal with the latest technologies in banks.

Training at all levels on the changing trends in IT is the required.

Future Research

There is a potential in Business Analytics and Artificial Intelligence (AI) to bring a major change. It is expected that Robotics, enabled by AI, will be the future game changer in the banking Sector. Now private banks are preparing such type of system where they deploy Robots for customer service, investment advisory and credit-approval process to improve the services and be cost effective in long run. Digital Banking will be the most preferred form of banking in coming years.

Findings of the study:

- This study has further revealed that There is positive attitude of customer towards conversion of traditional banking system to digitalization.

- There are some unique characteristics of the Internet, such as information accessibility, may modify the behavior of consumers who follow another-based decision making process though.

- The positive attitude of consume can be seen with the help of the rapid used of information technology and fulfillment processes required to do needful

- There are certain challenges to implement digitalization at full pace but that can be removed be certain awareness programs.

VII. CONCLUSION

The introduction of new technology has been changing the phenomena of banking sector. The brick and mortar banking is replacing by mouse banking. Technology is including globalization and integration of financial markets across the world. Customer’s expectations for new products and alternatives delivery channels have been rising. Banks are facing pressure to fulfill the need of customer, what customers would be expecting tomorrow. The introduction of new instruments such as ATM, retail Electronic Funds Transfer (EFT) and Electronic Clearing Services (ECS), UPI, BHIM App have all developed an effective, efficient and speedy payment and settlement systems.

REFERENCES

- Books
- Magazines
- e-Newspapers and Journals
- Published Material of different banks.
- Other Sources Internet Website
Exploring the Factors affecting Consumer’s Intention to Use Mobile Wallets

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Abstract: In this era of mobile technology, when most of the services have come within the reach of the palm of a hand, payment services are not to be left behind. The rise in the number of mobile phone users has provided the advantage of making payments with the touch of a button from anywhere, at any time. Mobile wallet is one such payment technology that provides the convenience of making payments without carrying large amounts of cash. As this service has become quite common, there is a need to understand what attracts the consumers towards using mobile wallets. Thus, this study was undertaken to find the awareness and perception of customers regarding mobile wallets. The study also aimed to find the factors that influence customer’s intention to use mobile wallets. A sample of 200 respondents was taken for this purpose. It was found that majority of the respondents were fully aware of the functionality of mobile wallets. Even though customers were not highly satisfied with the use of this technology still they considered it as a useful mode of payment. Three important factors were identified that influences customer’s intention to use mobile wallets namely, perception of technology, value to customers and other benefits.

Keywords: Mobile wallets, consumer awareness, intention, perception

I. INTRODUCTION

In India, an important shift in the profile of Indian customers has been seen. About 94 per cent of Indian public is utilizing cell phones for their individual works. There is excess of 150 million cell phones clients added every year and is anticipated to develop around 3.5 times in coming 5 years. Information additionally demonstrates the development of around 30 per cent in the number of mobile wallets in India in coming years (Singh et al., 2017; Bureau, 2016). Youthful Indians are more pulled in towards new portable payment like mobile wallets, as they appreciate utilizing it and inclined towards it for managing all their account needs and payments. In India, portable expense services are developing considerably quicker in the most recent years, as it's advantageous and simple to use with giving diverse options.

Mobile payment (M-payment) is characterized as an exchange technique in which cash is exchanged starting with one individual then onto the next utilizing a cell phone with some payment application. Mobile payment is another payment technique for buying of items and services, which utilizes a wide range of cell phones and mobile media transmission systems like Internet. In this new strategy for payment, cell phones can be utilized to make many different kinds of payments. The point by point message with all the favored products and service is sent to the vender or specialist organization through mobile and in the case of the merchant alongside the merchandise or service, an outlined bill is sent and later on the payment is made while utilizing mobile from the purchaser record to dealer account. Mobile payments enable us to perform exchanges for merchandise and ventures with a cell phone, for example, cell phones, PDAs and so forth. As such, portable wallet is comparable to one’s own wallet as it can have advanced cards, computerized coupons, digital cash and computerized receipts etc. This infers, one has to present the application that are made by a couple of organizations, for instance, Google Inc., Apple Inc. or then again PayPal in the handset and utilize those applications to pay straight forwardly for the things and services that have obtained benefit. A vast majority of the mobile wallet providers comprises Paytm, Oxigen, Freecharge, Mobikwik and M-pesa etc.

A. KEY PLAYERS OF MOBILE WALLET

Paytm Paytm was launched in February 2014 as Ecommerce website. It was started as mobile recharge, DTH plans and online bill payments. Paytm is offering shopping, travel, entertainment and food along with partners like Uber, Book My Show, Make MyTrip. It is the only wallet that had a permit to locate payments bank. It recommends present and saving accounts deposit, offering internet banking services and issuing debit cards. Mobile wallet may be finished with credit card, debit card, net-banking and furthermore it be capable of overseen by application.

Mobikwik Mobikwik was started as mobile recharge and bill payment options. Mobikwik offers vendor such as
MakeMyTrip, BookMyShow, eBay Domino’s Pizza, etc. Mobikwik gives money back offers recorded on site that incorporate both offline and online players; Mobikwik tied up with Ezetap whose new purpose of offering machines resembling credit machine that more than 70,000 stores are as of now utilizing, so one can pay with Mobikwik wallet of these shops regardless of whether they have not joined forces up straight forwardly.

Free – charge Free charge gives you mobile recharge, electricity bill payments, DTH and data card in India. Free charge was overtaken by Snapdeal in April 2015. Free charge was launched its own digital wallet in September 2015 and around then freecharge guaranteed a client base of five million wallet clients in a messaged factsheet. Freecharge wallet can be finished up with credit cards, debit cards and net banking and moreover it can be managed by an application or the Web program.

Oxygen Oxygen features deals giving mobile payment option for electricity bills, landline and mobile. Oxygen facilitates money top-up, data recharge, DTH and data card recharge. Oxygen wallet is authorized by RBI and tied up with NPCI (National Power Corporation of India) for direct money transfer. Oxygen claims to be India’s first non-bank wallet.

M-pesa Vodafone started their own mobile wallet. M-pesa deals in DTH connections, Recharge, online shopping, utility bills etc. Cash may be exchanged to bank by Inbuilt Immediate Payment Services or cell phone number yet charges apply in sections. M-pesa cases to be India’s biggest money out system and more than 85,000. M-pesa operators spread the nation over.

B. MOBILE WALLET TECHNOLOGY

Mobile technologies have progressed as a payment system. Mobile Payment System (MPS) is defined as “a payment system in which mobile devices are used to initiate, activate and confirm any payment”. In short, MPS can define as “a payment that is conducted with a mobile device, such as Smartphone’s and tablets”. According to mobile wallet technology definition, mobile payment system looks similar of electronic payment structure anyway when mobile payment system is differentiated of electronic payment framework. It has further prominent compactness. Here is a broad level of appropriations that depict the parts affect choice of mobile payment system which suggests simplicity of use, perceived trust, expressiveness, versatility, perceived cost, perceived handiness, relative purposes of intrigue, similitude, multifaceted nature, sort out externalities and costs. Schierz et al. (2010) finished an audit between 1447 persons to inspect the segments influencing acceptance of the mobile payment system. Outcome demonstrated that the connection among various components, perceived closeness has progressively basic cause on acceptance of MPS. In Korea, an examination considered how the segments (creativity, saw handiness, similarity, portability, reachability, m-payment data, settlement and saw accommodation) impact the gathering of MPS and it has uncovered that the most basic markers of appointment of MPS are perception of esteem and convenience. Yang et al. (2012) initiate so as to public effect, lead feelings, individual characteristics have quick or colossal impact on the gathering of MPS. Zhou (2013) show the stream is the majority basic issue impacting span toward utilizes mobile payment system. In comparable report that was focused on nature of the administration. Evident status is greatest marker of the belief. Here is an unenthusiastic connection among clear status as well as regular danger by players with an expense technique for their option and subject to antagonistic to illicit expense evasion course. Installment exchanges are required precondition for web-based card sharks to play in the way. As an outcome and conduct identified with extra dangers could have indications in pay me.

C. Payment behavior

A Payment is defined as a cross-diversion process which isn’t confined to particular sorts of recreations. Through utilizing a payment technique for their decision clients exchange cash to their betting records. The different betting exercises get to the assets on the betting record and exchange rewards back to the betting record. However, while different pointers utilized for the early location of betting related issues are appropriate for payment conduct, particular sorts of diversions, because of its innate cross-amusement nature, could yield hazard indicators that are all around pertinent over a wide range of recreations. The checking of betting conduct may give more bits of knowledge into the communication between the player and the amusement; the observing of payment conduct could build up for the money related circumstance of card sharks. Since scattered betting can manual for passionate and physical weakening and in addition extreme social and money related results, payment practices may not exclusively be administered by banking choices. Rather, payment conduct may show the budgetary confinements caused by expanding betting related monetary damage.

II. REVIEW OF LITERATURE

A. CONCEPT OF MOBILE PAYMENT

Raina (2014) studied that most accepted sort of mobile payment alternative for exchanges are mobile wallet. They enable a client to store the shopping data and charging that the clients can remind that cell phone is utilizing for shopping. Essential kind of m-wallet conspires in the market are facilitated and customer wallet. Facilitated wallets are alludes to the server wallets which are facilitated on the server. This wallet can act naturally facilitated wallets and third get-together facilitated wallets. Customer wallets are put away on the client gadget as SIM application that dwells on the telephone. It is hard to refresh on the grounds that the wallet depends on the equipment. Shin (2009) suggested that the mobile wallet is the most recent type of mobile payment that empowers client to share substance and services and lead payment and ticketing exchanges. Fundamentally a mobile wallet is the substitute of a man wallet with a cell phone furnished with the elements of a charge card, bank card, participation card, house scratch, organization get to control ID, metro tickets and so forth. Balan and Ramasubbu (2009) found that clients in South Korea and
Japan utilized their cell phones to pay for arrange beverages, basic needs and aircraft ticket. Companies in different nations, Sweden and US are intending to take off advanced wallet applications within the subsequent years. Two book digital wallet answers were created for use in Singapore - mFerio, a protected P2P (peer-to-peer) versatile money payment framework and pFerio, a point-of-sale data framework for significance the best arrangements to clients utilizing multiple payments, loyalty cards and discount. 

Yang et al. (2012) indicated that the impact of hedonic esteem was more grounded in the female group than the male group. Helpful esteem was huge unique incentive in utilizing mobile information benefits in the male group and demonstrated a more grounded impact for the male gathering than the female gathering. The outcome upheld that the impact of hedonic esteem and helpful incentive on utilizing versatile information services produced distinctive mobile information services uses over the gender groups. 

Dastan and Gürlü (2016) elucidated the TAM (Technology Acceptance Model) to study the components impacting the choice of mobile payment system. The TAM was exhibited by Davis (1989) to elucidate and assess the direct of equipment customers. Today, TAM is comprehensively used for envisioning the general population's apportionment of data technology's and objective to use. As indicated by this model, saw comfort and saw handiness affect lead made by the customer to information systems. The direct channel is the persons objective and prompts affirmation. The TAM has transformed into the majority standard model to foresee together use of information technology and expect to use. 

Kerviler et al. (2016) found how cell phones are changing the way buyers’ shop, even in physical settings. This investigation researches purchasers’ determination of region portable payment technology engages them to pay with their PDAs for purchases in a physical store. With an obvious regard perspective, the makers perceive utilitarian, hedonic and social focal points and budgetary and assurance risks as key drivers. They furthermore inquire about complexities differentiated and the drivers of more regular flexible shopping uses and highlight the piece of involvement. The paper discusses recommendations for both adaptable and channel research and proposition to empower retailers to abuse p-m-payment technology. Bailey et al. (2017) found that US retailers need to address self-viability concerns, MP protection concerns, perceived usefulness (PU), perceived ease of use (PEOU) and mentality toward mobile payment. In endeavors to execute versatile payments in the United States, retailers ought to put resources into preparing buyers to utilize these frameworks and guarantee them that their information will be ensured. Different specialized techniques, including purpose of procurement shows and instore showings, could be utilized to instruct customers and to manage the cost of them the chance to try different things with the technology. Current promoting in the US by Samsung Pay centers around the usability of versatile payment at purpose-of-procurement, which recommends retailer and MP supplier familiarity with this issue.

B. DEVELOPMENT OF M-WALLET TECHNOLOGY

Thakur and Srivastava (2013) established that use contrast directed the relations between the builds. This investigation demonstrates that effect of imaginativeness on training is extensively unique among client and non-client speaking to hazardous part of creativity by and by expectation of the m-payment services. Profound invasion of cell phone joined with awareness of m-payment. Biological system has empowered like recognition about the services independent of the training background along with city Indian consumers. Individual creativity is the pouring component into acknowledgment. Specialist organizations putting resources into empower and recognize the trailblazers to utilize the administrations. Higher creativity level being an identity measurement might be settled in word related statistic promotion socio-social part of the respondents. Slade et al. (2014) investigated the new client technology reception display (UTAUT2) and its expansion with hazard and trust builds. In clarifying, non-clients upcoming appropriation of nearness MPs to encourage vital improvement of the technology. The impacts of social impact, saw chance, propensity, execution hope and trust were found to essentially impact behavioural goal to embrace NFC, MPs by picking up a superior comprehension of the purpose of appropriation. It was conceivable to give reasonable recommendation to enhance plan and promoting of the equipment in order to build take-up. Koenig-Lewis et al. (2015) studied various models have been created to help clarify procedures of purchaser reception of new technologies. Technology Acceptance Model (TAM) and Unified Theory of Technology Acceptance and Use of Technology (UTAUT) are likely the most generally connected and approved models obvious in numerous exact investigations of consumers' take-up of new advancements. Specifically, these models have been stretched out to different settings including the acknowledgment of online business and versatile trade. Mustafa (2015) found that mobile keeping money is the product of mechanical approaches as advancement in media transmission and managing an account which additionally drove enhancing plans of action of mobile financial service (MFS) part. Versatile payment has been picking up an uncommon concentration for exact examination in the previous couple of years in different areas of the world. They implied that versatile payments can be seen as development from the point of view of a bank or a mobile network operator (MNO). Accordingly, MFS can be taken as development in convention plans of action of banks and MNO if there should be an occurrence of furnishing services to their clients with cutting edge offer. Madan and Yadav (2016) uncovered that few hypothetical structures have been created to look at appropriation expectations for different information technology and information system (IT/IS). Prominent among them are the theory of reasoned action (TRA), the technology acceptance model (TAM), the technology organization and environment (TOE) structure. The vast majorities of these theories have utilized basic standards from the field of brain science, advertising and IT to comprehend the selection expectations of different types of IT/IS at the entity and the firm level. The heartiness and informative intensity of these models differ and particularly. Against the background of progressions in IT/IS and the shifting idea of purchaser conducts. Yu et al. (2017) found that any mobile payment specialist co-op that executes as Token Requester (TR) must take the protection duties of TR.
While enlisting with Token Service Provider (TSP), TR ought to conform to the TSP's exclusive registry prerequisites and genuinely give adequate data, e.g., token area confinement control, for enrollment. In the token arrangement procedure, the TR ought to collaborate decidedly with TSP and the store issues payment tokens in a safe area. **Demney and Sammon (2015)** researched that a business system speaks to the interaction between various enterprises. The passing on of a m-payment structure is an instance of a natural framework as there are a couple of accomplices from different endeavors: customers, dealers, mobile network operators (MNO), money related foundations, phone producers, programming and development providers and controllers. Huge is that mobile phone producers, programming providers and development providers were delegated 'blend accessories' because these assistants are typically necessary in a mobile payment action, autonomous of the arrangement of activity got. **Zhong and Nieminen (2015)** studied how authoritative co-develop shows up as an effective methodology for mobile payment benefit advancement. Notwithstanding key decision on this, comprehension of prevalent and substandard assets and abilities impact firms' competitive points of interest in a competitive service improvement condition. Biological communities are framed alongside the improving exercises and troubles are caused by competition challenges. The RISE display empowers the examination and choice of key examples for benefit advancement in a competitive situation. **Mukhopadhyay (2016)** suggested that step by step relocate is required in making India a cashless economy. In doing as such, it appraises the measure of cashless transaction common in India and distinguishes what is working and what requires enhancements. This paper is likewise the main extensive endeavor to take a gander at cashless payments from the point of view of instruments (cards versus mobile payments) and smaller scale units (people and families). **Makki et al. (2016)** found that under social cognizance theory, a person's conduct is psychologically interceded by the power of their self-viability convictions, which is defined as a person's appraisal or certainty of their capacity to perform attractive practices in specific circumstances. As such, self-viability is connected to a person's apparent capacity to initiate their intellectual assets in under taking an errand. Besides self-adequacy is a noteworthy supporter of customers inherent inspirations and affects conduct aims. **Rathore (2016)** studied customer acknowledgment of portable expense solution that whether TAM portraying client acknowledgment the equipment presents complete clarification for the purchaser choices identified with selection of portable payments. The examination recommends that TAM gives decent premise to clarify utilization of MPS however information suggests that another develop, trust ought to be incorporated keen on the model.

### C. FACTORS AFFECTING M-WALLET PAYMENT

**Lu et al. (2011)** found that numerous web-based services have recently been ported to the mobile based condition and acknowledgment of the latest services are unsafe to infer salary for service supplier. Trust exchange hypothesis and valence structure in view of. To build up a trust-based client basic leadership representation of the non-autonomous and outsider m-payment service point of view. The author inspected how these trust convictions may cooperate by together negative and positive valence factors and influence a purchaser reception of mobile payment service. **Zhou (2013)** facilitated that their upkeep utilization is essential for versatile payment specialist co-op. Drawing on the stream hypothesis and the data frameworks achievement show. This examination recognized the factor influencing continuation expectation of mobile payment. We lead information examination with auxiliary condition show. The outcome showed to benefit characteristics is the fundamental determinant influencing trustworthy and framework characteristics is the determinant influencing fulfillment. Service quality and data quality influence the stream.

**Stream, fulfillment and trust finish up continuation goal of mobile payment.** The specialist needs to offer data, quality framework and service with a specific end goal to help client support utilization of mobile payment. **Doan (2014)** in the research essentially centered around discretionary acknowledgment choice. This implies it is the client appropriation choice. Nonetheless, discretionary does not include that the appropriation is prepared of impact factors as others of opinion. The impact of the advertising agency by forced image. So, adoption is essentially a social process. **Shaw (2014)** found that the technology of paying at the purpose of-offer with a smartphone is accessible, however the technology has not been set up by retailers and clients in the North America. Retailers are unwilling to put resources into the equipment to overhaul their store up apparatuses until there is a more extensive acknowledgment by the client. In this examination the exploration demonstrate depends on the TAM (Technology Acceptance Model) which sets that clients will acknowledge the mobile wallet when they see value. They find includes through casual learning and they are stressed over belief. The model is reached out with these builds and experimentally tried with an example of Canadian clients. The outcomes which demonstrate that apparent value is a key impact the factors and that casual learning is interceded by belief. They are an incentive to analysts and experts. **Yang et al. (2015)** found the impacts of apparent money related peril on evident regard and affirmation. This is on the grounds that the online registration process does not have the issue of protracted lines.
Opportune, exact and customized services help through intuitive recordings can be given to clients as a maintenance system. Moreover, comes about propose that post-buy comfort impact continuation use of m-shopping. The comfort factors like simple following of item development, wiping out and so forth, can make this channel alluring. A creative technique for following consumers exchanges history and connecting to area-based advancements impetus would lure shopper to this channel. Office to screen on-time conveyance and administration quality can improve post-buy accommodation. In an occasion of fragmented requests or harmed items, an exceptional application ought to be planned and made convenient for tending to such issues. Taylor (2016) studied numerous manners by which mobile examining and POS display challenges for the retail condition without bounds and there are numerous exercises to be learnt from the snappy take up of self-service look at keeping in mind the end goal to counteract misfortune and secure all that really matters. In the event that retailers need to remain important in the multichannel shopping condition, they have to advance and adjust to mechanical development. With a specific end goal to do this, they should have the capacity to explore the complexities of the payment’s environment viably on the off chance that they are to moderate misfortune. Any arrangement must focus on the unique circumstance and particular condition with which it is working since ‘arrangements are reliant upon condition’. A multi-disciplinary approach that adjusts the security work with business improvement, ITS and showcasing. Natarajan et al. (2017) utilized an expanded technology acceptance model (TAM) and the theory of diffusion of innovation (DOI) to comprehend the aim to utilize mobile trade applications for shopping purposes. The factors apparent pleasure, saw hazard and individual imaginativeness were added to the first model. The value affectability paradigm was anticipated utilizing the factors apparent hazard, individual ingenuity, fulfillment and the expectation to utilize. Discoveries of this examination uncover that individual creativity and saw chance assume a noteworthy part in choosing the goal to utilize versatile shopping applications. Clients who are profoundly inventive with a individual creativity and saw chance assume a noteworthy part in choosing the goal to utilize versatile shopping applications. The examination additionally found that security impacts social goal than the various factors utilized as a part of the investigation, showing that security difficulties and protection issues are huge worries for clients utilizing portable mobile banking.

D. IMPLICATIONS OF MOBILE PAYMENT

Van Bossuyt et al. (2007) examined the implications of various mobile payment models with regards to Next Gen MSPs (Mobile Service Platforms). The general message to bearers is that albeit Next Gen MSPs give an event to make new and extra benefits streams and increment the AIPU (Average Income Per User). This does not come without suggestions for their present plans of action. Nonetheless, this need not address an issue as it has been demonstrated that transporter driven payment models are liable to numerous inadequacy and drawbacks, for example, their improvement for little payments. It is imperative for bearers to be aware of the potential changes and their suggestions with the goal that they can set themselves up in like manner. Ghezzi et al. (2010) represented a deliberate investigation of mobile payment application and their development. There are four perspective that ought to be dissected in future research. Initially, a market esteem assessment ought to be given. Besides, both request side and offer side development must be broke down. Thirdly, the development in esteem chain relationship and the administrative system should be examined. At last, an expansion of the investigation to different nations to give a discerning benchmark was discussed. It would demonstrate to a great degree and be helpful to comprehend the phase of advancement in which the Italian mobile payments advertisements have come to. Additionally, it would permit to assess the simplification of the study center discoveries. Reuver et al. (2014) investigated top to bottom case on connection among three noteworthy Dutch bank and three Dutch telecom administrators who mutually built up a confined in benefit chief for m-payment. Platform hypothesis and collective action hypothesis is consolidated to think about the issues of cooperation and rivalry amongst bank and administrators. We locate that diverse vital goals, struggle, absence of conditions, interests and administration issues prompted disintegration of the m-payment stage. These inconveniences mostly result from stage attributes of trustworthiness to outsiders, administration of relations with outsiders and stage rivalry. Apanasevic et al. (2016) found that acknowledgment of a mobile payment benefit relies upon the capacity of mobile payment suppliers to assemble systems of the two retailers and customers at the same time. The administration will draw in these partners in the event that it lives up to their desires in the most ideal way. Another is that mobile payment services don't meet desires on an upgraded acquiring process. This is the region for future service development. Chawla and Joshi (2017) conducted a study in which they divided mobile clients into three groups in view of their impression of different elements affecting versatile saving money. These sections were named as technology appropriation pioneers, technology adoption adherents and technology adoption loafers. The outcomes demonstrate that both demeanor and aims towards mobile managing an account fundamentally contrasts over the three sections. As far as relative situating, technology
adoption pioneers have the most ideal states of mind and goals took after by technology adoption supporters and technology adoption slow pokes. Age was found to essentially impact technology adoption and utilization. Wu et al. (2017) demonstrated that clients’ acknowledgment aim is moderately identified with seen chance, saw handiness and positive feeling. Positive feeling had a solid negative effect on apparent hazard and positive effect on the apparent value. Additionally, saw convenience firmly diminishes clients view of hazard. Multi-group investigations locate that the positive feeling and saw hazard had critical both negative and positive effects on the acknowledgment goal at phase of the market presentation instead of market development. Guo and Bouwman (2016) researched the low infiltration of handset based mobile payment in many nations has been a critical research point over the most recent fifteen years and broke down from alternate points of view. In any case, the examination of a solitary perspective can’t give a refined response to the confused fundamental inquiry with reference to why versatile handset-based payments are not all the more generally utilized. The point of this study is to see how a moderately effective mobile payment environment is made and maintained through the competition of different performing artists. Keeping that in mind, we break down the instance of Alipay wallet, the m-payment specialist organization with the biggest piece of the overall industry in the China. Outcomes demonstrate that on-screen characters with heterogeneous and integral assets can produce mobile coordinated effort. Inside a biological system, albeit constantly compelled by assets and abilities, the activities that the center performing artists take and the subsequent power lop-sided characteristics are progressively changing, mirroring on-screen characters point of decreasing vulnerability. Liébana-Cabanillas and Rubio (2017) investigated the appropriation of mobile payment system the perspective and point of view of the shippers. Keeping in mind, we break down the instance of Alipay wallet, the m-payment specialist organization with the biggest piece of the overall industry in the China. Outcomes demonstrate that on-screen characters with heterogeneous and integral assets can produce mobile coordinated effort. Inside a biological system, albeit constantly compelled by assets and abilities, the activities that the center performing artists take and the subsequent power lop-sided characteristics are progressively changing, mirroring on-screen characters' point of decreasing vulnerability.

To understand consumer’s perception towards mobile wallet.

III. OBJECTIVES OF THE STUDY

- To find the awareness of customers regarding mobile wallet service providers.
- To study the factors that influence consumers in adoption of mobile wallet.
- To understand consumer’s perception towards mobile wallet.

IV. RESEARCH METHODOLOGY

Descriptive research design was utilized as a part of the investigation as it portrays the qualities of a specific individual gathering as customer in this case. The sampling unit included individual using mobile wallet in Haryana. The sample size was 200 respondents. Non-probability sampling technique was used for data collection. Further, convenience and judgmental sampling was used. Data was collected through questionnaire. Journals, research papers, articles, website and news. The data was analyzed and interpreted using Mean, Standard deviation, KMO, Bartlett’s Test and Factor Analysis.

V. DATA ANALYSIS AND INTERPRETATION

A. DEMOGRAPHIC PROFILE
The sample size is 200 in which 132 are males and 68 are females. Majority (79.5 per cent) of the respondents were in the age group of 20-30 years. 58 per cent of the respondents were students. Most (72.5 per cent) of the respondents were graduates or post-graduates. Most (70.5 per cent) of the respondents were unmarried.

B. AWARENESS OF DIGITAL WALLETS
Majority (49.5 per cent) of the respondents were fully aware of the functionality of digital wallets whereas 45 per cent were partially aware and only 5.5 per cent were not aware.

C. FACTOR ANALYSIS

Source : Survey by authors
Kaiser-Meyer-Olkin measure of sampling adequacy was used and as the KMO value was .942 which is above the minimum requirement of 0.6 so the sample is adequate for factor analysis. Three factors had been extracted using Principal Component Analysis using varimax rotation. The three factors explained 64.28 percent of the total variance. The results obtained through Varimax rotation helped to retain the factor loading greater than 0.50. The names of factors, factor loadings, variance and reliability are summarized in table 2.

Table 1: KMO and Bartlett’s Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | .942 |
| Bartlett’s Test of Sphericity | Approx. Chi-Square | 3399.820 |
| | Df | 276 |
| | Sig. | .000 |
Factor Statement Factor loadings Percentage of variance Reliability

Perception of technology
Social influence 0.757 31.078 0.951
Brand loyalty 0.743
Perceived reputations 0.743
Banking information 0.732
Privacy 0.722
Perceived usefulness 0.716
Efficacy 0.701
Knowledge of the technology 0.682
Informal learning 0.681
Perceived value 0.660
Behavioural intention to use 0.645
Perceived risk 0.626
Security 0.587

Value to customer
Price value 0.805 17.237 0.843
Perceived enjoyment 0.777
Compatibility 0.690
Transaction fees 0.569
Convenience 0.501

Extra benefits
Ease of use 0.826 15.966 0.835
Time saving 0.765
Transfer speed 0.592
Easy to access 0.536
Discount offers 0.507

Source: Survey by authors

Naming of Factors: These three factors are named as Perception of technology, Value to customer and Extra benefits.

The paper examined the factors which influence the consumers to change their preferences towards mobile wallet. The results showed that the twenty-four variables converged into three factors. One item had to be excluded as the factor loading was less than 0.5. The reliability of all obtained factors was above .7 which showed that the scale chosen was reliable for measuring the chosen factor. These factors are discussed below:

Factor-1: Perception of technology

The analysis has revealed that respondents have considered this factor to be the most important factor with the highest explained variance of 31.078 per cent and the reliability obtained was .951. Thirteen statements out of twenty-four load on this factor Perception of technology include are Social influence, Brand loyalty, Perceived reputations, Banking information, Privacy, Perceived usefulness, Efficacy, Knowledge of the technology, Informal learning, Perceived value, Behavioural intention to use, Perceived risk, Security.

Factor-2: Value to customer

The respondents have considered this factor to be second most important as it explained 17.237 per cent of variance and the reliability obtained was .843. Five statements out of twenty-four load on this factor. Value to customer include are Price value, Perceived enjoyment, Compatibility, Transaction fees, Convenience.

Factor-3: Extra benefits

Five statements load on this factor and the explained variance is 15.966 per cent and the reliability obtained was .835. Extra benefits are Easy of use, Time saving, Transfer speed, Easy to access, Discount offers.

D. PERCEPTION REGARDING MOBILE WALLETS

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<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Std. Deviation</th>
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</thead>
<tbody>
<tr>
<td>Would you like to refer your friend to use E - Wallet?</td>
<td>1.92</td>
<td>.924</td>
</tr>
<tr>
<td>Do you believe your transaction are secured?</td>
<td>3.18</td>
<td>1.094</td>
</tr>
<tr>
<td>Do you store card details on your phone or laptop?</td>
<td>2.88</td>
<td>1.187</td>
</tr>
<tr>
<td>How do you rate the E - wallet service that you have used?</td>
<td>1.88</td>
<td>.672</td>
</tr>
</tbody>
</table>
Would you want to continue using E-Wallet? | 1.90 | .866
---|---|---
Are E-Wallet services useful mode of payment? | 3.44 | 1.180

Source: Survey by authors

The mean value 1.92 shows that most of the respondents are refer your friend to use E-Wallet. The mean value 3.18 shows that most of the respondents are believe your transaction are secured. The mean value 2.88 shows that most of the respondents are store card details in your phone or laptop. The mean value 1.88 shows that most of the respondents are the E-Wallet service that you have used. The mean value 1.90 shows that the majority of the respondents are disagree with the statement that they want to continue E-Wallet. The mean value 3.44 shows that most of the respondents are E-Wallet service useful mode of payment.

VI. Conclusion
The present study focused on factors affecting customers intention to use mobile wallets. For this an exploratory cum descriptive study was undertaken. The research revealed that for customer, the digital wallet is the easy to use instant payment option. Mobile wallet is essential tool to run your business. People can connect all your payment options and use without revealing any financial details with the help of mobile wallets. Mobile wallet in India is developing day by day yet payment Bank and UPI are other payment system which will gobble up the piece of the overall industry of mobile wallet and more people will transform into such system soon. Consequently, these mobile wallets need to get a few changes their applications so it can be utilized be all the more effectively like UPI applications and ought to likewise give more focus on offers, discount and loyalty programs to attract in existing and new clients. Mobile Wallets will replace card payments and will dominate micro billing long term. Mobile wallets have made paperless transaction easier.

VII. Suggestions
The following suggestions are recommended for increasing mobile wallet services to the customers:

- Increasing awareness regarding mobile wallets is important as majority of the customers have not benefited from the mobile wallet services since they assume it as difficult to use. So, mobile wallet holder may set up a team of personnel to train the customers to get to know about this mode of payment.
- E-Wallet is suitable and simple to utilize. Customers fear adopting these services since they think that utilizing these services is troublesome and confusing so they need to be made aware of this fact.
- Mobile wallet provider should provide proper lock facilities on their apps so that no other one can use the wallets. Mobile wallet provider should make their e-wallets compatible to all the systems so that everyone who equipped with any system can easily use the wallets.
- Mobile wallet provider should enhance the ease of use of digital wallets and the system should be enhanced to make the online enquiry much easier to the customers.

REFERENCES
mobile payment adoption. The Service Industries Journal, 35(10), 537-554.


CSR - “PERCEPTION V/S REALITY

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Abstract- CSR is an obligation and responsibility of corporations towards society to serve different areas such as poverty, education, employment, etc. CSR is where a company recognizes the society in which it exists and attempts to benefit it in same way. The research is empirical in nature and is based on primary and secondary data. Primary data, which is collected by survey through an online questionnaire and secondary data is based on observations. Random sampling method of data collection is used for collecting primary data and the responses of 50 respondents are analyzed. Some of our findings are based on secondary data which shows that Lego, Microsoft and Google are among the top three companies majorly contributing to the areas of corporate social responsibility.

Key words: Corporate Responsibility, Perception, Reality. Social Responsibility

I. INTRODUCTION

Social Responsibility is a framework which poses an obligation on an entity, whether an organization or an individual that it must work for the upliftment of society at large and to create a balance between the economy and the ecosystem.

In recent times, more emphasis is being placed on corporate social responsibility because organizations get various benefits from society in terms of raw material, natural resources and skilled/unskilled labour for its existence and in order to pay them back it fulfills social responsibility towards society. In general terms, CSR is an obligation and responsibility of corporations towards society to serve different areas such as poverty, education, employment, etc. CSR is where a company recognizes the society in which it exists and attempts to benefit it in same way. CSR (also known as Corporate Citizenship and Corporate Social Opportunity) is a concept whereby the organizations consider the interests of society by taking responsibility for the impact of their activities on all stakeholders as well as the environment. Social responsibility and business ethics are often regarded as the same concepts however social responsibility is one aspect of the overall discipline of Business ethics.

Number of issues has been raised regarding the relevance of CSR. However, business firms conduct social responsibility not only for profit motives but to fulfill other long term objectives. According to Professor Milton Friedman, the social responsibility of business is the green signal to pure socialism. Because of increasing literacy rate, people are more aware and expecting more from corporate houses to pay attention to their social needs.

Acc. to the EU Commission (2002) 347 final: 5
“...CSR is a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis.”

Some people believe that social responsibility is the sole responsibility of the government but in the new scenario the emergence of private sector is also playing a great role in fulfillment of social responsibility and to justify the same, this paper aims to analyze the 10 private companies with the best CSR reputation in 2017 as per FORBES REPORT and also analyzing the perception of the employees regarding CSR activity. The perception of the employees have been recorded through a survey and the reliability of the survey depends on the responsiveness of the employees.

CSR has become an integral part of companies day to day operations in order to sustain competition and moreover people are willing to pay higher if they believe that the corporate is using their money for the purpose for which it is invested and the investors too will invest in those companies which have robust CSR initiatives.

SECTION-135

1. Every company having net worth of Rs.500 crore or more, or turnover or Rs.1000 crore or more or a net profit of Rs.500 crore or more during any financial year shall constitute a Corporate Social Responsibility Committee of the Board consisting of three or more directors, out of which at least one director shall be an independent director.

2. The Board’s report under sub-section (3) of section-134 shall disclose the composition of
the Corporate Social Responsibility Committee.

3. The Corporate Social Responsibility Committee shall:

a) Formulate and recommend to the Board, a Corporate Social Responsibility Policy which shall indicate the activities to be undertaken by the company as specified in schedule VII;

b) Recommend the amount of expenditure to be incurred on the activities referred to in clause

c) Monitor Corporate Social Responsibility Policy of the company from time to time.

4. The Board of every company referred to in sub-section (1) shall:

(a) after taking into account the recommendations made by the Corporate Social Responsibility Committee, approve the Corporate Social Responsibility Policy for the company and disclose contents of such policy in its report and also place it on the company’s website, if any, in such manner as may be prescribed; and

(b) Ensure that the activities as are included in Corporate Social Responsibility policy of the company are undertaken by the company.

5. The Board of every company referred to in sub-section (1), shall ensure that the company spends, in every financial year, at least 2% of the average net profits of the company made during the three immediately preceding financial years, in pursuance of its Corporate Social Responsibility Policy:

Provided that the company shall give preference to the local area and areas around it where it operates, for spending the amount earmarked for Corporate Social Responsibility activities:

Provided further that if the company fails to spend such amount, the Board shall, in its report made under clause (o) of sub-section (3) of section 134, specify the reasons for not spending the amount.

ADVANTAGES:

As we are aware of what Corporate Social Responsibility means, Let’s have a glance how it adds value to the corporate sphere.

● Enhances the corporate image.

● Helps to increase stakeholders attention, attraction and retention.

● Aids to attract more capital inflow from various sources.

● Positive publicity of the organization.

● Regulatory authorities become less hostile.

DISADVANTAGES:

The reasons behind the criticism of CSR as an unprofitable activity are:

● Divergence from the main objective i.e profit making.

● Backdrop to the company’s image.

● High customer expectations.

● Increase in cost of production.

II. LITERATURE REVIEW

Jorge A. Arevalo, A. Deepa, (2011) “Corporate social responsibility practices in India: approach, drivers, and barriers”, Corporate Governance The aim of this paper is to examine how corporations in India interpret corporate social responsibility (CSR). Focusing on four commonly known approaches: the ethical, the statist, the liberal, and the stakeholder approach, the paper seeks to investigate the reported drivers and barriers to implementing CSR practices. The paper surveyed top-level managers of a sample of companies currently engaging in a CSR initiative, representing a variety of industry sectors. The study finds that the CSR approach that is most favored by Indian firms is the stakeholder approach and that the caring or the moral motive, followed by the strategic or profit motive, are important drivers for Indian firms to pursue CSR. Further, the results indicate that the most significant obstacles to CSR implementation are those related to lack of resources, followed by those related to the complexity and difficulty of implementing CSR.

Shubham Singh, Shashank Mittal, (2019) "Analysis of drivers of CSR practices’ implementation among family firms in India: A stakeholder’s perspective", Differences in institutional environment and governance structures pave the way for heterogeneous nature of different businesses; this, in turn, shapes the way various sections of society act toward each other enacting their responsibilities. Taking into account the unique institutional environment and governance structures of firms in developing economies, this paper aims to build on the “stakeholder theory” to address the issue of the implementation of corporate social responsibilities (CSR) practices in these economies, particularly India. This paper also
aims to uncover the saliency (legitimacy and power) of different stakeholder groups on different aspects of a firm’s CSR activities.

Further, as most of the firms in developing economies are family-run firms, the paper examines role of organizational leadership in shaping firms’ CSR strategies.

### III. RESEARCH METHODOLOGY

The research is empirical in nature and is based on primary data which is collected by survey through an online questionnaire. Some of the observations are also based on secondary data which is derived from THE FORBES LIST-“THE 10 COMPANIES WITH THE BEST CSR REPUTATIONS IN 2017”.

The primary data is collected through the method of random sampling. A total of 50 employees of various companies acted as respondents for the survey. In order to explore employee experiences of CSR, a structured online questionnaire sought valuable feedback. The questionnaire is all about employees personal level of awareness regarding their companies CSR activities and it analyzes the data in the form of pie charts. The secondary data is collected and examined in the form of table.

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>RED TRAK CSR POINTS</th>
<th>RANK (2017)</th>
<th>RANK (2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEGO</td>
<td>74.4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>MICROSOFT</td>
<td>74.1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>GOOGLE</td>
<td>73.9</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>WALT DISNEY COMPANY</td>
<td>73.5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>BMW GROUP</td>
<td>71.5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>INTEL</td>
<td>71.1</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>ROBERT BOSCH</td>
<td>71</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>CISCO SYSTEMS</td>
<td>71</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>ROLLS ROYCE AEROSPACE</td>
<td>70.7</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>COLGATE - PALMOLIVE</td>
<td>70.4</td>
<td>10</td>
<td>23</td>
</tr>
</tbody>
</table>

Further, as most of the firms in developing economies are family-run firms, the paper examines role of organizational leadership in shaping firms’ CSR strategies.

### IV. OBJECTIVES

- To analyze which companies are effectively fulfilling their corporate social responsibility.
- To analyze the reasons or benefits of practicing social responsibility by companies.
- To study the contribution of Top 10 companies fulfilling CSR.
- To examine the views of employees regarding companies CSR activities.

### Data Collection and Interpretation

**FORBES LIST- “The 10 Companies With The Best CSR Reputations In 2017”**

The companies are analyzed based on their social responsibility reputations, positive influence on society and treatment of employees. The table examines the 10 best companies as per the consumers perception regarding most socially responsible companies with its proprietary rep track pulse system.

LEGO tops this year’s roster as it beats all other companies in the perception that it behaves ethically, conducts business fairly, operates transparently, protects the environment and supports worthy causes while Microsoft maintains consistency by retaining second position from last year by earning a reptrack CSR score of 74.1. On the other hand, Google falls from its first position in 2016 to third position in 2017 with a score of 73.9. Walt Disney Company secured fourth position in 2017 as against third place in last year with a score of 73.9. Walt Disney Company secured fourth position in 2017 as against third place in last year with a fall of 1.2 points this year. BMW Group secured fifth position this year with a fall of 2.4 points from last year whereas Intel reached 6th position as against 10th position in 2016. Robert Bosch secured 7th position as against 21st position with a rise of 1.4 points. Cisco systems measures 71 points this year with a rise of 1.8 points while Rolls Royce Aerospace falls from 8th place to 9th place with -2.4 points. Colgate Palmolive shows a very favourable change of position from 23rd to 10th with a rise of 1.1 points.

Dropping on the list are Apple, Samsung and Volkswagen that have witnessed a fall in their CSR Reputations. Apple and Samsung secured 49th and 89th places respectively with a fall of 5.3 points each. At 100th place is Volkswagen which dropped by 8.2 points this year.
V. RESEARCH FINDINGS

The primary data for the research purpose is collected through an online questionnaire from the employees of different companies regarding their perception about their company’s CSR practices and the following generalizations are made:

The employees were asked about their views if they feel their company fulfills CSR practices to maintain the reputation of their organization. 72% of the employees responded in favour of the question. Around 10% of them disagree with the proposition. 18% of the total people did not make any claim.

Secondly, the employees were asked whether the company practices CSR to fulfill their legal obligations. 51% of the total employees voted positively. Around 15% of them responded against it whereas nearly 35% of the total were not clear regarding the claim.

Nextly, when the employees were asked if they feel their company practices CSR due to concern for society, we analyzed that a very high proportion of the total sample responded in favour. A very least percentage of 10% employees were against the claim. Around 26% of the total were not sure.

At last, nearly 38% of the total employees voted positively when they were asked if their company fulfills social responsibility to earn maximum profits and 36% said that their company do not perform CSR activities to earn high profits. and approximately one fourth of the total were not sure about the claim.

VI. RESEARCH LIMITATIONS

Although Corporate Social Responsibility is being viewed as more of voluntarily action rather than a legal binding. But still there are certain limitations that hamper its level of growth. Despite of growing importance of CSR, many people are still unaware of its significance and even the organizations are not willing to educate their employees regarding CSR activities. Therefore employees in the organizations were not ready to respond actively.
VII. SUGGESTIONS

Corporate Social Responsibility should not be just viewed as a public relations tool but it is much more vital component for succeeding in the modern business world. Since most of the employees are unaware of the relevance of CSR activities, the companies should organize CSR programs to aware and educate the employees. The organizations should focus on dual mindset i.e. they should make decisions that do not only have global benefits but it should take care of its immediate surroundings and actively seek to be engaged in its local community.

VIII. CONCLUSION

behind fulfilling CSR activities. Whereas, 54% employees surveyed believe that companies are performing corporate social responsibility due to legal pressures. CSR is a prominent activity which needs to be fulfilled to some extent and some companies are undertaking it as a serious cause that’s why Lego attains the topmost position in the Forbes list of companies fulfilling CSR. Ethical conduct, transparent operations and fair business practices are the bold characteristics to attain number one position.

The title “CSR - Perception v/s Reality” is justified by our research that the perception of employees is completely on a different platform where employees think CSR is for enhancing the reputation of the company and attaining higher profits and on the other hand Lego proved it wrong by proving Corporate Social Responsibility as a more broader aspect because Lego emphasizes on fair and transparent business activities, ethical conduct etc. From the above research we conclude that, CSR is the important area for the companies to focus on. As per the survey conducted,72% of the employees perceive that enhancing the goodwill of the firm is the main reason.

REFERENCES

To Study the relationship between Job Satisfaction and Organisation Culture at Bikanervala

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Abstract-- With the help of the instrument i.e OCTAPACE, organization culture can be define. OCTAPACE is all about and what are eight values that may be examined to develop the profile of an organizational culture. This study is limited to employee working in Bikanervala (Bikano). The present study is a descriptive study based on both primary and secondary data and Sample size 108 will include managerial employees and supervisor and workers. Simple random sampling technique will be adopted. Independent t test, correlation analysis (pearson) and regression analysis (simple regression) is applied to test the hypothesis to satisfy the stated objectives. Statistical package for social sciences (SPSS) and Microsoft excel (Ms Excel) is used as tools for data analysis.

Key Words: job satisfaction, organization culture, OCTAPACE, organizational climate,

I. INTRODUCTION

Organizational culture is the meanings that the people attach to their actions and it is the collective behaviour of humans working in an organization and. Culture includes the visions, norms, organization values, working language, systems, beliefs, symbols, and habits. It is also the pattern of assumptions and collective behaviours that are taught to new members in an organization, as a way of perceiving, thinking and even feeling. Organizational Culture affects the way people interact with each other. Organisational culture includes ethics, values, beliefs, attitudes, norms, ethos, climate, environment and culture. The Instrument developed by Udai Pareek i.e OCTAPACE, has been used to determine the organization culture. It has emerged that some of the values are distinguished enough to make the culture a performing culture. Results have confirmed that culture is derived out of ethos, which ultimately leads to performance. The abbreviation of OCTAPACE culture are openness, confrontation, Trust, Authenticity, pro-action, autonomy, collaboration and experimentation which are essential for a strong and successful organization. An organization with OCTAPACE culture values has the greater chance of achieving high growth, satisfaction and involvement, teamwork and free flow of communication within the organization.

Job satisfaction basically tells how much employee like his/her job and the tasks assigned to him/her. It reflects a positive attitude of employee toward his job. Job satisfaction is not the same as motivation, although it is clearly linked. Many past studies said that satisfaction is very important factor to motivate them. Job satisfaction is a very important component at work place. Treating respectively with employee will enhance satisfaction in employee. Satisfaction means job commitment and if employees are much satisfied with their job than they are more productive for organization. The most common way of measurement is the use of rating scales where employees reactions to their jobs will be reported. Job can be influenced by various factors like quality of employees relationship with their supervisor, quality of working environment in which they work, degree of fulfillment in their work, etc

II. LITERATURE REVIEW

Bapat, B, Soni, V and Khare, V (2014) conducted their study on “Organizational dynamics through OCTAPACE culture in IT companies” The study was conducted to identify the major factors based on descriptive research design undertaken with the help of structured questionnaires. The paper employs certain statistical tools for assessing whether the hypotheses that had been formed are valid or not. The results showed that the sample organizations differ significantly in their OCTAPACE Culture and are having varying level of OCTAPACE culture.

Mulatu Takele Babushe, & Narendranath, K (2013) The purpose of this study was to examine employees’ perception about “HRD climate in relation to job satisfaction in the public sector (civil service organizations) of
Ethiopia based on the selected Bureaus in two regional states viz., Amhara and Benishangul-Gumuz.” The data was collected from 615 employees (both executives and non-executives) using self-administered questionnaire. The final response rate was 87.5% (539); based on this the analysis is carried out. The findings revealed that the extent HRD climate and the HRD climate elements are all below average, i.e., they are indicating the existence of very poor HRD climate in the selected bureaus or in the public sector of Ethiopia. The tested hypotheses suggested that the correlation between HRD climate and job satisfaction is statistically significant, and there is significant impact of HRD climate on job satisfaction.

Subrahmanian, M.U (2012) conducted his study on “Achieving high involvement & satisfaction through octapace culture in IT companies”. Understanding organizational culture helps to increase the organizational effectiveness and development. A total of 200 software employees were selected for the study. The study revealed that some of the OCTAPACE culture dimensions show value lower than the norms specified and there is variation in dimensions in the organization. Collaboration and trust among employees should be cultivated among employees which is essential for every organization for its effectiveness. Thus, the management should work for develop the organizational culture that requires the culture of OCTAPACE.

III. RESEARCH METHODOLOGY

RESEARCH DESIGN

a) Methodology used for data collection: Research design for the study shall be descriptive in nature. Descriptive research describes the characteristics of the variables which are chosen for the research and helps in inference building about population parameters and the relationship among two or more variables. Population for the research consists of employees in working in Bikanerval. Total population of the study is 300. Sample size 108 will include managerial employees and supervisor and workers. Simple random sampling technique will be adopted to select the sample elements. two standardised questionnaires will be used to collect primary data from the respondents.

b) Data collection: Both primary and secondary data collection methods will be employed to conduct the research work. The survey shall be carried out by means of standardized questionnaires on Organization Culture developed by Udai Pareek (1994).Minnesota Satisfaction Questionnaire was used to measure the level of job satisfaction among employees.

c) Data Analysis: The above aims and objectives will be reached using the methods of statistical analysis and through investigation of primary and secondary data. The collected data will be analyzed by using SPSS software package version 20.

THE OBJECTIVES OF THE STUDY

i) To study the Organization culture at Bikanerval.

ii) To examine the relationship between Organization Culture and Job Satisfaction.

iii) To study the impact of Organization culture on job satisfaction of employees at Bikanerval

IV. STATEMENTS OF HYPOTHESIS

\( H_01: \) There is no significant difference between the job satisfaction of male and female employees.

\( H_1: \) There is significant difference between the job satisfaction of male and female employees.

\( H_02: \) There is no significant relationship between job satisfaction and Organization culture.

\( H_2: \) There is a significant relationship between job satisfaction and Organization culture.

\( H_03: \) There is no significant impact of Organization culture on job satisfaction of employees.

\( H_3: \) There is a significant impact of Organization culture on job satisfaction of employees

Testing Hypothesis: For testing the Hypothesis following tests have been applied:

a. Independent t-test

b. Correlation

c. Regression

\( H_{01}: \) There is no significant difference on job satisfaction between male and female employees.

\( H_1: \) There is significant difference of job satisfaction between male and female employees.

For testing Hypothesis 1 Independent t - Testing has been applied.
The p-value is (0.399) for job satisfaction therefore, the difference between the two means is not statistically significantly different from zero at the 5% level of significance, which means that there is no significant difference on job satisfaction between male and female employees. Therefore alternative hypothesis is rejected. 

**H₀**: There is no significant relationship between job satisfaction and Organization culture. 

**H₁**: There is a significant relationship between job satisfaction and Organization culture.

For testing **Hypothesis 2** Correlation Testing has been applied.

**CORRELATION MATRIX**

**TABLE 3**: CORRELATIONS BETWEEN ORGANIZATION CULTURE AND JOB SATISFACTION

<table>
<thead>
<tr>
<th></th>
<th>JS</th>
<th>Openness</th>
<th>confrontation</th>
<th>Trust</th>
<th>authenticity</th>
<th>Proaction</th>
<th>Autonomy</th>
<th>collaboration</th>
<th>experimentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>JS</td>
<td>1</td>
<td>0.229*</td>
<td>0.213*</td>
<td>0.179</td>
<td>0.210*</td>
<td>0.240*</td>
<td>0.146</td>
<td>-0.214*</td>
<td>0.223*</td>
</tr>
<tr>
<td>Openness</td>
<td>0.229*</td>
<td>1</td>
<td>0.565**</td>
<td>0.568</td>
<td>0.396**</td>
<td>0.156</td>
<td>0.187</td>
<td>0.296**</td>
<td>0.330**</td>
</tr>
<tr>
<td>confrontation</td>
<td>0.213*</td>
<td>0.565**</td>
<td>1</td>
<td>0.443</td>
<td>0.337**</td>
<td>0.043</td>
<td>-0.077</td>
<td>0.141</td>
<td>0.264*</td>
</tr>
<tr>
<td>Trust</td>
<td>0.179</td>
<td>0.568**</td>
<td>0.443**</td>
<td>1</td>
<td>0.244*</td>
<td>0.099</td>
<td>0.237*</td>
<td>0.238*</td>
<td>0.399**</td>
</tr>
</tbody>
</table>

**TABLE 1: DESCRIPTIVE STATISTICS**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>JS</td>
<td>62.3000</td>
<td>9.21583</td>
<td>90</td>
</tr>
<tr>
<td>Openness</td>
<td>15.0889</td>
<td>2.58189</td>
<td>90</td>
</tr>
<tr>
<td>confrontation</td>
<td>15.2667</td>
<td>1.92441</td>
<td>90</td>
</tr>
<tr>
<td>Trust</td>
<td>14.8000</td>
<td>2.27937</td>
<td>90</td>
</tr>
<tr>
<td>authenticity</td>
<td>16.5000</td>
<td>1.59529</td>
<td>90</td>
</tr>
<tr>
<td>Proaction</td>
<td>16.9444</td>
<td>1.54601</td>
<td>90</td>
</tr>
<tr>
<td>Autonomy</td>
<td>15.6444</td>
<td>1.92740</td>
<td>90</td>
</tr>
<tr>
<td>collaboration</td>
<td>16.5889</td>
<td>1.60683</td>
<td>90</td>
</tr>
<tr>
<td>experimentation</td>
<td>15.8444</td>
<td>2.00511</td>
<td>90</td>
</tr>
</tbody>
</table>
### The value of correlation between two variables

Organization culture (all eight dimensions of OCTAPACE) and job satisfaction is $0P = 0.229$, $C=0.213$, $T=0.179$, $A= 0.210$, $P= 0.240$, $AU=0.146$, $CO= -0.214$, $E= 0.223$. The $p$ value (calculated) is equal to $0P=0.03$, $C=0.044$, $T=0.92$, $A=0.047$, $P=0.023$, $AU=0.170$, $CO=0.043$, $E=0.035$, among these dimensions following dimensions are significant (openness, confrontation, authenticity, proaction, collaboration, experimentation,) because the $p$-value of these dimensions are less than the tabular value i.e. 0.05.and rest of the dimensions are not significant (i.e trust, autonomy) because the $p$-value of these dimensions are more than 0.05. Therefore the null hypothesis is rejected and the alternate hypothesis is partially accepted.

### Hypotheses

**$H_0$:** There is no significant impact of Organization culture on job satisfaction of employees.

**$H_1$:** There is a significant impact of Organization culture on job satisfaction of employees.

For testing **Hypothesis 3** Regression Testing has been applied.

### Variables of the Hypothesis

i. **Organization culture:** Statement number 1 to 40 measures the Organization culture.

ii. **Job satisfaction:** Statement number 41 to 60 measures job satisfaction.

### Table

| A | Pearson Correlation | .210 | .396** | .337** | .244 | .025 | .044 | .050 | .162 |
|   |                    | (0.04) | (0.00) | (0.01) | (0.02) | 1 | (.815) | (.682) | (.637) | (.128) |
| P | Pearson Correlation | .240 | .156 | .043 | .099 | .025 | .325** | .018 | .291** |
|   |                    | (0.02) | (.142) | (.689) | (.35) | (.815) | 1 | (.002) | (.867) | (.005) |
| AU| Pearson Correlation | .146 | .187 | .077 | .237 | .044 | .325** | 1 | .108 | .131 |
|   |                    | (0.17) | (.078) | (.470) | (.02) | (.682) | (.002) | (.310) | (.219) |
| CO| Pearson Correlation | .214* | .296* | .141 | .238 | .050 | .018 | .108 | 1 | .151 |
|   |                    | (.043) | (.005) | (.184) | (.02) | (.637) | (.867) | (.310) | .156 |
| E | Pearson Correlation | .223 | .330* | .264* | .399 | .162 | .291** | .131 | .151 | 1 |
|   |                    | (0.03) | (.001) | (.12) | (.00) | (.128) | (.005) | (.219) | (.156) |
TABLE 4: MODEL SUMMARY ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>1661.001</td>
<td>8</td>
<td>207.625</td>
<td>2.851</td>
<td>.008b</td>
</tr>
<tr>
<td>1 Residual</td>
<td>5897.899</td>
<td>81</td>
<td>72.814</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7558.900</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: JS
b. Predictors: (Constant), experimentation, autonomy, authenticity, collaboration, proaction, confrontation, trust, openness

TABLE 5: REGRESSION ANALYSIS BETWEEN ORGANIZATION CULTURE AND JOB SATISFACTION

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>95.0% Confidence Interval for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>(Constant)</td>
<td>34.547</td>
<td>17.613</td>
<td></td>
<td>1.961</td>
<td>.053</td>
</tr>
<tr>
<td>Openness</td>
<td>.439</td>
<td>.506</td>
<td>.123</td>
<td>.867</td>
<td>.388</td>
</tr>
<tr>
<td>confrontation</td>
<td>.522</td>
<td>.608</td>
<td>.109</td>
<td>.859</td>
<td>.393</td>
</tr>
<tr>
<td>Trust</td>
<td>.102</td>
<td>.522</td>
<td>.025</td>
<td>.196</td>
<td>.845</td>
</tr>
<tr>
<td>1 authenticity</td>
<td>.620</td>
<td>.627</td>
<td>.107</td>
<td>.989</td>
<td>.325</td>
</tr>
<tr>
<td>Proaction</td>
<td>.919</td>
<td>.648</td>
<td>.154</td>
<td>1.419</td>
<td>.160</td>
</tr>
<tr>
<td>Autonomy</td>
<td>.423</td>
<td>.527</td>
<td>.089</td>
<td>.803</td>
<td>.424</td>
</tr>
<tr>
<td>collaboration</td>
<td>-1.760</td>
<td>.596</td>
<td>-.307</td>
<td>-2.954</td>
<td>.004</td>
</tr>
<tr>
<td>experimentation</td>
<td>.532</td>
<td>.517</td>
<td>.116</td>
<td>1.028</td>
<td>.307</td>
</tr>
</tbody>
</table>

a. Dependent Variable: JS

Interpretation

The above Tables depicts that R square value of (0.220) indicates that 22% variation in job satisfaction is explained by organization culture at Bikanerval. Here f-value is (2.85) which is significant at 0.01.this means that final model significant improve the ability to predict the job satisfaction.

V. FINDINGS OF THE STUDY

TABLE 6 REPRESENTING RESULTS OF HYPOTHESES ALONG WITH THE ‘P-VALUES’ OF THEIR TESTING.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Hypothesis</th>
<th>P- Value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Job satisfaction among employees of Bikanerval.</td>
<td>0.399</td>
<td>H₀ : Accepted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>H₁ : Rejected</td>
</tr>
</tbody>
</table>
2. Relationship between Organization Culture (all eight dimension of OCTAPACE) and Job Satisfaction.

\[ O(0.030), C(0.044), T(0.92), A(0.047), P(0.023), A(0.170), C(0.043), E(0.035) \]

\( H_0 : \text{Rejected} \)
\( H_1 : \text{ Accepted} \)

3. Impact of Organization Culture on Job Satisfaction

\[ O(0.38), C(0.39), T(0.84), A(0.32), P(0.16), A(0.42), C(0.00), E(0.30) \]

\( H_0 : \text{Rejected} \)
\( H_1 : \text{ Accepted} \)

* P-Value at 95 % of significance.

VI. FINDINGS

From the analysis it could be deduced that there was no difference of job satisfaction between the males and females employees of Bikanervala. The p-value is 0.399 for job satisfaction. Therefore, the difference between the two means is not statistically significantly different from zero at the 5% level of significance.

From the second hypothesis it can be seen that there was correlation between Organization culture (all eight dimension of OCTAPACE) and job satisfaction as the correlation value was \( O(0.030), C(0.044), T(0.92), A(0.047), P(0.023), A(0.170), C(0.043), E(0.035) \) among these most of the dimensions value lies between 0.25 to 0.75. This indicated that more the OCTAPACE Organization culture adopted by the employees at Bikanervala leads to increase in job satisfaction.

These results reveal that the study variables correlate partially and significantly with one another at the significance \( O(0.030), C(0.044), T(0.92), A(0.047), P(0.023), A(0.170), C(0.043), E(0.035) \) level. Besides, the correlation between Organization culture and job satisfaction is statistically significant at the 0.05 level of significance. Thus, the null hypothesis is rejected and the alternative hypothesis is partially accepted. This means a significant, correlation exists between organization and job satisfaction.

It was analyzed from the third hypothesis that there was a slightly significant impact of Organization culture on job satisfaction, which verified that null hypothesis was rejected and alternate hypothesis was slightly accepted. Among Eight dimensions of OCTAPACE only collaboration has slightly impact on job satisfaction. The p-value = 0.00 which is significant at 0.01 and the correlation between the collaboration and job satisfaction is -0.30. Which means that there is more collaboration involve in the organization due which the employees are more engaged towards team work. Which is the main reason of negative correlation value.

VII. LIMITATIONS OF THE STUDY

a. The questionnaire might have been filled without much attention to the questions due to lack of time by the respondents.

b. In case of Primary data, respondents were not very much interested in filling the questionnaire and sometimes it was difficult to contact or meet the respondents, because of their work schedules and personal reasons.

c. There may be biasness against some personal preferences and which would have led to unjustified responses from the respondents.

d. Personally contacting the respondents involved time and cost.

e. The alternate hypothesis was rejected in first hypothesis because of less sample size.
4.3 Scope for further Study

The scope of extending the study in future:

In this research, there is a lot of further scope for study. The researcher in this study has just considered the employees of Bikanervala. Also the area covered for the study was only the head office of Bikanervala (Delhi region).

The sample size considered for the study, is just 90, an increase in sample size ultimately would increase the scope of study. This study focus on today’s turbulent, often chaotic environment commercial success depends on employees making use of their talents in full. The management can create the work environment in which their employees will thrive. This study will help the management to enhance the professional perception of the employees. The organization can identify the relationship existing between the superiors and subordinates. It encourage the resolve of the employees to change the negative behaviour pattern.

VIII. RECOMMENDATION

- The top management must give the employees freedom to make employees down hierarchy to participate in decision making as this will improve the participation of the employees and belongingness towards the job.
- Employee evaluation systems need to be transparent, employee driven, corporately supported and monitored. There is a need to align and integrate it with achievement of enterprise goals.
- Open communication channels between managers and their subordinates enhance employee satisfaction, commitment and performance. Such communication channels are paramount during the change process to ensure participation and involvement.
- Developing and building teams within organizations with the participants drawn from different operational units and imparting skills to enhance creativity, behavioural modifications, communication and divergent thinking skills will improve organizational productivity. Organizations should foster “knowledge culture” through the creation of knowledge environment.
- The organizations should promote collaboration in an organization as it fosters efficiency and productivity of employees. The organizations should be proactive instead of being reactive as it helps in better problem solving.
- Organization should move to team-building interventions like creating Cross-Functional teams which will promote more communication amongst members of the organization.
- Organization should consider about introducing QWL programs and Quality Circles to develop the sense of belongingness and responsibilities amongst employees.
- Organization should promote more of Informal Communication structure to improve the inter-personal relations amongst employees.
- There should be more of systematic implementation of policies, considering the pros and cons.
- Regular and healthy discussions should be facilitated between superiors and subordinates and supervisors should act as the counsellors or mentors to employees in the area where they are falling behind of other team members.

REFERENCES


An Overview of Challenges and Opportunities of Rural Marketer in India

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Abstract - This paper makes an attempt at understanding the challenges being faced by a rural marketer in India. It is done through conceptualization based on literature review and some experimental learning. It aims to (1) develop a framework for understanding rural market (2) explore various options available to a rural marketer (3) examine the effect and contributions of other factors like culture, customs, society etc. (4) challenges to be faced by a rural marketer (5) review the literature on rural situation and (6) explore future concern of rural marketing.

I. INTRODUCTION

Rural sector have always been considered as the most important element of Indian economy and culture. A big portion of population resides in this sector and arranges their livelihood from this sector only. But since independence, till now when we have crossed a complete decade of 21st century, the rural sector is left untouched with some of the basic infrastructure required to live easily with a minimum standards, in this global competitive market, and absence of such infrastructure kills several opportunities of contributions that can be made by rural sector in favor of economic development of the country. The census of India defines rural as any habitation with a population density of less than 400 sq.km, where at least 75% of male working population is engaged in agriculture and where there exists no municipality or board. Thus, the rural population today consists of 800 million inhabitants accounting for 70% of India’s population. Now coming to rural marketing, rural marketing can be defined as the process of developing, pricing, promoting, distributing rural specific goods and services leading to exchange between urban and rural markets, which satisfies consumer demand and also achieves organizational objectives.

A. Evolution of rural market

- Phase 1 (from independence to green revolution): Before the advent of the green revolution, the nature of rural market was altogether different. Rural marketing then referred to marketing of rural products in rural and urban areas. Most of the literature on rural marketing of that time relates to agricultural produce.
- Phase 2 (green revolution to pre-liberalization period): During these times, due to the advent and spread of the green revolution, rural marketing represented marketing of agricultural inputs in rural markets and marketing of rural produce in urban areas.
- Phase 3 (post liberalization period of 20th century): The third phase of rural marketing stared after liberalization of Indian economy. In this period, rural marketing represented the emerging, distinct activity of attracting and serving rural markets to fulfill the needs and wants of rural households, people and their occupations.
- Phase 4 (21st century): Learning from its rural marketing experiences after the independence, the corporate world has finally realized that quick-fix solutions and piecemeal approaches will deliver only limited results in the rural market. And if, an organization wants to tap the real potential of the rural market, it needs to make a long-term commitment with thus market. Its approaches and strategies must not focus on just selling the product and services.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Share in rural income</th>
<th>Share in urban income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>43</td>
<td>32</td>
</tr>
</tbody>
</table>
Delivering a better standard of living and enhancing the quality of life in an efficient manner will be the new role of rural marketing in the 21st century. The rural salesperson is much more than a mere order taker as he is a carrier of the development message to the less informed rural population (Singh 2001).

II. CHALLENGES IN RURAL MARKETING AND SOLUTIONS

Rural markets remain untapped because of three - Distance, Diversity and Dispersion, according to D.K Bose, Vice President, O&M Rural. Initially, the development of the rural market in India had been incidental as the effects of urban markets percolated to rural areas. (Pareek 1999). The major challenges to be faced by rural marketer are as following:

1. Distribution: The cost of distributing goods and services to rural areas sometimes not commensurate with the returns that the marketers expect.

2. Understanding the psyche of the rural consumer: understanding the needs and choice of a rural consumer regarding a particular product is a difficult choice.

3. Limited knowledge: findings and researches sometimes show a different picture, different data may confuse the marketer.

4. Communication: communication barriers are always found in advertising any particular product in rural market.

5. Cost per contact: High cost of media per rural contact versus mass media’s sheer reach and low cost per thousand rates in urban market is another challenge.

6. Sale of fake and spurious products: sometimes retailer pushes imitation products, which are less priced and also offer better earning to the retailer, to illiterate and unaware rural consumer.

7. Budgetary allocations: The amount of investments allocated by corporate in rural sector is very low.

8. Urban orientation and bias: The notion that rural people are just like urban ones and thus, they have same needs, desires, and aspirations is one of the major roadblocks in the path of achieving success in rural markets.

9. Lack of right competence and commitment at frontline level: The competence necessary for interacting with and comprehending rural attitudes and behavior is lacking.

III. OPPORTUNITIES IN RURAL MARKETS

Mr. Neville Gomes, MD, Multimedia Aquarius puts this perspective very clearly “Subsistence economy has morphed into a consumption economy”. Once the marketer develops an innovative low cost model of reaching the rural market, there is a consumer. It implies that rural market is not as poor as it is perceived to be. Following are some of the opportunities rural marketer can explore:

1. Rising rural prosperity: - The ratio of rural per capita income to urban per capita income is increasing, where it was 0.58 in 1996 it is now increased to 0.64 in 2005.

<table>
<thead>
<tr>
<th>Income Source</th>
<th>1994-95</th>
<th>2000-01</th>
<th>2006-07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 1,00,000</td>
<td>1.6</td>
<td>3.8</td>
<td>5.6</td>
</tr>
<tr>
<td>77001-100000</td>
<td>2.7</td>
<td>4.7</td>
<td>5.8</td>
</tr>
<tr>
<td>50001-77000</td>
<td>8.3</td>
<td>13.0</td>
<td>22.4</td>
</tr>
<tr>
<td>25001-50000</td>
<td>26.0</td>
<td>41.1</td>
<td>44.6</td>
</tr>
<tr>
<td>25000 &amp; below</td>
<td>61.4</td>
<td>37.4</td>
<td>20.2</td>
</tr>
</tbody>
</table>

Income of percentage of rural households

2. Lesser dependence on agriculture and monsoon: Non-farming sector has been increased and whosoever are involved in farming are no more dependent on monsoon.

3. Increasing rural consumption: consumption of FMCGs is far more in rural areas as compared to urban areas.

4. Rural marketing efforts: An increasing number of organizations are realizing the importance of the rural markets. The marketing efforts of these organizations are becoming more aggressive every day. Innovative models are being developed to take the products to rural shelves.

5. Increase sale of branded products: as per FICCI reports 1/3 of premium luxury goods were sold in rural markets in 2002. Sale of labeled goods has overtaken sale of non labeled goods in rural markets.
6. Large population: This fact is very much evident to all and this is very attractive feature of the rural market.

IV. FINDINGS

Not only the corporate sector but also the centre and state governments are trying innovative ways to carry developmental programmes to rural areas. IT is being applied for development of land records in electronic form, or putting information about governmental schemes on the internet and intranet. The government of India has set up following departments to undertake rural development activities:

- Department of Drinking Water Supply (DDWS)
- Department of Land Resources (DLR)
- Department of Rural Development (DLR)

The department of rural development has implemented various programmes and these are:

- Pradhan Mantri Gram Sadak Yojana (PMGSY)
- Swarnjayanti Gram Swarozgar Yojana (SGSY)
- Sampoorna Gramin Rozgar Yojana (SGRY)
- Rural Housing (Indira Awaas Yojana)
- Training schemes

Setting of e-governance.

E-governance is a set of technology—mediated processes that are changing both the delivery of public services and the broader interactions between citizens and government.

The fields of e-governance are e-administration refers to improving of government processes and of internal workings of public sector with new ICT-executed information processes. Some of the recent examples are:

- GYANDOOT (in Dhar district, Madhya Pradesh) launched on January 1, 2000, with installation of a low cost rural intranet covering 20 villages that has expanded to 39 kiosks covering 311 panchayats over 600 villages and serves population of 5 lacs.
- Electronic Land Record systems (in Andhra Pradesh, Punjab and Karnataka).
- Andhra Cards (in Andhra Pradesh) a CARD (computer—aided administration of registration department) in Andhra Pradesh is the pioneering efforts in registering real-estate transactions.
- Punjab’s PRISM (in Punjab) this is Punjab registration information system module.
- Karnataka’s Bhoomi (land) has put most of 1.7 crore land records on the internet.
- Andhra Pradesh’s eSeva
- National e-government plan.

V. CONCLUSION

To overcome the challenges of rural marketing, the MART approach can be implemented and business objectives can be achieved.

1. Research: - It studies the profile of the consumers.
2. Strategy: - It designs a pilot for testing and assessing the low income masses.
3. Pilot implementation: - It demonstrates the relevance and utility of the product to meet the needs of the consumers.

Future of rural marketing is very bright, but to exploit its potential, companies will have to take a dedicated look at this market, have innovative rural distribution strategies, work on new approaches and these approaches can be:

1. Dedicated rural team
2. Forward innovation
3. Inclusive marketing
4. Innovative rural distribution
5. New price performance paradigm

REFERENCES

[3]. Studies by Andrew Foster and Mark Rosenzweig, October 2003
Abstract- Entrepreneurs are considered as agents of economic growth. They create wealth, generate employment, provide new goods and services and raise the standard of living. In recent years, entrepreneur and Entrepreneurship Development Programme (EDP) has become a serious matter of discussion about meaning of entrepreneur, characteristics of entrepreneur, role of entrepreneur in economic growth etc. Entrepreneurship Development Programme which is primarily meant for developing those first generation entrepreneurs who on their own account cannot become successful entrepreneurs.

A few of India’s efforts at promoting entrepreneurship and innovation are:

Startups India- Startups give an entity or registration at tenure of seven years from the date of incorporation and in the case of Biotechnological sector it will be exceed up to ten years. It is launch in Jan 2016, the initiative has successfully given a head start to many aspiring entrepreneurs, with a 360 degree approach to allow startups.

Make in India- Transformation of India into Global level and making it as a manufacturing hub, Initiative was taken as a Make in India in Sep. 2014. Make in India prove as a powerful call for Indian citizens, business leaders, and an invitation to potential partners and investors around the world to revamp obsolete processes and policies, and centralize information about opportunities in India’s manufacturing sector.

Jan Dhan Aadhar Mobile - JAM, for the first time, is a technological intervention that enables direct transfer of subsidies to intended beneficiaries and, therefore, eliminates all intermediaries and leakages in the system, which has a potential impact on the lives of millions of Indian citizens.

Digital India- Digital India was helping the country in a better way and modernizes the economy to make all the service provides by the government electronically available. The initiative aims to transform India into a digitally-empowered society and knowledge economy with universal access to goods and services.

I. INTRODUCTION

EDP is a program meant to develop entrepreneurial abilities among the people. In other words, it refers to inculcation, development, and polishing of entrepreneurial skills into a person needed to establish and successfully run his/her enterprise. Thus, the concept of entrepreneurship development programme involves equipping a person with the required skills and knowledge needed for starting and running the enterprise.

In recent years, entrepreneur and Entrepreneurship Development Programme (EDP) has become a serious matter of discussion about meaning of entrepreneur, characteristics of entrepreneur, role of entrepreneur in economic growth etc. Entrepreneurship Development Programme which is primarily meant for developing those first generation entrepreneurs who on their own account cannot become successful entrepreneurs.
II. IMPORTANCE OF EDP

Entrepreneurs are considered as agents of economic growth. They create wealth, generate employment, provide new goods and services and raise the standard of living. EDP is an effective way to develop entrepreneurs which can help in accelerating the pace of socio-economic development, balanced regional growth, and exploitation of locally available resources. It can also create gainful self-employment. An EDP equips entrepreneurs and makes them competent to anticipate and deal with a variety of problems that any entrepreneur may have to face. It gives confidence to the entrepreneur to face uncertainties and take profitable risks. It prepares them to deserve and make good use of various forms of assistance.

Institution Providing Entrepreneurship Development Programs in India

National Institute for Entrepreneurship and Small Business Development (NIESBUD)

NIESBUD was established in 1983 by the Ministry of Industry, Government of India. Its main functions and objectives are:

- To serve as an apex national level resource institute to accelerate the process of entrepreneurship development.
- To help and facilitate various agencies in carrying out training and other entrepreneurship development activities.
- To provide vital information support to trainers, promoters and entrepreneurs.
- To evolve effective training strategies.
- To identify, train and assist potential entrepreneurs for setting up ventures.

This institute acts as a nodal agency. It organizes about 29 national and 6 international training programmes every year.

Entrepreneurship Development Institute of India (EDII)

It was established in 1983 by financial institutions. It conducts research, training and institution-building activities for encouraging the participation of backward regions. The main objectives of EDII are:

- To increase the supply of trained entrepreneurs through training.
- To generate opportunities for self-employment.
- To improve managerial capabilities of small-scale industries.
- To promote small enterprises at rural level.
- To contribute to the dispersal of business ownership.

Some other organizations providing EDPs are:

- Small Industries Development Organization (SIDO)
- Indian Investment Centre (IIC)
- National Institute for Small Industry Extension and Training (NISIET), Hyderabad
- Small Industry Development Bank of India (SIDBI)

![Fig 1 Reasons For Entrepreneurship](image-url)
III. YOUTH ENTREPRENEURSHIP

Before looking at the potential benefits of promoting youth entrepreneurship, it is important to have an understanding of what 'youth entrepreneurship' is. Related to this is the need to understand the importance of promoting entrepreneurship in general and youth entrepreneurship in particular. Thus, the key questions that this section addresses are: What is entrepreneurship? What is youth entrepreneurship? What is the value of youth entrepreneurship? What are the social attitudes towards youth entrepreneurship? Who are youth entrepreneurs? ‘Youth’ is defined by the United Nations as those between 15-24 years of age. For the purpose of this paper, however, a ‘youth’ is defined as any person aged between 15-35 years of age.

Transitions in the process of Youth Entrepreneurship Development

Below is a discussion of the transitional categorization of youth entrepreneurs.

Pre-entrepreneurs

This is the formative stage which appears to serve as a probationary period. It comprises young people in the age group 15-19 years. The great majority of youth in this group are 'pre-entrepreneurs' who have a very low level of proprietary participation in the small enterprise sector. These younger youth are often in transition from the security of the home or education to the work place. But, as Curtain (2000) observes, for many young people, the transition from education to work is not a single step of leaving the educational system and entering the world of work.

In many countries, the transition process for young people extends for some time with neither an obvious starting point nor a clearly defined end. It may involve several steps forth and back between education and work, only being interrupted by search and waiting times involving unemployment or chosen time off for leisure, travel and other activities.

In consequence, pre-entrepreneurs tend to experiment with various activities before some of them attempt to set themselves up in business.

Budding Entrepreneurs

This is the growth stage. It comprises young people in the age group 20-25 years who are in their middle twenties. These youth are likely to have gained some experience, skills and capital
to enable them run their own enterprises. They often face three enterprise pathways: 1) remaining stuck in marginal activities; 2) going out of business; and; 3) running successful enterprises. Recent evidence from Zambia suggests that the majority of these young people will be trapped in marginal enterprise activities, with a considerable proportion of enterprises collapsing.

Emergent Entrepreneurs

In the age group 26-29 years, youth are in their prime. This means that emergent entrepreneurs have a higher level of maturity than youth in the lower age groups. They are also likely to have accumulated vital experience in business or in other areas of life. Hence, they are more likely to run more viable enterprises than younger youth. As the evidence from South Africa suggests, the majority of successful youth are in their middle twenties or older.

It should, however, be stressed that the transitions in the process of youth enterprise development is neither mutually exclusive nor a linear process as some young people from different age groups may find themselves at different positions along the enterprise continuum. Secondly, it is not clear whether this process occurs in a similar manner in various sub-sectors of the economy, especially the informal economy in LDCs. Nonetheless, the general tendency is for youth proprietors to follow the stages described above.

The transitions in the process of youth entrepreneurship development have policy implications for the promotion of youth enterprise. They suggest the need to carefully recognize the capabilities of various youth age groups and the need to come up with carefully targeted youth entrepreneurship promotion programmes. It is also important to consider the reasons that motivate young people to start their own businesses.

Youth Policies

Since the mid-1990s, many nations have shown a growing interest in, and commitment to, the concept of a national youth policy recognizing and addressing the needs and development opportunities facing their young women and men (ILO, 2000). The ILO observes that such interest has been supported internationally through specific initiatives by such organizations as the International Labor Office, the United Nations, through its Youth Policies and Programs Unit, the Division of Youth and Sports Activities in UNESCO, and the Commonwealth Secretariat, through the Commonwealth Youth Program.

National youth policies are wide-ranging documents, covering the issues affecting young women and men. Enterprise and employment is only one element that can be contained in such policies. A national youth policy may establish such goals and objectives as involving young men and women in national development and social responsibility; facilitating a coordinated response to youth development; developing supportive families and communities; achieving social justice; promoting healthy lifestyles and personal well-being; encouraging a positive perspective toward global issues and international understanding; developing positive attitudes.

The following are the key issues that emerge from a survey of the literature on youth policies in many countries, especially LDCs:

• There are no proper policy/program linkages
• Youth policies are not properly integrated with key macroeconomic policies
• Youth policies are not properly integrated with key sectarian policies,
• There is a dominant welfares perception of youth, and
• The policies lack effective implementation mechanisms.

IV. IMPLICATIONS FOR POLICY AND PROGRAMME DESIGN

The needs of youth entrepreneurs in the three categories discussed above have serious implications for policy and the design of youth enterprise promotion programmes. They strongly suggest that the design of programmes should recognize the capabilities of different youth groups and how this impact on their ability to set up, run, manage and expand a business. Also critical is the choice of intermediary institutions.

In the literature, views differ on whether young people need specialized, youth-oriented, business support services or whether they should use the same general agencies and programs as anybody else (White and Kenyon, 2000). As White and Kenyon observe, some analysts argue that specific youth agencies risk creating a ‘youth ghetto’ which is artificial and gives youth poor preparation for the ‘real world’. It is also argued...
that such agencies prevent young people from the opportunity of learning from older people.

However, promoters of specialized youth business support programs such as Business in the Community (UK) (quoted in White and Kenyon, 2000), argue that young people as a group require more time and attention than older people and this may exceed what general development agencies wish to provide one client. This requires staff trained and experienced in dealing with young men and women.

Given the evidence on the transitions in the process of youth entrepreneurship development and challenges discussed above, a distinction should be made between younger and older youth.

This suggests that younger youths may require special attention to address their needs, largely from their own perspective. As White and Kenyon (Ibid.23) observe, dealing with young people requires skills and sensitivity quite different from those required when dealing with adults. On the other hand, older youths, especially the budding entrepreneurs should be facilitated to graduate from specialized youth institutions to general enterprise support agencies and programmes as anybody else in society.

**Youth Enterprise Promotion Programmes**

There is no single policy model for the encouragement and promotion of entrepreneurial activity among youth. As the OECD report (2001) notes, as new programmes develop in various national and cultural settings, they tend to show more, rather than less variety in their content and delivery mechanisms. Enterprise promotion projects have different goals and objectives, in terms of clients, aspirations and types of interventions. Broadly speaking, however, programmes aimed at promoting enterprise among youth can be divided into two categories: those aimed at in-school youth and those designed to meet the needs of non-school youth. This section does not attempt a detailed discussion of these programmes, but rather highlights those that have emerged as examples of ‘best practice’ in both developed and developing countries. As used here, ‘best practices’ refers to approaches that deliver the most beneficial outcomes (Gibson, 1997).

**Future Aspirations of Youth**

In the USA, nearly half (40 percent) of young people finishing secondary school express high interest in forming their own businesses (OECD, 2001). Similarly, in the United Kingdom, which, according to the OECD report (Ibid.), is Europe’s second most entrepreneurial large economy (to Italy) and has the fastest growing self-employment rates, more than a third of the nation’s young people express a desire to start their own businesses, and each year about 50,000 of them actually do it (Ibid.).

In France, a survey specifically focused on beginning and finishing secondary school pupils as well as those in the first year study for a BTS (Brevet de Technicien Superieur), a professional qualification, conducted in 1999 revealed that 32 percent of the respondents were seriously envisaging the creation of an enterprise as their first professional work (OECD, 2001).

These aspirations are also evident among youth in developing countries. Recent survey data from Malawi and Zambia suggest that slightly over half of the youth express a desire to start their own businesses. In Malawi, the research shows that about a third of the youth entrepreneurs want to expand or diversify their businesses into other ventures, with only 3.0 percent saying that they would look for a formal sector job. Equally, in Zambia, slightly more than half (50.9 percent) of the unemployed youth want to start their own enterprises in the urban informal sector, while 19.6 percent indicated that they intend to seek informal wage employment (Chigunta, 2001).

Among the youth entrepreneurs, the majority (63.6 percent) of youth proprietors express a desire to grow their business ventures in the informal sector.

The expressed desire by many youth to start their own businesses seems to contradict the conventional wisdom that the majority of young people have a negative attitude towards self-employment, especially in the urban informal sector. The current tendency in the literature is to portray youth as ‘job seekers’ who mainly view self-employment as a ‘stop gap’ measure as they wait for better opportunities in the formal sector. Indeed, in the case of the developing countries, it is tempting to dismiss the desire of over half of the youth to set up their own businesses as arising from a lack of viable alternatives. This could be true for some youth. But, as discussed above, the expressed interest in starting or
growing an enterprise among young people can be attributed to a complex combination of factors. Among others, these reflect positive changes in the political and social environment of entrepreneurship and low wages in the formal sector which act as a disincentive to job seekers with entrepreneurial aspirations.

The great interest expressed in starting or expanding an enterprise among youth in both developed and developing countries should be seen in the context of the increasingly importance of self-employment as a source of new jobs and economic dynamism in both developed and developing countries.

Objectives of the study
- To study the awareness about entrepreneurship development program among youth.
- To identify and train the potential entrepreneurs in the region;
- To develop necessary knowledge and skills among the participants in EDPs.
- To impart basis managerial knowledge and understanding;
- To develop and strengthen entrepreneurial quality and motivation;
- To analyze the environmental issues related to EDP;
- To enlarge the supply of entrepreneurs for rapid industrial development;

V. RESEARCH DESIGN

The research design used in this project is descriptive in nature. Descriptive research designs help provide answers to the questions of who, what, when, where, and how associated with a particular research problem.

Sampling
Non-Probability sampling technique is most commonly associated with survey-based research where the samples are gathered in a process that does not give all the individuals in the population equal chance of being selected and thus a convenience sampling method has been used to collect data from respondents.

Sample Universe – Panipat Residents
Sample Unit – Middle Class Residents in Panipat
Sample Size - Total Sample Size = 100

Source of Collection of Data
Data Collection is an important aspect of any type of research study. Inaccurate data collection can disrupt the results of a study and ultimately lead to invalid results. …

Primary Data
Under this study primary data was collected by using structured questionnaire. The structured questionnaire consists of closed-ended questions. The primary data has been collected through the questionnaire by means of personal interview. The questionnaire consists of number of questions printed in a definite order on a form.

Secondary Data
A secondary source is something written about a primary source. Secondary source include comments on interpretations of or discussions about the original material. One can think of secondary sources as second-hand information.

The most of information are collected from the EDP Publications such as Brochures, Websites, Annual Reports, Booklets, Monthly Bulletin, and different daily Newspapers and Business Magazines. The internet was a real helping hand in the data collection through the different search engines.

VI. TOOLS AND TECHNIQUES FOR ANALYSIS

The data is analyzed by chi-square Test and have been represented in the form of Ratios, tables, pie chart and bar.

Hypothesis
Research hypotheses are the specific testable predictions made about the independent and dependent variables in the study. Hypotheses are couched in terms of the particular independent and dependent variables that are going to be used in the study.

H₀: There is no significant relation between knowing about EDP and EDP help in career path.
H₁: There is significant relation between knowing about EDP and EDP help in career path.

INFERENTIAL STATISTICS: Chi-Square Test

Degree of freedom = (r-1) (c-1)
\[ (5-1) (2-1) = 4 \times 1 = 5 \]

**Level of significance = 5%**

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**Interpretation**

\[ V_t^2 = 11.070 \]

\[ V_t^2 > V_{t}^2 = 14.78668 > 11.070 \]

As calculated value is greater than table value, so the null hypothesis is rejected, this implies that there is significant relationship between knowing about EDP and EDP help in career path.

**FINDINGS**

- Most of the respondents are aware of entrepreneurship development program (EDP).
- It has found that the respondents were came to know about the entrepreneurship development program (EDP) through Government office, self visit, media and family/ friends but many of them came to aware from media.
- It is cleared that entrepreneurship development program (EDP) help to develop their career path.
- Entrepreneurship development program (EDP) increases competition among youth.
- It is also helpful for the global market.
- Many of them want to open their own business and to be an entrepreneur.
- Maximum numbers of people are believed that EDP can give new opportunities to economy of the country.
• It is also believed that frequent change in technology in business play a vital role for EDP.

• 37 of the respondents said that EDII policies promote entrepreneurship Development programmed among youth.

• Most of the respondents have positive attitude towards Yes Bank for youth entrepreneurship programmed.

• Maximum numbers of respondents believes that Financial & Psychological Support can affect youth for becoming an entrepreneur in India.

• People believe that lack of experience among youth may lead to failure.

• It has found that Creative thinking of young generation is inspirations for Entrepreneurship development program.

• It is cleared that the most profitable platform for young entrepreneurs is agriculture followed by Banking.

VII. LIMITATION AND FURTHER RESEARCH

Although the study was carried out with extreme enthusiasm and careful planning there are several limitations. It is difficult to know if all respondents gave accurate information; some respondents tend to give misleading information. Moreover, the results depend upon the perception of the respondents; therefore, some subjectivity in their response is possible. Since, the present study focuses only on the Panipat, the future research can focus on other states and cities too.

VIII. CONCLUSION

It is concluded that the Entrepreneur Development Program is very helpful to the society to bring a positive mind among people. EDP helps to inspire their career path as it provides an effective program. So the study is concluded that EDP is the source to develop people’s personality, attitude and also changing the mind of becoming an entrepreneur. It helps in the global market as well as it brings the mind to compete among youth exist today. Financial & Psychological Support can affect youth for becoming an entrepreneur in India and EDP can give new opportunities to economy of the country.

EDP helps every organization to inspire and brings good quality of a person. It is further useful for the society to bring a good knowledge regarding each and every field and enhance their knowledge by experience. It provides the way of how to behave, talk. So EDP is a must for each and everyone especially for those who want to be a good leadership.

EDII provides a special EDP for those who are interested in it and it assist a person to behave, talk towards other. So EDII has been providing an opportunity for everyone those who have an interest with EDP.

REFERENCES


Right to Education: Accessing Education to the Doors of Disadvantaged and Weaker Sections

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Abstract—Education is the single most important instrument for social and economic transformation. Since its independence the Government of India is continuously doing efforts in the direction to attain the goal of Education for all. This act was an appreciable step in which the Government of India has taken the responsibility to provide 6 to 14 years children free and compulsory education in their neighborhood school. This act will certainly a revolution to access education to all children to all section of India, particularly the disadvantaged and weaker section of the highly plural and socially stratified society. The Act has open up the whole sphere of circumstances which come in the way of a child’s enrolment in school and his/her completion of the elementary stage. This necessitates an attempt at listing of categories of children who might be covered under section 2(d) and (e) and spelling out of possible strategies to prevent explicit and implicit discrimination in pursuing and completing elementary education. But it will be significant more if the policies and act implemented with full and force in its practical form.

I. INTRODUCTION

India is a plurist country, with rich diversity, reflected in the multitude of cultures, religions, languages and racial stocks. The prevalence of such pluralism has made the social fabric stratified and hierarchical. Consequently, social and economic opportunities are differentially distributed on the lines of caste and the class affiliation. There is a dominance of one category over other. The root of this stratification is unawareness, social and geographical diversity, highly conservative attitude and poverty of Indian people.

The Government of India has officially recognizes historically discriminated communities of India such as untouchables and Shudras under the designation of Scheduled Castes, certain economically backward castes as other Backward Castes (OBC), geographically isolated schedule tribes (ST), women and some religious minorities. These people have to face special problems and are deprived of basic social rights and security because of poverty, discrimination, or other unfavorable circumstance. The people belonging to these groups are more generalized as socially disadvantaged or weaker sections. Out of them two segments are Schedule Caste (SC) and Schedule Tribes (ST) which both constitute about 82% of the disadvantaged. The schedule castes are the lowest rung of caste Hindus subjected to social discrimination i.e. untouchability due to their lowly occupations, while the schedule tribes are those who suffered physical isolation, remote from civilization.

The scheduled tribes are one of the most disadvantaged groups in terms of educational development. India has the single largest tribal population in the world compared to any other country. Out of them 10.4% lives in rural areas. The ST has their own unique culture and has been cut off from the main stream for a long time.

It is important that the accident of birth in a particular religion, class, caste or gender should not define one’s life chances for all time to come. To overcome these disparities ‘Education’ is the single most important instrument for social and economic transformation. As an empowerment, education is the primary vehicle by which economically and socially marginalized adults and children can lift themselves out of poverty and obtain the means to participate fully in their communities. This unequal social economic and power equations, which persist, deeply influence children’s access to education and their participation in the learning process.

According to India’s Education for All Mid Decade Assessment, in just five years between 2000 and 2005, India increased primary school enrolment overall by 13.7 percent and by 19.8 percent for girls. There were and estimated eight million six to 14-year-olds in India out of school in 2009. To tackle this situation Government of India passed another legislation of Right to Education Act in 2009.
Is RTE thriving for Disadvantaged and other Weaker Sections?

The Right to Education Act 2009 has provided several educational provisions for its effective implementation. The Right of Children to compulsory Education Bill, 2008, is anchored in the belief that the values of equality, social justice and democracy and the creation of a just humane society can be achieved only through provision of inclusive elementary education to all. The section 3 of this act provides to every child of the age of 6 to 14 years the right to free and compulsory education till the completion of elementary education. According to the Kothari Commission Report, the neighborhood school is meant to be a common space, where all children cutting across caste, class, gender line, learn together in the best inclusive manner. The ‘free education’ should be read in consonance with the provisions of section 12(1)(a)-(c)which specify the extent of the school’s responsibility for free and compulsory education.

If there is no provision of school within the area of 1 km then the act provided with special schemes run under SSA by Government of India. Like ‘Ashram Schools’or ‘Schools at your Doors’through Education Guarantee Scheme(EGS)Alternative and Innovative Education(AIE) Centers in the habitations with atleast 15-20 children to meet the educational needs of the disadvantaged groups of our society. The (EGS)are intended to provide access to formal schooling,through a regular curriculum and textbooks to children in remote areas that do not qualify for a regular school due to existing state norms for opening schools. While Alternative and Innovative Education centers are intended for children in difficult circumstances, with no regular schooling experience or whose schooling has been disrupted.

It has been several times seen that children are screened through tests or interviews and even their parents have to face interview to enroll their wards. The wards of disadvantaged parents deprived of taking admission in many educational institutes as the children are not able to crack out the nut of screening nor are their parents well qualified. Therefore it result in ‘NO ADMISSION’. All Schools have been directed to must adopt an admission procedure that is non-discriminatory, rational and transparent, and that schools do not subject children and their parents to admission tests and interviews in order to decide whether they will admit a child or not.

It is seen that exclusion from educational institutions increases as the stage changes from low to high. As also noted enrolment does not necessarily mean that students attend classes regularly. Several micro studies show a gap between enrolment on record and actual presence in classroom particularly at the primary stage. Even among those who attend classes for relatively many days do not complete the respective stage of education. Thanks to various campaigns like Sarva Shiksha Abhiyan, launched in 2001, drop out rate in the last decade has considerably declined. At the same time the rate from class 1 to 5 is fluctuating.

The RTE act has provided with a new through of ‘Age Appropriation’. Although the concept has aroused confliction among educational stakeholders particularly teachers and administrators running educational institutes. Section 4 of this act provides children above six years, who have either not been admitted to any school or having been admitted have not completed elementary education and have dropped out. The right to be admitted to school in a class appropriate to his or her age for completing elementary education. The section will certainly prove to be a boon for deprived and disadvantaged children but only when it will be implemented effectively. Section 7(1)—(5) of this act provides for financial and other responsibilities of the Central Government and the State Governments for carrying out the provisions of the proposed Act. The Central Government has estimated a total requirements of Rs. 2.31 lakh crore over a five year period from 2010-11 to 2014-15 to implement the RTE Act. Separately the 13th Finance Commission has also provided a grant of Rs. 24,068 crore specifically for elementary education.

II. EDUCATIONAL PROVISIONS FOR GIRLS’

Education provisions for girls under RTE Act, girls are likely to enroll in school than boys in 2005, for upper primary school girls enrolment was still 8.8 points lower than boys, for Scheduled Tribes (ST) the gender gap was 12.6 points and 16 points for SC. In addition ST and SC children are less likely to access their right to 8 years of schooling. The drop out rate for ST children being 62.9% and 55.2% for SC children compared to a national average of 48.8% leaving school before completing Grade 8. While there have been significant improvements in enrollment and retention figure of girls, girls especially from disadvantaged communities continue to form the bulk out of school children. SSA has
undertaken severa lmeasures to improve girls' access to schooling and retention and more recently on addressing issues of quality and equity. Some of the important measures have been the formulation and implementation of two targeted schemes (NPEGEL and KGBV-Kasturba Gandhi Balika Vidyalaya)improving the school infrastructure and providing support (e.g. free textbooks, uniforms etc.)to girls especially from disadvantaged communities. The Act has provided with to keep continue the programmes like Mahila Samakhya Programme which was started nearly 20 years agowith effective strategy for creating circumstances for girls education

III. EDUCATIONAL PROVISIONS FOR MINORITIES

Educational provisions for other minorities Muslims, community comprises nearly 13% of India’s population. Muslim enrolment at the primary school level (1-5) was a meager 9.39% of total enrolment figure for 2006-07. There is enough evidence that educationally Muslims are an extremely disadvantaged community. There is no comprehensive policy for the education of Muslim children and no specific programmes in increasing participation from this large and important minority group. The Act has provided with Scheme for Infrastructure in Private Aided/Unaided minority Schools /Institutions(Madarsas/Maktabs) located in districts, blocks and towns having a minority population above 20%.

IV. EDUCATIONAL RIGHT FOR CHILDREN WITH SPECIAL NEEDS UNDER RTE ACT

A study by MHRD has revealed that 40% of all out of school children are children with special needs. The act further provides that the provision of the Persons with Disabilities (Equal Opportunities, Protection and Full Participation) Act, 1996 will apply in the case of children suffering from disability as defined under that Act. Children with disabilities have not been explicitly included as a category in section 2(d) of the RTE Act,which otherwise lists children belonging to disadvantaged groups. However, the same section also allows the appropriate government to specify by notification, any other group of children who are disadvantaged as aresult of any other factor. Thus ,appropriate governments can issue a notification in section 2(d)of the RTE Act to include children with disabilities, within the category of children belonging to disadvantaged groups.

V. STUMBLING BLOCK IN THE WAY OF RTE ACT

Democratization coupled with increased literacy and mass communication has inculcated at least normative desire among all parents, irrespective of their social status to send their children, particularly boys to school. They believe that education would improve their life chances. Yet a large number of children, four percent in the age group between six and 11 years still continue to remain out of school. Highest among them are Muslims; followed by SC and ST.the main reason for such a scenario is chronic poverty of households. Poor’s are haunted with constant insecurity because of low wages, irregularity of availability of work and seasonal and/or daily migration in search of livelihood. Children of such families are forced either to look after the siblings when parents go for work and/or assist parents in economic activities to get a square meal. The situation in urban areas is not much different with increasing informalisation of labour. In their everyday struggle for survival, not withstanding their aspirations for better future of their children,“it is only natural for poor households to have short term view of life , where immediate gains or comforts are valued more. The schooling of children demands continuous care and long term commitment which is a difficult proposition for households living in continued insecurity and uncertainty.” orphan children face the worst condition except a few ‘lucky’ who get some institutional support, they have no other alternative but to sell labor to mitigate hunger. Beside poverty, experience of humiliation – discriminating treatment in the institutions keeps some children away from school. The children of SC, denotified and nomadic tribes, tribes in predominantly non tribal areas, some OBCs and Muslims are the victims. At the tender age they are hurt by teachers and fellow students. Nearly in 1/5 schools in rural areas Dalit children are not allowed to sit with non-dalits. In mid day meals separate lines are observed. They do not get drinking water along with other students in several schools. Besides discriminatory practices, location of school, regularity of teachers, pedagogy curriculum etc. also contribute in drop-out process.Despite several legal provisions such as fundamental right for life, free and compulsory education upto the age of 14 and ban on child labor under various laws(Articles 24,21Aand 45), an estimated more than 15 million children work for their livelihood. This is out of compulsion than a choice. Thus
under neo-liberal economy, the number of child laborers has increased and not declined.

Another major consideration is the curriculum. What will be taught? That discussion is not even on the table in many areas. Schools seem to teach independently and teachers develop their own knowledge as they grow as teachers. Bachelor of Education programs are mainly online and a teacher may in some areas earn a BA in Education without ever stepping into a classroom to teach a lesson or have clinical experiences with students. Materials and supplies are always a challenge to procure.

VI. CONCLUSION AND RECOMMENDATIONS

The Right of children to Free and Compulsory Education (RTE) Act, 2009 passed by the Indian Parliament mandates free and compulsory education of all children of 6-14 years age until they complete elementary education in a neighbourhood school. However, there is an important concern over implementation of RTE Act in the school system with reference to the special training or instruction, its modalities and execution for children admitted underage-appropriate admission. The states are expected to respond to the situation arising out of the implementation of the Act. States and UTs are required to pay special attention to cope with the situation in terms of appointment of qualified teachers, development of special Training programmes for out-of-school children admitted to age appropriate classes and preparation of relevant teaching learning materials for them. Similarly, there is an urgent need of taking appropriate steps for inclusive education of children with disabilities by providing teaching-learning materials, aids and appliances in accordance with nature and needs of each disability, suitable infrastructural modifications, training of regular teachers and school-based appointment of special teacher. There is also a need for organizing programmes for community awareness and attitude change in order to make school for all children. Home-based education has to be given to children suffering from multi-disabilities, severe and profound disability conditions.

All the people can be heard voicing a feeling that the RTE act would have the same fate as several other laws enacted to bring about reform. Therefore, it is a matter of greatest importance that conviction is built among media, intelligentsia and the masses that not only is government totally committed to ensure implementation of this law, but also teachers and general public would no more tolerate the status quo in education and that through collective efforts of all concerned we shall bring about a real change. A massive mobilization would be required to build awareness round the act and to enable the community to monitor and demand accountability. Building a vibrant campaign to generate a momentum and a broad-based awareness of the provisions of the act would be crucial contribution of civil society organizations.

REFERENCES

[1]. Annual Status Education Report, 2012
A Study of Working Capital Management in Special Reference to Private Limited

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Abstract - Working Capital Management is a part of the financial considerations that a finance manager needs to determine and plays an important role in determining the profitability of the firm. In view of its importance, this study aims to investigate on the effect of working capital management components and working capital management policy towards profitability of firms in services and manufacturing sector in Malaysia for five years period from 2006 to 2010 which also coincides with the implementation of the Ninth Malaysia plan and Third Industrial Master Plan. Further, the objective of the study is to examine whether there is any significant difference in profitability between firms in services and manufacturing sector during the period of 2006 to 2010.

1. INTRODUCTION

Working Capital management is a significant face of financial management. Working Capital is referred to as the “Life–Blood of any business firm”. In a manufacturing concern, Management of working capital requires a great deal of time of managers over its different issues:-

- Framing working capital policies.
- Assessing the needed level of working capital.
- Arranging short-term financing.
- Controlling the movement of cash.
- Administering accounts receivables and
- Monitoring investment in inventories.

Working capital in simple terms is the amount of funds which a company must have, to finance its day to day operations. It can also be regarded as the proportion of company’s total capital which is employed in short term operation. Besides these issues, management of working capital has been the point of discussion because of ever growing demand for short term finance, its increasing scarcity of finance. It is discipline that seeks proper policies for managing current assets and current liabilities for maximizing the benefits. An effective management of working capital enables a firm to maximize the profitability and also to maintain adequate liquidity in the business as maintaining optimum level of working capital is the ultimate objective with which finance manager is seriously concerned.

Considering the above issues, a study has been carried out in particular to assess the requirement of working capital in AMBICA OVERSEAS, PANIPAT. Various option to finance the short term requirement and ways and means of control of utilization of available resources because today industries find it difficult to procure adequate credit. Therefore the basic concern is to optimize the use of available resources through the effective and efficient management of working capital.


Working Capital can be classified into Fixed or Permanent and Variable or Fluctuating parts. The minimum level of investment in current assets regularly employed in extra working capital needed to support the changing nature of the activity is called Variable / Fluctuating Working Capital.

Working Capital Management is thus concerned with all aspects of managing Current Assets and Current liabilities

1. Level of investment in each aspect of current assets.
2. Financing or working capital, mix of various sources of financing, managing bills payable, short term bank loans, deposits.
3. Inter relatedness of various aspects of business. For example inventory level keeps changing acc. To changing levels of sales.
During higher sales, inventory decreases, cash balances or receivables increases.

Thus all the current assets decisions are inter related and studies of Working Capital Management constitute all the inter related areas as shown:

II. LITERATURE REVIEW

Nobanee et al., (2017) A strong negative relation between the length of the firm’s cash conversion cycle and its profitability is found in all of the authors’ study samples except for consumer goods companies and services companies.

Hainaut, (2016) It shows how the parameters ruling the switching regime cash flows associated to a project can be inferred from the stock market quotes of a company, active in the same sector of activities. To illustrate it the tractability of the model applies to a project in the healthcare industry.

Abuzayed, (2013) Using robust estimation techniques it found that profitability is affected positively with the cash conversion cycle. This indicates that more profitable firms are less motivated to manage their working capital. Financial markets failed to penalize managers for inefficient working capital management in emerging markets.

Odeyinka et al., (2012) There are 11 significant risk factors out of 26 research risk variables. These significant risk variables can be grouped under three generic factors of “changes in the design or specification”, “project complexity” and “natural inhibition”. The significant risk variables are those ranking high in “extent of occurrence” and with critical impacts on cash flow forecast. It showed that there is no statistically significant difference in the opinions of different categories of contractors regarding the extent of risk occurrence and impacts on cash flow forecast.

III. RESEARCH METHODOLOGY

Research in general refers to the search of knowledge. One can also define research as a scientific & systematic collection of information.

In simple words research is the careful investigation or enquiry of markets especially through search for new facts in any branch of knowledge. Research methodology is a way to systematically solve the research problem.

Research methodology constitutes of research methods, selection criteria of research methods, used in context of research study and explanation of using of a particular method or technique and why other techniques are not used so that research results are capable of being evaluated either by researcher himself or by other. Why a research study has been undertaken how the research problem has been formulated what data have been collected and what particular methods have been adopted, why a particular technique of analyzing data has been adopted, why a particular technique of analyzing data has been used and a host of similar other questions are usually answered when we talk of research methodology concerning a research problem or study.

Research refers to the systematic method consisting of:

- Enunciating the problem,
- Formulating a hypothesis,
- Collecting the fact or data,

Analyzing the facts and reaching certain conclusions either in the form of solutions towards the concerned problem or in certain generals for some theoretical formulation.

IV. RESEARCH DESIGN

“A Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure”. The research design followed to study the working capital management in AMBICA OVERSEAS, PANIPAT is Descriptive and Analytical Research Design.

V. OBJECTIVES OF THE STUDY

Main Objective

“To analyze the Working Capital” in Ambica Overseas, Panipat and to study the day to day operations of the company.”

Sub Objectives of the Study

- To understand and analyze the working capital of the company over the year.
- To get an insight of corporate world.
- To understand the practical application of the theoretical concepts.

VI. SOURCES OF DATA COLLECTION

Data collection is the basic step and of importance on which authenticity of study depends. Before going for the study the researcher have to collect the appropriate data required for the study. Source of allocation of data are two types.
1. Primary Data

2. Secondary Data

This project report is based on secondary data. Following statements are used for analysis and to derive the results required.

- Annual Report
- Data maintained by the department
- Report made by other agencies

VI. LIMITATIONS OF THE STUDY

However, I tried my best to have desired information from the respondents and to make the report fruitful but some limitations are bound to incur which may affect the results or findings.

Limitations of the study are:-

- **Lack of experience**: I was new on the topic which was assigned to me. So lack of experience in getting information from respondents came in to the way of collecting the relevant data.
- **Time Constraints**: Time was a bit short to fathom into the depth of the study. But still all efforts to the best possible extent have been made to collect the data.
- **Data collection Constraints**: Since most of the data used is secondary in nature, this poses the constraints on the validity and reliability of the data.
- **Busy Employees**: Employees are not available as are busy in their work.
- **Appointments**: There was a problem in taking appointments from the managers.
- **Sources**: Sources were confounded some time to give proper information.

VII. ANALYSIS & INTERPRETATION

1. Comparative Analysis of Current Assets (Rs in Lacs):

<table>
<thead>
<tr>
<th>Year</th>
<th>Current Assets (Rs in Lacs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>3183.41</td>
</tr>
<tr>
<td>2017</td>
<td>3337.98</td>
</tr>
</tbody>
</table>

   **Interpretation**: According to the analysis the current assets have increased in 2016 as compared to 2017.

2. Comparative Analysis of Current Liabilities (Rs in Lacs):

<table>
<thead>
<tr>
<th>Year</th>
<th>Current Liabilities (Rs in Lacs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>312.99</td>
</tr>
<tr>
<td>2017</td>
<td>263.57</td>
</tr>
</tbody>
</table>

   **Fig. 2**

   **Interpretation**: According to the analysis the liabilities of the company have decreased in 2016 as compare to 2017. It’s 263.57 in 2017.
3. Comparative Analysis of Working Capital (Rs in Lacs):

**Fig. 3**

Comparative Analysis of Working Capital (Rs in Lacs)

**TABLE 3 COMPARATIVE ANALYSIS OF WORKING CAPITAL (RS IN LACS)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Working Capital (Rs in Lacs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Working Capital is 2870.42</td>
</tr>
<tr>
<td>2017</td>
<td>Working Capital is 3110.41</td>
</tr>
</tbody>
</table>

**Interpretation:** According to the analysis working capital have increased in 2016 as compare to 2017.

VIII. FINDINGS

- Demand of carpet is so high that capacity enhancement proves to be indispensable.
- Due to recession, the sales of Ambica Overseas, Panipat is decreased compared to last years.
- The total sales 63.12 crore with an increase 10.88% from previous year,& in 2017 it increased by 4.65% and total sales 66.12 crore.
- In 2016-17, the Gross Profit 11.81 crore with an increase 67.97% from previous year,& in 2017 it increased by 12.49% and total sales 13.29 crore.
- In 2016-17, the Net Profit 5.18 crore with an increase 185.08 % from previous year,& in 2017 it decreased by 39.04% and total sales 3.29 crore.

In 2016-17, the Current Liabilities 299.12 crore with an increase 0.69% from previous year,& in 2017 it decreased by 0.56% and total sales 250.37 crore.

IX. CONCLUSION

- The working capital analysis is the one of the important tools of financial statement analysis because with working capital analysis the day to day operations of company can be analyzed and Ambica Overseas, Panipat do not have a satisfactory financial health according to analysis.
- Ambica Overseas, Panipat have a good location area in the vicinity of panipat but it’s not able to explore panipat resources in an efficient manner. So it is concluded that the management has the finance available but it is not able to invest in a right direction. Therefore it should take in concentration the financial analysis of concern statement to take appropriate decisions.
- Textile industry in India has vast scope to grow as Panipat & Ambala is the hub of ‘textile industries and there are many options available to manufacture textile products such as weaving and designing. Ambica Overseas, Panipat is basically engaged in weaving business. It is recommended to focus more into designing, which will improve the financial health of the Company.

REFERENCE


Stewart Jones, Rohit Sharma, (2001) "The impact of free cash flow, financial leverage and accounting regulation on earnings management in Australia’s “old” and “new” economies", Managerial Finance, Vol. 27 Iss. 12, pp.18 – 39

Impact of Job Satisfaction on Turnover Intentions among University Teaching Staff

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Abstract-The present study measures the impact of job satisfaction on turnover intentions in the private universities teaching staff of Punjab. A sample of 300 university teaching faculty was studied. Proportionate stratified random sampling technique was used for the selection of respondents. After ensuring the normality of the data, factor analysis was conducted to reduce the data into factors. After that, multiple regressions were applied in order to find out the impact of job satisfaction on turnover intention. The results of the study highlighted that different factors of job satisfaction viz; time management and organizational support, leave policy and job security, organizational culture and job pressure were found to have a significant negative impact on urgency of quitting job and have a negative impact on the intention to leave among the teaching staff. Besides these, the paper also presents the managerial implications, limitations and future research of the study.

Keywords: Job Satisfaction, Turnover Intentions, Demographic variables, teaching staff, Private University, Organization culture, job security, pay and rewards.

I. INTRODUCTION

Turnover intention is basically the probability that an employee would stay in the organization or not (Cotton and Tuttle, 1986). Basically employee turnover is the ratio of the number of workers that had to be replaced in a given time period to the average number of workers (Agnes, 1999). Moreover, when people speak about the attitude of an employee they usually mean the job satisfaction of that employee, an employee with high level of job satisfaction have found the positive feeling and attitude and in reverse with a low level of attitude have shown negative feelings (Robbins and Judge, 2013). Employee’s emotions and affection towards his/her job or job characteristic defined the job satisfaction level among the employees and it could be predicted by the job characteristics, leadership quality, age and pre-employment expectation of the employees and it is employees’ emotion and affection response to his/her job (Williams and Hazer 1986). Kreis and Brockopp (1986) suggested that job satisfaction relate with the self-perception of the employees needs fulfillment through work. Over-education and over-skilling are found to be the consequences of the job satisfaction which create the dissatisfaction because of people are over educated and their job profile did not match with their education it may create the dissatisfaction among them (Green and Zhu 2010). Wexley and Yukl (1984) found personal characteristics like education, skill, attitude along with the work-related attributes at work-place viz; working environment and working condition are influence job satisfaction. Right decisions have to be taken by the leaders to increase job satisfaction and determine those factors which influence job satisfaction (Cranny, Smith and Stone, 1992).

II. REVIEW OF LITERATURE

Result of the study show that women found to be happier and satisfied at the workplace and it may show that gender differential is one of the well documented reasons for the job satisfaction (Clark, 1997). Drago and Wooden (1992) show a negative relationship between job satisfaction and absenteeism. Satisfaction level of the employees among the school teachers also enhance with the help of certain demographic factors viz; age, gender and education (Shan, 1998). Rhoades and Eisenberger (2002) gave the two factors viz; training and rewards which act as satisfactory factors because training help the employees in dealing with the new technology and changing environment and with rewards they feel that they are valued by the management and it will help in reducing the turnover intentions.

Dissatisfied employees create problems for the organization such as turnover intention.
Vroom, 1964; Sarminah, 2006; Korunka et al., 2005) which leads to actual turnover in future (Griffeth et al., 2000). Price and Mueller (1981) found in his study that job satisfaction gave an indirect effect on turnover but gave direct influence on intention to leave. Because when employees do not satisfy with their job or working culture, it ultimately creates an intention to leave the job. When turnover does not take place in the organization it may create many problems for the management in future like consistencies of poor performer, career development stoppage and caring out dated method (Dalton and Todor, 1994). Gautam, Dick and Wagner (2001) found that affective commitment when compared with the normative and continuance it is found to be the only predictor of the search and turnover intentions.

Parvin and Kabir (2011) done a research on the pharmaceuticals sector and found in his study that in male, job security was an important aspect for the job satisfaction than to female employees. Employees from medium- and large-staff-sized organizations, compared with those from small staff-sized organizations, were more likely to cite job security as a very important contributor to their job satisfaction. Fatimah et al. (2012) explore the importance of job security in her research and found that higher the job security, higher the job satisfaction experienced. Results of t-test showed that job security has a significant relationship with job satisfaction. So, when the security at the workplace they have it may increase the level of satisfaction at workplace. This is because with job security the workers will not feel threatened by the economic strain and uncertainty that arises from job insecurity. The workers will also feel safe and thus this situation can lead to job satisfaction for the workers, because safety is directly related to the job security. Telecom sector employees show that Pay and promotion have a positive and strong correlation with the Job security and when they have the job security it may lead to the job satisfaction so pay was an important aspect for the employees at their workplace (Saeed et al. 2013).

Jeromy (2001) determine the many reasons related with the organizational culture which leads to job turnover, they are low wages, inadequate wages, lack of career advancements, poor relationship management, poor understanding of the job, lack of proper training and poor working environment. When employees getting the adverse work-place like physical hazards such as loud noise, poor lighting and vibration, bad working environment and work policy etc. these may leads to voluntary turnover (Cottini, Kato, Nielsen, 2009; Martin et al., 2005). When the rules and regulation related with the work and related with the organization does not in the favor of the employees moreover when the employees does not have the clarity about the authority during the time of job and accountability it may leads the employees to leave the organization (Hong and Kaur, 2008). There are various different factors which are related with the turnover intention viz; mentoring (Scandura and Viator, 1994), flexible work arrangement (Almer and Kaplan, 2002), gender (Dalton et al., 1979), personal characteristic (Harrell and Eickhoff, 1998), and stressors, burnout (Fogarty et al., 2000). Intentions are the important immediate determinants of actual behavior (Igabaria and Greenhouse, 1992) and it identify the reasons related with the organization, for the management that why the employees leave the job (Firth, Mellor, Moore and Loqyet, 2004). When organizational culture does not give the fair treatment and opportunity to the employees and when employees perceived the higher career opportunity outside the organization and lack of career advancement inside the organization increase the employees intentions to leave the organization (Stahl et al., 2009) and fail to provide necessary growth opportunity (Negrin and Tzafrir, 2004). Braddy and Meade (2006) discuss about the perception of the employee and found that when perceptions of the employees towards organizational culture change when they know about the information about the organizational values, policies, and award. That will help in increasing the job commitment among them because they feel valuable by the management and more strongly attach with the organization. Culture gives a strong impact among the employees towards the organization because culture includes the many factors viz; information sharing, promotion, working culture, communication etc. and when they have the proper knowledge of those factors, it may enhance the satisfaction level of them (Lehman et al., 2004). Caza and Barker (2004) determine the different factors in organizational culture viz; ethics, moral value, and responsibility which are act as an important factor because all these factors reflect the overall image of the organization when ethics and moral was found to be higher valuable and pure it may enhance the organization status. Ali and Baloch (2010) found in his study that many factors viz; pay, social security, promotion, commitments and age are negatively related with the turnover intentions. Wang et al. (2012) done a comparative
study among the public and private sector employees and results showed that public sector employees have a high level of job satisfaction as compared to private sector employee because the organizational culture, promotion, pay was higher in the public sector as compared to the private. Dickey et al. (2011) done a research among the workers and result concludes that job satisfaction; promotion and training opportunities are the most important determinants of the workers intentions to quit because without all these facility they are not able to do the job with full of satisfaction. Fang and Wang (2006) explored in his study that organizational commitment of the employee was the significant predictor of performance. Latif et al. (2011) done a comparative study on the public and private college teachers and result conclude that teachers of public sector reported more satisfaction with their nature of work, working hours, benefits, salary, job security, opportunity for promotion, family and work-life balance while the private college teachers were not satisfied. Mehmood (2012) Study shows that working condition which provided to the workers has the no effect on their satisfaction level. Promotion opportunity for the employees gave the minute effect on the satisfaction level of them. Benefits, upward striving, and autonomy influence the job satisfaction of employee. Working environment role was the predominant factors that affect the level of satisfaction among them.

When the employees getting the organizational support from their management, seniors in every aspect it may increase the job satisfaction among them and commitment, citizenship and turnover intent among the employees (Saks, 2006). Sweeney and Boyle (2005) trainee accountant show that supervisory actions and their support was positively related with job satisfaction and also analyzed that job satisfaction was positively related to the intentions to remain in the firm. When the organization give them support and knowledge of the goals then employees identify that goals and values of the organization then they involve physically and mentally in the organization and emotionally attached with the organization (Porter et al., 1974). There are different way that can help the management in improving the job satisfaction, they are involvement of the managers and their subordinate can be done through participative management like they can take part in decision making, information processing and problem solving (Wagner, 1994). Owens (2006) found in his study that there was a significance relationship between training and job satisfaction and especially those employees who receive training were more satisfied than those who did not receive training. Training helps them in making friendly with the new and changing technology and the working method. Rousseau (1998) gave the two ways to retain their employees within the organization and maintain the good working environment and they are, enhancing employees’ perception towards the organizational membership and care, value them when they are taking any responsibility give them moral support whenever they are required and same treatment also give to those employees who are work on temporary basis. Recant HR theories explained the different way which help in increasing the job satisfaction and reducing the turnover they are giving the power to employees so that they can take the day to day small decision, give them relevant information related to the organization, proper rewards at the right time for boosting up their moral, all are helpful in increasing the effectiveness of the organization and reduce turnover (Vandenberg, Richardson and Eastman, 1999). Organizational support like training program arrange for them, promotion given to the deserving employees etc. was the important factors considered by the employees as a care for them and in help to increase the trust and quality of relationship, which ultimately help in increasing the job satisfaction and reduce the turnover intention (Chen et al., 2005). Dupre and Day (2007) examine the relationship of both support viz. supervisory support, organizational support and work life balance provided to personal and job quality viz. work stimulation and job clarity with the employees’ health and with that of turnover intentions. Result explored that supportive management of personnel viz; supervisory support, organizational support and work-life balance and job quality factor which include the work stimulation and job clarity were found to be indirectly related to health and turnover intentions which give influence on job satisfaction.

Luna-Arocas and Camps (2008) found that salary was a precursor of intention to turnover in both direct and indirect ways. Because an employee working for the money and it was the one of the important factor for them, salary will help them in living their life in a good way. Joseph, Ng, Koh and Ang (2007) turnover intention was negatively related with pay among the information technology employees. If the employees receiving the pay according to their work and education it will increase the job satisfaction and reduce the
intention to leave the organization. De Tienne et al. (2012) Result showed that lower income employees reported higher level of moral stress, employees higher in position experiences lower stress level and higher job satisfaction and younger employee experience less job satisfaction and more stress and no difference were found between the men and women. Result show that when employees suffer from the higher levels of moral stress level, it may increase employee physical and emotional fatigue which ultimately leads to decrease the job satisfaction and increase the turnover intention among the employees on his job. Gieter et al. (2012) Result has explored that both the pay-level satisfaction and psychological rewards satisfaction was found to be negatively related to turnover intention. An employee was more satisfied with their rewards which they are getting and less likely to leave their organization as compared to those who do not receive the rewards. Turnover rate can be decreasing in organizational when policies regarding the wages are high for the employees because wage theory was redefined by the management from time to time (Batt, Colvin and Keefe, 2002). Khatri et al. (2001) studied different variables which are linked with the turnover intentions they are demographic variables, satisfaction with pay and supervision, justice and organizational commitment. Pay was one of the important factors which relate with the overall job satisfaction of the employees and when pay was good it may reduce the chances of turnover within the organization. If employees receive the rewards from the organization they feel motivated, appreciated because they feel that their efforts was appreciated by the management and management value their work and give them importance and take them as a part of the organization and it ultimately increases their performance at work and reduce the turnover intention among them (Entwistle, 1987). With the help of rewards, management should focus on that how the employee could make more productive and motivated because rewards make them feel so important assets for the organization and help in making them more loyal and productive towards their work and organization (Gerhart and Becker, 1996). Appropriate compensation manages the employee in a proper manner and it increases the output of the organization (Lawler, 2003). Extrinsic rewards which are monetary in nature, measured in term of monetary benefits like bonus, pension and increment all these help in enhancing the job satisfaction level among them and reduce the intention to leave the job (Judge et al., 1999).

Lance (1998) found in his study that performance and turnover intentions have positive relationship because high performer would be voluntarily quit more than that of the low performer because of the opportunities available outside and negative relationship was found between the satisfaction and turnover intentions in between high performers as compared to low performers. Hwang and Kuo (2006) Result concluded in their writing that when employees perceive many alternative employment opportunities, they may quit their jobs quickly because they are confident of finding a new job soon. Job satisfaction does not have a significant relationship with the turnover intention. The results showed that the interaction of job satisfaction and perceived alternative employment opportunities negatively affects turnover intention.

NG and Butts (2009) Result of this study was found that information sharing, locus of control and job significance among the employees positively affects the intentions to stay and attainment the rewards for good performance, availability of opportunity for learning also enhance the intentions of the employees to stay in the organization. Lyness and Judiesch (2001) found that the relationship of promotions to voluntary turnover depended on the timing of the promotion; managers who had been promoted were less likely to resign than managers who had not been promoted only if the promotions had occurred within the past 11 months. Study show that managers who had taken family leaves had higher voluntary turnover rates than managers who had not taken leaves or managers who had taken sick leaves. Among family leave takers, managers with graduate degrees were much less likely to resign than managers with less education. Manafi et al. (2012) Result has identify that there is no significance difference between the work-load, conflicting value with relate to job satisfaction and there was a significance difference between all others factors, perceived control, rewards, community and social support, fairness on the job with job satisfaction. So, overall there was a positive relation between the job satisfaction and intentions to leave in pharmaceutical organization.

III. RESEARCH GAP

Most of the studies reviewed focusing on the relationship between job satisfaction and turnover intentions pertain to manufacturing industries study done by (Ali and Baloch 2010) viz; job satisfaction and turnover intention in banking sector followed by the (Wang et al., 2012) viz; job
satisfaction and quit turnover intentions of offshore workers in the UK oil and gas industry (Dickey et al., 2011), and some study was studied which are based on school and college viz; teaching performance and turnover in school (Fang and Wang, 2006), and job satisfaction among public and private college teachers of District Faisalabad (Latif et al., 2011) but there is lack of such studies among the university teaching staff. Thus considering the need of empirical research in educational sector, especially universities, the present study aims at exploring the factors affecting job satisfaction of private university teachers and formulating certain strategies to overcome dissatisfaction from job with particular reference to private universities. Thus, the main objective of the study is to find out the impact of job satisfaction on two dimensions of turnover intentions, viz., urgency of quitting job and exploring appropriate opportunity among the teaching staff of private universities. Hence, we propose that:

\textbf{H01:} Respondents differ in their perceptions regarding job satisfaction according to their demographic profile.

\textbf{H02:} Job satisfaction has a significant impact on urgency of quitting job.

\textbf{H03:} Job satisfaction has a significant impact on exploring appropriate opportunity.

\textbf{IV. RESEARCH METHODOLOGY}

This present study was covering the private universities of Punjab, only those universities was taken under the study which were established before 2010 and where all the academic courses along research works are undertaken, viz., Lovely Professional University (Phagwara), Chitkara University (Chandigarh), Thapar University (Patiala). On the basis of pretesting, mean and standard deviation were computed and standard error formula given by Malhotra (2007) was applied as under:

\[
 n = \frac{(\sigma)^2 (z)^2}{D^2}
\]

Here, \( D = \) Level of precision
\( \sigma = \) sample standard deviation
\( z = 1.96, \) where confidence level is 95%

Thus, minimum sample size was calculated as 290, which were rounded off to 300 respondents. Further, proportionate stratified random sampling technique was used to select the respondents. On the basis of the total strength of the teaching staff a proportionate sample size was selected from each university, viz. LPU-200 respondents, Chitkara University-42 respondents and Thapar University-58 respondents. The respondents were further selected through systematic random sampling from each strata/university.

\textbf{Measures}

In order to study the relationship of job satisfaction with turnover intentions of the teaching staff a scale of job satisfaction and turnover intention was used.

\textbf{Job Satisfaction-} Job satisfaction was measured by a scale developed by absorbing the statements from Pike and Hudson (1993), DSP job satisfaction questionnaire (www.directcareclearinghouse.org), and Minnesota satisfaction questionnaire (Weiss et al., 1967).

\textbf{Turnover intentions-} Intention to leave of employees were assessed by a questionnaire developed by Sonnentag et al. (1994), Bishop et al. (2002) and Cummam et al. (1979).

The questionnaire has three sections:

\textbf{Section A-} Background of the Respondents- the first section of the questionnaire requires information about personal and demographic data of respondents. Questions covering gender, age, years of experience, income, designation will be asked.

\textbf{Section B-} Inventory of Job Satisfaction- Section B measures the level of employee’s job satisfaction that represents the level of job satisfaction. This section is consisted of 45 items adapted from DSP and MSQ.

\textbf{Section C-} Turnover Intentions- Last section consists of questions that can measures the intention of respondents to leave the organization.

\textbf{Results}

The data was analyzed by using ‘Statistical Package for Social Sciences (SPSS 16.0 version). Before analyzing the data, normality of the distribution was checked using Skewness and Kurtosis. The questionnaire items where values of Skewness and Kurtosis were between (-1 to 1) and (-3 to 3) were retained for further analysis. Three statements from the questionnaire were deleted from further analysis in the process of checking normality of distribution.
Before applying the multiple regressions on the data, firstly factor analysis was applied on the 42 statements of Job Satisfaction and 9 statements of Turnover Intentions in order to reduce the statements. Finally, six factors with 20 items resulting from factor analysis were recognized as: time management and organizational support, leave policy and job security, organizational culture, relationship with seniors and supervisors, job pressure and pay and increments, and 2 items from the turnover intention was recognized viz: urgency of quitting job and exploring appropriate opportunity. In order to maintain the consistency in the data, factors whose Cronbach’s alpha was below 0.60 were ignored.

V. TESTING OF THE HYPOTHESES

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Designation</th>
<th>Age</th>
<th>Experience</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time mgt. and organizational support</td>
<td>.185</td>
<td>.906</td>
<td>.751</td>
<td>.586</td>
</tr>
<tr>
<td>Leave Policy &amp; Job Security</td>
<td>1.530</td>
<td>.207</td>
<td>1.144</td>
<td>.337</td>
</tr>
<tr>
<td>Organizational Culture</td>
<td>.716</td>
<td>.543</td>
<td>1.760</td>
<td>.121</td>
</tr>
<tr>
<td>Relationship with Seniors and Supervisors</td>
<td>2.464</td>
<td>.063</td>
<td>.913</td>
<td>.473</td>
</tr>
<tr>
<td>Pay and Increments</td>
<td>1.649</td>
<td>.178</td>
<td>1.164</td>
<td>.327</td>
</tr>
<tr>
<td>Job Pressure</td>
<td>3.196</td>
<td>.024</td>
<td>3.067</td>
<td>.010</td>
</tr>
<tr>
<td>Urgency of Quitting Job</td>
<td>.235</td>
<td>.872</td>
<td>1.687</td>
<td>.138</td>
</tr>
<tr>
<td>Exploring Appropriate Opportunity</td>
<td>2.518</td>
<td>.058</td>
<td>2.524</td>
<td>.029</td>
</tr>
</tbody>
</table>

ANOVA was applied to test the difference in perceptions of different categories of teaching staff according to their demographic profile with respect to all factors of job satisfaction and turnover intentions. The results of ANOVA test are discussed as under:

A one-way between subjects analysis of variance (ANOVA) was conducted to compare the effect of designation on the research variables and their respective subscales. The significance value of job pressure and exploring appropriate opportunity came out to be .02 and .05, respectively. Hence, designation is found to be significantly related to job pressure and exploring appropriate opportunity.

The significance value of job pressure (p = .01) and exploring appropriate opportunity (p = .02) came out to be less than 0.05, which shows a significance difference in job pressure and exploring appropriate opportunity with respect to age.

The result of one-way between subjects analysis of variance (ANOVA) shows that time management and organizational support, organizational culture, leave policy and job security, relationship with supervisors and seniors, job pressure, pay and increment, urgency of quitting job and exploring appropriate opportunity have no significant difference because the significant value is more than 0.05 that is the level of significance. So, there is no significant difference between the factors of job satisfaction and turnover intentions with the years of experience.

A one-way between subjects analysis of variance (ANOVA) was conducted which shows that time management and organizational support, organizational culture, leave policy and job security, relationship with supervisors and seniors, job pressure, urgency of quitting job and exploring appropriate opportunity, except, pay and increment (.02) have no significant difference because the significance value is more than 0.05. Hence we
conclude that there is no significance difference between the factors of job satisfaction and turnover intentions in relation to the income with an exception of pay and increment dimension of job satisfaction.

Hence, we partially accept $H_01$, significant difference existed in case of designation and age, whereas, years of experience and income showed no significant difference in relation to dimensions of job satisfaction and turnover intentions.

Now, Multiple regression analysis was used to determine the impact of dimensions of job satisfaction viz; time management and organizational support, leave policy and job security, organizational culture, relationship with the supervisor and seniors, job pressure and pay and increments on dimensions of turnover intentions, viz., urgency of quitting job and exploring better opportunities.

a) Impact of job satisfaction on ‘urgency of quitting job’.

The dimensions of job satisfaction, viz., time management and organizational support, leave policy and job security, organization culture, relationship with supervisors and seniors, job pressure and pay and increment were entered as independent variables and the dimension of turnover intentions, viz., urgency of quitting job, was entered as dependent variable. Table 1.1 depicts the result of multiple regression analysis showing the impact of dimensions of job satisfaction on urgency of quitting job.

**TABLE 2: MULTIPLE REGRESSION ANALYSIS**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Predictor</th>
<th>Criterion</th>
<th>Beta</th>
<th>Sig.</th>
<th>t value</th>
<th>R square change</th>
<th>R square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time mgt. and organizational support</td>
<td>Urgency of quitting job</td>
<td>-0.345</td>
<td>.000</td>
<td>-5.142</td>
<td>.217</td>
<td>.217</td>
</tr>
<tr>
<td>2</td>
<td>Leave policy and job security</td>
<td></td>
<td>-0.128</td>
<td>.049</td>
<td>-1.981</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Organization culture</td>
<td></td>
<td>0.021</td>
<td>.747</td>
<td>.323</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Relationship with senior and supervisor</td>
<td></td>
<td>-0.065</td>
<td>.319</td>
<td>-0.999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Job pressure</td>
<td></td>
<td>-0.134</td>
<td>.014</td>
<td>-2.469</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pay and increment</td>
<td></td>
<td>-0.019</td>
<td>.730</td>
<td>-0.345</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: time management and organizational support, leave policy and job security, organizational culture, relationship with seniors and supervisor, job pressure and pay and increment.

b. Dependent variables: urgency of quitting job.

Thus, we may conclude that relative high percentage of the variance ($R^2$) in urgency of quitting job was explained by the selected predictors of job satisfaction (21%). The value of $R^2$ comes out F1 viz; time management and organizational support is -0.345, F2 viz; leave policy and job security -0.128, F3 viz; organizational culture 0.021, F4 viz; relationship with senior and supervisor -0.065, F5 viz; job pressure -0.134 and for F6 viz; pay and increments -0.019, followed by the $t$ values which comes out -5.142 for F1, -1.981 for F2, 0.323 for F3, -0.999 for F4, -2.469 for F5 and -0.345 for F6 and the significance values comes out for each factors are .000 for F1 viz; time management and organizational support, .049 for F2 viz; leave policy and job security, .747 for F3 viz; organizational culture, .319 for F4 viz; relationship with senior and supervisor, .014 for F5 viz; job pressure and .730 for F6 viz; pay and increments.

Further, the dimensions of job satisfaction, viz., time management and organizational support with significance value .000, leave policy and job security with significance value .049 and job pressure with .014 significance values were found to have a significant negative impact on urgency of quitting job ($p < 0.05$). Result of the study were in a support with the previous study done by Mosadeghrad (2013) found in his study that in the profession of nurses, they have to face the different type of job.
stressors which create an intention to leave the organization. Because of the job pressure they have to face the mental and physical stress and it may create a frustration among them and this frustration creates an intention to leave the organization. Another study done by Samuel and Chipunza (2009) also in support of the previous study, they found there was strong association between job security and employee retention in underdeveloped and developing economies, in either type of economy, employees place great importance on their jobs, because it provides them with the source of income with which socio-economic stability and psychological well-being are achieved.

b) Impact of job satisfaction on ‘exploring appropriate opportunity’.

The dimensions of job satisfaction, viz., time management and organizational support, leave policy and job security, relationship with supervisors and seniors, job pressure and pay and increment were again entered as independent variables and the dimension of turnover intentions, viz., and exploring appropriate opportunity was entered as dependent variable. Table 1.2 shows the result of multiple regression analysis showing the impact of the dimensions of job satisfaction on exploring appropriate opportunity.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Predictor</th>
<th>Criterion</th>
<th>Beta</th>
<th>Sig.</th>
<th>t value</th>
<th>R square change</th>
<th>R square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time mgt. and organizational support</td>
<td>Exploring Appropriate Opportunity</td>
<td>-.141</td>
<td>.043</td>
<td>-2.036</td>
<td>.164</td>
<td>.164</td>
</tr>
<tr>
<td>2</td>
<td>Leave policy and job security</td>
<td></td>
<td>-.129</td>
<td>.055</td>
<td>-1.923</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Organizational culture</td>
<td></td>
<td>-.275</td>
<td>.000</td>
<td>-4.115</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Relationship with senior and supervisor</td>
<td></td>
<td>.085</td>
<td>.204</td>
<td>1.272</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Job pressure</td>
<td></td>
<td>-.088</td>
<td>.120</td>
<td>-1.559</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pay and increment</td>
<td></td>
<td>.006</td>
<td>.912</td>
<td>.110</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: time management and organizational support, leave policy and job security, organizational culture, relationship with seniors and supervisor, job pressure and pay and increment.

b. Dependent variables: Exploring appropriate opportunity.

Thus, we may conclude that relative high percentage of the variance (R Square) in exploring appropriate opportunity was explained by the selected predictors of job satisfaction (16%). The value of beta comes out F1 viz; time management and organizational support is -.141, F2 viz; leave policy and job security is -.129, F3 viz; organizational culture is -.275, F4 viz; relationship with senior and supervisor is .085, F5 viz; job pressure is -.088 and for F6 viz; pay and increment is -.006.

Followed by the t values which comes out -2.063 for F1, -1.923 for F2, -4.115 for F3, 1.272 for F4, -1.559 for F5 and .110 for F6 and the significance values come out for each factors are .043 for F1, .055 for F2, .000 for F3, .204 for F4, .120 for F5 and .912 for F6. Further, the dimensions of job satisfaction, viz., time management and organizational support with significance value .043, leave policy and job security with sig. value .055, organizational culture with sig. value .000 were found to have a significant negative impact on exploring appropriate opportunity (p < 0.05). Result of the present study was in a support with the previous study done by Corneliben (2006) found in his study that job security have the positive relation with the intention to quit, if they have job security it will increase the job satisfaction but if not it may reduce the satisfaction, increasing the another job search and increase quitting.

Hence, we conclude in the result that, three out of six dimensions of job satisfaction were found to have an impact on turnover intentions.

VI. DISCUSSION

This present study has investigated the effects of job satisfaction factors on the intention to leave and also find out the factors which create the major impact on the turnover intention and focusing the management for taking the remedial action. The service quality increased and also the
level of satisfaction, if the employee feel satisfied at their work-place. In such cases, it is the duty of policy makers and management to concern and turn their focus to their employees. In the sector of teaching, private university facing the challenges to retain their staff due to the competition and less of job security and due to many others reasons. So, this concern make the study of intention to leave among teachers is a topic of great importance. Factors which are contributing in the turnover intention among the teaching staff, was essential for the researchers to study and find out the different factors in order to meet the future needs. This present study gave the attention to the various factors which act as hurdle for the teaching staff and they leave the university.

Result of the present study revealed that in case of designation and age there was significant difference in relation to dimensions of job satisfaction and turnover intention whereas, years of experience and income showed no significant difference in relation to dimensions of job satisfaction and turnover intentions. Previous research done by Heshizer (1994) also supports the result of present study and found there was a significant difference between age and factors of job satisfaction. Moreover, in relation with the designation a study done by Carmeli and Weisberg (2006), on the professional group of the employees among the public sector viz; social worker and financial officer and lawyer relate to the private sector. Result found that the lower turnover intention was carry by the social workers as compared to the financial officers and lawyers. With the support of income, previous study done by Latif et al. (2011) on the public and private college teachers and found that with regards to the pay, promotion and job security public college teachers was found to be more satisfied as compare to the private teachers.

Further, the result of the study shows that the dimensions of turnover intention viz; job pressure negatively relate with the urgency of quitting job because faculty facing the different types of job pressure like unplanned or planned events, open houses discussion among the students in that events faculty must have to present and this will gave the stress among them. Study also explained the negative consequences of work load, result of the study explained that work load and turnover intention was having a positive relationship it means with increasing the workload the intention to leave the organization also increase.

Further, result show that job security also has a negative impact on the urgency of quitting job. The result of the present study was found in a support with the previous study done by the Sohail and Delin (2013) found that job security and relation with co-worker show stronger negative effect on the satisfaction level of employees. When they found that they have less job security, it may ultimately create an intention to leave the job. Even the bad relations with the co-worker also create an intention to leave the organization. Moreover, another study also support the present study viz; study done by Clark (2001) found a negative relation between the job satisfaction level and job security and this job dissatisfaction create an inclination to quit the job therefore among the job factors majority of the workers rank the job security as a valuable factor for them at workplace. So, job security was directly related with the satisfaction level and it may help in retaining their employees.

Organizational culture which includes the different factors viz; promotion, working area, working hours, rewards, also gave the negative impact on the exploring appropriate opportunity. The result of the present study contradict by the previous research study done by Bushra (2012) among the employees and the results of the study show that different factors at the work place affecting the job satisfaction they were working hours, working area, paid leave, incentives, promotion, recognition for work and relationship with the supervisors and coworkers, level of responsibility, and job security all they have a positive and significant relationship with turnover intentions. Furthermore, result of the present study about the organizational culture were in a support with the previous research done by Chen et al. (2013) among the managers and result explained in his study that organizational culture have a negative impact on the turnover intention among the respondents. When the culture with in organization was not satisfactory, it may create an intention to leave the job. This shows that, if all these factors were not found satisfactory for the employees they start thinking to leave the organization and grab another opportunity which came from another organization.

Another study describe the importance of the organization culture viz; study done by Lok and Crawford (2003) among the managers and explained in his study that innovative, supportive culture gives a positive impact on the level of job satisfaction among the Australian manager as compared to the Hong Kong managers. So, if
companies want to retain their employees they have to create a fair culture in the organization. Study done by Elkordy (2013) on the dimension of leadership and organization culture and the outcome also in favor of the present result, result of the study explained that organizational culture have the stronger impact than leadership on the job satisfaction and organizational commitment of the employees. If the employees having the healthy environment and fair culture at the workplace, it may enhance the job satisfaction level and employees committed towards their job and organization as well.

Furthermore, result show that time management and organizational support, leave policy also found a negative impact on urgency of quitting job because meeting in the university are not always pre planned, they are organized on the spot which disturb the schedule of the faculty and it will take more than 2 or 3 hours. The result of the previous study done by Shelton and Markus (2013) on the cyber security practitioners’ shows in his study a positive and significant relationship between the perceived organizational support and propensity to leave the organization. Means, if employees do not have the support from their organization it may increase the chances that employees leave the organization. Result also show that faculty who perceived the support from the superiors and used to with the organizational culture, they was found to be more satisfied and stay in the university as compared to those who receive less support. Likewise, Sass et al. (2011) study also show that those teachers perceived the greater superior support they were found more committed and make a difference in their student’s education. There was a strong positive relation was found between the job satisfaction and superior support among the teachers.

Result of the present study show the different factors which create an intention to leave the organization among the teaching staff. So if management wants to retain their staff they must have to take care of all these issues which are related with the job security, organization support, pay and rewards, organizational culture. Some previous research study also show the importance of all these factors of job satisfaction which help in retain their staff. Result of the study explained that supervisors and superiors support helps in reducing the stress and retain their staff within the organization (Beehr et al. 2000). Study done by Hussain and Asif (2012) this study has explored that when the organizational culture was fair it may promotes a sense of ownership and belonging among them and organizational commitment a well. This will essential for making them satisfied, productive, and loyal employees. Organizational support towards employees’ welfare has proved strong predictor of employees’ turnover intention. High level of perceived organizational support develops commitment and ownership among employees towards organization, hence reduces turnover intention.

Our findings indicate that management of private university should focus on the factors which reduce the turnover intention among the faculty. During the study it was found that feedback, support and relationship with seniors, leave policy, positive working environment and security of job these all factors help in improving the job performance and increase the job satisfaction level among the faculty. In private university job security one of the major reason which create the intention to leave the organization and that’s why employees want security. So, management must identify all those factors which help them in retain them at workplace and also must have to take care of all these factors and improve them in order to retain their teaching staff.

VII. MANAGERIAL IMPLICATIONS

The present study also suggests certain managerial strategies, guidelines for human resource managerial action, to enhance job satisfaction and reduce the turnover intention in private universities. Higher institutions, university serve the larger number of students and help in build a good nation with educated people. So, that there is a need to reduce the level of turnover intention among those institutions. Based on the result of this present study, management should examine the sources of the turnover intention and they develop certain remedial strategy to fill this gap so that teaching staff can be retained in their university. Teachers are the nation and future builders so they should be motivated by the management.

A. Relationship with employer and organizational support

As the result of the study explore that organizational support and culture create an intention to leave the organization. For this purpose, Eisenberger et al. (2001) explain that management use the scale based on the Perceived Support in Employee Development (PSED), this scale was used to analyze the general perception of the employees about their intentions and attitude
of the organization. In that particular scale management are able to focus more directly on the support which they are receive from their supervisor and colleagues, manifestations of support such as having to deal with challenging tasks, as well as getting feedback and opportunities for the transfer of learning to the work floor. These types of analyses help the management to find out the strategy to improve the relations among them and create a supportive management. Study done by De Grip and Sieben (2009) in a small firm pharmacies also explore the importance of personal relation among the employees and employer. They also focus how to improve the relations among them.

B. Pay and Reward act as a motivator

Many studies show the importance of reward in employee’s life and career. Management should pay regularly and incentive related with the performance also gives to the staff, to keep them motivating. Because it show that there efforts was recognized and appreciated by the management and it will motivate the employees in future. Proper paid leave, or annual breaks should also give to the academic staff. This will help in reducing the boredom, stress at the workplace. Moreover, these strategies make them more committed towards their job and they remain in the organization. Zahra et al. (2013) in his study also explain the importance of rewards, universities management should gave competitive rewards to good performers to ensure that the culture within the institution promotes hard work and academic achievements. By such effort, recognition can also become as considerable factor of job satisfaction for faculty members which can contribute towards their turnover intentions.

C. Organizational culture

Every organization have its own culture, way of doing work, ethics, morale, policies which are maintain and follow by the both employees and employer. When the organization culture was found fair for all the employees, it will increase the job satisfaction level. By creating the fair and good organizational culture management attracts the high quality personnel. Skrla et al. (2004) also explore the importance of organizational culture part viz; ethics and explain that educational leaders should understand their ethical and moral obligation to create and promote ethics-oriented schools.

D. Enhancing the Employees Engagement

When employees were satisfied they were found to be more engaged with the organization. To enhance the engagement level, Corporate Leadership Council (2010) recently suggested the different ways to increase employees’ levels of engagement. In that different type of strategy used by the management viz; management support their employees in their career development, day to day decision taken authority given to the employees, communication with the employer and helping them in contributing the organizations success.

E. Imbalance in work life balance due to job pressure

Result of the present study show that job pressure also creates an intention to leave the organization. When the employees was not able to make a balance between the work and life it may create the frustration, low morale, reducing the stability and that frustration leads to turnover. So creating a balance between the work lives is part of great concern for management. Long working hours, work overload, extra duties, and unplanned events all these activities cause the high degree of job pressure and ultimately create an intention to leave. So management must focus in reducing the job pressure, make the suitable working hours, arrange some management games, outing, give them some breaks so that they feel relax and reduce their pressure.

F. Develop a survey and take corrective action

HR department develop a survey instrument that can measure the job satisfaction of teaching staff considering moderating and intervening variables (i.e. it assesses job satisfaction in terms of student body, training of faculty members, changes in policies for higher education etc.). Every university should carry out yearly or half-yearly surveys of its turnover rate and explore why faculty members left their jobs. Comparison of the current turnover rate can be made with that of the previous year’s rate to check whether the measures taken previously have been successful or not. It will help in find out what kind of new factors exist in organization, which increase the level of turnover intention and corrective action can be take place by them. Rewarding the employees in a positive way and give them proper training of new technique so that they can give the best service to others such type of action will also help in improving the job satisfaction.
G. Time management

The meeting time among the university must be effectively managed by the management since during the survey faculty members complained about the shortage of time for work on account of unplanned meetings and meetings held on regular or everyday basis. Thus, time should be managed in such a way during meetings that all relevant issues are covered without any wastage of time and faculties get sufficient time to complete the work assigned to them. Management and higher authorities should develop strategies to deal with the needs of those faculties who experience less job satisfaction.

Finally, management should provide a positive working environment to the teaching faculties which would create a friendly atmosphere at the work-place, reduce unnecessary negative vibes, motivate them and improve the relationship between the supervisors and their subordinates. Those efforts will help the management in decreasing the level of intention to leave. Also at the regular interval of time, management should focus on the employees’ perception of psychological climate. When this approach was directed on right time, such control can help in analyzing the early threatening symbols and can help the management to take remedial actions before employee assessments are reflected in their affective states and turnover intentions.

VIII. LIMITATIONS AND SCOPE FOR THE FUTURE RESEARCH

The present research work has few limitations. To begin with, the study covers Punjab state only. This research work takes into consideration only private universities. Moreover, the results depend upon the perception of the respondents; therefore, some subjectivity in their response is possible. Since, the present study focuses only on the private universities in Punjab.

The future research can focus on private as well as government universities covering other states too. A comparative study among the public and private university can also be done by the researcher in future. In addition, impact of job satisfaction can also be measured on several outcomes, like, organizational commitment, Organization citizenship behavior, employee empowerment, etc. Also, further study can explore the other antecedent of the turnover intention and job satisfaction.

Conclusion

To conclude, this study is an active attempt to analyze the impact of job satisfaction on the turnover intention among the private university teaching staff and to investigate the difference between the satisfaction levels of different private universities. The study found that job security, time management and organizational support and organizational culture have the impact on the urgency of quitting job. In addition, job pressures also have an impact on exploring appropriate opportunity. If management wants to retain their employees they should create a supportive and fair culture, essential changes related to the job pressure, job security must be done by them. Moreover, this study also suggests some new factor or topic for the further research. This present study confirms that job security, organization culture and support are the very essential aspect for the employees which help in retaining them within the organization. Human resource management should actively be involved in finding out the reasons which are causing the employees to quit their work, the organizations should begin to take the exit questionnaire and interview; this can help organizations to understand the actual picture of the problem. Hopefully this present work will help and inform the teaching profession on these problems so that they can develop policies that are appropriate for their staff.

REFERENCES


Women Entrepreneurship in India Solutions & Prospectus of Development
A Case Study of Lucky’s Bakery, Panipat

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Abstract-The main purpose of this study is to disclosure the issues related to the female Entrepreneurship in India regarding the difficulties, problems and Future prospects. This is based upon some observations and secondary data for those issues, which are observed in several research, articles, and reports to Elicit that deficiency of specific agenda of life visualization of difficulty, prospects, psycho-social barriers, financial problem for women, lack of direct ownership of the property, professional education, government schemes, plan, lack of self-confidence are the main problems of women entrepreneurship in India.

Key words: Women Entrepreneurship, psycho-social Barriers, Self-confidence, Professional education, Field of Research: Entrepreneurship and Economics.

I. INTRODUCTION

Half of total population in the country is women. Scarcity of thinking, dogmatism is Main reason for women not picking up from all of side in comparison to males economically so colossal. Although Indian constitution given equal right all citizen yet cast discrimination, gender discrimination are available here. In this situations Indian women Entrepreneurship rate less than 14 percent (that is 8.5 million out of 58.5 million enterprise, note the vice president of India), wither develop country this rate more than 30 percent in linings word all though various difficulty such-religion, dogmatism, male socialism, competition, complex world finance management etc. Some group of women stick with for self-development, helps to family, society, employment generation even contribution of National Income. India women entrepreneurship are 70 percent small scale and rural are remnant 30 percent small scale joining with Export business.

II. CONCEPTION OF WOMEN ENTREPRENEURSHIP

Women entrepreneurship means as a process where the women or the group of women are the creator of business, ownership of business that means buildup of empower in economically, self-dependent along with the rank position creation in society as stated by the Indian government “A women entrepreneurship is referred as an enterprise controlled and owned by a women with a minimum financial interest of 51% of the capital given and having not less than 51% of the employment generated in the enterprise for women is called women entrepreneurship. Assign in a business which have independent occupation and stands on their own feet. Its helps them to take their own decisions on the life errors and inspiration subject which their drive. So any women or group of women which adapts an economic activity innovation may be called as women entrepreneurship. Hence women entrepreneurship has been creating an operative impact in economy which is maximum to 25% of all the types of business. In Indian entrepreneurship is quite low in percentage according to the countries women Ratio.

Why Study Women’s Entrepreneurship?
Entrepreneurship is the capacity for expansion in new markets products or techniques and for the
Entrepreneurship is an expanding area of research worldwide. Women are the better part of Owners of 30% (6.7 million) of all privately held firms in the USA and own minimum 50% share of 46% (10.1 million) of such enterprises. These firms brag $1.2 trillion in revenues and employ 19.1 million employees (Center for Women’s Business Research, 2017). The drift in the USA are close to those in other countries. Women globally are actively starting and managing entrepreneurial ventures. While the Global Entrepreneurship Monitor (GEM) project shows that women in many other countries are launching ventures at a lower rate than men, women’s entrepreneurial undertaking is more than 26%. While the other researches has shown That the percent of women-owned businesses are maximum 30% in Canada, Denmark, Finland, and New Zealand (Brush, Carter, Gatwood, Greene, & Hart, 2017). In spite of this, we have a close considerations that women are one of the fastest growing populations of entrepreneurs and that they make a outstanding contribution to innovation, Job, and wealth creation in economies across the globe, they are vastly understudied.

III. OBJECTIVE\PURPOSE OF STUDY

The data is collected from, newspapers, websites, journals, RBI, SSI Reports, censuses NABARD surveys etc. which is based on secondary data which .The main objectives of study women entrepreneurship in as follow.

- To assess the influences responsible for uplift women to become entrepreneurship.
- To provide solution to the diverse problems overlook by women Entrepreneur group.

IV. METHODOLOGY

Methodology is a comprehensive literature review of secondary data from varying sources that has been held as related to the selected purpose of the study in addition to research study on various survey reviews.

V. ROLE OF WOMEN ENTREPRENEURSHIP AT PRESENT IN SOCIETY

The women plays crucial role in the economic development of any Nation. Its prevailing social, cultural, Religious, psychological elements in society. In most of the develop countries implantation women entrepreneurship in their finance market, after world war USA 25% of business generate women even though average sales 2/5th come from small business group. 1/3th small business group owner women is Franc, UK 1/5th since 1980. A self-dependent women they assume new and fresh challenges and change fulfill its, innovation personality, make prove competitive job, and balance between families responsibility and business obligation.

VI. IMPORTANCE OF WOMEN ENTREPRENEURSHIP

Women constitution about half of the total population in the world. But their portrayal in successful employment is comparative stubby According to ILO report in 2018, women are 50% of the planet population. In most countries average earnings of women are lower than men. In some developing countries marriage is the only career for most of the women. Women have block their mobility to select professions such as nursing, office work, medicine, education and very few women, enter into profession like industry, Engineering etc.

In Hindu scriptures Women has been narrated as the personification of shakti (Durga). But in actual life she is treated as able (Work and dependent) but today women entrepreneur contributing GDP, and take decision – making individually for their personal life interesting are which helps to stand Owenlags.
VII. PROBLEMS\BARRIERS TO FEMALE ENTREPRENEURSHIP IN INDIA

At present female work in Banking, fashion design, Interior design, Industry, Hand looms even in defense segment etc. Although there are a numeral barriers concerning to female Entrepreneurship in India. Researchers had identified various issues associated to the social aspects, skill problems, psycho-social barriers, economic life, problems of family support etc. Flow chart shows the Problems\Barriers to Female Entrepreneurship in India.

VIII. RECOMMENDATION FOR THE PROSPECTS OF WOMEN ENTREPRENEURS

All are the blessing in the world which are made half by man and half by women. if we properly given chance and facility for women they contribute are equal of man for developed country, society. Entrepreneurship essentially implicate that being in control of one's life and activities and women entrepreneurs need to be given confidence, independence, and mobility to come out of their paradoxes. The following measures are recommended to empower the women to seize various options and face challenges in business.

- Open different helps desk as well as different bank for women entrepreneurs.
- Made different desk in business bank.
- Make fair for small and cottage industry produced goods to build up market.
- Given the quota system in export fair for women entrepreneurs.
- Facility for Training program develop of entrepreneur skill,leadership, and finance management etc.
- Nameable of women entrepreneurs for motivation others women.
- Given to adequate market facility.
- Making distribution of micro credit system and enterprise credit system to the women entrepreneurs at local level.
- In the initial stages women entrepreneurs may face problems but they must persist, believe in themselves and not give up mid-way.

**NEERJA KHURANA—lady breaking barrier in male Bastion**

It is said that where there is will there is a way the proverb holds well for the business women Neerajakharana born on 26th June 1961 started bakery business in 1991 with initial primary capital of Rs. 10000/- with brand luky’s. After a few years of her marriage there was no luck following her but she had to face a tough time when it became difficult for her family to make ends meet. But lucky’s didn’t lose hope and went to establish her own venture which has an annual turnover Rs. 3 cores per annum. The story may sound like movie but journey was not completed in two and half hours where the pain go for more than half an hour.

“it was like a snakes and ladders game where one success was not enough to cover one mistake, but
one mistake was enough to wash out the entire hard work”, recalls lucky begun her bakery business from a house oven which she had got from her sister in law because she had nothing to invest except self-confidence, hard work and honesty towards her clients

Lucky’s is one of the far reaching food Processing Company at Panipat in Haryana. Its annual growth rate is 25%. The quality the test, the fancy, the predilection for perfection is what has given the demand for the thrust to sale. From a single venture at Panipat today, Lucky’s has numerous ventures in situated various locations in India. Lucky’s existence in the market is seen in the vast range of products which include Date and Walnut, Cake, Honey Almond cake, Tea cakes, Brownies, Cookies, Breads, specialty Cakes, Cheesecakes, Tarts and pies, Macarons, Snacks, ect. Bakery products.

A homegrown business Lucky’s was founded by NEERAJ KHURANA who commence making Cakes, Cookies in her home. Take formal training from Italy and now exporting cakes and bakery products across 10 countries successfully.

Neeraj Khurana is one of the first women Entrepreneur in Panipat. Before entrepreneur she was just housewife. First of all she started selling her kitchen made Cake and Cookies, slowly by slowly become a successful entrepreneur. Now her organization annually turnover approximately 3 core.

Below mentions are the steps of success in which Mrs. Neeraj Khurana made growth in her business to be the successful women Entrepreneurship.

- 1961-Neeraj Khurana borne well of family, her in-law were billionaires in Panipat.
- 1991-Found Lucky’s stared her beginning in a new career from a housewife to an entrepreneur with a scanty investment of RS 10000 for produce bakery products her residence.
- 1995-khurana’s husband joined her business to help her with the increased business volumes.
- 2000-She started another unit in Panipat related to the production of bread and bakery biscuits with investment 1.5 lac.
- 2008-Mrs.khuran’s girl also joint her organization for manufacturing of the 8000 loaves of bread and Cake per day.
- 2011-Lucky’s Bakery and Patisserie was converted into a Private Limited company
- ny under the name is Lucky’s Bakery Private Limited Company.
- 2012 to 2017-Open numerous Franchises (Delhi, Ambala, Panipat, karnalct).Joint also various online retail company and also provided online selling facility
- Various repotted company offer her establish for new food processing venture.
- She joint many social welfare organizations and numerous organization award.
- Also given best women entrepreneur award.
- At present 50 worker play her company.

IX. CONCLUSION

It can be visualized that in this present day, we are in a brighter position where in women are participation in the field of entrepreneurship is increasing at a significant rate. Efforts are being made at the national level, so as to bring a promise to the right of equality of opportunity in all areas to the Indian women and laws guaranteed equal rights of participation in all processes regarding rights in education and employment were enacted. But the story is quite different, the government sponsored development projects have assisted only a small segment of women i.e. the urban middle class women at large. At this juncture, effective actions are required to create entrepreneurial awareness, orientation and skill development programs and its implementation for the women of all segments. The role of Women entrepreneur in economic development is also being appreciated and steps are being taken to promote women entrepreneurship. Resurgence of women entrepreneurship is the need of the hour focusing on educating women strata of population, creating awareness and awareness amongst women to excel in the enterprise field, making them realize their hidden potentials, and crucial position in the society and the great contribution that they can make for their industry and also for the whole economy.
REFERENCES


[8] These journals include Entrepreneurship Theory and Practice, Journal of Small Business Management,


A Design thinking Approach for Entrepreneurship Education

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Abstract-Entrepreneurship has traditionally been taught from a business administration perspective, where predicting the future is central and where the world is seen as linear with known inputs and outputs. The world of entrepreneurs is a quite different, usually highly uncertain environment, and therefore requires a different type of skill set. In this paper, we conceptualize entrepreneurial learning through a method- and design-based approach and illustrate how a course can be developed and designed. In this paper it is argued that by utilizing design thinking and a methods approach, learning from a “through” approach can be achieved. This learning is more focused on the entrepreneurial process, highlighting the role of skills and mindset. This learning approach enables student-centered learning and focus on skills more applicable to entrepreneurs. It is also argued that the entrepreneurship process is not linear; therefore, creativity is central and finding structure is an unstructured process. Design thinking emphasizes a practical approach where students step outside the classroom. This experimentation and interaction in the real world of users and customers with real feedback is important in combination with reflection exercises.

Keywords: Entrepreneurship, Entrepreneurship education, Design thinking, Iteration, Creativity

I. INTRODUCTION

Entrepreneurship is a messy and complex process that is not linear (Neck and Greene 2011). Educators in entrepreneurship have the task to educate students to have the skills to survive in a fast and rapidly changing environment. Nonetheless, traditional entrepreneurship courses have focused on business plan development as a planned practice (Honig 2004; Solomon 2007), and many courses are still more “about” entrepreneurship than “for” or “through” entrepreneurship (Pittaway and Edwards 2012). In addition, many courses have a focus on business planning and prediction (Daniel 2016), which can have a negative impact on students’ intention of starting a venture (Carrier 2005; von Graevenitz et al. 2010).

In this paper, a different approach is taken compared to the traditional way of teaching entrepreneurship and innovation, based in no small extent on design thinking and the methods approach (Neck and Greene 2011). One of the teachers (who also is one of the authors) became frustrated with the traditional entrepreneurship course which was to a large extent based on developing a business plan. The way the course was set up, the students developed different parts of the business plan over the time of the course. Quite often, it became problematic when the different parts of the plan did not fit well together, which frequently resulted in that the individual parts were forced together in the end. Students quickly had to come up with an idea and thereafter spent most of the course developing the business plan itself. To a great degree, ignoring the pre-idea stage and the actual problem-solving activity (or opportunity creation/development) was only briefly covered, which seems common in entrepreneurship courses (Daniel 2016). During the development of the business plan, the students frequently found that the parts did not fit together, which often happened too late for real change to be possible within the time frame of the course.

It was realized that, rather than a course in entrepreneurship, the course was trying to teach small parts of all aspects of running a business (marketing, management, accounting, etc.) into one course where planning and predictability were emphasized. But, entrepreneurship is a complex process that lacks linearity of business thinking and entrepreneurship students need to master
uncertain environments (Neck and Greene 2011). Hence, the business plan might not be the best tool for students studying entrepreneurship and innovation practices. Therefore, the purpose of this paper is to conceptualize entrepreneurial learning through a method- and design-based approach and to illustrate how a course can be developed and designed.

Theoretical background Entrepreneurial education Entrepreneurial education can be taught in different ways, and Pittaway and Edwards (2012) distinguish four different approaches to teaching entrepreneurship. They propose that the approach of teaching can be “about,” “for,” and “through.” Most entrepreneurial education has been found to be of the “about” approach, which has a more traditional pedagogy that does not engage the students in activities and projects (Pittaway and Edwards 2012; Stovang and Nielsen 2015). We reason that entrepreneurial education should move away from approaches of “about” and “for” to be more of the character of “through.” It can be argued that entrepreneurship education and learning need to reflect the process that entrepreneurs go through by focusing on action, experiences from the real world, and reflection (Kasseean et al. 2015). What this entrepreneurial process consists of can be debated (Stovang and Nielsen 2015), but it can be argued that the entrepreneurial process is dominated by effectuation logics in comparison to causation logics (Sarasvathy 2001).

Effectuation suggests that instead of predefining goals in highly uncertain environments, entrepreneurs rely on the means that are available at hand and co-create opportunities (Sarasvathy 2001). The effectuation logic is based on many features that align with design (Stovang and Nielsen 2015) and is closely associated with the work of Herbert Simon (1969). The opposite of effectuation is causation, which is a logic based on prediction, control, planning, and rational analysis to reach predefined outcomes (Sarasvathy 2008).

Effectuation is also closely related to the ideas of bricolage (Baker et al. 2003; Baker and Nelson 2005) and organizational emergence (Katz and Gartner 1988). These ideas all highlight that creating entrepreneurial opportunity and developing it for the market is a process that is highly complex, social, and evolves gradually. This process is quite differentiated from a traditional manager role in an established firm where structure and predictability exist (Nielsen and Christensen 2014).

II. DESIGN THINKING

Design thinking is essentially concerned with human needs and solving problems. Design thinking is not a strictly linear process or based on specific milestones. Rather, it is the interaction that happens between the three spaces of inspiration, ideation, and implementation (Brown and Katz 2009). The professionals of design have conventionally worked with forming, styling, designing, redesigning, and constructing artifacts, but over the past few years, the design process has become relevant for much wider use (Stovang and Nielsen 2015) such as business, innovation, and entrepreneurship. In design thinking, the problem can be seen as wicked (Buchanan 1992) because the problem is not fixed and can change and take new shapes as more is found out about the problem. The wicked problem will eventually come forward after extensive explorative activities, but even then, the problem will continue to change its face. Insights into the problem, its possible solutions, and the effects of those solutions are seen as constantly evolving (Nielsen and Christensen 2014). It has been argued that creativity and an innovative mindset is central for students in design (Koh et al. 2015). It can be reasoned that constantly challenging for new ideas and constantly rethinking current solutions are central aspects of design thinking.

The new entrepreneurial education Neck and Greene (2011) argue that entrepreneurship is an applied discipline but is often taught as it was a natural science. They reason that entrepreneurs and designers have much in common and that entrepreneurs “think and to some extent act like designers”. Conventionally, entrepreneurship education has assumed a fixed problem that can be solved through a linear problem-solving process. Also, students are often forced to come up with a business idea very quickly at the beginning of the semester and then perform planning and prediction activities with the goal of showing economic viability at the end of the course (Daniel 2016). Students of entrepreneurship courses are also often graded on the output of the course, the business plan, instead of being graded on the process of learning the skills and mindsets of entrepreneurs. Shifting focus to the process instead of the output also switches what is graded; instead of grading the business plan, the process should be graded. An effective way to capture the learning process has been through a learning log, also called a reflection log (Robinson et al. 2016).
With this in mind, there has been somewhat of a shift from the traditional courses that are more of the type “about” or ones that are “for” but have a planning approach to a more holistic approach, where the actual output from the course (e.g., business plan) is not the main goal, but developing an entrepreneurial mindset and behaviors is (Daniel 2016). The creation of new businesses is therefore not the central focus, but rather for students to develop entrepreneurial attitudes and skills (Fayolle et al. 2006). It has also been argued that entrepreneurship education should be moved away from teacher-centered to student-centered education (Daniel 2016; Robinson et al. 2016). Neck and Greene (2011) suggest that entrepreneurship should be taught as an approach of methods instead of as a process (see Fig. 1). It has also been argued that design thinking is the possible future of entrepreneurial education (Val et al. 2017) and has many compatibilities with the methods approach (Fig. 1).

The process of redesigning a course The following section will elaborate and illustrate how entrepreneurial education can be transformed to follow more of an approach focused on methods and developing entrepreneurial skills and mindset. Design thinking follows many aspects of the methods approach, as it is based on toolkits that usually are of a creative and iterative nature. Experimentation is a central part of design thinking, as is practice. Students that take part in a design thinking process would also develop entrepreneurial skills and techniques. The process of redesigning the course started when the university received a grant which had the goal of increasing the entrepreneurial culture of students at the university. There was also a goal of developing entrepreneurship courses for all departments at the university. The paper describes the development of a single course over several years. The time periods include 3 years of experience with the “preexisting course,” 1 year of development of the new course and building a “prototype course,” and 2 years of running the new course. The experiences have been captured through documentation of the development process (reports for the grant, presentations of the work in progress, etc.) as well as documented learnings from the prototype courses (learning documented for each prototype). The students’ perspective has also been considered from formal feedback (survey after course) and informal feedback (meetings with students), and student reflection logs have also been used to understand the students’ experience. It was decided that the development process of the course should be influenced by the design process, and therefore a pilot program was first developed to allow for iteration and early feedback, instead of focusing too much on planning and predicting.

1. First pilot
First, a pilot program, which can be seen as a prototype, was developed and lasted for 10 weeks. The pilot was based on design thinking and centered around the “double diamond” model, which in the first diamond highlights learning about the problem and in the second diamond focuses on solutions to the problem. The pilot lasted for 10 weeks, with the 12 students alternating meeting in workshops 1 week and the next meeting with a teacher for a coaching session to help with the progress with the work in-between sessions. The problems for the pilot came from organizations that had a need to find new and innovative solutions. These organizations developed a problem statement and attended the first workshop and then were available for contact with the teams throughout the course. The organizations also attended the final workshop, where the solutions and plans forward were presented.

2. Second pilot
In the second pilot, some of the learnings from the first pilot related to feedback. The coaching was not only assessed as helpful but also time consuming for the teachers. In an effort to increase the teachers’ effectiveness and also downplay the view that the teachers knew the right answers, the coaching part was deleted. Instead, more focus was on learning between the groups and students, with teachers as facilitators. This also resulted in a decrease in the timespan of the course from 10 weeks to 5 weeks. It was also found that the groups of students seemed to work better with four students compared to the groups with three students. A few times, a student was missing, and then the group only had two students left, which seemed to be too few to complete the workshops in a creative and energized way. In addition, although the organizations were happy with the results of the students’ solutions, it was decided to keep a more “open” approach to problems without an organization behind every problem, thereby influencing the students to work in certain directions.

Instead, some areas of focus where problems could be identified were compiled by the teachers before the course, and the first session included
identification. These areas of problems were, for example, food waste, elder care, and segregation.

3. Learning from pilots
After the second pilot, the new course was developed, based on the learnings from the pilots. Overall, the design thinking approach was received well by both the teachers and students. Students were found to be more engaged in developing their ideas. The focus was somewhat switched to pre-idea stages compared to only developing an idea that was not always very thought through. Several of the teams from the prototypes continued developing their ideas after the pilot was over, and one team went on to a business incubator. However, it has to be emphasized that the learning process of skills and mindset was more important than achieving great end results in the project. For the course, this resulted in clearly explaining to the students that they were not evaluated and graded on the idea itself, but rather on the process of understanding the problem and developing the idea. In the pilots, it was also found that it was important to document the process. For example, when the results from the first workshop were compared to the last workshop, the students could comprehend how much they had developed their ideas during the course.

III. CONTENTS OF A NEW COURSE
Teams need to be formed, and each team needs a challenge to solve. The teams should be formed with as high heterogeneity as possible, where different points of view from the students can contribute, rather than homogeneous teams that think alike. The challenges can be distributed by the teacher. We have had success with challenges that have been identified by the teachers, e.g., society-based challenges such as how to reduce food waste, and the teachers have also had success with asking different types of organizations to provide challenges they need to solve (e.g., how can customers have an improved experience while waiting in the lobby for our service?). The student groups themselves can also identify challenges: have the students ask different types of professions, e.g., a nurse or a bus driver, about common challenges they face. From our experience, it is useful for the students not to think about their own personal challenges or campus-related challenges as they themselves experience the challenge and therefore have a difficult time seeing the bigger picture and interviewing fellow classmates. It is better for the students to take on a challenge that is new to them. The challenge should specify the purpose and goal of the solution. It is a good idea to identify possible results of the solutions, but not suggest what type of solution that is needed. Also, some limitations might apply.

❖ Module 1: Discovery of challenge
Discovery is about understanding the context of the challenge by collecting information. Here, it is emphasized that students get out of the classroom and collect data about users’ experiences and people with expert knowledge about the challenge. To be able to solve the challenge, the team needs plenty of information about the challenge they are about to solve and to build empathy with the users. Often students (and we as teachers) will see one easy solution right away, but, at this stage, the focus should be on the challenge and not yet on trying to solve it. Interviews can be a powerful tool to collect information and get a deeper understanding of the situation. First, try to identify different types of people that can share their insights. Users are of course essential; however, other people might also be able to provide useful information. For example, if you want to know more about people’s preferences about food choices at a certain place, you, of course, can ask the people eating and serving food. However, the people that clean the area might have useful information about what type of food that they have noticed has been thrown away or left behind. Open questions are preferred which do not restrict the answers that yes and no questions usually do. Follow-up questions are also encouraged because the first answer you get might not tell the whole story. Why? When? How? What is an example of that? These can all be useful follow-up questions to dig deeper into a previous answer. Observation is a research approach often applied in ethnography and anthropology but used more and more to understand users. Interviews can provide a rich understanding but sometimes the users themselves will not know (when asked) why they act in a certain way, and it is easy to come to premature conclusions. By observing (at least 60 min) to understand users’ needs and preferences in a certain situation, a deeper understanding of why people act the way they do can be achieved. During the observation, the focus should be on what is happening and which behaviors are noticed (not counting, measuring, or thinking about solutions).
Module 2: Interpretation of challenge
After module 1, the teams should have collected plenty of different types of information about the challenge. Now is the time to start to sort and analyze the information and consider the following questions: what can we learn from all of it? What are the needs of the user? When talking about needs, we emphasize not only physical needs such as that the solution is functional but also cognitive needs in the form of user-friendliness and emotional needs in the form of feeling pleasure and meaningfulness. When analyzing for needs, the teams will seek patterns, structures, and relationships that can give a deeper understanding of the needs. What are the keywords that describe the challenge? Can they be structured or sorted in a specific way? Creating personas is a powerful method for understanding users. Who are the typical users in terms of attitudes, motivations, and goals? What is the narrative that describes how personas act in a sequence of actions? When creating a persona, it should describe the specific wants or needs of the persona. Another method is mapping the customer journey from initial contact and into a long-term relationship.

Module 3: Ideation of solutions
Once the teams have a deep understanding of the challenge, they can start to create solutions for it. Creativity is at the forefront, where the focus is on thinking differently and in new ways. In this module, there is no learning without coming up with many ideas and knowing that many of the ideas will fail. It is important to create many ideas, where some are wild and crazy. Usually, the first idea is not the best idea. We challenge the students to be creative and ask the teams to come up with at least 50 solutions to the challenge. Here, we emphasize keeping the ideas simple and not criticizing them. The method of brainstorming in different ways can be a good way to come up with many different ideas.

Module 4: Prototyping of solutions
In the prototyping module, the teams take their ideas for solutions and start sorting and grouping them to find realistic solutions. The teams then take a few ideas (3–10) further and prototype them. The purpose of prototyping several ideas is to advance the one-sentence statement into a more advanced solution. This can be done through a simple sketch, Legos, or perhaps an advertisement describing the main features. The teams can then go out and interview users, show them the simple prototypes, and get feedback on which ones to develop further. As the number of prototypes is reduced, the more advanced prototypes can be developed, with more detail and functionality. More advanced prototypes include functional prototypes that solve the functional challenge but do not have the final design; it can be a 3D computer simulation, a scaled-down version, and so on.

Module 5: Solution and future
In the last module, the students present their final solution and prototype(s). This can be done by pitching the solution to an audience or showcasing the prototypes in a student exhibition. In this module, the teams also develop a plan looking forward. What team members and resources are needed to complete the solution? What needs to be completed, and what would a timeline consist of Grading and assessment

IV. DISCUSSION

In this entrepreneurship course, students are exposed to developing new solutions for a problem/challenge and practicing identifying entrepreneurial opportunities. The focus is also on the pre-entrepreneurial process, focusing on identifying the opportunity and developing it. Previous entrepreneurship research has to a large degree focused on the latter part of the entrepreneurial process (Kreuger and Welpe 2014), which also reflects the entrepreneurship education (Daniel 2016). The traditional entrepreneurship theory has assumed that opportunities already exist and require alertness to discover them (Kirzner 1973). The centrality of creating opportunities in entrepreneurship research has later been highlighted (Alvarez and Barney 2007), and this centrality has slowly started to shift the focus in entrepreneurial education from the planning and prediction to the pre-idea phase of creating opportunities. Connecting entrepreneurship education with design thinking and a methods approach, in line with education “through,” is one way to focus more on the creation of opportunities, instead of assuming ideas exist and the entrepreneur only needs to act on them.

Previous research has highlighted the value of learning/reflection logs as an essential tool in teaching entrepreneurship (Robinson et al. 2016). Our experiment also shows that the students learn in an enhanced way when reflecting throughout the course on their development. The teachers have also noticed an improvement in outcome in the quality of ideas in the new course compared to the old one, even though this aspect has been
deemphasized in the new course. This finding can indicate that when the students worry less about the outcome and instead focus on the process, the outcome will be of high quality anyway. The reflections also help the students connect the practical knowledge with their understanding of the theoretical perspectives of entrepreneurship. When the students took back at their early reflections, they often find that their comprehension of the challenge changes and that the most obvious solution is not always the best one.

Previous research has underlined the usefulness of design thinking for promoting entrepreneurial skills (Val et al. 2017). Our experiment with switching to a design thinking-based course as a possible new entrepreneurial education approach should be seen in many ways as a positive change. Design thinking underscores a classroom culture that fosters collaboration and creativity, which can be in contrast to traditional formal education at the university level. Iteration is an important aspect of the methods approach (Neck and Greene 2011). When opening up the course to iterations as a natural part of the entrepreneurial process, the ideas became more developed. When comparing the end results of the old course and the new course, a clear trend can be noticed, as the parts of the ideas fit together much better and the ideas were not forced together, which was one of the triggers for the teachers to redesign the course. Research on new ventures shows that ventures can learn much from these iterations in the entrepreneurial process (Hasche and Linton 2018). When focusing more on iterations, students seem to dare more to do an iteration and show that they learned something and went back and made it right, instead of covering up and making ideas of a more “make-believe” character. Using design thinking for entrepreneurship education also shifts the center of attention away from the teacher and more to a student-centered learning (Daniel 2016; Robinson et al. 2016). The active workshops and the reflection logs help students facilitate their own learning in a much different way compared to the traditional university lecture style of learning. In agreement with Val et al. (2017) we extend the thoughts of the fit of design thinking with entrepreneurship education by illustrating an example of how a course can be modified and we also extend the theoretical arguments for why design thinking is a suitable for entrepreneurship education.

From our experience, students gain a deeper level of understanding by taking a practice approach, stepping outside the classroom and experimenting in the real world of users and customers with real feedback. Thus, the focus from the “about” and “for” approaches of entrepreneurial education has turned to a “through” approach (Pittaway and Edwards 2012). Edelman et al. (2008) suggest that more of a practice approach can help to develop an entrepreneurial skill set. We find that it is difficult to assess if the students have more or less entrepreneurial skills with the new course; however, we can note that the students leave with a different set of entrepreneurial skills that are more focused on creativity, collaboration, and problem-solving. These skills seem to include more entrepreneurship characteristics, while the previous course developed more (small) business skills.

V. CONCLUSION

The paper contributes with extending the theoretical connection between entrepreneurial education and design thinking compared to previous research in this literature stream (e.g., Armstrong 2016; Daniel 2016; Nielsen and Christensen 2014; Stovang and Nielsen 2015; Val et al. 2017). The paper also contributes by conceptually connecting previous research that call for both a methods approach (Neck and Greene 2011) and entrepreneurship education with a “through” perspective (Pittaway and Edwards 2012) ; this paper highlights how these approaches can be achieved by utilizing design thinking (Brown and Katz 2009).

REFERENCES


Emerging Indian Startup Ecosystem

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Abstract- Entrepreneurship in India has grown remarkably over the past few years and startups are beginning to dramatically impact the economy. India is the third largest startup market in the world after the US and UK with thousands of startups adding every year. This research paper aims to put some light on the present scenario of startup ecosystem in India along with rise in government’s support through various programs in this direction. For this purpose a research has been conducted, through online survey, to know how much the youth in India favors entrepreneurship as choice of career over job, and, the hindrances they face while taking such decision.

Key Words: Entrepreneurial ecosystems, startup communities, new ventures, dynamic capabilities, regional entrepreneurship

I. INTRODUCTION

What is a Startup?

Startup Definition (As defined by DIPP)

Startup means an entity, incorporated or registered in India: Not prior to seven years, however for Biotechnology Startups not prior to ten years, With annual turnover not exceeding INR 25 crore in any preceding financial year, and Working towards innovation, development or improvement of products or processes or services, or if it is a scalable business model with a high potential of employment generation or wealth creation Provided that such entity is not formed by splitting up, or reconstruction, of a business already in existence. Provided also that an entity shall cease to be a Startup if its turnover for the previous financial years has exceeded INR 25 crore or it has completed 7 years and for biotechnology startups 10 years from the date of incorporation/registration. Provided further that a Startup shall be eligible for tax benefits only after it has obtained certification from the Inter-Ministerial Board, setup for such purpose.

Startup ecosystem

Startup ecosystem is a combination of various elements such as existing startups at their various stages, various types of organizations which facilitates starting up business whether physical or virtual, financial or non-financial, public or private, government, people and many others which come together to form a system which create and scale new startups. These organizations can be further divided into categories such as universities, funding organizations, support organizations (like incubators, accelerators, co-working spaces etc.), research organizations, service provider organizations (like legal, financial services etc.) and large corporations. Different organizations typically focus on specific parts of the ecosystem function and startups at their specific development stage

II. LITERATURE REVIEW

Philip T. Roundy, Dutch Fayard (2018) “Dynamic Capabilities and Entrepreneurial Ecosystems: The Micro-Foundations of Regional Entrepreneurship” In pursuit of the beneficial outcomes of entrepreneurship, governments and regional development organisations enact policies to stimulate entrepreneurial activity. A growing focus of policymakers in emerging and developed economies is the promotion of entrepreneurial ecosystems: the interconnected system of forces that generate and sustain regional entrepreneurship. Despite intense interest in entrepreneurial ecosystems, the topic is under-theorised. Studies draw attention to the positive effects of entrepreneurial ecosystems on the creation and functioning of early-stage ventures; however, the specific mechanisms through which ecosystems influence entrepreneurs are not clear. To address this issue, we build on dynamic capabilities theory to create a theoretical framework that identifies a set of forces through which ecosystems influence
entrepreneurship. We propose that in vibrant entrepreneurial ecosystems entrepreneurs are more able to sense, seize and reconfigure resources and opportunities. Our theory contributes to entrepreneurship research, has implications for policymakers and practitioners, and suggests directions for future studies.

Ben Spigel (2017) “The Relational Organization of Entrepreneurial Ecosystems” Entrepreneurial ecosystems have emerged as a popular concept to explain the persistence of high-growth entrepreneurship within regions. However, as a theoretical concept ecosystem remain underdeveloped, making it difficult to understand their structure and influence on the entrepreneurship process. The article argues that ecosystems are composed of 10 cultural, social, and material attributes that provide benefits and resources to entrepreneurs and that the relationships between these attributes reproduce the ecosystem. This model is illustrated with case studies of Waterloo, Ontario, and Calgary, Alberta, Canada. The cases demonstrate the variety of different configurations that ecosystems can take.

III. OBJECTIVES

The objectives of the research is to:

i. To know about the prevailing startup ecosystem in India.
ii. To know the behavior pattern of people regarding their career prospects.

IV. RESEARCH METHODOLOGY

A research has been conducted, through an online survey in form of questionnaire, on students of university who are doing post graduation, to know the extent to which the youth in India favors entrepreneurship or stating up their business as a career instead of job. It also aims to answer other questions as whether they want to invest in India or abroad, which sector will they prefer for stating up their business, and how they are aware about present governments various initiatives for encouraging entrepreneurship.

V. DATA INTERPRETATION

[Fig 1: Do you prefer starting up your business over job?]
Fig 2 Which sector would you prefer for investment?

Fig 3 In Which type of city would you like to startup your business?

- Manufacturing: 73.3%
- Retailing: 20%
- Service: 6.7%
- Agriculture: 0%
- Other: 0%

- Metropolitan city (tier 1 city): 46.7%
- Second level metropolitan (tier 2 city): 13.3%
- Third level metropolitan (tier 3): 40%

- Finance: 3 (23.1%)
- Lack of...: 2 (15.4%)
- Reluctance...: 0 (0%)
- Lack of...: 0 (0%)
- Feel safe...: 4 (30.8%)
- Other: 5 (38.5%)
VI. RESEARCH FINDINGS

Indian Startup ecosystem: Present scenario: In the era of startups, India has made a name for itself in the global startup ecosystem and continues to be one of the most vibrant landscapes for startups as the third largest startup ecosystem across the world amidst intensifying competition from countries like the UK, USA, Israel etc. Sharing his thoughts, Mr. Raman Roy, Chairman, NASSCOM, and CEO and MD, Quattro Global Services, said “The Indian technology industry is renowned globally for its pioneering innovation and the start-ups arena is no different. India is one of the fastest growing start-up landscapes in the world and every major accelerator, investor, angel group, is participating in becoming a part of this growth journey. Today, Indian ecosystem is flooded with innovative ideas and needs the right channel and guidance in terms of acceleration, scaling up and funding to continue to disrupt.”

VII. CONCLUSION

The conclusions that can be drawn out of survey are:

1. Over 1000 start-ups added in 2017
2. India continues to be the 3rd largest start-up hub globally
3. Banglore, NCR, Mumbai—key startup hubs, Tier II/III accounting for 20% of the start-ups
5. Advanced tech startups growing at 30% CAGR
6. Year on Year start-up growth in top verticals – Health-tech (28%), fin-tech (31%) and ecommerce (13%)
7. Start-up talent:
   a. Median age of founders: 32 years
   b. ~550 female entrepreneurs
   c. Over 450 student start-ups, driven by academic incubators.
8. ‘Build for India’—becoming a strong focus area with over 300+ startups building solutions for core India problems such as healthcare, education inclusion, Financial inclusion, Clean energy, Agriculture etc.

REFERENCES

Customer Satisfaction towards Online Marketing - An Empirical Study

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Abstract--The online marketing is one of the most interesting topics especially for researchers in the marketing field. It is a modern way of marketing a product or service to the targeted market around the world. This paper is an attempt to analyze customer satisfaction level in internet marketing. The primary goal of this research is to analyze the customer satisfaction of the online customers in Panipat customer. The theoretical framework discusses in brief about the effects of customer retention on customer satisfaction. To understand the customer satisfaction level of online Panipat customer shoppers, we pursued with the collection of quantitative data with the help of online survey. From marketing and strategic point of view we will point out those factors that might affect the customers, while purchasing goods online.

I. INTRODUCTION

Internet and the World Wide Web have amended the business competitions and tailored the Business-to-Consumer (B2C) relationship by introducing an innovative retailing platform that provides for electronic one-on-one communication with the customers. The Internet possesses a capability of revolutionizing the business conventional format and the customer service experience in many ways. In the era of globalization and with the wonderful expansion of the Internet, various businesses have globalized their sales and marketing efforts for their products and services all through the net. Over the decades maximum business organizations have been providing various products like books, hardware, software, toys, household appliances etc to their customers through online. Online shopping is the process of buying and selling of the goods and services through online. It includes transferring of funds online, supply chain management, marketing over internet. It is the use of technology for better marketing performance. Through online shopping different type of business and organizations has gained a tremendous opportunity to increase their sale and to maintain a direct relationship with its customers. The increasing use of internet by the young generation in India provides an emerging prospect for online retailers. Unlike traditional marketing, online marketing has many advantages like global reach, availability of wide variety and cheaper products, if online retailers know the factors affecting Indian consumer’s buying behaviour they can further develop their marketing strategies to convert potential customers into active ones. Customer satisfaction is the key factor for customer retention and acquisition in online shopping system.

A. CUSTOMER SATISFACTION

Customer satisfaction is a critical issue in the success of any business system, traditional or online. In a turbulent commercial environment, in order to sustain the growth and market share, companies need to understand how to satisfy customers, since customer satisfaction is critical for establishing long term client relationships. It is evidenced by the fact that over the last five years, customer satisfaction surveys have become common in many financial institutions. Thus a fundamental understanding of factors impacting customer satisfaction is of great importance to business.

B. ONLINE MARKETING

Online marketing refers to a set of powerful tools and methodologies used for promoting products and services through the Internet. Online marketing includes a wider range of marketing elements than traditional business marketing due to the extra channels and marketing mechanisms available on the Internet.

II. TYPES OF INTERNET MARKETING

There are several types of internet marketing, some which work alone, which work in conjunction with others. Here are some types of internet marketing.

A. Search Engine Optimizer
Search engine optimizer or SEO for short, is possible for popular search engine to index a website and boost it up to the top of the result page.

B. Social Media Marketing
Social media marketing (SMM) is the process of gaining website traffic or attention through social media sites. The goal of SMM is to produce content that users will share with their social network to help a company increase brand exposure and broaden customer reach. The use of social media services to garner attention and website traffic is gaining just as much popularity as the networks themselves.

Blog marketing is any process that publicises or advertises a website, business, brand or service via the medium of blogs. This includes, make a contribution to our industry. upcoming products.

C. Pay Per Click Advertising PPC
Stands for pay-per-click, a model of internet marketing in which advertisers pay a fee each time one of their ads is clicked. Essentially, it’s a way of buying visits to your site, rather than attempting to -earn those visits organically.

D. E-mail Marketing
Email marketing is a way to reach consumers directly via electronic mail. Unlike spam, direct email marketing reaches those interested in your business” area of expertise. It includes,
- It’s the easy, effective, and affordable way to keep your customer coming back
- It should be professional to attract
- About new product
- Promoting their products by wishing special events
- While giving feedback they put information about their product too
- Save paper and postage

E. Networking
A business model in which is a distributor network is needed to build the business. Usually such businesses are also multilevel marketing in nature in that payouts occur at more than one level. The advantages of network marketing include:

III. CONCEPT OF ONLINE MARKETING
Online marketing is the wave of the future. Businesses turn to the internet to market themselves in place of billboards and paper advertisements, and find that it is not only more effective, but much less expensive. However, internet marketing plays by an entirely different set of rules than traditional marketing does, and it is important to understand the basic concepts before embarking on any marketing endeavor.

In most general terms, any marketing in the Internet should be considered electronic marketing. As it has been mentioned, due to the technical peculiarities of the Internet, almost all forms of electronic marketing have certain features of direct marketing. It should be noted that marketing by e-mail is not a predominant form of electronic marketing. Marketing by e-mail has the notably expressed advantages of electronic marketing, i.e. apart from businessmen”s own websites; marketing by e-mail is the cheapest and the most accessible Very often marketing by e-mail is identified with a socially undesirable or even negative marketing, spam, since social challenges raised by electronic marketing manifest themselves in its form rather dislikes. Due to the abovementioned reasons, in this article marketing by e-mail is regarded as the fair representative of all types of direct electronic marketing.

IV. IMPACT OF INTERNET MARKETING
Clearly, marketing's tool kit is experiencing an unsettling amount of change. The boom in direct and database marketing, the dawning of electronic commerce, new ways to automate sales force management and the sudden blossoming of the World Wide Web all suggest that the discipline is under pressure to redefine itself. The stock market is well aware that something important is developing; venture capitalists and technology companies are making large bets; and students at business schools, alert to any hint that their investment in the development of personal skills might have to pay off in a changed environment, show particular interest in new methods of market making. Mass marketing concepts and practices are taking advantage of new ways to become more customized, more responsive to the individual. The challenge facing the companies today is how to take strategic advantage of these opportunities to build more desirable products and services, build brand equity and increase revenues and profits. The Internet represents new opportunities for the marketers and sales people because it provides a wide reach for all marketing efforts conducted on
it. International markets can be opened up at low costs. Advertising and promotion costs in other countries can be significantly reduced, if not eliminated. With the use of the Internet there can be continuous customer support. Services can be made available through interactive e-mail systems on the net. This saves time and money. In addition, feedback (i.e., research data) from the marketplace can be likewise collected on an on-going basis, and in many cases, in the form of „real-time“ data. New products and services can be tested through interactive questionnaires on the Internet. This feedback forms the basis of market identification and segmentation that enables marketers to better position their products.

V. PROCESS OF ONLINE PURCHASING.

Many studies frequently mention that there is a vast amount of window shopping taking place online but the number or the rate of surfers who turn into purchasers or regular buyers are very low. This might happen because of the lack of consumer intention to purchase an offering from the online environment at the outset. It might also happen because of various problems that arise during online shopping driving the consumer to abandon the task in the middle. Therefore, while one stream of research should identify the reasons behind the purchase reluctance of consumers, another area of concentration should be why people abandon their shopping carts and stop the purchasing process in the middle. Such attempts can help to understand how to turn surfers into integrators”, purchasers, and finally, repeat purchases by making them enter into continuous interaction with this environment. Common reasons for purchase reluctance are the difficulties and costs of distance shipping, inadequate amount of purchase related information, troubles experienced after the purchase such as delivery or refund problems, general security fear, and various perceived risks such as financial, product-related or psychological risks. On the other hand, the reasons of abandoning purchases are much more technical such as unexpected shipping costs or transaction complexity. In other words, some consumers accept to shop from the Internet in principle but technical complexities or ineffective systems discourage them. Regardless of the pessimistic state of events, marketers should not be hopeless about the future. Once the risks consumers perceive about shopping through the Web are reduced, the environment still promises a high potential for selected consumer segments. Studies show that consumers who search for product related information through the Web have stronger intentions to make purchases online. Therefore, building on the information advantage can be expected to pay off in the future. Constructing effective decision support systems and assisting consumers with interactive decision tools are also successful attempts that need to be developed further. However, investing on the pre-purchase stages of the decision making process is not adequate. Developing and testing the effectiveness of specific “selling” strategies and tactics for the cyber market are also crucial. Studies that focus on currently unavailable but possible tools of cyber shopping in the future, such as the use of artificial shopping agents that work on behalf of consumers in the online market, are also very valuable efforts enlightening the road for future studies.

VI. CATEGORIES OF ONLINE MARKETING

The Internet Marketing into four categories: communicating, selling, providing content and providing a network function.

a. Communication

A range of different businesses uses the Internet as a way to communicate with their customers. Marketers can use this essentially useful medium to build relationships with new customers or enhance the interaction with existing customers. Internet provides many alternative options for marketers that help them to interact and communicate with the consumers. Email, email lists, online chat and forums offer quick and easy communication between different parties.

b. Selling

Consumers today have less time to work. Companies use direct marketing to sell their goods. The significant advantage of the Internet selling is that it is available 24 hours per day, 7 days per week. Large and small businesses develop websites and sell via the Internet through innovative use of technology and more attractive features than in traditional marketing. The way the information appears to the consumer can affect the online decision of purchasing a product. As to that, firms should pay attention on the designing and structuring of an effective website. Moreover, online selling sites can be used to offer much more products than can be shown in a printed catalogue. In addition, consumers can enjoy self-service services such as, tracking their purchases and orders or saving their information to be used in later transactions.
c. Providing Content

Businesses must provide their customers with all the necessary information about their company, their services and products. A content website allows visitors to interact with interesting and useful information and not with unnecessary and irrelevant data. Every website should have the capability of keeping people on the website and getting people to return. Companies performing in the world of internet marketing should create websites that provide all the needed information to their customers by keeping the content fresh and updated.

d. Providing a Network Function

Except from content, websites can also provide useful functions for visitors. This can be done by using the network to make access to information provided by another website possible. For example, Yahoo! created a menu for websites that enables owners of other websites to register their URLs.

VII. INTERNET MARKETING TOOLS

Internet is not only a place for buyers and sellers to discover product information it also plays a role of intermediary. Therefore, the buyers and sellers could be matched on the internet. To accelerate the match, online marketing tools were implemented. The internet marketing strategy is vital for achieving goals. However, whether the internet activity fulfilled the initial goal is uncertain. A critical influential factor is the instruments which execute the internet activities. Therefore, internet marketing tools were generated to accelerate the internet marketing activities. New types of intermediary have evolved that sort information and bundle our needs and wants on the web. They act as “hubs” to buyers and sellers.

VIII. MAIN POTENTIAL DRIVERS FOR CUSTOMER ADOPTION OF ONLINE MARKETING

a. Accessibility and Convenience

The possibility to shop anytime, from anywhere is the most obvious and most commonly cited advantage of online marketing, and was found to be the most important perceived consumer benefit of internet shopping in cuddalore customer district.

b. Global Choice

Since the boundaries of online marketing are not defined by geography or national borders, consumer will benefit from a wide selection of vendors and products - including a wider availability of hard-to-find products.

c. Online Delivery

For digital products, the whole commercial cycle, including distribution, can be conducted via a network, providing instant access to products immediately when a need arises.

d. Test and Trial Online

Digital products can be tested over the internet prior to making purchase decisions, reducing uncertainty.

e. The Real Time Nature of the Medium

The internet can provide consumers with up-to-the minute information on prices availability, etc.

f. Time Savings

Consumers may benefit from the shopping process being faster in the market space than in the market place as a result of the rapidity of the search process and the transactions.

g. Possibilities for Comparison Shopping

By allowing consumers to shop in many places and conduct quick comparisons of offerings and prices (Hoffman et. al. 1995, Hart et al. 2000), Internet market places have the ability to reduce search costs for price and product formations.

h. Access to Extensive Information

An important consumer benefit is the access to greater amounts of dynamic information to support queries for consumer decision-making

i. Privacy and Anonymity

The internet has the potential to offer consumers benefits with respect to a partial, or even a total privacy and anonymity/pseudonymity throughout the purchasing process.

j. Competitive Prices

By embracing online marketing consumers may benefit from price reductions as a result of increased competition as more suppliers are able to compete in an electronically open market place as a result of reduced selling prices due to reduction in operational/transaction costs and manufacturers internalizing activities traditionally performed by intermediaries.
k. **Availability of Personalized Offers**

Consumers can benefit from IT enabled opportunities for personalized interactions and one-to-one relationships with companies, which allow for products, services and web content to be, customized more easily.

1. **The Social Nature of Purchasing Process**

Since consumers differ in their social disposition, Many customers may find an impersonal purchasing situation desirable for social reasons or simply because they find the verbal contact with a seller time-consuming. Moreover, the lack of physical sellers creates sales setting where there is virtually no pressure to buy.

IX. **CUSTOMER SATISFACTION TOWARDS ONLINE MARKETING**

Online shopping involves seeking information and carrying out activities that provide the customers the information that help them to arrive at an informed decision and conduct business. On the other hand, online buying represents technological infrastructure used to exchange data and purchase product or services electronically. The important online marketing such as types online buyers, online purchase experience, website highly used, mode of payments, influenced the purchase of products in the online marketing, type of products you are buying in the online marketing, awareness regarding online marketing, Customer satisfaction towards the website, Customer satisfaction price in online marketing, Customer satisfaction towards products in Online marketing, after sale services, delivery of product and so on.

X. **SUCCESSFUL WEBSITES**

For Web sites to be a success, it should be informative, entertaining, challenging, and unique. The homepage should be short, clear and simple to avoid wasting the customer’s time. They should be Understandable and easy to search information needed. Moreover, it must continuously be up-to-date for most recent information about the company; customers like to see modification in the website.

Products/services available should be represented clearly by key words or images on the Web site. Programs should be set up to find out which kind of customers are interested and what can keep customers coming back. This is the key of marketing strategy to know your customers, as well as, what they want. A company should create a Web site with unique SME knowledge and should not put Web links that are not completed. There are different marketing strategies for the Internet:

a) **Targeting**

This is different from the traditional segmentation because the customers come to you, they initiate contact, control information flow and control message content. Accessibility is primordial for customers. Market the Web sites through packaging or “click-through” from other companies’ Web sites. “Click-through” banner advertising is a sort of digital word-of-mouth which is becoming a stronger means of the Web.

b) **Product Strategy**

Brand recognition is made clear on the Internet but the number of purchase is not there yet. Sometimes the products are not available on the Web site and consumers hesitate before getting this particular product. To increase their confidentiality, recognized vendors should be mentioned on the Net. Authenticity is important for both sellers and products.

c) **Pricing Strategy**

In the long run, it will be good if firms can concentrate on offering products with the unique characteristics. Online shoppers will differentiate by the benefits and quality of the products/services. Otherwise, a low price strategy should rely on cost advantage and high volume to be able to compete.

d) **Distribution Strategy**

There is a necessity of a direct-to-customer mechanism. The industry has to be the first providing unique services to always be ahead of competitors.

e) **Promotional Strategy**

This depends on the marketing research and consumer preferences. A “frequently asked questions” (FAQ) section should be provided in the Web site and high-level marketing officers should also be involved for a stronger marketing message for the company’s vision.

In fact, the FAQ, through Internet, can save over one million dollars by providing what customers want. It also reduces online catalogue processing costs and cycle time. Other than that, grouping and Ranking the content of the Web site is effective so as to group consumer needs and to provide a good Structure for navigation of the Web site according to a consumer.
XI. ONLINE MARKETING AUCTIONS

Internet auctions can be characterised in two ways: third-party auction sellers such as eBay, Amazon.com and Yahoo! that auction goods for others (either individual sellers or corporate chains), and direct auction sellers which create their own auctions online via their company websites. A substantial number of retailers and catalogue firms are taking advantage of the boom in these online auctions to unload merchandise and increase sales, and growth in the online auction category is now well documented. Catalogue marketers as diverse as The Sharper Image, Ross-Simons, Cameraworld.com, and CompUSA are all successfully auctioning products online.

XII. CONCLUSION

Customer satisfaction has a direct impact on loyalty and hence businesses should focus on satisfying their customers. Customers should be encouraged to make use of the online customer support services in case of any inconvenience. Also, in internet shopping, customers decide to purchase a product or service based on its review. By providing reviews, a customer indirectly recommends the brand or product to others. Since product or service review is increasingly important for its growth, online customer should encourage their customers to provide constructive feedback in their websites. To summarize, online businesses in Cuddalore customer will have to focus on acquiring new customers through advertisement, publicity and discount packages. These customers will have to be retained and satisfied as both lead to higher levels of customer loyalty. However, it is a big challenge to retain customers and urge them to be loyal in a volatile environment like internet shopping. Online shopping is becoming more popular day by day with the increase in the usage of World Wide Web known as www. Understanding customer’s need for online selling has become challenge for marketers. Specially understanding the consumer’s attitudes towards online shopping , making improvement in the factors that influence consumers to shop online and working on factors that affect consumers to shop online will help marketers to gain the competitive edge over others.

REFERENCES


English Language Teaching in India: A Review

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Abstract—English in India is a symbol of people’s aspirations for quality in education and a fuller participation in national and international life. The visible impact of this presence of English is that it is today being demanded by everyone at the very initial stage of schooling. ELT in India is vibrant and dynamic today. The context of the whole teaching paradigm has changed totally. This article traces the course of this change, along with the causes and consequences while comparing this with the course of ELT in other contexts where it has always been a first language.

Keywords: ELT in India, evolution of ELT, Foreign language and Educational Programmes

I. INTRODUCTION

Every educational system has certain objectives which aim at bringing about desirable changes in pupil. In order to bring about those changes, the institutions arrange learning experience. The success of learning can be judged only in terms of the changes brought about by this experience. This is a learning experience and evaluation. English has become a global language and teaching it as a foreign or second language has increasingly become a universal demand.

Due to its association with the British colonizer, English started life in India as not just a foreign language, but as a much-hated language. From the despised instrument of oppression to the reluctantly adopted lingua franca to the status symbol of the upper classes to its position today as a second language, English has come a long way. In fact, it won’t be an aberration to label it a first language for some echelons of Indian society. Just as the status of the language underwent constant reinvention, the whole ELT paradigm also travelled the complete gamut of modification. In the closing years of the Twentieth century when English began to emerge as the global language, the Indian classroom was transformed because of the change in the environment of the learner. Whereas the earlier surroundings had been acquisition poor with regard to English, suddenly every language user seemed to be jumping upon the learn-English-bandwagon.

The liberalization of the Indian economy ushered in all kinds of reasons to learn the language. While earlier in the century students who had specialised in English joined either teaching or the civil services, now a whole new spectrum of job opportunities has opened up. There are now call centres that need trainers to equip their employees with communication skills, there are multinationals who have been recruiting marketing staff that needed to be taught spoken English, there are medical transcription centres which need efficient translators and reporters. Those desirous of immigration to the west needed professional help for clearing tests like the IELTS. Hence, the avenues where ELT came to be required in India are unlimited today.

Although a foreign language is now as much an Indian language as any other. English has been taught in our schools and colleges for many decades. It occupies the position of associate official language. It is used widely as a link language in offices and among the educated people. It is not only a compulsory subject at school, college and university but is also the medium of instruction to the large extent. It is the language of science and technology. It occupies the position of a second language in the school curriculum and for higher education.

English language has been assigned the role of library language. Without exception every secondary school child has to learn English as a subject, usually for six years but in some cases for three years only. This contemporary position of English in India shows English language teaching occurring at all levels of Education, mainly as a second language. This brings us to our present topic of interest - a history of English language teaching in India. English language teaching as a discipline has come into its own during the past several decades both in India and
abroad and along with it English language teaching historiography also has gained prominence. It is now possible to cite a large body of literature devoted to this area of study. But in India, even though English language teaching has been going on for many decades there is no document, which contains a comprehensive history of English language teaching in India. Now English language teaching has gained the status of a new discipline and also has gained relative importance on our educational programmes. It is felt that a comprehensive history of English language teaching in India is needed.

II. LEARNING A LANGUAGE
Each language is structured differently, and the different structures offer users different suggestions to meaning. So when we learn our first language, our brain/mind ‘tunes into’ the way the particular L1 works, and we learn to pay attention to particular cues to meaning that are most helpful. When we meet a new language, our brain/mind automatically tries to apply the first language experience by looking for familiar cues. Part of learning a foreign language is developing new understandings about the particular cues to meaning that the new language offers, and that differ from those of our first language. The transferability of knowledge, skills and strategies across languages depends closely on how the two written languages work.

III. ROLE OF A TEACHER
As said by Sir Philip Sydney, teaching is the end of all learning. A teacher’s primary role is not only to enable the students to understand what he is intending to say or teach. It is also the duty of the teacher to understand what the student wants and says.
In teaching-learning process, two things play the vital roles; one is the delivering capacity of the teacher and the other one is the receiving capacity of the students. Without the two aspects, the teaching-learning process will not be a successful one. Teaching-learning process is just like making sound by clapping. Without two hands we cannot clap. Like that without a right teacher and the students, the teaching learning process is meaningless. Teaching should be a worthy of learning a concept deeply and broadly. Teaching should facilitate the students to face the world which is full of political, social, international as well as personal controversies, without fear. It should give self-confidence to the students. By the effective teaching, the students should be enabled to go for right choices, judgments and also decisions individually. In the process of teaching-learning, the teacher should try to understand the students first. Then only, he can enable the students to understand him or his teaching. Theory with practice on some of the teaching topics may enable the students to understand the concept easily. Success of a teacher in his/her attempt in enabling the students to understand what is the concept taught by the teacher, depends on the methods he/she applies. The teacher may be a good, but the students’ physical problem may lead him to ignore the teaching. Or sometimes, the background of family of the students may drive him to be dull. Hence, the teacher should take into account everything. At the school level, the teaching-learning process is checked up the teacher by repeated class tests and examinations. Based on the result (marks scored by the students), different methods are adopted to improve teaching in case of negative result. At the college levels also the same traditional (Macaulay) method of examinations is used. The only difference is the volume of syllabus prescribed for the colleges students will be more than that of the school level.

IV. TEACHING ENGLISH AS A SECOND LANGUAGE
The Council of Chief State School Officers (CCSSO), U.S., defines English language proficiency in this way:
A fully English proficient student is able to use English to ask questions, to understand teachers, and reading materials, to test ideas, and to challenge what is being asked in the classroom. Four language skills contribute to proficiency as follows: Reading - the ability to comprehend and interpret text at the age and grade appropriate level. Listening - the ability to understand the language of the teacher and instruction, comprehend and extract information, and follow the instructional discourse through which teachers provide information. Writing - the ability to produce written text with content and format fulfilling classroom assignments at the age and grade-appropriate level. Speaking - the ability to use oral language appropriately and effectively in learning activities (such as peer tutoring, collaborative learning activities, and question/answer sessions) within the classroom and in social interactions within the school. Hence, the teacher should keep in mind while teaching English as a second language to the students.

V. LANGUAGE PROFICIENCY TESTS
Oller and Damico (1991) indicate that language proficiency tests can be associated with three schools of thought. The first of these trends, the discrete point approach, was based on the assumption that language proficiency consisted of separable components of phonology,
morphology, lexicon, syntax, and so on, each of which could be further divided into distinct inventories of elements (e.g., sounds, classes of sounds or phonemes, syllables, morphemes, words, idioms, phrase structures, etc). A discrete point language proficiency test typically uses testing formats such as phoneme discrimination tasks where the test taker is required to determine whether or not two words presented aurally are the same or different (e.g., /ten/ versus /den/). A similar example might be a test designed to measure vocabulary which requires the test taker to select the appropriate option from a set of fixed choices.

VI. TECHNICAL/BUSINESS ENGLISH FOR ENGINEERS

The lab practice is divided into two categories as “English Language Lab” where the listening comprehension, reading comprehension and vocabulary and speaking tests are conducted, and “Career Lab” where writing tests on Resume/ Report preparation and Letter writing are conducted. Also the students are given training in presentation, Group Discussion and interview skills. Forty per cent of the total marks (100) in final examinations is given for the English Language Lab practice and the rest of 60% is given for the Career Lab Practice, for which the test and evaluation are decided by the examiners during final examinations.

VIII. CONCLUSION

In our country, as already said 75% of the students are from rural areas and they are coming through regional language medium schools. Hence, based on their background, we have to design the syllabus and adopt methods to test their English language proficiency. Therefore, it is necessary to go for a detailed discussion as to whether the existing curriculum is fulfilling the need of the hour and suitable to the students in achieving their goals, the present methods for testing the proficiency of the students are suitable and opinion and suggestions from the teaching faculties of the English language in technical institutions are to be obtained.

REFERENCES

The Dynamic Relationship between Stock Prices and Exchange Rate: Evidence from G20 Countries

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Abstract: This paper studies the dynamic relationship between Stock Prices and Exchange Rate using data from 2000 to 2018 of G-20 Countries. We are developing annual long run relationship price and rate, calculating data by time series and increase and decrease relation, for which raw selection of data is 100, national currency unit or dollar. The collected data is from secondary sources and some observations, for those issues which are observed in several research, articles, and reports etc. This paper investigates the nature of linkage between Stock Prices and Exchange Rate. We have taken the data with specific period as the Exchange Rate was floating during this period. There exists a neutral relationship between Stock Market & Foreign Exchange Market.

Key words: G-20, Stock Prices, Exchange Rates, Time Series

I. INTRODUCTION

The liberalization of foreign capital controls and adoption of floating exchange rate regime in South Asian countries have widened the scope of studying the relationship between exchange rates and stock prices. Liberalization of foreign capital controls has opened the possibility of international investment and the adoption of floating exchange rate regime has increased the volatility of foreign exchange market. Thus has become crucial for the academicians, practitioners and policy makers detecting the association between stock prices and exchange rates.

There are different economic models regarding exchange rate determination. Introduce country’s current account as important determinant of exchange rate by the “Flow oriented” models. In this view, asset markets selecting the exchange rate at a point in time, but its effect on net asset positions by current account through, and on asset markets, determine the path of the exchange rates over time (Dornbusch and Fischer, 1980). Thus movements in the stock prices may affect the exchange rates. On the other hand, models that concentrate on the capital account of the balance of payments are known as stock models. Stock models are divided in to monetary models and asset (or portfolio) models. According to monetary model the exchange rate is seen as a relative asset price. Its expected rate of return influenced by the present value of an asset be largely. Thus actual exchange rate has to be determined by expected future exchange rates (see Gavin, (1989)). Portfolio balance model states that if prices of domestic stock rise, it will persuade investors to buy more domestic assets by selling foreign assets to obtain domestic currency. Lead to appreciation of domestic currency when will increase in demand of domestic currency. On the other hand, if the prices of domestic asset rise that will result in growth of wealth, which will also increase the demand for money by the investors that will give rise in domestic interest rates. In this situation more foreign capital will be attracted, which will increase the foreign demand for domestic currency and ultimate result will be the appreciation of domestic currency. In this way according to portfolio balance model there is an inverse relationship between stock prices and exchange rates (for detail see, Frenkel (1976), Branson (1983), Macdonald and Taylor (1992)). Among the models regarding the interactions between stock prices and exchange rates is no theoretical similarity. The empirical debate regarding the interaction between stock prices and exchange rates has been started few decades ago. Since then a good number of empirical studies so far have been conducted to investigate the relationship between the variables. But regarding the existence of relationship and the direction of relationship contradictory results found have by the researchers which have made the area disconcerted environs of finance literature. Some of the studies showed that there is a significant positive relationship between the variables, such as, Aggarwal (1981), Giovannini and Jorion (1987), and Roll (1992). But some of the studies
counter this argument and showed a significant negative relationship between the variables, such as, Soenen and Hennigar (1988). On the other hand some studies find that there is no significant relationship between the variables, such as, Chow et al. (1997), Franck and Young (1972), Solnik (1987), and Bhattacharya and Mukherjee (2003), Bahmani-Oskooee and Sohrabian (1992), Nieh and Lee (2001) found no long-run relationship between the variables. So there is no interaction between stock prices and exchange rates empirical harmony among the researchers which justify the need of more research in this area to contribute to the literature.

G20 Countries

The G20 (or G-20 or Group of Twenty) is an international forum for the Governments and Central Bank Governors from Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, The Republic of Korea, the Russian Federation, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States, and the European Union, (plus Spain as a permanent guest member). Established in 1999, the G20 objectives to discuss policy regarding to the promotion of international financial stability. It seeks to address issues that go beyond the responsibilities of any one organization. The G20 heads or government start their initial meeting in 2008, and the group also hosts separate meetings of finance ministers and foreign ministers due to the expansion of its agenda in recent years. The G20 formation membership 19 individual countries plus the European Union (EU). Represented by The European Union (EU) is the European Commission and by the European Central Bank. Collectively, the G20 85% of the gross world product (GWP), two-thirds of the world population, 80% of world trade (or, if excluding EU intra-trade, 75%), and approximately half of the world land area.

II. LITERATURE REVIEW

A literature review is an assessment of a body of research that addresses a research question, identifies what is already known about an area of study; make a case for why study of research of questions is important to a field. It is a process of framing a research question, searching relevant bodies of literature, managing search results, synthesizing the research literature and writing an assessment of the literature. Following are the literature review of topic under studies i.e. Dynamic Relationship between Stock Prices and Exchange Rate: Evidence from G20 countries. It examines linkage between exchange rate, stock return and interest rate for India and uses the monthly data from January 2000 to December 2014. This study has scrutinized the linkage between exchange rate, stock return and interest rate using maximum overlap discrete wavelet transforms (MODWT) which is very much appropriate when the variables are discrete in nature for examining the cross-correlation and causality. The findings of the study indicate that the empirical relationship between these variables is not significant at lower scales. When this study considered the higher scales, there is a clear linkage between them and three markets are associated with each other. By bifurcating the overall periods into pre- and post-financial crisis sub-periods, result shows that the causality among few pairs do exist even at lower scale. Malepati Jayashankar, Badri Narayan Rath, (2017), analysed the relationship between exchange rates and stock market indices in Turkey, Japan and England by using the time varying bootstrap causality test in the period spanning January 1990 to April 2013, monthly data from the FTSE, NIKKEI and BIST are supplied from Yahoo Finance (www.ukfinance.yahoo.com); nominal exchange rates of these countries against the US-dollar, which is an important variable in shaping the world economy. The most significant result gained from this study on Turkey, England and Japan, spanning the period January 1990 to April 2013 is that local and global crises strength relationship between the exchange rate and the stock market index as two-way causality. Feyyaz Zeren & Mustafa Koch (2016). Dr.S.Poornimaand and M.Ganeshwari (2015) analyze the dynamic relationship between stock market index and exchange rate. The period for the study has been taken from 1-07-2014 to 29-07-2016 using daily closing indices. Statistical tests have been applied for analysis of the study involves correlation, ordinary least squares method, unit root test and granger causality test. In this regard, the ADF test was used which showed non stationarity at level and stationarity at first difference. Then, the coefficient of correlation between the two variables was computed, which indicated negative correlation between them. Babajide Fowowe (2015) conducts an empirical investigation into the relationship between stock prices and exchange rates for the two largest economies in Sub-Saharan Africa – South Africa and Nigeria. The sample period runs from January 2003 to December 2013 and uses the monthly data for stock market indices and the exchange rate for Nigeria and South Africa. Waseem Aslam (2014) conducted a study on Relationship between stock market volatility and
exchange rate in Pakistan. Variables used for the study is Exchange rate (represented by US $) and KSE 100 index. This paper found a Negative correlation between PKR-USD and KSE-100 index. Granger causal test found that there exist a relationship between KSE 100 and exchange rate. Zheng Yang, Anthony H. Tu & Yong Zeng (2014) applies the least square (LS) models (such as vector autoregressive) and Granger causality test in quintiles to investigate causal relations between stock returns and exchange rate changes for nine Asian markets (India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand) over the period 1 January 1997 to 16 August 2010. The empirical results indicate that the quintiles causal relations vary across different quintiles’ and different periods. Although the causal effects of exchange rate changes on stock returns (or stock returns on exchange rate changes) are heterogeneous across quintiles, the overall evidence suggests that most stock and foreign exchange markets are negatively correlated. The result shows that there are more bidirectional causal relations in accordance with this method than the conventional least square (LS) estimation. Giulia Piccillo (2008) investigate the relationship between exchange rates and asset prices. It takes the new born approach for build-up both the markets in a framework of heterogeneous agents. Due to the heuristics embedded within the model, this simple frame work alone is able to create a complex, time-varying dynamics. This dynamics is analysed for different parameters and conditions. Finally the model is brought to the data, to check the fitness of the predictions on the real world markets. This study has established a model of exchange rates and stock prices based on heterogeneous expectations. The model is structured in such a way that most of the dynamics origins from the behavioural finance aspect. This is to emphasize the complexity of the simplest model. Findings of a study develop a new approach that creates a complex and consistent with data dynamics in the most general of economic assumptions.

**Stock Exchange Rate and Stock Exchange Price Dynamic Relationship**

The table show of the dynamic relation and stock exchange price and stock exchange rate (annual report data), the data work on 2000 to 2018 and each country data calculating time series analysis, then every data individually calculated increase and decrease price and rate which raw is 100(compeer to National currency unit/dollar)

<table>
<thead>
<tr>
<th>NO</th>
<th>Country Name</th>
<th>Stock exchange rate</th>
<th>Stock price rate(Annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Argentina</td>
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(The table show of Exchange rates Total, National currency units/US dollar, 2000 – 2018 and stock price annual National currency units/US dollar, 2000 – 2017 increase and decrease, which raw is 100.)

*The data Source: OECD National Accounts Statistics: PPPs and exchange rates.*
III. CONCLUSION

The existing literature reveals that majority of the studies are in the context of developed economies. Not only that many of the empirical studies are giving different and conflicting results also. Some studies found positive effect of foreign exchange rate on stock prices, while some others are showing negative impact on it. It is also found that most of the studies have adopted general stock market indexes for the analysis, instead of analysing the case of firms or industries separately. From the methodological point of view, the majority of the studies have used one directional analysis. For this purpose authors have employed econometric models such as ordinary least squares (OLS) and generalized least squares (GLS). Only very few studies have examined the market integration with reference to stock market and foreign exchange market. Besides, much emphasis has not been given in the literature to examine the inter-relationship between stock market and foreign exchange market. Not only that, for the above purposes most of the authors have adopted methods such as Granger Causality test, and it assumes that time series are stationary in level, which can be highly restrictive for stock price or exchange rate time series. But, the techniques such as Johansen's co-integration, Vector Autoregressive model and Vector Error Correction models are underlining the problem of non-stationary of the data with unit roots. The present study is an earnest attempt in this direction.

Another important lacuna of the existing literature is that in the case of India very few studies have taken place. The liberalisation and the globalisation of 1990s in India again show the importance of a re-examination of the linkages between foreign exchange market and the stock market. Liberalized exchange rate system, opening up of the capital account for international investment, the advent of floating exchange rates, the development of 24-hour screen based global trading, the increased use of national currency outside the country, innovation in internationally traded financial products, recent spurt in the Foreign Institutional Investments (FII), and the introduction of American Depository Receipts (ADR) and Global Depository Receipts (GDRs) after 1992, are multiplying the relevance of a detailed analysis in the above mentioned direction in Indian context. On the basis of the above observations, the present study attempts to examine the validity of market integration with reference to foreign exchange market and stock market and its inter-relationship in India. For a clear understanding of the interrelationship between the exchange rates and the stock prices study has been carried out both at the firms and at the industry levels. In addition to this, for a meaningful comparison analysis has also been carried out by employing the market index (BSE Sensex).

REFERENCES

Abstract: Effective Quality Assurance systems are the basics for successful manufacturers. Beyond brand name, price, and market share; poor quality of products can sink customer demand for a company's goods. Quality of products must be provided with due consideration that it must be compatible with customer satisfaction. This study revolves around the quality control and its management. The objective of this study is to elaborate the various aspects of quality control and why they are needed to be checked at various intervals of time. Quality management is beneficial for both business as well as society.

Keywords— Standardization, Quality Control, Total Quality Management.

I. INTRODUCTION

Quality control is a process of checking and inspecting product during the production process and after the production process to ensure that the final product meets the expected standard. In other words quality control is a series of steps which are undertaken by entities to review or recheck the quality of each and every factor involved in the production.

A. Management of Quality Control

Quality cannot be improved by only checking or inspecting the finished product, continuous efforts are required to move the emphasis of quality management from inspection to process control. To control and manage the quality it is essential to move from detecting defects to preventing them and to continue the process improvement until you meet the customer requirements on the continuous basis. Mainly the purpose of quality control is to find defects in products that are manufactured by a company. On an average every company develops a process to find out the defects in their production system and organisation. Quality control management may include evaluating the employees and workers working in your company and ensure that they possess adequate skills or training. If your employees are not informed properly then they may be a part of problem in your quality control. If you want to remove defects then you have to make sure that each and every person indulges in production process must be aware about that how to make a quality product or service. The quality control management focused not only on product but also on the means to achieve them. Product of good quality serves benefits to the customers as well as to the society. Consumption of superior quality products leads to the better health of consumers. Quality control is a technique which is used by companies control quality in their product. Some of the quality control process may include inspecting, checking and verifying that a product contains or exhibits certain characteristics. Other related process may include examination and testing to ensure quality products. At the final stage of every quality control process a quality product should be produced. Quality product can be defined as a convenient, safe and affordable.

Quality control management is used synonymously with the concepts like quality assurance and improvement. Quality control management is based upon some fundamental concepts and advantages of workflow streaming, process centralisation and information centralisation. The main objective of quality control management is to minimize errors and wastes as much as possible and maximize the quality efficiency and profits.

To implement the quality control management effectively a team of quality controller or managers is hired to oversee the whole process and to give someone the authority and responsibility to accept or reject the first product release.

Quality assurance can also be a part of this process and its main focus is on the improvement and stabilization of the product and services rendered. The objective of quality assurance is to minimize the issues that can cause the defects in production. Once the defects are identified it is easy to eliminate them, and the whole process can be improved to prevent future defects in the product. In general a team of quality control managers and workers is required to achieve the goal of manufacturing quality products. Further as the products are produced or services are rendered they are examined or checked at a random interval and the objective of any quality control team is to yield quality products which
meets the standards determined by International Organisation for Standardisation (ISO). If the process is not up to mark then the process should be modified. In any case if the product does not meet the predetermined standard then the product will have to be redesigned. Quality control team is not responsible to correct the quality issues, once they are identified. They are responsible only up to the identification of defects issues. They notify another team that can make necessary changes in the design to improve the product or services rendered. When the proper quality is achieved then the further production can be continued. This is an ongoing process and mostly all the successful companies are constantly implementing quality control process.

**Examples of Quality Control Management**

- Quality control is an essential part of every food manufacturing process. Most of companies used to test the samples of their product at different intervals in order to ensure that their products are safe and edible.

- Companies manufacturing electrical appliance also incorporates a quality control process in their manufacturing process. They review or check the product again and again to ensure the safety. While testing they may pour some water on the device to ensure that they will survive for a longer period.

- Mainly there are four components of quality control. Quality planning, quality assurance, quality management, quality improvement. What a customer wants and what he is actually willing to pay for it determines quality. It is an oral or written commitment to a well known or unknown customer in the market. Customer satisfaction is the backbone of quality control and management. Establishing a million dollar company without considering the needs of customer will decrease it's revenue ultimately.

II. LITERATURE REVIEW

According to Hansson and Klefsjö (2003) TQM can be defined as a management system, which consists of three interdependent units, namely core values, techniques and tools. But the definitions for total quality management are vague. The aim of TQM is Zero defect and it mainly emphasis on quality. The core values of TQM which will lead to better quality in the organisation is summarised from the authors (Boulter and Bendell, 2002, Ehresman, 1995, Ghobadian and Gallear 1995, Hansson and Klefsjö 2003, 2006) it is divided into three parts, first the whole organisation has to committed and work towards common goal i.e. continuous improvement. Secondly the customers are to be focused, through better satisfaction in the products and services. The decisions made with regard to customers are to be given the highest priority by top level management. Thirdly the decisions must be taken with trusted facts and figures.

"QM can provide a clearly defined structural frame work in which all organizational activity occurs- a must for empowered self-directed or cross-functional work place teams, multi-skilled flexible workforces, or dynamic workplace environments" -Dennis Grimwood [79, p.2]

III. RESEARCH METHODOLOGY

This study has been initiated and completed having some objectives which includes:

- To bring out the concept clarity about the quality control and management
- To study the relevance of quality products and services in the market
- To study the benefits of using quality products for business as well as society

Secondary data has been used to represent the quality control management. Sources used for secondary data are desk reviews of the research articles, books, magazines, journals, content analysis of newspapers and periodicals have been made along with the browsing of materials available on internet. This study is based on the combination of exploratory and descriptive research design.

a) **Findings**

Quality control and management is a business principle that ensures the excellence in a company's products and internal processes. Companies by implementing quality management programmes seek information from them to identify weaknesses, faults and the areas for improvement. This gives the companies the ability to set the standards and make adjustments as and when needed and to offer the greater value overall to their customer base.

Quality management aims to improve the quality of raw material, semi-finished goods and finished products at various stages of production process. It focuses on the batter utilization of resources which help in reducing the waste of raw material, men and machine during and after the production process.

b) **Positive Impact**

The primary aspect of quality control and management starts with the performance, reliability and durability of the product.
Quality management programmes also helps in ensuring customer satisfaction. By including customers survey in quality management programmes key personnel can gain understanding of product features important to customers. Survey of non customer should also be included because it provides additional insight in to why they use competitors’ product. Quality control and management result in reducing waste. By implementing a supply chain management program a company can reduce the excess quantity of raw material and it can acquire the same as and when needed so that the funds of company will not be blocked in inventory. Quality management approach enhances the productivity by eliminating the unnecessary task and improving the essential and existing ones. Quality product can improve the goodwill of a company in the market which helps in sustaining the existing customers and attracting the new ones. This results in employee spending less time and material to produce quality products which ultimately leads to increased revenue and a better bottom line.

IV. NECESSITY OF QUALITY CONTROL

The effect of quality thinking has spread to modern application outside the boundaries of manufacturing, extending in to service sector also and in to other related areas such as sales, marketing and customer service. Quality control can be achieved by zero defect mechanism. When there will not be any kind of defect in your product then automatically your quality will be improved which in turn leads to capturing and sustaining current and potential customers.

V. CONCLUSION

In this competitive era quality is the most important weapon to win the market. From past few years it has been observed that quality control and management plays a crucial role in increasing profitability and sustainability in the market. Therefore quality is a competitive priority. It is the only factor that ensures the survival and growth of any organization. Today it has been well understood that the poor quality products caused to lost the consumers and ultimately it leads to the death of company’s business. Therefore to be successful in today’s competitive business environment every organization must pay attention to the quality because it focuses on meeting the customer need, meeting the competition and continuously improving extending these concerns to all phases of business. Hence, a systematic procedure should be followed for designing and producing a quality product.

REFERENCES

[1] ISO 9000:2005, Clause 3.2.10
Block Chain: Reshaping the Banking Sector

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ABSTRACT-This paper depicts about the Block Chain Technology that is almost a new phenomenon for all the sectors. We are going to focus about the usage and benefits of this new emerging technology named Block Chain, particularly in the Banking Sector. Block Chain is providing a highly secured and safe environment when it comes to the exchange of data, information and money. This paper hopefully will give a clear understanding of Block Chain Technology and its application in Banking Sector.

Keywords: Block Chain Technology, Banking, Network, Consensus.

I. INTRODUCTION

In today’s world of sustainable development, ozone depletion and climatic changes across the globe are one of the major challenges faced by the mankind. And effectively sustainable initiatives need to be taken as quick as possible to promote environment sustainability. In fact in the present scenario, many organizations including banking and non-banking institutions are working on ways to reduce their carbon footprint and save money. This can generally be done by making use of green and sustainable product, software and technology. Block Chain may soon prove to be the biggest technological advancement for a number of sectors including the Banking Sector. Block Chain as the name depicts, is a chain of blocks carrying data and information. Though this concept was discovered many years back, the Block Chain technology came to the knowledge general public in the year 2009, when a person named Santoshi Nakamoto introduced a new peer-to-peer network for Financial Transactions. This came into existence with a new digital crypto currency named the Bitcoin, with which I think most of us are quite familiar these days The idea of creating such a Block Chain system came into existence mainly to remove the middling Centralized Authorities involved in any Financial System.

As a result many bank and Corporate Organizations have already started experimenting with the Block Chain Technology. Majors like Infosys, IBM, TCS and Samsung have started to test and work with Block Chain technology. Bank of America has filed around 50 Block Chain related patents. Thirty Investment Banks including Citigroup, UBS, Goldman Sachs and Barclays formed the R3 CEV Consortium to explore the potential of this new technology in reducing the overall business costs. In 2015, ICICI bank successfully executed transaction in International trade finance and remittances using this technology with Emirates NBD, a Dubai based Bank .The main reason for its popularity is that Block Chain can be used more broadly to create a temper-proof, cryptographically secure online ledger that can be used to verify transactions directly and securely, on a decentralized and peer-to-peer basis, without the need for a middlemen like a bank or any other financial institution. In simple words, this will help promote economic growth by speeding up the entire system and will lead to faster development of green technologies.

Fig. 1 Sectors Using Block Chain
This pie chart clearly shows us the information about the usage of this peer-to-peer technology called Block Chain in different sectors of our economy. We can see that out of all the sectors using this Block Chain technology it is the banking sector having the maximum usage constituting around 30% of the total usage of this Block Chain network at present. And on the second and the third positions are government & public goods sector with around 13% and the Insurance sector with around 12% usage share respectively. So currently it is the banking sector that is working the most to utilize the best from this network of Block Chain.

II. WORKING OF BLOCK CHAIN TECHNOLOGY

The concept of Block Chain actually works on some parameters. Working of Block Chain can be well understood by some of the points given here:

- A Block Chain system makes use of public and private keys to form digital signature ensuring higher security.
- Upon authentication of these keys the need for authorization arises
- This system is based on the performance of mathematical verifications to reach upon a consensus on any particular value.

For Example:

- When a person or the node makes a transfer, they use their Private Key and announce the information about transaction over the network.
- This leads to the creation of a block containing details of digital signature, timestamp and the public key for the receiver.
- And the validation process starts for this block of information broadcasted.
- Miners all over the network start solving the mathematical puzzle using the computer power.
- The first to solve this mathematical puzzle receives a reward in form of Bitcoin and this acts his Proof of work PoW
- Once the majority of nodes in the network come to a consensus on a common solution a block is added with a time stamp to the existing chain of blocks.
- It may contain data, amount, information etc.
- After the new block is added to the chain the existing copies of Block Chain are updated for all the nodes on the network. And once a block is added it cannot be altered, but only new blocks can be added to the chain.

III. RESEARCH METHODOLOGY:

In this paper we are discussing about both the present relationship between the banking sector and the Block Chain technology usage and also their future prospects. So our main objective here is actually to spread awareness among people about this great technology of Block Chain. For this we are making use of secondary data in general in this paper of ours.

IV. LITERATURE REVIEW

On June 12, 2017, Bank chain, a platform for banks to implement Block Chain solutions announced that it has exclusively partnered with Microsoft Azure as their cloud partner, so all its consortium members will be using Azure.

Head of Global Finacle says, “with that kind of capability the technology can avoid all the fraud that could have taken place in a situation like Punjab National Bank.”

CBO of Finacle says about this new technology, “we are in very advanced discussion in Australia with a consortium of banks and I think you will see more announcements.”

Redditor says, “Asians are way ahead in technology and Block Chain sector as they know are acceptive and smarter, eventually the banks will kneel down to them.”

Shinam Arora, CEO at Prime chain Technologies, “Block Chain technology can help banks improve customer satisfaction, minimize fraud, and maximize efficiency, security, and transparency. We are excited to collaborate with Microsoft and bring in their expertise and globally-trusted solutions to help the banks address these challenges take the next quantum leap”

V. USAGE OF BLOCK CHAIN

While conducting the research about this topic of Block Chain we found that there are a number of areas where this new technology can be implemented. Some of the main reasons for such wide scale implementation potential can be well understood through the given below point of benefit it provides in the current scenario.
 Executing Smart Contracts

Distributed ledgers convert the simple contracts into smart contracts executable on fulfillment of certain specified conditions. Ethereum is one such big example of smart contracts having the potential to leverage the usefulness of Block Chains on a truly world changing scale.

Generation of Money via Crowd-funding

Crowd-funding organizations like GoFundMe and Kickstarter are doing Great work in the emerging peer-to-peer economies. In 2016Ethereum based DAO (Decentralized Autonomous Organization) raised a hooping! USD 200 Million in just over 2 months where participants bought cryptocurrency based DAO tokens.

No transaction fees involved

By making use of peer-to-peer payment over Block Chain network, the door to a direct interaction between parties gets opened. For example OpenBazaar makes use of Block Chain to create peer-to-peer eBay where you can transact with sellers or vendors with paying transaction fees.

High Transparency

Being accessible by public in general, distributed database technology can bring full transparency to the entire system and it is the ethereum based smart contracts help automate the entire process.

Smart storage of File

By not storing the data at a particular centralized location and distributing it throughout the network, protects such data from getting hacked or lost. It is a necessary upgrade to the Web’s currently overcrowded content delivery system.

Secured Identity

The management of identity for financial transactions that takes place online need to ramp up. Distributed Block Chain ledgers offer enhanced ways to prove who you are, and can digitalize your personal data information and documents. Although it may be a bit of complex task for beginners, startups like Netki aspires people to create a SSL standard for the Block Chain.

Ease in KYC and Anti-Money Laundering

KYC; know your customer and AML have great potential for being adapted to this new network technology. Currently financial institutions have to undergo a labor intensive multi-process kyc system for each new customer. But with the emergence of startups like PolyCoin and Tradle’s Trust in Motion (TiM) Key documents of individuals once verified by any bank, gets cryptographically stored on the Block Chain network and can be used by other institutions upon the consent of individuals.

Better Data Management

At present most of us are unknowingly providing all our personal data for free to number of organizations simply by making use of social media sites like facebook instagram twitter etc. But by making use of Block Chain’s capability to distribute amount into small fractions, users will soon be able to charge money from organizations for providing such personal data about themselves.

Instant Transfers

By making use of Block Chain technology both the inter-bank transfer as well as the international transfers can be completed faster and at a reduced or negligible cost. At present most of the Big financial institutions and companies rely on SWIFT bank transfer system which takes 1-4 days for international transfer of money. So Block Chain may prove to be a great alternative to these.

Faster Insurance Claims

Block Chain can prove to be a stepping stone in improving the traditional insurance system by automating payments on insurance cases. If the systems are made to run on Smart contract that do not require long bureaucratic delays involving numerous managers, client will be able to receive payments immediately.

So we can say that this entire network is based upon the three main pillars which are given below

1. Decentralization
2. Transparency
3. Immutability
In a centralized system the biggest threat is of the entire data stored at one location getting hacked. And if the central storage node or system needs to be upgraded or gets shut down for some reason, the entire Centralized system gets a halt. But in a decentralized system like that of Block Chain, data is not stored at one place, but available to all. So in case of a potential hack or a particular node(s) facing shut down, rest of the nodes and system does not get affected and still work perfectly.

Talking about the transparency level, some people think that it is completely private network but actually it is very transparent. Though the real identity of an individual remains secure, but we can easily see all the transactions that takes place with their public address.

Immutability here, basically relates to the fact that once a data or an information has been entered into the Block Chain, it cannot be altered. Suppose for a moment, there occurs a situation where hacker alter a particular block in the chain. We know that a slightest change in data can change other blocks drastically and thus the entire chain system, which is impossible. That's how it achieves immutability.

VI. CHALLENGES IN ADOPTION

Block Chain has several benefits in its adaption but like the two sides of a coin, Block Chain can never be escaped from the hurdles that may come in its way of universal applicability. Firstly, it is still in its initial stage. Which means that like any other initial phased technology, Block Chain technology too at present require huge initial investment in specialized high-tech computers and other resources for its proper functioning.

Secondly it is based on the mechanism of consensus matching, which means that a lot of computations need to be worked out which can only be done by use highly specialized hardware. In this block chain network, to increase the chances of gaining rewards in the form of Bitcoin (say) or to simply create a new block, miners all over the network enter into a super high tech virtual race of doing millions of computations.

Basically all this in general requires high level of automation in form of super computations, and at present requires a lot of financial resources. Also because of millions and billions of computations taking place throughout the network just with a main motive to earn rewards like Bitcoin leads to the wastage of energy resource in form of electricity consumption to a very high extent.

But for a moment by keeping all other problems on one side, we can see that the biggest of all problems is actually the lack of proper awareness about this technology, its concept, features, characteristics, and the benefits associated with it in general and all these problems need to rectify as quick as possible for this technology to develop to the best of its potential and help in taking the world’s economy to an entire new level of growth prospect.

VII. BITCOIN-THE ULTIMATE FUTURE

This technology though in its initial stage at present, has a great future potential. But the main problem associated with it is of the lack of awareness about this technology’s benefits and great future prospect. 2018 has been a banner year for Block Chain and the momentum isn’t showing any signs of slowing down in 2019. The Reserve Bank of India’s research and development arm has published a blueprint suggesting a broad roadmap on adoption of
Block Chain technology in the local banking sector. The Institute for Development and Research in Banking Technology which conducts applied research and experimental development in the area of banking technology. India’s largest banks are building a consortium to test an interbank Block Chain platform, putting the country at the cutting edge of adoption of the technology that forms the backbone of cryptocurrency Bitcoin. Finacle is the software that powers the core functionality for the majority of the Indian banks. In the year 2016, Infosys through its press release in London gave an overview of the market as well as adoption strategies. According to this survey report, the press release explained that almost 50% of the financial institutions would have invested in Block Chain by 2018. The statistics further explain that by the year 2020 over 80% of the bankers are expected to adopt the technology at a commercial rate. The private-sector banks adopting the Block Chain technology are promising the entry of institutions into Block Chain network.

VIII. CONCLUSION

Block Chain Technology has great future potential as it has the power to completely revolutionize the technologies associated with the banking sector, thus upgrading them to a whole new level. Though there are certain problem and challenges too associated with this new technology, but from the history we can clearly see that such challenges and problems always arise whenever a new technology evolves out. But it all depends on us that how quickly and efficiently deal with such problems and develop this new technology. Hence the day is not far away when this Block Chain would be implemented in most of the sectors including the Banking Sector.

A huge number of populations are now worried about Block Chain technology and want it to go away, but this technology is here to stay. In the coming days, people will be trading using this new concept. Paper money will be a thing in past, and use of Bit-coin ATM sin many places will increase to a great extent. It is important that we jump on this bandwagon as early as possible and start getting adjusted.

REFERENCES

A Study of Employee Job Satisfaction in special reference to Private Educational Institute

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Abstract: Job satisfaction is an integral component of organizational climate and an important element in management-employee relationship. It is a positive emotional state that occurs when a person’s job seems to fulfill important job values, provided these values are compatible with ones needs. Job satisfaction, in simple words, is an individual’s emotional reaction to the job itself. It is a person’s attitude towards the job. It may be viewed as the pleasurable emotional state resulting from the perception of one’s job as fulfilling or allowing the fulfillment of one’s important job values, provided these values are compatible with one’s needs.

Keywords: Satisfaction, Employee relationship, emotional state, organizational climate

I. INTRODUCTION

The term **Job Satisfaction** describes a positive feeling about a job, resulting from an evaluation of its characteristics. A person with a high level of job satisfaction holds positive feelings about his or her job, while a dissatisfied person holds negative feelings. When people speak of employee attitudes, they usually mean Job Satisfaction.

**Job satisfaction** describes how happy an individual is with his or her job. The happier people are within their job, the more satisfied they are said to be. Logic would dictate that the most satisfied (“happy”) workers should be the best performers and vice versa. This is called the "happy worker” hypothesis. However, this hypothesis is not well supported, as job satisfaction is not the same as motivation or aptitude, although they may be clearly linked. A primary influence on job satisfaction is the application of Job design, which aims to enhance job satisfaction and performance using methods such as **job rotation, job enlargement, job enrichment** and **job re-engineering**. Other influences on satisfaction include management styles and culture, employee involvement, empowerment, and autonomous work position. Job satisfaction is a very important attribute and is frequently measured by organizations. Job satisfaction is an integral component of organizational climate and an important element in management-employee relationship. It is a positive emotional state that occurs when a person’s job seems to fulfill important job values, provided these values are compatible with ones needs. Job satisfaction, in simple words, is an individual’s emotional reaction to the job itself. It is a person’s attitude towards the job. It may be viewed as the pleasurable emotional state resulting from the perception of one’s job as fulfilling or allowing the fulfillment of one’s important job values, provided these values are compatible with one’s needs. 

According to Lock, work satisfaction as a pleasurable or positive emotional state resulting from the appraisal of one’s work or work experience’. The extent that a person’s work fulfils his dominant need and is consistent with his expectations and values, the work will be satisfying.

<table>
<thead>
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<th>MODES OF JOB SATISFACTION</th>
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<tr>
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<td>Job characteristics model</td>
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Determinants of Job Satisfaction

According to Abraham A there are two types of variables that determine the job satisfaction of an individual:

- **Organization Variables**
- **Personal Variables**

### (1.) Organization Variables:

- **Occupational level:** The higher the level of the work, the greater the satisfaction of the individual. This is because higher level work carry greater prestige and self-control. People at higher level work find most of their needs satisfied than when they are in lower level ones.
- **Work Content:** The extent to which work provides the individual with interesting tasks, opportunities for learning, and the chance to accept responsibility will increase work satisfaction.

This is a major cause of job satisfaction as a whole, and particularly of the component of it known as intrinsic job satisfaction. Hockman (1980) suggested that five features of work produce such satisfaction. Many studies have investigated this issue and the latest meta-analysis found the following average correlation with job satisfaction.

- **Task Identity** (completing a clear and identifiable piece of work)
- **Task Significance** (the degree to which the job has an impact on the lives of others)
- **Autonomy** (the degree to which the job provides freedom, independence and discretion)
- **Skill Variety**
- **Feedback** (the extent to which information about effectiveness is available)

- **Considerable Leadership:** People like to be treated with consideration. Hence considerable leadership results in higher satisfaction than inconsiderable leadership.
- **Pay:** In a number of studies people have been asked to rank various sources of job satisfaction and pay has usually come out among the first. In job satisfaction scales, contentment with pay is always one of the main components, and gives a reasonably good prediction of overall satisfaction. Many people try so hard to increase their pay in one way or another that it would be surprising if pay was not an important source of satisfaction – some go on strike, some try to be promoted, others do a second job. However across the population, pay has a surprisingly small correlation with happiness or satisfaction. But within organizations there is a correlation between job satisfaction and pay, after other variables have been held constant although it is still small. People at work have a clear idea of what they ought to be paid in comparison with others, and in relation to their skill, experience, etc. If there is a discrepancy between what employees think they should be paid and what they are paid, they are dissatisfied.

- **Promotion Prospects:** American surveys show that opportunity for advancement is usually ranked first or second in importance. Herzberg et al., (1959) found that achievement, recognition and advancement were the main causes of positive satisfaction. On the other hand, if people expecting promotions, do not get it, they will be discontented. The importance of promotion is quite different for people in different social classes and at different skill levels. For managerial and professional people work is part of a career and promotion is of the highest importance. For unskilled and semi-skilled workers promotion is less likely and is less sought after.

- **Interaction in the Work Group:** Work Satisfaction will result if interaction is most satisfying i.e., when
  - a) It results in recognition that other person’s attitudes are similar to Ones own.
  - b) It facilitates the achievement of goals.

### (2.) Personal Variables:

For some people, it appears most jobs will be dissatisfying irrespective of the organizational conditions involved, whereas for others, most work will satisfying, personal variables like age, educational level, sex etc., are responsible for this difference.

- **Age:** Generally there is a positive relation between the two variables up to the pre-retirement years and then there is a sharp decrease in satisfaction. An individual aspires for better and more prestigious work in later years of his life. Finding his channels for advancement blocked his satisfaction declines.
- **Educational Level:** The higher the education, the higher the reference group which the individual looks for guidance to educate his job rewards.
- **Role Perception:** Different individuals hold different perceptions about their role that is the king of activities and behaviors. They should engage in performing their job successfully. The more accurate the role perception of an individual the greater is satisfaction.
- **Gender:** There is yet no consistent evidence as to whether women are most satisfied with their jobs than men, holding such factors as work and occupational constant. One might predict this to be the case, considering the generally lower occupational aspirations of women.

### II. Measuring Job Satisfaction

There are many methods for measuring job satisfaction. By far, the most common method for collecting data regarding job satisfaction is the Likert scale (named after Rensis Likert). Other less common methods of gauging job satisfaction include:

- Yes/No questions,
- True/False questions,
- Point systems,
- Checklists,
- and forced choice answers.

This
data are sometimes collected using an Enterprise Feedback Management (EFM) system. The Job Descriptive Index (JDI) is a specific questionnaire of job satisfaction that has been widely used. It measures one’s satisfaction in five facets: pay, promotions and promotion opportunities, coworkers, supervision, and the work itself. The scale is simple, participants answer either yes, no, or can’t decide (indicated by '?') in response to whether given statements accurately describe one’s job.

A related scale is the Job in general index, which asks employees how satisfying their job is in a broad overall sense. In certain situations, it can be more useful than the JDI because rather than focusing on individual facets, it asks about work satisfaction in general. Other job satisfaction questionnaires include: the Minnesota Satisfaction Questionnaire (MSQ), the Job Satisfaction Survey (JSS), and the Faces Scale. The MSQ measures job satisfaction in 20 facets and has a long form with 100 questions (five items from each facet) and a short form with 20 questions (one item from each facet). The JSS is a 36 item questionnaire that measures nine facets of job satisfaction. Finally, the Faces Scale of job satisfaction, one of the first scales used widely, measured overall job satisfaction with just one item which participants respond to by choosing a face.

III. LITERATURE REVIEW

Kele & Mtyuda (2017) research outcomes indicated that a lack of resources, too much crowd of courses and indiscipline amid pupils were severe sources of disappointment amid teachers. Other causes of job dissatisfaction amid teachers are management consequences. All these factors create disengagement among teachers and filled negativity in their job.

Troesh & Bauer (2017) investigated job satisfaction and stress in second career teachers compared to first career teachers and the role of self-efficacy in this context. Results showed that second career teachers are highly filled with satisfaction with their occupation than first career teachers. Hussein et al. (2013) indicated that job satisfaction is a significant element in all sectors for the reason that it is anticipated to achieve a better workforce retention rates and better-quality service delivery. Moreover, it appears that employees have the tendency to view their work with unfavorable and favorable feelings; it is the degree of contentment and pleasure connected with work. Apparently, if employees like their job strongly they are expected to experience a higher job satisfaction, whereas employees who do not like their job will feel dissatisfied (Ashwathapa, 2008). A prosperous organization usually has satisfied, and pleased employees whereas deprived satisfaction can paralyze the organization. Job satisfaction distresses organizational managers and leaders for the reason that it has an impact on significant organizational results (Sinha and Shukla, 2012). As argued by De Grijp et al. (2009), employees who feel satisfied and content were found working at the highest limits of their abilities. Therefore employee’s satisfaction at their job is considered a valuable element for organizations. In fact, satisfaction reveals the employee's emotional state and beliefs, and can improve or deteriorate through mental and emotional reactions to the job and the job dimensions. Employees tend to view their work with unfavorable and favorable feelings (Rich et al, 2010).

IV. RESEARCH METHODOLOGY

Research is an art of scientific investigation. In other word research is a scientific and systematic search for pertinent information on a specific topic. The logic behind taking research methodology into consideration is that one can have knowledge about the method and procedure adopted for achievement of objectives of the project. With the adoption of this others can evaluate the results also. Its main aim is to keep the researchers on the right track.

V. RESEARCH DESIGN

A Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. It is a frame work, which determines the course of action towards the collection and analysis of required data. The Research design used in this project is Descriptive in nature. Descriptive research includes surveys and fact-finding enquiries of different kinds.

Major Objective: This study is conducted to judge the level of Job Satisfaction of employees who are working in GEETA ENGINEERING COLLEGE, NAULTHA, PANIPAT

Secondary objective:

1. To measure the level of satisfaction of employees with respect to the company.
2. To identify the factors which influence the job satisfaction of employees?
3. To identify the factor which improves the satisfaction level of employees?
4. To know the employee satisfaction towards the facilities.
5. To offer valuable suggestions to improve the satisfaction level of employees.

VI. DATA COLLECTION

Data collection plays an important role in any study. It can be collected from various sources. In this research paper data have been collected from Primary as well as Secondary sources.

A. TOOLS USED FOR DATA ANALYSIS

Contact Instrument: A structured closed-end Questionnaire is used and the type of questions are dichotomous and Likert scale.

Contact Method: The research was conducted by using contact instruments like questionnaire, and observation.

Data Analysis Techniques:
VII. LIMITATIONS OF THE STUDY

- The study conducted is limited to one organization only.
- Top management could not be approached for questionnaire because of their busy schedule.
- The research was carried out in a short span of time, where in the researcher could not widen the study.
- Due to confidentiality of some information accurate response was not revealed by some of the respondents.
- Respondents had marked the answers in questionnaires which may be socially incorrect irrespective of their actual feelings.

VIII. FACTORS OF JOB SATISFACTION

Job satisfaction is under the influence of a series of factors such as: The nature of work, Salary, Advancement opportunities, Management, Work groups and Work conditions.

- When talking about factors of job satisfaction the fact that they can also cause job dissatisfaction must be kept in mind.
- Therefore the issue weather job satisfaction and job dissatisfaction are two opposite and excludable phenomena?
- There is no consensus regarding this issue among authors. Herzberg’s Two Factor Theory is probably the most often cited point of view. In fact, the main idea is that employees in their work environment are under the influence of factors that cause job satisfaction and factors that cause job dissatisfaction. Therefore, all factors that have derived from a large empirical research and divided in factors that cause job satisfaction (motivators) and factors that cause job dissatisfaction (hygiene factors).

<table>
<thead>
<tr>
<th>TABLE 1: JOB SATISFACTION FACTORS (HERZBERG, 1976)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hygiene factors</strong></td>
</tr>
<tr>
<td>Company policies</td>
</tr>
<tr>
<td>Supervision</td>
</tr>
<tr>
<td>Interpersonal relations</td>
</tr>
<tr>
<td>Work conditions</td>
</tr>
<tr>
<td>Salary</td>
</tr>
<tr>
<td>Statues</td>
</tr>
</tbody>
</table>

IX. EFFECTS OF JOB SATISFACTION

- Job satisfaction causes a series of influences on various aspects of organizational life. Some of them such as the influence of job satisfaction on employee productivity, loyalty and absenteeism are analyzed as part of this text.
- The preponderance of research evidence indicates that there is no strong linkage between satisfaction and productivity. For example a comprehensive meta-analysis of the research literature finds only a.17 best-estimate correlation between job satisfaction and productivity. Satisfied workers will not necessarily be the highest producers. There are many possible moderating variables, the most important of which seems to be rewards. If people receive rewards they feel are equitable, they will be satisfying and this is likely to result in greater performance effort. Also, recent research evidence indicates that satisfaction may not necessarily lead to individual performance improvement but does lead to departmental and organizational level improvements.
- Employee loyalty is one of the most significant factors that human resource managers in particular must have in mind. Employee loyalty is usually measured with the Loyalty Questionnaire and can cause serious negative consequences when not in a high level.
- Usually three types of employee loyalty are considered: affective loyalty, normative loyalty and continuity loyalty. Affective loyalty has done with the cases when an employee feels an emotional connection to the company, normative loyalty is a sort of loyalty that appears in cases when the employee feels like he owes something to the company and continuity loyalty comes as a result of the fact that the employee does not have an opportunity to find a job somewhere else.

X. CONCLUSION

Findings and suggestion are based on the survey conducted and these points are to be looked into and steps are to be taken in this regard for higher growth. From the analysis I conclude that the job provides the opportunity to the employees to exercise his/her skills at work place. Number of the employees accepted that at times there is a considerable flexibility in co-coordinating with work and they are satisfied with the existing inter personal communication. In Geeta Engineering College they follow the systematic planning and review process to evaluate the performance of employee.
XI. RESULTS AND FINDINGS

As per questionnaires and also through my personal observations the findings derived are as follows:-

1. Majority of the employees are satisfied with present job.
2. Employees are satisfied with the compensation that they receive for their work.
3. Majority of employees are satisfied with employment conditions prevailing in Organization.
4. Majority of employees are satisfied with Promotion and Transfer policy.
5. Employees are satisfied with Physical working conditions at GEETA ENGINEERING COLLEGE.
6. Employees feel happy that they are recognized as individuals.
7. Most of the employees are satisfied with non-monitory benefits provided to them.
8. Employees are satisfied with level of work assigned to them.
9. Almost all the employees are satisfied with the co-operation of co-workers.
10. Employees feel that the organization has a culture that develops team spirit.
11. Majority of the employees are satisfied with the welfare facilities provided by the management.

REFERENCES


Assessment of Solar Radiation Resources: A Sustainable Energy Solution

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Abstract: Solar resource assessment plays a critical role for development of futuristic technologies in the emerging area of solar energy. This paper summarizes the assessment of solar radiation resources network in Indian context. All solar resource stations have advance measuring instruments of same type to collect, store and send radiation and metrological parameter at central station C-WET Chennai. One-year solar data from January to December, 2015 of DCRUST, Murthal centre is assessed, which assist solar project developers for feasibility analysis and development of new solar projects in this area. From the analysis of solar data, it is observed that this area receives good amount of solar radiation during the months of February to October. The maximum average monthly GHI (Global Horizontal Irradiance) is 6.0 kWh/m²/d in the month of June, while minimum average value is 2.1 kWh/m²/d in the month of December. Moreover, development of clean and green energy project in this area help to reduce the coal based environmental pollutions. This study is significant for design, modeling and performance analysis of solar plants. In addition to this solar resources give impetus for deployment of solar energy along with futuristic solar technologies.

Keywords: Solar resources, Radiation, solar data, metrological parameters.

1. INTRODUCTION

Energy plays a significant role for industrial, sustainable and socio-economic growth of any country (Shukla et al., 2015). Power sector emerged as crucial factor for overall progress of any developing nation like, India (Saini, 2018). Being an emergent nation, India's entire installed capacity of power from diverse resources is 1,362 GW in 1947 to 344,002 GW at the end of financial year, 2018 (Central Electricity Authority, 2018a). India's power producing capacity is mainly commanded by the coal since independence (Central Electricity Authority, 2018b). Due to this, coal based power is the prime source of pollutants (carbon monoxide, sulfur dioxide, nitrogen oxides, particulate matter and traces of heavy metals) to spew-out in the environment (Shahzad and Yousaf, 2017). Producing electric power from non-renewable resources leads to large numbers of premature of deaths by emitting huge quantity of pollutants and heavy metals (Guttikunda and Jawahar, 2014; Gupta and Spears, 2017). Presently, India is looking forward to increase the sustainable power source blend in Indian power sector. The renewable power transition will help to accomplish the increasing power demand. Moreover, this clean and green energy also raise the socio-economic development of the country (Sharma and Balachandra, 2015; Kahr et al., 2011; Sharma and Balachandra, 2018). The all India estimated potential is 900 GW from different renewable energy source in this the contribution of wind potential is 102 GW at 80 m pole height, biomass potential is 25 GW, while from solar energy is 750 GW at 3% wasteland of the nation (Ministry of New and Renewable Energy (MNRE), 2017). Therefore, the capability of sunlight based power gives enormous opportunity to fulfill the target of various missions started by the Indian Government along with 100 % electricity stability of the country with a sustainable energy solution.

A. HARNESSING SOLAR ENERGY IN INDIA

Solar power is the most prevailing source among all the sustainable energy sources. The demographic position of any nation between Tropic of Cancer and the Tropic of Capricorn has the tremendous potential to generate clean and green electricity to meet its power requirements (Pillai and Banerjee, 2009). The International Solar Alliance (ISA) approach started by Indian Government among 121 nations which lie in tropical zone demonstrates the significance and there is ability to tap vast potential of solar energy (Sharma and Khurana, 2018). India is honored with this demographic position around 320 bright days, which got average yearly solar irradiance of 4-7 KWh/m²/d (Sahoo, 2016). India’s total installed solar power is now 26.02 GW as on 31.01.2019 (Central Electricity Authority,
2018a; Central Electricity Authority, 2018b). This demonstrates that India has a colossal undiscovered potential to harness solar power without polluting the environment. Figure 1 shows the growth of solar power installed capacity. The progress journey of solar power starts with 2.12 MW in the year 2008-09 and saw the great development with 26025.97 MW as on 31st January 2019 (Central Electricity Authority, 2018a; Central Electricity Authority, 2018b). The Electric power requirement of India is expected 746 GW by 2030, while the estimated potential is 750 GW (Gould, 2015; Ministry of New and Renewable Energy (MNRE), 2017). Hence, solar power will tackle all the power necessity of nation.

![Growth of Solar Power in India, 2008-09 to 2018-19](image)

**Fig. 1. Growth of Solar Power in India**

II. LITERATURE REVIEW

The segment of solar power in India is increasing at a rapid rate with the goal of 100 GW solar power mission till 2022 (Nathan, 2014). Production of solar power is directly influenced by the amount of incident radiation at a specific site. The yield of this environmental friendly power relies on the radiation quality, sunshine hour, ambient temperature and use of solar technology (Zell et al., 2015; Tripathy et al., 2017; Makade and Jamil, 2018). Therefore, precise, high quality, reliable and accessibility of solar radiation data is imperative for solar energy development. In addition to metrological data are not promptly available in India because of lack of measuring instruments and metrological stations (Katiyar and Pandey, 2010).

Estimation of ground based solar data need precise measurements. Pyranometer a solar radiation measuring apparatus is utilized for DHI (Direct Horizontal Irradiance) and GHI (Global Horizontal Irradiance) while Pyrheliometer is utilized for DNI (Direct Normal Irradiance). The quality of solar data can be kept up at a specific level by removing uncertainty, operational mistakes and instrumental errors (Younes et al., 2005). There are various forms of solar radiation data are exist for example, time series, ground and satellite based data. For site specific analysis, satellite based solar data is used. The success story of any site specific solar project requires at least one year ground based solar data (World Metrological Organization, 2006). Additionally, the recognition of any solar project is profoundly dependent upon the measurement of solar resource quality and its appraisal. So as to anticipate the energy yield of solar plants the time series, multi-decadal, long term and variability of solar radiation is very important (Stoffel et al., 2010).

Solar data of any region plays a critical role for assessing the solar potential and for selection of solar applications in that zone (Nehrir et al., 2011; Capizzi et al., 2012; Vindel et al., 2015). The knowledge of solar radiation evaluation is essential for solar system designing, modeling, simulation and analysis as well as for solar appliances and development of futuristic solar technologies (Celik and Muneer, 2013; Dahmani et al., 2015; Vinod et al., 2018). Evaluation of global solar radiation assumes an essential job for solar technologies and applications selection along with feasibility evaluation of solar project (Boland et al., 2013; Demirhan and Atilgan, 2015; Despotovic et al., 2016). Karakoti et al., (2012) analyzed the diffused solar radiation data of 23 solar stations in India and suggested the empirical models which demonstrate the relationships with daylight hours, temperature and relative humidity. Moreno Tejera et al., (2015) explored the parameters and solar radiation data which influence the evaluation of solar power of specific local site. Zafarani et al., (2018) evaluated the utility of metrological data for estimating the solar power.

Few studies have been depicted about the potential estimation and solar radiation appraisal in Indian context. Ramachandra et
al., (2012) assessed the solar power potential of Himachal Pradesh utilizing the satellite-driven GHI data collections. Schwandt et al., (2014) and Kumar et al., (2014) examined the 51 Indian solar centers data of solar radiation. There are some gaps observed in solar radiation data because of instrumental errors, misalignment, failures of power supply, stations operational errors and maintenance problems, etc. Additionally, the technique of gap filling is depicted and further checked the quality of solar radiation data. Tripathy et al., (2017) outlined the effect of short term solar radiation variability and help for development of solar power in Rajasthan. Gupta et al., (2017) depicted the solar and wind asset appraisal process for India. Mahima et al., (2018) studied the solar radiation pattern for a specific area which is imperative for the determination of solar applications based on their performance. It is very important to assess solar radiation precisely for the growth of clean and green energy in India. This requires quality and reliable solar database. Also, India still needs more solar resource centers for solar database so as to fulfill the accurate assessment of solar based resources. This article summarizes solar centers network design, usage and quality affirmation of solar data. This investigation also incorporates examination of one-year solar radiation parameters information of a specific station. In addition to this, present investigation contributes significant effect towards technological selection, forecasting of solar resources and solar based modeling of power plants in India as well as globally.

III. SOLAR RADIATION RESOURCE NETWORK IN INDIA

Multiple needs for designing of optimal solar plant, quality and reliability of solar radiation data are imperative to deploy solar energy in any nation. Precise estimations of ground based solar data and other metrological parameters are the basic building block for solar radiation resource assessment, which can accomplish the following objectives:

- Provides solar data base for researchers, solar companies, policy developers and financial institutions.
- Support the improvement of analysis tools to assess and predict solar resource and performance of solar technology.
- Support climatologically research in the country.
- Support in potential estimations and cost of solar power at a particular site.

Solar radiation is the most important parameter to evaluate the power yield of solar plant; however, it doesn't reach on earth in a full amount. Some portion of radiation is absorbed, some reflected and some dispersed because of complex interactions of the Earth's climate with occurrence of solar radiation. So there is a need to think about the basic of radiation, which is used in solar powered conversion technologies (Stoffel et al., 2010). Production of electricity from solar technologies needs solar irradiance as input. The basic knowledge of solar irradiance as well as solar radiation measuring apparatus is essential to evaluate the solar data for any nation. There is a vast potential of solar energy in India. So assessment of solar resource is critical to harvest and tap clean environmental friendly power. In the year 2011, National Institute of Wind Energy (NIWE) under the aegis of Ministry of New and Renewable Energy (MNRE), Government of India began a pilot project in phase manner of erection and commissioning of SRRA network stations all over the India in technically collaboration from Deutsche Gesellschaft für International Zusammenarbeit (GIZ GmbH).

Location of SRRA stations in various states of India in phase manner are depicted in Fig. 2. NIWE has set up 51 SRRA stations in 11 states and 1 in Union Territory in the first stage. While in the second stage, 60 SRRA stations in 28 states and 3 Union Territories alongside 4 Advanced Measurements Stations (AMS) were set by June, 2014. NIWE has additionally commissioned 6 SRRA stations for Maharashtra Energy Development Agency in Maharsahtra, under consultancy mode by May, 2015 (Mitra et al., 2014; Müller et al., 2017).

The network of SRRA stations in India is one of the most advance setup for assessment and measurement of solar irradiance, processing and handling of data, quality assurance, modeling and development of solar atlas for the nation. In addition to this data collection and assessment of metrological parameters is also done by SRRA stations for dissemination of solar power in the country (Kumar et al., 2014; Gupta et al., 2017; Müller et al., 2017). Figure 3 illustrate the solar radiation resource data flow in India.

IV. INSTRUMENTS FOR SOLAR RADIATION RESOURCES

Irradiation is a vital factor for site selection, design and economics of solar plant. There are
several ways and technologies for measurement of solar irradiance. During measurements, there are other metrological parameters such as ambient temperature, wind speed and direction, atmospheric pressure, relative humidity and precipitation, which are Fig. 2. Locations of SRRA stations in India essential to measure because these parameters affect solar irradiance. Fig 4 illustrates the instruments installed at one of the SRRA stations in India. All the established SRRA stations in India are similar in design and have same model and quantity of instruments. Table 1 illustrates the instruments and sensors mounted in SRRA stations with their model and manufacturer details (Kumar et al., 2014).

Fig. 2. Locations of SRRA stations in India

Fig. 4. A Typical SRRA Station Instruments in India,
TABLE 1: INSTRUMENTS DETAILS OF SRRA STATION. SOURCE: (KUMAR ET AL., 2014).

<table>
<thead>
<tr>
<th>Instrument Types</th>
<th>ParametersMeasured</th>
<th>Manufacturer-Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Pyranometer</td>
<td>GHI (W/m²)</td>
<td>Eppley Lab USA-FSP</td>
</tr>
<tr>
<td>2nd Pyranometer</td>
<td>DHI (W/m²)</td>
<td>Eppley Lab USA-FSP</td>
</tr>
<tr>
<td>Pyrheliometer</td>
<td>DNI (W/m²)</td>
<td>Eppley Lab USA-NIP</td>
</tr>
<tr>
<td>Solar Tracker</td>
<td>Mounted with shaded pyranometer &amp; pyrheliometer</td>
<td>Geonica Spain- SMT-3</td>
</tr>
<tr>
<td>Metrological Instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp. &amp; Relative HumiditySensor</td>
<td>Ambient Temp. (°C), Humidity (%)</td>
<td>RM Young, USA-41382VC</td>
</tr>
<tr>
<td>Ultrasonic Wind Sensor</td>
<td>Wind speed (m/s), Wind direction (°)</td>
<td>RM Young, USA-85000</td>
</tr>
<tr>
<td>Rain Gauge</td>
<td>Rain accumulation (mm)</td>
<td>RM Young, USA-52203</td>
</tr>
<tr>
<td>Barometer</td>
<td>Atmospheric pressure (hPa)</td>
<td>RM Young, USA-61302L</td>
</tr>
<tr>
<td>General Instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Logger &amp; Modem</td>
<td>Gathering data from instruments &amp; send it to central station at CWET, Chennai.</td>
<td>Geonica, Spain</td>
</tr>
<tr>
<td>GPS</td>
<td>Synchronise sun tracker with sun movement.</td>
<td>Garmin, USA</td>
</tr>
<tr>
<td>GPRS</td>
<td>Transfer data through mobile sim-cards to central stations, CWET, Chennai.</td>
<td>Garmin, USA</td>
</tr>
<tr>
<td>Solar PV Panel</td>
<td>Supply power for charging station batteries.</td>
<td>Moserbaer, India</td>
</tr>
<tr>
<td>External Battery</td>
<td>Electrical storage</td>
<td>Exide, India</td>
</tr>
</tbody>
</table>

To decrease the fossil fuel based power percentage, the solar generated power will play a critical role in the Indian power sector. So the estimation of solar irradiance is essential to deploy the environmental friendly clean and green power in the country. The data base of solar irradiance and metrological parameters are measured at SRRA stations, after that send and stored at C-WET-Chennai central station. In this study, we explore the solar irradiance data base of year 2015 of SRRA station (Station ID: 2389) setup at DCRUST, Murthal.

V. RESULTS AND DISCUSSIONS

This study examines the solar radiation of the SRRA station, Murthal and explores the feasibility of solar plant as well as overall magnitude of the solar resources in this region. Moreover, metrological parameters were also investigated, because of the influential effect of these parameters on solar irradiance and due to this the performance of solar plant is affected. Table 2 described the monthly average values of solar irradiance and metrological parameters during the year 2015. The highest value of GHI is 6 kWh/m²/d and DHI is 3.8 kWh/m²/d with corresponding ambient temperature is 30.1 °C in the month of June 2015 and found a good relationship between these parameters. In the month of December 2015 lowest average value of GHI is observed with corresponding ambient temperature of 14.85 °C. The association of high average value of GHI and DHI with high average value of ambient temperature is also observed by the Abdullahi et al., (2017) and Abbas et al., (2017) in his study.

TABLE 2: Monthly Average Values of Solar Radiation & Metrological Parameters Of Year 2015

<table>
<thead>
<tr>
<th>Month</th>
<th>GHI (kWh/m²/d)</th>
<th>DNI (kWh/m²/d)</th>
<th>DHI (kWh/m²/d)</th>
<th>AT (°C)</th>
<th>RH (%)</th>
<th>WS (m/s)</th>
<th>WD (°)</th>
<th>PR (hpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>2.4</td>
<td>1.4</td>
<td>1.7</td>
<td>11.4</td>
<td>88</td>
<td>2.3</td>
<td>299</td>
<td>989</td>
</tr>
<tr>
<td>February</td>
<td>3.9</td>
<td>2.9</td>
<td>2.0</td>
<td>17.1</td>
<td>37</td>
<td>2.7</td>
<td>327</td>
<td>986</td>
</tr>
<tr>
<td>March</td>
<td>4.9</td>
<td>3.7</td>
<td>2.3</td>
<td>20.2</td>
<td>15</td>
<td>3.0</td>
<td>293</td>
<td>985</td>
</tr>
<tr>
<td>April</td>
<td>5.7</td>
<td>3.5</td>
<td>3.0</td>
<td>26.8</td>
<td>44</td>
<td>3.0</td>
<td>84</td>
<td>980</td>
</tr>
<tr>
<td>May</td>
<td>5.2</td>
<td>2.6</td>
<td>3.3</td>
<td>32.7</td>
<td>42</td>
<td>2.8</td>
<td>270</td>
<td>975</td>
</tr>
<tr>
<td>June</td>
<td>6.0</td>
<td>2.6</td>
<td>3.8</td>
<td>30.1</td>
<td>52</td>
<td>2.9</td>
<td>265</td>
<td>972</td>
</tr>
<tr>
<td>July</td>
<td>4.9</td>
<td>1.6</td>
<td>3.6</td>
<td>29.8</td>
<td>25</td>
<td>2.8</td>
<td>125</td>
<td>971</td>
</tr>
<tr>
<td>August</td>
<td>4.6</td>
<td>1.3</td>
<td>3.3</td>
<td>29.0</td>
<td>34</td>
<td>2.2</td>
<td>240</td>
<td>974</td>
</tr>
<tr>
<td>September</td>
<td>5.2</td>
<td>1.9</td>
<td>3.7</td>
<td>28.8</td>
<td>87</td>
<td>2.6</td>
<td>299</td>
<td>978</td>
</tr>
<tr>
<td>October</td>
<td>4.4</td>
<td>1.8</td>
<td>3.1</td>
<td>26.0</td>
<td>68</td>
<td>2.1</td>
<td>312</td>
<td>983</td>
</tr>
<tr>
<td>November</td>
<td>2.9</td>
<td>1.5</td>
<td>1.9</td>
<td>21.0</td>
<td>65</td>
<td>1.9</td>
<td>324</td>
<td>986</td>
</tr>
<tr>
<td>December</td>
<td>2.1</td>
<td>0.4</td>
<td>1.8</td>
<td>14.8</td>
<td>83</td>
<td>2.0</td>
<td>291</td>
<td>989</td>
</tr>
</tbody>
</table>
The DNI is useful for CPV and CSP power plants because this parameter is helpful for design of plant and work over a longer duration of time. The GHI, DNI and DHI solar resources, Relative humidity and ambient temperature at DCRUST, Murthal, SRRRA station are depicted in Fig. 5 and Fig. 6. The annual cycle of these parameters are vary due to variation of seasons in India. From February to June, this area receives good amount of solar resources and low value of relative humidity is observed, which shows good relationship among these parameters. Moreover, relative humidity is the factor that has great impact on the solar radiations. It is also observed that when ambient temperature decreases the relative humidity increases as found in the month of January and October to December. Kazem and Chaichan, 2015; Ettah et al., 2015; Abbas et al., 2017 analyzed the effect of relative humidity on solar plant generation and found that when relative humidity decreases, the current output as well as efficiency of solar power generation system increases. Therefore, a good correlation is observed among DNI and relative humidity.

In conclusion, this study shows the effect of variation of solar radiation resources and variation of metrological parameters in the area of Murthal, SRRRA station. The GHI radiation parameter is explored to study the impact of solar irradiance on solar photovoltaic as well as on solar thermal system. GHI is evaluated using the sum of DNI and DHI with respect to the incident radiation. In addition to this metrological parameter also have effect on the solar irradiance, which further effect the output.

![Solar Irradiance - Year 2015](image1)

**Fig. 5.** Monthly Average Solar Irradiance, Year 2015

![Ambient Temperature and Relative Humidity - Year 2015](image2)

**Fig. 6.** Monthly Average Ambient Temperatures and Relative Humidity, Year 2015.
performance of the solar power generation system.

VI. CONCLUSIONS

The growth of solar energy paves the development path for India and also raises the socio-economic culture. It is essential to assess the solar radiation resources network in India for generation of solar power without polluting the environment. The solar resources network offers solar and metrological data of different parts of India. This data is useful for solar technology developers, solar researchers, clean energy project developers and policy makers. The conclusions of this study are as follows:

- This paper investigates the one-year solar radiation data from January 2015 to December 2015 of DCRUST, Murthal centre, one of the advanced SRRA station in India.
- GHI, DNI, DHI and metrological parameters are described in tabular as well as in graphical form.
- The maximum monthly average GHI is 6.0 kWh/m²/d in the month of June, while corresponding ambient temperature is 30.1 °C and relative humidity is 52 %.
- The minimum monthly average GHI is 2.1 kWh/m²/d in the month of December and corresponding ambient temperature is 14.8 °C.
- A good relation was found among GHI and ambient temperature. Moreover, association of high GHI with high value of ambient temperature behaviour is also observed by other authors in different part of the country as well as in world.
- The assessment of GHI solar irradiance is very important for development of solar photovoltaic as well as solar thermal power project.
- This zone observed good quality solar irradiance from February to October. During the months of February to June this area receives good amount of DNI while the corresponding relative humidity is in lower side.
- Relative humidity is observed at higher side when the ambient temperature is at lower side as seen in the month of January and October to December. In addition to this relative humidity decreases the DNI part of solar irradiance. Due to this a good relation is observed among relative humidity and DNI.

Solar resource assessment in India uses advance instruments for measuring solar radiation and metrological parameters, which further help to develop new solar power projects, based advance technology. This analysis will support to develop solar maps, evaluate the feasibility of solar projects and will be act as a base for development of futuristic solar technologies. The present study would assist to fulfill the target of various missions such as “100 GW Solar Missions”, “Paris Agreement on Climate Change”, “24 X 7 Power for all”, “Digital India”, “Women Empowerment”, “Rural Electrification”, etc. started by Prime Minister Narendra Modi. Moreover, this study helps to deploy solar energy not only in India but also at international level.

REFERENCES

stations”, pp.1-7.  

https://doi.org/10.1016/j.biombioe.2010.04.003


https://doi/10.1016/j.rser.2015.11.058


http://niwe.res.in/assets/Docu/srra_solar_radiation_brochure.pdf


Optimize of CNC Machining Parameters using ANOVA & Artificial Neural Network

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Abstract: In the present study, the influence of machining parameters on surface roughness and material removal rate is examined by utilizing ANN & ANOVA techniques. Three important variables i.e. spindle velocity, depth of cut and feed rate which are influence on the surface roughness and material removal rate are examined and also analyzed. Artificial Neural Network and Analysis of variance techniques are effective tools for analyze and optimize the cutting parameters. Based on taguchi, design of experiments, L27 orthogonal array was selected for conducting turning experiments. 3 factors are considered at 3 levels for orthogonal array L27 design. The experimentation has been conducted on Aluminum alloy AL 6253 using CNC turner with carbide tip tool and experimental results are taken for preparing of the ANN model. The experimental results were analyzed by using ANOVA and the regression equation for predicting the surface roughness and MRR.

Keywords: Surface Roughness, Material removal rate, ANN (Artificial Neural Network), ANOVA Analysis of variance and Regression modeling

I. INTRODUCTION
Material removal rate and Surface roughness are very significant factors in cutting process as one of these factors will involve in the economic justification of the process and other to decide the product quality. Turning operation is a material removal process for which is used to generate cylindrical parts by removing the extra material as shown in Fig. 1. The major process parameters in turning operation are speed, feed and depth of cut. In the present work surface roughness and material removal rate are the output responses. The Taguchi technique is used to design the experiments and to examine various process parameters (cutting velocity, feed rate and depth of cut) influence on output responses. Taguchi orthogonal array (TOA) offers the way of leading the base number of investigations that gives the full data of every last one of elements that influence parameters. As per the Taguchi information, the choice of orthogonal Array (OA) depending on upon the degree of freedom (DOF) of the procedure and level of opportunity can be processed. of= (number of levels-1) for each one control factor+ (number of levels for A-1) × (number of levels for B-1)×(number of levels for C-1) for every connection + 1]. Where A, B and C are the communicating control elements [1].

Fig. 1: Representation of figure during Turning Process

Artificial neural Network (ANN) is the sequence process by using Network; they have been used in different areas of engineering problems. ANNs are used to solving non-linear and difficult problems that are not solved by numerically. Applying ANN to the process needs sufficient input and output information in the place of mathematical statement. Also, it can consistently prepare the new information among the process; therefore it can adjust to changes in the background. ANN can be used to manage issues with insufficient and loose information [2].

ANN has been developing as a simplification of technical model of human knowledge and neural science. The presented information set
is divided into two sections, one related to training and the other related to validation of the model. The object of training is to conclude the position of relationship and nodal limits the region. ANN is to estimate the outputs that are adequately nearer to target values. This little of the completing records to be using for training must have satisfactory examples so that the network can follow the basic correlation among the input and output variables sufficiently [3].

M.Madic et.al [4] the advance by combination artificial neural network (ANN) and improving agreement searching algorithm (IASA) to conclude the optimal cutting constraints setting for minimize the surface roughness when turning of polymeric materials. The ANN model surface roughness is developing in conditions of cutting speed, feed rate, depth of cut, and nose radius of tool used. The data obtained from the turning experiment conduct to Taguchi’s L27 orthogonal array. Mr. Manoj Kumar Sahoo [5] report the optimize of turning process by the effect of machining parameter apply Taguchi method. Three machining parameters i.e., cutting speed, Feed rate and Depth of cut. Experiment should be complete by changeable one parameter and keep other two fixed so maximize value of each considering should be obtain. Taguchi orthogonal array is calculated with three levels of turning parameters with the help of software Minitab 16.

Julie Z. Zhang , Joseph .Chenb, et.al.[ 6] In his paper, an investigation of Taguchi outlines function to upgrade surface quality in a CNC face processing procedure. Keeping up great surface quality typically includes extra assembling expense or loss of profit. This study included feed rate, shaft velocity and depth of cut as control components. The commotion elements were the working hollow temperature and the utilization of distinctive device surrounding the same detail, which presented apparatus condition what's more dimensions are changing. An orthogonal show of L9(34) was utilized; ANOVA examines must be completed to distinguish the huge variables influencing surface unpleasantness, and the ideal cutting blending was dictated by looking for the best surface unpleasantness (reaction) and sign to-commotion degree.

S.thamizhmani, et.al [7] The motivation behind examination paper was centered around the investigation of ideal cutting conditions to get least surface unpleasantness in turning SCM 440 combination steel by Taguchi strategy. The technique is force device for outline of top notch frameworks. It gives basic, productive furthermore careful methodology to upgrade outline for execution, quality and expense. Taguchi technique is effective technique for outlining process that works reliably and ideally over a mixed bag of conditions. To focus the best outline it helps the utilization of purposely plan test.

V.n.gaitonde, et.al. [8] Has created the application of Taguchi technique and useful idea for upgrading the machining parameters in turning of liberated-machining steel utilizing an established carbide instrument has depicted. The tests were arranged according to L9 orthogonal collection. The ideal levels of the procedure parameters was departed set during the dissection of means .The Relation vitality between the method parameters was distinguished during the dissection of difference (ANOVA).The ANOVA results showed that most critical methodology parameter is cutting velocity took after by profundity of cut that influenced the streamlining of various execution qualities. The improvement results uncovered that a combo of larger amounts of cutting pace and depth of cut alongside feed rate in the medium level is crucial keeping in mind the end goal at the same time minimize the surface roughness and to improvement the MRR.

The objective of the present work is to enhance the process parameters in Turning of Aluminum 6253 with Taguchi method furthermore study the importance of each of process parameter along with analysis of variance (ANOVA) and Artificial neural network (ANN). The present work, MINITAB 16 is statistical analysis software was utilized for the design and study of experiments to perform the Taguchi and analysis of variance. In this work, the process parameters are optimized in Turning of Aluminum 6253 utilized Taguchi and design of experimental technique and the results are analyzed with analysis of variance technique to identify the percentage involving of each parameter on thrust force, torque and surface finish of hole.

II. METHODOLOGY

A. Taguchi method

Taguchi developed a particular design of orthogonal arrays to study the whole parameter space with a little amount of experiments. Then transformed the experimental results to taken with a signal-to-noise(S/N) ratio. It utilizes the signal to noise percentage to
estimate of quality characteristics dissimilar from nearing to the preferred values. S/N ratios are three types of excellence characters, i.e. the smaller is the better, the higher is the better, and the nominal is the finest. The formula utilized to designed for analyze S/N percentage, it is shown below.

**Smaller is-better:**
It is utilized where the smaller value is desired. For turning process surface roughness should be low for better quality; hence smaller S/N ratios are measured for these parameters.

\[
\frac{S}{N} \text{ ratio}(\eta) = -10 \log_{10} \frac{1}{n} \sum_{i=1}^{n} y_i^2
\]

Where \( y_i \) is observation of responding value and \( n \) is number of imitations.

**Nominal is-finest:** It is utilized the nominal or object value and difference as regards the value is nominal is the smallest.

\[
\frac{S}{N} \text{ ratio}(\eta) = -10 \log_{10} \frac{\mu^2}{\sigma^2}
\]

Where \( \mu \) = mean and \( \sigma \) = variance.

**Higher is-better:** It is utilized where the bigger value is preferred; in turning operation MMR should be higher.

\[
\frac{S}{N} \text{ ratio}(\eta) = -10 \log_{10} \frac{1}{n} \sum_{i=1}^{n} \frac{1}{y_i^2}
\]

Where \( y_i \) = observed react value and \( n \) = quantity of imitations.

Taguchi recommended a standard methodology for optimizing any process parameters, the steps involved in Taguchi are

- Determination of the excellence quality to be optimized. Identification of the smash factors and test conditions.
- Identification of control variables and their option levels.
- Designing the matrix testing in addition to significant the information analysis procedure.
- Conducting the matrix test,
- Analyzing the information furthermore determining the best possible levels of control variables.
- Predicting the recital by these levels.[9]

**C. Selection of process parameters**

For the present analysis, the machining parameters like speed, feed and depth of cut of turning process to be considered. As indicated by Taguchi’s outline of investigations for three parameter design and three levels L27 orthogonal array be chosen. The quality of their variables and their related levels are represented in Table 1.

**TABLE 1: PREFERRED RANGES OF LEVEL FOR TURNING**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameters</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cutting speed (rpm)</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Feed rate (mm/min)</td>
<td>Y</td>
</tr>
<tr>
<td>3</td>
<td>Depth of cut (mm)</td>
<td>Z</td>
</tr>
</tbody>
</table>

**III. EXPERIMENTAL WORK**

Aluminum 6253 is used as work piece material with the size of 30 mm diameter and 55 mm length. Taguchi’s L27 orthogonal array was used to performing the Turning experiments on Aluminum 6253 through the solid carbide tipped tool. Chemical composition of Aluminum 6253 is represent in Table (2) and the mechanical properties of Aluminum 6253 density is 1054.5 (kg/m3), tensile strength is 400 Mpa, yield stress is 350 Mpa, modulus of elasticity 50-100 Mpa and also hardness is 45 HRC etc.

**TABLE 2: COMPOSITION OF ALUMINUM 6253**

<table>
<thead>
<tr>
<th></th>
<th>Si</th>
<th>Co</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.7</td>
<td>0.10%</td>
<td>0.04-0.35%</td>
</tr>
<tr>
<td>Mg</td>
<td>1.0-1.5%</td>
<td>95-97.4%</td>
<td>1.6-2.4%</td>
</tr>
</tbody>
</table>
There has been an increase in the research interest in the applications of ANOVA and ANN modeling the relations among the cutting conditions on the process limitations during the machining. The input parameters both the models being the speed, feed and depth of cut and the output parameters like material removal rate (MRR) and surface roughness. The experimentations are conducting on a great and exact 3-axis CNC perpendicular machining midpoint on perfectly. FLEXTURN MTAB available at Madanapalle Institute of Technology and Science, Madanapalle the spindle speed 150-4000 rpm and the extreme shaft power of 3.7kw. The rating on feed should be usual active to a maximum of 0-5000mm/min.

Each experiment was carried out thrice, to minimize the experimental error. A computer numerical control (CNC) machining centre (model: FLEXTURN MTAB) was used for conducting the experiments. The material removal rate and surface roughness are measure from the instrument of digital balance meter and tally surf surface roughness meter. The experimental arrangement utilized for turning operation is shown in Fig.2. After the completion of the experimentation, surface roughness of the fine quality of turning surface roughness was measured by Mitutoyo make of surf test SJ-201 Taly surf surface profile meter. Units are using: cutting speed – Rpm, Feed rate-mm/min, depth of cut (DOC) – mm, surface roughness Ra –μm and material removal rate MRR-mm3/min.

Machining is an important cutting process by remove the unwanted material from the surface of work piece by turning operation. In turning process cutting tool fed as depth of cut and provided feed parallel to the axis is of the rotation with the specified cutting speed. The object of machining operation is to machine at low surface roughness and high material removal rate of the parts. Suitable selecting of cutting parameters can create longer cutting tool life and lower surface roughness and high removal rate. A neural network is a modeling tool and it is planning model in which the brain performs a specific task or function of interest. A neural network is performing useful calculations through a process of learning. A neuron is a data preparing unit that is fundamental to the operation of a neural network. The maximum benefit of ANN is simply and speed calculation. ANN has been developed as a generally in the form of the numerical model having of human cognizance and neural biology. The present data set is divided into two parts, one for preparing and other relating to validation of the model. The principle of train is to verify the position of connecting the weights and nodal limits that cause the ANN to estimating output values that are satisfactorily near target values. This part of the completing data to be using for preparing must to containing sufficiently pattern with the therefore that the network can be hidden layer relation in the middle of input and output variables sufficiently. A back multi-layer feed forward network (MLN) is the most generally using for prediction and as a part of engineering application. A MLN commonly has an input layer, an output layer, and one or more masked layers. There are various approaches to describe the actuation purpose, for example, limit capacity, step activation purpose, twisting purpose, and hyperbolic purpose. The type of opening capacity depending upon the kind of neural network to be design. A twisting capability is generally using for the exchange capacity. The neuron in ANN is non-direct components which accept various inputs, with deliver weights, and transmitting a single output by process for a particular performance capacity. The outputs, then turns into an input feed the neurons in the following layer. The preparation methods continue pending the network output match the target i.e. the preferred output. Calculate among this inputs and target output is calling "error".

The error among the network output and the design output is minimizing by changing the weights. At the point when the mistake falls less than a decided values or the greatest number of epochs is exceed, the preparation procedure was ended. At that point this prepared network can be using for simulate the method outputs for the inputs that have not been introduce previously. The ANN (Artificial Neural Network) using for the experiment has three layers, for example, one
data layer, one masked layer and another one is output layer as showing in fig. 2.

The input layer, masked layer and the output layer consider of three neurons, twenty neurons and one neuron individually. The arrangement of predictive neural network with input and output parameters. Feed rates, depth of cut, cutting speed are taken as the data parameters. The output parameter is taken as the surface roughness (Ra) and material removal rate (MRR). Eighteen data are used for training set. They all are chosen randomly from [11]. Training speed and error ratio of ANN were 0.5 and 0.001, respectively. The total data having is normalize in the ranges of 0 to 1 for better generalization of ANN modeling by the process given in Eq.

\[ V_N = \frac{V - V_{\text{min}}}{V_{\text{max}} - V_{\text{min}}} \]

There VN is the standard estimation of a variables V (actual value in a parameter), Vmax and V min are the maximum and minimum values of V, separately. Training and testing data graphs and performance after 6 and 19 epochs in Mat labANN Toolbox are shown in Fig 2. Mean square error performance with respect to epochs is shown in Fig. 2 the performance is finding to be 0.736462 and 2.671

**PROCEDURE**

![Proposed Methodology Diagram](image)

A. Neural Network

The ANN indicated in fig. 3 and 4. It has three layers, one data layer, one masked layer & one Produced layer. The data layer comprises of three neurons, the produced layer comprises of one neuron, and the masked layer comprises of 20 neurons. The structure of perceptive neural system with data and give in parameters is confirmed in Fig 3 and 4. Feed rate, depth of cut, cutting velocity, is taken as the input parameters.

NN Toolbox programming are indicated in Fig 3&4. Variety of the mean square error with preparing and test finding is 0.736462 and 2.671. The network which turned out from Taguchi technique (Design of Experiments)

The out parameters are taken as the surface harshness (Ra) and material removal rate (MRR). The nature of introduction capacity relies on upon the nature of neural system to be outline. A sigmoid capacity is picked for the exchange capacity. Preparing and test information illustrations and execution after 6 and 19epochs in MAT LAB.

has been utilized for systems, then it reproduces to get yield as Fig5. From the fig 5 one can choose the base surface roughness and material removal rate on the basis of arrangement.
A decently prepared ANN is generally summed up a system is that which gives reasonable output for those input likewise which has never been experience with the networks while preparing. Preparing networks is only to located ideal weights of the connections of two neurons. These weights, actuation capacity, number of layers and neurons in a layer choose how well nonlinearity can be characterized. After the preparation the system weights are situated and including to Fig. 4 their individuality is as takes after:

IV. RESULTS AND DISCUSSIONS

The results of surface roughness, material removal rate and surface irregularity of every sample are analyzed. The experimental results were altered into S/N percentage using Eq. (1). The main effect for mean and S/N proportion is graphs within Figs. 6–7, respectively.
Fig. 6 Most important effects plot for S/N ratio (material removal rate).

Fig. 7 Most important effects plot for S/N ratio (surface roughness)

Fig. 6 shows the weight of process parameters on the material removal rate. The optimum process parameters on the material removal rate are obtained as speed at level 1 (1500 rpm), feed at level 1 (70 mm/min) and depth of cut at level 3 (0.8 mm) and Fig. 7 shows the outcome of cutting parameters on the surface roughness. The optimum process parameters on the surface roughness are to be obtained a speed at level 1 (1500 rpm), feed at level 1 (70 mm/min) and depth of cut at level 3 (0.8 mm). The model adequacy checking was conducted after performing an ANOVA analysis to verify the normality postulation of the residual.

Fig. 8 Residual plots for material removal rate versus feed, depth of cut

Fig. 8, 9, show constant variance, normality, independence, histogram plots, common probability plots of the residuals and these figures reveal that almost all the residuals follow a straight line pattern and this agree well with the result are reported by Davidson et al. [12]. This work will be useful for industries while the selection of process parameters in the Aluminum materials, to get better the quality of the Turning process by reducing the material removal rate and surface roughness.
This paper presents the optimization of cutting process parameters are cutting speed, feed and depth of cut during the Aluminum 6253 material using the application of ANOVA and ANN analysis. The conclusions drawn from this work are as follows:

**The optimum process parameters in the Aluminum 6253 material are:**

- Speed of 1500 rpm, feed rate at 70 mm/min and depth of cut at 0.8 mm for material removal rate whereas for surface roughness, speed at 1500 rpm, feed rate of 70 mm/min and depth of cut at 0.8 mm are found to be optimum.
- Speed at 1500 rpm, feed rate of 70 mm/min and depth of cut at 0.8 mm for surface roughness is the optimum parameters.

The ANOVA and ANN results reveal that feed rate and depth of cut are the most significant influencing on the material removal rate and surface finish.

**REFERENCES**


Abstract: Solar cooling absorption system requires more research because of its poor COP. So, the study examined the performance of specific effect lithium bromide water (LiBr-H2O) absorption system of cooling with 15 kW solar power. In addition, space heating modes were also examined and improved methods were analyzed and discussed. The Vapor Absorption machine (VAM) uses the LiBr-water solution to generate absorbent - refrigerant pair. The absorption system of cooling was operated by trough collector of parabolic type of 36 sq m aperture are and 325 sq. feet was used to cool the meeting room. The results of the research show that For Parabolic Trough Collector maximum solar radiation was 954.86 W/m² and the minimum solar radiation was 507.52 W/m². The average COP of Parabolic Trough Collector was 0.46 and for absorption Refrigeration System the average COP calculated was 0.47.

Keywords: Vapor absorption system, lithium bromide

I. INTRODUCTION

Solar energy refers to energy from the sun. The sun generates large amounts of energy due to continuous thermonuclear fusion reaction in its interior. This solar energy can be used by two different technologies. Is a solar thermal technology that uses thermal energy and the second is solar photovoltaic which converts light energy into electricity.

The average annual solar separation coming on top of the Earth's atmosphere is 1366 watts/m². Approximately 30% is reflected into space and approximately 19% is absorbed by environment and clouds. Only 50% of the solar energy reaches the ground's surface above the earth's atmosphere. A solar thermal system uses solar energy by using solar energy, utilizing solar radiations to generate heat for hot energy, hot steam etc. That can be made more effective for meeting many applications in different areas like electricity generation, space heating and cooling, community cooking etc. A small part of the Sun's energy meeting the Earth's exterior is converted to electrical energy through photovoltaic cells and used for power lights and machines.

To maintain our current environment, the entire energy of the atmosphere, the oceans and the land should be transmitted back to space. If the amount of energy returned in space decreases, it can increase warming.

Air conditioners, which we all see, require electricity to cool the room. Solar air conditioners use energy from the sun to get some or all the energy needed to cool. Therefore, by using the solar air conditioner we can either reduce the requirement of electricity to cool down.

In the absorption refrigeration system, refrigerated water used is water which is pollution free and there is no other pollution effect. It is non-toxic, non-corrosive and environment-friendly. It is also a very high heat of evaporation which absorbs much heat during boiling it. Heating or cooling load is thermal energy which should be supplied or removed from the interior of a building to maintain desired comfort.

II. LITERATURE REVIEW

Much research has recently investigated the applications of solar power absorption refrigeration system and related performance improvements. Ghaddar et. al. (1996) Presented Modeling and Simulation of an H2O-LiBr Absorption System of solar type in Beirut, Lebanon. The results show that minimum collector area should be 23.3 sq m per ton of refrigeration and optimum water storage capacity should be 1000 to 1500 L so that only solar energy can be worked on for seven hours.
Henning and Glaser (2006) studied about the Solar powered refrigeration system for a University Laboratory Freiburg. There is a vacuum tube collector is used in this system. The collector area is 170 m² and the COP of the system varies in between 0.2 to 0.3. Mazloumi et al. (2008) H₂O-LiBr presented a solar powered system for a 120 m² room, with a cooling weight of 14.5 kW, in Rasht, Iran. They proposed a minimum parallel area of trough collector of 57.6 m² and related hot water storage tank volume of 1.26 m³. The system runs between 6.49 hours and 18.82 hours (approximately 6 am to 7 pm).

Li et al. (2016) Investigating the experimental performance of single effect H₂O-LiBr refrigeration system of absorption type (23 kW refrigeration capacity) operated by aperture area of parabolic trough collector of 56 m² for air conditioning of 102 m² meeting room China of. They analyzed the appropriate methods for improvement in the cooling performance. Manjit Singh et al. 2017, studied the flow through unsaturated porous media by extension of Darcy’s law and Richard differential equation. They presented finite difference techniques using forward Euler time-marching coupling simulation approach for soil-water content-pressure head curve.

III. MATERIALS AND METHODS

Solar Absorption Refrigeration System 15 kilowatt prototype system based on water cooling absorption cycle was established by Thermax India Pvt. Limited in December 2015 in Gujarat, India, Relaxo Footwear’s limited. Objectives were to develop indigenous components for the cost-effective high-efficiency cooling engine and steam absorption machine (VAM), and the non-fictional solar collector system was designed to utilize the energy of the sun in an efficient manner, Integration, system performance. The system has a high efficiency three- phase vapor absorption machine, which is based on the COP 0.5 on the basis of the Schematic- H₂O cycle, in which the approximate storage system is at the appropriate moderate temperature of the solar-centric collectors. 36 m² parabolic trough collector (PTC) provide 210°C temperature pressure water. This heat is used to generate 70°C chilled water, which, in turn, is dispersed through the fan coil unit installed in various cooling rooms.

Industrial refrigeration is one most energy consuming area among the conventional refrigeration system of vapour compressor type, compressor is the dominant power consumer element. Steam absorption refrigeration system is one of the best replacement for vapor compression refrigeration system.

A. CONSTRUCTION & WORKING OF ABSORPTION REFRIGERATION SYSTEM:

As the name suggest, lithium bromide is used as an absorbent in this system. Lithium bromide solution is a corrosion solution. So to reduce the corrosion nature lithium chromite is added in this solution. Lithium chromites is used in this solution to protect from corrosion of various parts of the system. Lithium Bromide is worked as an absorbent in this system. Inside the water in the system, it is like a refrigerant because lithium bromide is a strong efficiency with water vapor, whereby it absorbs the water vapor and use this system where we need more than 4°C temperatures like air conditioner, chilling of drinking water, chilling of beverages and fruit juices and the system which is the operating system in which the refrigerant's operating temperature is the freezing point of water that is 0°C is approximate 4°C plus around 4.4°C.

Basically, It consist of two cylindrical cell, one is of HPS (high pressure side) and other is of LPS (low pressure side). In Low pressure side it consists of two components Absorber and Evaporator. In high pressure side it also consists of two components Condenser and Generator. The number of tubes is visible inside this diagram. There is a chilled tube inside the evaporator and in an absorber there is cooling water tube and this tube is also within the condenser. or in a generator there is a heat coil inside it this is for steam and warm water. Now there is a cooling pond/tower, pump, heat exchanger in this system. Two pump is separately engaged in it one of solution pump and second one is evaporator and refrigerant pump.

B. VAPOUR ABSORPTION REF SYSTEM

In evaporator there is a refrigerant (water) inside it and this refrigerant is flow from tube with the help of refrigerant pump and with the help of nozzle, spray is done on the chilled water tubes. Inside these tubes there is a chilled water is flowing and it will extract heat and the heat spray that has been extracted from extracting the heat will be evaporated. After the evaporation, it will move to the side of the absorber. In absorber there is a Li Br solution inside it which is called weak solution.
Now due to vaporization the vapor enter in the absorber will mix up in the absorber. When lithium bromide (LiBr) and water vapor mixed with each other then weak solution is obtained from it. Then after that weak solution flow from absorber to the solution pump. Then with the help of solution pump it flow from heat exchanger into the generator. Where it sprays inside the generator on heating coil. This weak solution is evaporated due to heating coil. Due to evaporation it will rise up and it enters into the condenser. Then due to this water vapour will be separated from this weak solution and the remain solution in the generator will call it Strong Solution or concentrated of strong solution of lithium bromide. Then this strong solution will pass to the heat exchanger and then this Strong Solutions will go to the absorber with the help of tubes and It will be sprayed with the help of nozzles.

When the strong solution flow from heat exchanger then it extracts some amount of heat from it. The advantage of this is that to separate the water vapor from solution, there is no need of large amount of heat from heating coil. When the strong solution sprayed inside the absorber then the water vapor comes from evaporator and the refrigerating water flow from cooling pond among the help of pump through tubes then this spray is done on this tubes then this flow will extract some amount heat from it. Due to extraction of heat from the strong solution it condensates or convert this vapor into liquid form and the water vapor mix up will become a strong solution. Then cooling water flow to the condenser. Now how they work in the condenser when the Water Vapor from Generator went to Condenser The water that comes in the cooling water condenser will extract heat from water vapor and convert it into condensate or liquid form and the cooling water from tubes will go out of the way. The water vapor condensate has been stored in condenser, then it supplies from condenser to the evaporator. The main reason is to supply it into the evaporator is that to compensate or to maintain the level of the liquid inside the evaporator which will reduced due to be spraying with help of nozzle over the chilled water tubes. Now there is a pressure reducing valve the function of pressure reducing valve is to maintain or to reduce the pressure from pressure from condenser to the evaporator because it flows to the side of low pressure from high pressure side. Main reason is to reduce pressure as we know when we reduced the pressure then the boiling point of water will also reduce and also to extract heat from the warm water tubes of evaporator and become watery. In evaporator tubes have one outlet and one inlet. Inlet is for warm water and outlet is for chilled water. This chilled water is supply to the air condition system according to requirement such as chilling of beverages and fruit juice etc.

C. PERFORMANCE TEST:
The major performance parameter used for study is the cycle COP and the solar cooling coefficient of performance. The total heat supplied to the system is change of solar heat equal to the enthalpy change of solar heated water.

\[
Q_T = m C_p (T_h - T_o)
\]

where
- \(m\) – mass flow rate of water, kg/s
- \(C_p\) – specific heat of water, kJ/kg K
- \(T_h\) – Temperature of fluid input, °C
- \(T_o\) – Temperature of fluid output, °C

Total energy input, kW

\[
Q_e = m_w C_{pw} (T_w)
\]

where
- \(m_w\) – mass flow rate of water, kg/s
- \(C_{pw}\) – specific heat of water, kJ/kg K
- \(T_w\) – Temperature of water, °C

Solar COP is defined as the ratio of cooling effect to the net solar energy input:

\[
\text{Solar COP} = \frac{Q_e}{Q_s}
\]

Where
- \(Q_s = \text{Collector Area} \times \text{GHI}\)
- \(\text{GHI} = \text{DNI} \times \cos(\theta) + \text{DHI}\)

where,
- \(\text{GHI}\) – Global Horizontal Irradiance, W/m²,
- \(\text{DNI}\) – Direct Normal Irradiance, W/m²,
- \(\text{DHI}\) – Direct Horizontal Irradiance, W/m².

Absorption refrigeration system and Parabolic trough collector, PTC collector, solar radiation and temperature and hot water inlet and outlet flow and chilling water inlet and outlet performance were recorded and recorded three times in a day regularly and from observed values, COP was calculated both for Parabolic Trough Collector and Absorption Refrigeration System.
IV. RESULTS AND DISCUSSION

A. SOLAR COP OF PARABOLIC TROUGH COLLECTOR:

The maximum solar radiation was 954.86 W/m² on 02.02.2018 and the minimum solar radiation was 507.52 W/m² on 06.03.2018. The solar radiations variation depends on the sun rays falling on the surface of the collector. During cloudy days, the radiation will be low and at the time of sunny days, the radiations will be high. The variation in the solar radiation affects performance of the PTC collector. So, if the radiation is high, the PTC efficiency will be more and if it is low, PTC efficiency will be less.

At the time of morning, the solar radiations are slightly less in comparison to the evening time. In the morning, the efficiency of PTC is less due to the low radiation and in the afternoon time, the radiations are high so the efficiency of PTC is more at that time. At sometimes, the efficiency is found more at less radiation at the evening time because the heat received by the collector is more so that at low radiations the efficiency calculated was high.

The maximum inlet temperature of PTC was 140.40°C on 02.03.2018 and the minimum inlet temperature was 117.20°C on 05.02.2018. The maximum outlet temperature of PTC was 127.70°C on 02.03.2018 and the minimum outlet temperature was 103.20°C on 15.03.2018. PTC inlet and outlet temperature varies according to the change in the solar radiations.

The collector area of PTC is 36m², the calculation of the maximum solar COP was 0.59 on 05.02.2018 and the minimum solar COP was 0.30 on 02.02.2018. Calculation of average COP was 0.46. Various recorded parameters and calculations are mentioned in the recorded table of COP.

B. EFFICIENCY OF 15KW ABSORPTION REFRIGERATION SYSTEM:

The maximum value of Chilled water inlet (CHW IN) was 30.9°C on 06.02.2018 and the minimum value of Chilled water inlet (CHW IN) was 7.2°C on 08.02.2018. The maximum value of Chilled water outlet (CHW OUT) was 29.8°C on 19.02.2018 and the minimum value of Chiller water outlet (CHW OUT) was 5.9°C on 02.02.2018. The maximum value of Hot water inlet (HW IN) was 177.9°C on 02.03.2018 and the minimum value of Hot water inlet (HW IN) was 131.6°C on 19.02.2018 while the maximum value of Hot water outlet (HW OUT) was 123°C on 19.02.2018.

In the 15kW Absorption Refrigeration System, the maximum COP calculated were 0.76 on 27.02.2018 and minimum COP were 0.37 on 22.02.2018. The average COP calculated was 0.62. On the four parameter i.e. CHW (inlet) CHW (outlet) and HW IN (inlet), HW OUT (outlet) the Coefficient of Performance of the system depends. If the value of COP is less it means the output of PTC collector is less due to low radiations and if the weather is sunny, the system achieves high COP. The COP varies according to the variation in Hot water, inlet and outlet and Chilled water, inlet and outlet.

C. SWOT analysis of Solar Powered Vapour Absorption Refrigeration System:

In this study, we use to analyze the characteristics of Vapor Absorption Refrigeration system from the various aspects.

Strength:

(1) Moving parts is pump, which consumes very less power than compressor.
(2) Load variation does not affect the output performance.
(3) Capacity can be more than 15KW at 4.5TR it saves approximately 90% electricity.
(4) It is more economical to use above 4.5TR comparison to conventional compressor based system.
(5) Its running cost is low.
(6) It can be integrated with solar thermal source easily.
(7) It can be converted into multiple effect and which raised the COP of the system.

Weakness:

(1) COP is lower than conventional compressor based system.
(2) Initial investment is more than conventional compressor based system.
(3) When operated using kerosene/oil/gas gives bad smell.
(4) COP of the system during the day, it doesn’t remain constant.
(5) This system is used for big scale industry not for small scale industry due to its size and cost.

Opportunity:

(1) It can be integrated with solar which will make it more economical and eco-friendly in long term.
(2) We can explore multiple effect with the VAM, at present with triple effect we can achieve COP of approx. 1.7.
(3) We can explore this system for household purpose also because it consumes less power than compressor.

Threats:
(1) Its absorbent is usually toxic in nature to humans as well as environment.
(2) When we look at the parabolic trough with the naked eyes, its reflection can have a bad effect on the human eye.
(3) Due to PTC higher temperature range, as we know the surrounding temperature of PTC is 70% higher than the normal temperature, this temperature will affect the body temperature of human being as well as animals also.

V. Conclusion & Recommendations
The efficiency of Parabolic Trough Collector (PTC) was calculated using the parameters like the inlet and outlet temperature, solar radiations received by the collector surface. The maximum solar radiation was 954.86 W/m² on 02.02.2018 and the minimum solar radiation was 507.52 W/m² on 06.03.2018. The maximum inlet temperature of PTC was 140.40°C on 02.03.2018 and the minimum inlet temperature was 117.20°C on 05.02.2018. The maximum outlet temperature of PTC was 127.7°C on 02.03.2018 and the minimum outlet temperature was 103.20°C on 15.03.2018. PTC inlet and outlet temperature varies according to the change in the solar radiations. The collector area of PTC is 36m², the maximum Solar COP calculated were 0.59 on 05.02.2018 and minimum Solar COP were 0.30 on 02.02.2018.

The average COP calculated was 0.47 The efficiency of absorption refrigeration system was calculated using the parameters like chilled water, mass flow rate of water, hot water, inlet & outlet. In 15kW Absorption Refrigeration System, the maximum value of Chilled water inlet (CHW IN) was 30.9°C on 06.02.2018 and the minimum value of Chilled water inlet (CHW IN) was 7.2°C on 08.02.2018. The maximum value of Chilled water outlet (CHW OUT) was 29.8°C on 19.01.2018 and the minimum value of Chiller water outlet (CHW OUT) was 5.9°C on 02.02.2018. The maximum value of Hot water inlet (HW IN) was 177.9°C on 02.03.2018 and the minimum value of Hot water inlet (HW IN) was 131.6°C on 19.02.2018 while the maximum value of Hot water outlet (HW OUT) was 171.1°C on 22.03.2018 and the minimum value of Hot water outlet (HW OUT) was 123°C on 19.02.2018. The maximum COP calculated were 0.76 on 27.02.2018 and minimum COP were 0.37 on 22.02.2018. The average COP calculated was 0.62.

Absorption refrigeration system can be a good option for controlling cooling and greenhouse gas emissions from the perspective of renewable energy in the future. Water is used as refrigerant in this system which is nonpolluting and environmentally friendly. The total efficiency of the system was 62%. Further research is needed to increase the efficiency of the system.

SWOT analysis of vapor refrigeration system of absorption type was to analysis the strength, weakness, opportunity, threats of the system. In case of Strength it is more economical to use above 4.5TR comparison to conventional compressor based system and to consume less power.

Further in case of Weakness COP of the system during the day, It doesn’t not remains constant and is lower than conventional compressor based system and moreover in case of opportunity we can explore multiple effect with the VAM, at present with triple effect we can achieve COP of approx. 1.7 and In case of threats its refrigerant is usually toxic in nature to humans as well as environment.

Based on present study, the following recommendations are.
1. Hot water and chilled water, temperature sensors should be calibrated.
2. Insulation in partition between evaporator and absorber.
3. Condenser outlet temperature measurement should be placed or maintained.
4. Regular care of condenser coil should be done. The fan and condenser unit is situated apart from the office/room. The dust makes it highly complex for hot air and heat to disperse outward. The inferior heat diffusion results in heating of condenser. Thus to work efficiently, a monthly cleaning of condenser coil is extremely essential for the condenser.
5. Cleaning of coils fins should be done. One can easily see the aluminum fins on the condenser and evaporator coils. The coil fins should be regularly cleaned to protect the evaporator and condenser.
6. Proper maintenance of condenser, expansion valves and evaporator should be done by weekly and monthly basis.
7. There should be no any leakages within the body of the refrigeration system so that the efficiency of all does not drop down.
REFERENCES


Friction Stir Welded Joints Using Grey Relational Analysis: A Review

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Abstract: This paper investigates the effect of the tool pin profile and friction stir welding parameters on the microstructure and mechanical properties of the 6061 aluminum alloy welded joints prepared by friction stir welding. It has been found that a fine grain microstructure obtained by hexagonal pin profile. But using a square pin profile produced a higher strength welded joints. FSW process offers a potential advantage in manufacturing industries to eliminate mechanical fastening such as riveted or bolted joints. Incorporation of light aluminum alloy coupled with steel by the FSW process as sub-frame component in auto industries also yields a milestone in the weight reduction capability of this process. There is no melting involved in FSW process, hence this solid state joining technique offers some specific advantages over fusion weld by preserving material properties in the joint closest to that of base materials.

Keywords: Friction Stir welding, Aluminum Alloy, Pin profile, Tensile

I. INTRODUCTION

Friction stir welding is a solid state welding process developed by Wayne Thomas at The Welding Institute (TWI) in 1991. The research was funded in part by the National Aeronautics and Space Administration (NASA) in an effort to find a welding method that would not add weight to orbital spacecraft. A major advantage of friction stir welding is that it is a solid state weld where the base material does not reach the melting point. Therefore, it does not exhibit the same deficiencies as fusion welding, which is associated with cooling from the liquid phase. Other benefits of friction stir welding include the ability to make welds in “hard-to-weld” materials and in dissimilar metals. It also eliminates toxic fumes which makes it much more environmentally friendly than fusion welds [1]. Friction stir welding is extensively used by NASA to join large portions of aluminum for their space shuttle external fuel tank at the Michoud research facility. It is the preferred NASA welding technique for their moon rocket. As friction stir welding advances and is used in more applications, tool materials will need to be selected for optimal weld efficiency. This thesis will determine the significance a tool material has on the mechanical properties of a friction stir weld in 5083-H131 aluminum[2].

The difference in the friction stir welds will be compared directly to both MIG welds and the parent material. A fixture was developed which allowed welds to be performed in a vertical CNC machine. Test samples were cut from the work piece for visual evaluation, tensile, bend, and hardness testing. Welds produced by three different tool materials were compared: H13 tool steel, 420 stainless steel, and A2 tool steel. The system developed at Auburn University, with support from Anniston Army Depot and NASA’s Marshal Space Flight Center, uses a threaded pin and scrolled shouldered tool to perform welds as detailed in Figure 1.1 [2]. The following research paper is designed as follows. Section II describes the overall previous research work whereas Section III gives idea of problem formulation. Performance parameter define in section IV and last but not the least Section V concludes paper.

II. LITERATURE REVIEW

In this section, we will discuss basic introduction and highpoints of influence, explanations and issues in the research work by researchers in different field. Researchers have tried a lot in recent times to attain the max tensile strength.
Gurmukh Singh et al (2017) studied the effects of tool speed, feed rate, and shoulder diameter on various mechanical properties of Aluminium alloy 6063 produced through friction stir welding have been analysed. AA6063 is an aluminium alloy with magnesium and silicon as the alloying detail. It has usually moral mechanical properties and is heat mendable and weld in a position. It is similar like to aluminium alloy HE9. Experiments are exposed by using varying rotational velocity, transverse velocity and altered shoulder diameter. The Taguchi approach is used to treasure the mixture of the 3 welding parameters. In this work 3 parameters are taken and L9 orthogonal array are decided on to improvement parameters for power of the welded joint. A most desirable result has been received using main results plot the usage of S/N ratio values. The elongation is particularly posh by temperature distribution and near it shoulder diameter & feed rate also have an effect on to some extent.

Anitesh Mukherjee et al (2017) studied on comprehensive essay of understanding that has been documented with recognize to the friction stir welding (FSW) of various alloys because the technique was invented in 1991 is reviewed on this paper. The friction stir welding is an unexpectedly growing welding technique within the manufacturing industries. The design of device pin profile and device shoulder diameter creates vast variations on welded microstructure. Special system parameters are considered for the variations inside the final results of the weld materials to optimize the welding techniques [1].

Gharaibeh, Al-jarrah and Sawalha, 2016 the effect tool pin profile and welding process on friction stir welding of AA 6061 Al alloy was studied and based on the results the following conclusions can be drawn. The weld prepared by hexagonal pin profile possessed better microhardness and microstructure compared to the one prepared by square or triangle pin profiles. The strength of the joints prepared by square pin profile have higher ultimate tensile strength compared by one produced by hexagonal and triangle pin profiles. The highest ultimate tensile strength observed at 1120 rpm and 1.5 mm/sec for stir zone produced by square pin profile.

Sushant Sukumar Bhave et al (2016) reviewed of research papers related to friction welding is performed. Friction welding is a best till date recognized approach to weld similar as well as dissimilar metals. It is an ordinarily used welding process in industries like vehicle industries, submarine engineering industries aeronautical industries, and heavy responsibility industries.

Vanita S. Thete and Vijay L. Kadlag (2015) studied the effect of process parameters of friction stir welded joint for comparable aluminium alloys H30 was studied. Taper cylindrical with 3 flutes all made of high speed metallic was used for the friction stir welding (FSW) aluminium alloy H30 and the tensile test of the welded joint were tested via universal testing method. The optimization completed using distinctive mathematical model is simulated by means of Minitab17. In this investigation a powerful method primarily based on Taguchi technique, has been developed to decide the top-quality conditions main to higher tensile strength. Experiments had been performed on various rotational speed, transverse speed, and axial force using L9 orthogonal array of Taguchi technique.

Sirajuddin Elyas Khany et al (2015) studied the impact of friction welding parameters which includes rotational speed, friction time, forging pressure and friction stress on tensile strength of a joint among SS316 and EN8 is experimentally investigated. A partial factorial design of experiment based totally on Taguchi analysis is conducted to obtain the response measurements. Analysis of variance ANOVA and fundamental results plot is used to determine the significant parameters and set the optimal level for each parameter.

(Dawood et al., 2015) discussed geometry and dimension of the welding tool used in the FSW process influence the mechanical properties of the joints. The best mechanical properties are obtained for the FSW joint produced by a triangular tool pin profile when compared with their counterparts. Moreover, the less pulsating action experienced in the NZ of triangular tool pin profile produces fine grains (Ilangovan, Boopathy and Balasubramanian, 2015).

The effects of tool pin profile on microstructure and tensile properties of friction stir welded dissimilar AA 6061- AA 5086 aluminium alloy joints were investigated and the following conclusions are derived. The three tool pin profile used, the straight cylindrical pin profile tool yielded cross-sectional macro level defects in the stir zone and hence is not available for AA 6061 and AA 5086 dissimilar joints. Prakash Kumar Sahu and Sukhomay Pal (2015) have been accomplished experiments by using the usage of Taguchi’s L18 factorial design of experiment. Grey rational analysis became used for optimizing process parameters. Percentage impact of individual process parameter on the weld quality was measured. They used AM20 Magnesium alloy to form square but joint. Process parameters had been used such as tool
rotation speed, welding speed, shoulder diameter and plunge depth

Ali Akbar Nadim and Hakeemuddin Ahmed (2014) have executed an experiment on CNC Milling device to weld the elements together. The components being welded are made from multiple materials like Aluminium and Copper. The rotational velocity is various from 900 rpm to 1500 rpm whilst the welding velocity is kept regular at 25 mm/min. The opposite parameter worried is the axial load, which reaches two hundred bars. Singla and Burman, 2014) Welding is a fabrication process used to join materials, usually metals or thermoplastics, together. During welding, the work pieces to be joined are melted at the joining interface and usually a filler material is added to form a weld pool of molten material that solidifies to become a strong joint. In contrast, Soldering and Brazing do not involve melting the work piece but rather a lower melting point material is melted between the work pieces to bond them together. Friction Stir Welding is a solid-state process, which means that the objects are joined without reaching melting point. Zhang et al., 2014) presented study demonstrate that the plastic flow could provide a driving force for the formation of banded textures and flashes and could also be critical for the keyhole welding. The flash of the FSW joint was mainly distributed on the retreating side, and the microstructures could be divided into two layers. The forming and healing process of the transient state keyhole was studied visually in one rotation period, including flowing out of the weld materials from the keyhole region until 1/3 period and back flowing into the keyhole region after the FSW tool was rotating to the 2/3 period. The large deformation region distributes near the top surface of the FSW joint and was close to the advancing side, which is consistent with the previous work in other literatures.

Narsimhachary et al., 2014) the following conclusions can be drawn that AA 6061-T6 Al-alloy samples were laser-welded with different welding parameters and the welds were defect-free. The hardness value was very low at the weld zone compared to the base metal even after post-weld aging treatment, but hardness of the FZ and HAZ of the specimen were increased after PWHT.

Tikader, Biswas and Puri, 2014) research study, 6 mm thick commercial grade aluminum plates have been welded by using 4 different types of tool (two straight cylindrical and two tapered cylindrical). For various FSW tool geometry and different process parameters, eight no. of very good quality welds have been obtained. The following conclusions may be drawn from the above study that tensile strength was higher in case of tapered cylindrical tools with same process parameter. The hardness value is more in case of straight cylindrical tool pin than tapered cylindrical tool pin for the same process parameter. The hardness values of the weld zone and HAZ are lower than the base material which indicates the improved ductility of the weld.

Jannet, Mathews and Raja, 2014) The mechanical and metallurgical properties of TIG, MIG and Friction Stir Welded joints dissimilar AA 5083-O and 6061-T6 were evaluated in detail, a comparison was made and the following conclusions were derived from the investigation. The tensile properties of welded joints AA 5083-O and 6061-T6 aluminum alloy joints were influenced by welding process and post weld aging treatment with a reasonable increase in tensile properties been noted for post weld aged joints as compared to welded joints. Gadakh and Adepu, 2013) an analytical model for heat generation for FSW of Al alloy using taper cylindrical pin profile was developed. A combined of both analytical as well as numerical approach was considered. There is good agreement between the generated heat energy and the associated maximum temperature by the proposed model and results available in the literature. With the proposed analytical approach one can directly see the peak temperature for respective taper probe angle under given process conditions which will be helpful for predicting the mechanical properties for that Al alloy and hence elimination of post weld testing cost and time.

State and Street, 2012) During FSW of AA7075, fatigue is unlikely to be the mechanism of tool failure except for welding of 8mm or thicker plates. Although the toughness of the tools varies, uncertainty in the toughness values does not change this finding. Bending stress, which affects the fatigue life of the tools, increases significantly with plate thickness, and somewhat less significantly with the reduction in tool shoulder radius and decrease in tool rotational speed. Computed values of peak temperature and the maximum shear stress, obtained from ANN models trained with results from a well-tested three-dimensional heat and materials flow model, were used to generate a series of maps aimed at enhancing tool durability against mechanical erosion ignoring chemical erosion. These maps examine the effects of welding velocity, tool rotational speed, tool shoulder radius, tool pin radius, pin length (or plate thickness) and axial pressure from a series
of an index of tool durability that is defined as the ratio of the tool shear strength to the maximum shear stress on the tool pin. (Rajakumar, Muralidharan and Balasubramanian, 2011)

Using the friction stir welding machine, within the limits of the process parameters and tool parameters considered in this study, the following points can be concluded that multi objective optimization using RSM is an useful technique to optimize the friction stir welding parameters to obtain the maximum tensile strength without deteriorating the corrosion resistance of FSW joints. A tool rotational speed between 1155 and 1157 rpm is an optimum input to obtain an excellent welded component produced from AA6061-T6 aluminum alloy. The welding speed is the most predominant welding parameter and its interaction with the rotational speed should be monitored. Welding speed between 84.51 and 84.67 mm/min is compatible with axial force 7.17 kN, while shoulder diameter 15.71 mm, pin diameter of 5.21 mm and tool hardness 44.85 HRC is compatible.

III. PROBLEM FORMULATION

From the literature review following research issues are identified and are summarized as below:

1. In order to get good weld strength and weld geometry it is necessary to optimize the friction welding process such as friction time, friction pressure, upset pressure, upset time, rotational speed.
2. Optimization of above parameters is highly material specific.
3. The optimum welding parameters that obtained from equal diameters parts could not be used in welding of different diameters parts.

IV. MACHINE USED & PERFORMANCE PARAMETER

To set off the FSW experiment a vertical milling machine is used. The tool is fix inside the vertical arbour using the perfect collates. The plates to be connected are clamped to the horizontal bed with nil root gaps. The clamping of the check pieces are executed such that the strength of the plates is definitely constrained beneath each plunging and translational forces of the FSW tool.

<table>
<thead>
<tr>
<th>TABLE 1: SPECIFICATION OF MILLING MACHINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
</tr>
<tr>
<td>Spindle position</td>
</tr>
<tr>
<td>Max. rpm</td>
</tr>
<tr>
<td>Diameter of Tool Holder</td>
</tr>
<tr>
<td>Motor</td>
</tr>
<tr>
<td>Longitudinal Transverse speed Range</td>
</tr>
</tbody>
</table>

The performance of Tensile strength is measure with S/N Ratio, Confirmation Test.

1. S/N Ratios For Tensile Test

For the calculation of S/N ratios ‘Bigger the Better’ is selected and is given by formula:

\[
S_{\text{N(bigger)}} = -\log \left( \frac{\Sigma(1/y)}{n} \right)
\]

2. Confirmation Test

Larger the better characteristic

\[
S_{\text{N(bigger)}} = -\log \left( \frac{\Sigma(1/y)}{n} \right)
\]

Where yi are the responses and n is the number of tests in a trial. The level of a factor with the highest S/N ratio was the optimum level for responses measured. In order to test the predicted result, confirmation experiment has been conducted by running three trials at the optimal setting of the process parameters determine from the analysis i.e. A2, B3, C3 for tensile strength.

V. CONCLUSION

In the present study, the effect tool pin profile and welding process on friction stir welding of AA 6061 Al alloy was studied and based on the results the following conclusions can be drawn that the weld prepared by hexagonal pin profile possessed better microhardness and microstructure compared to the one prepared by square or triangle pin profiles. The strength of the joints prepared by square pin profile has higher ultimate tensile strength compared by one produced by hexagonal and triangle pin profiles. The micro-hardness of the welded joints decreased as the rotational speed increased, irrespective of the pin profile used to prepare the joints.

REFERENCES


Analysis of Loss Factor of Aluminium Structure under Free and Constrained Layer Damping

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Abstract— Viscoelastic materials show good damping property. Damping is concerned with the energy dissipation capacity of the material. Viscoelastic materials are widely used to reduce the vibration of the vibrating structures. We can apply the viscoelastic material on the metal plate in the form of free and constrained layer damping. First we made two aluminium structures by using free and constrained layer damping. Then loss factor of both the structures is determined by using logarithmic decrement method. Then from the results obtained we determined that the loss factor of the structure with constrained layer damping is more as compared to free layer damping. It is also found that as the thickness of the viscoelastic material increases the damping capacity of structure also increases and natural frequencies decreases.

Keywords: Constrained layer, damping, viscoelastic material

I. INTRODUCTION

A viscoelastic material is considered by showing both viscous and elastic property. A complete elastic material is that in which all energy stored in the sample through loading is returned when the load is removed. Due to this the stress-strain curves for elastic materials move completely in phase. Hooke’s Law applicable for elastic materials, where the stress is directly proportional to the strain. Complete opposite to elastic material there is a purely viscous material. Viscous material does not return any of the energy stored during loading. Complete energy is lost as “pure damping” when the load is removed. Here the stress is proportional to the rate of the strain, and the ratio of stress to strain rate is known as viscosity (μ). These materials have damping only and no stiffness component. All others material that do not fall into one of the above classifications, are called viscoelastic materials. Some portion of energy stored in a viscoelastic system is recovered after removal of the load, and the remaining energy is dissipated in the form of heat. At a loading frequency ω the cyclic stress is out-of-phase with the strain by some angle δ (where 0 <δ<π/2). This angle δ is measure of the materials damping level; the larger the angle the more is the damping. The loss factor is also given by the relation: η = tanδ.

In passive control of vibration free and constrained layer damping viscoelastic materials are used. So it becomes necessary to obtain their dynamic characteristics. Oberst (1952) suggested to use viscoelastic material in the form of thin layer to the surface of flexible structures for passive vibration control, this is called unconstrained (free layer) damping and the dissipation of energy take place due to the alternate expansion and compression of the VEM layer.

In the present paper the damping property of the viscoelastic material is evaluated. For this purpose first the sandwich structure having viscoelastic silicon rubber sandwiched between two aluminium metal plates is prepared. Then the loss factor of the cantilever sandwich structure is determined by using logarithmic decrement method. With the help of loss factor of the cantilever sandwich specimen the loss factor of the viscoelastic core material is estimated by using ASTM E-756 norms.

II. LOGARITHMIC DECREMENT METHOD

The sandwich specimen loss factor is determined by logarithmic decrement method. Logarithmic decrement is defined as the ratio of any two successive amplitudes on the same side of the mean line. As per the definition logarithmic decrement δ for two successive amplitudes x₁ and x₂ is given as

\[ δ = \ln \frac{x_1}{x_2} \]

For under damped system the equation for amplitude is given as

\[ x = x_0 e^{-\omega t} \cos (\sqrt{1-\epsilon^2} \omega t + \phi) \]
Here \( c \) and \( \phi \) are constants which are determined from the initial conditions, \( \varepsilon \) is the damping ratio.

Let \( t_1 \) and \( t_2 \) denote the times corresponding to two successive amplitudes. We can find the ratio of amplitudes \( x_1 \) and \( x_2 \) as

\[
\frac{x_1}{x_2} = e^{-\varepsilon \omega (t_1 - t_2)} \frac{\cos(\sqrt{1 - \varepsilon^2} \omega t_1 + \phi_2)}{\cos(\sqrt{1 - \varepsilon^2} \omega t_2 + \phi_2)}
\]

Let us assume \( t_2 = t_1 + t_d \)

Where \( t_d = \frac{2\pi}{\omega_d} \) is the period of damped vibration. The term

\[
\frac{\cos(\omega_d t_1 + \phi_2)}{\cos(\omega_d (t_1 + t_d) + \phi_2)} \quad \text{as} \quad \sqrt{1 - \varepsilon^2} \omega = \omega_d
\]

Again considering equation 2.3 and using equation 2.5 in it, we have

\[
\frac{x_1}{x_2} = e^{-\varepsilon \omega (t_1 - t_1 - t_d)} = e^{\varepsilon \omega t_d} = e^{\frac{\varepsilon \omega 2\pi}{\omega_d}}
\]

\[
\frac{x_1}{x_2} = e^{\varepsilon \sqrt{1 - \varepsilon^2} \omega} = e^{\frac{2\pi \varepsilon}{\sqrt{1 - \varepsilon^2}}}
\]

\[
\delta = \ln \frac{x_1}{x_2} = \frac{2\pi \varepsilon}{\sqrt{1 - \varepsilon^2}}
\]

When the value of the \( \varepsilon \) is very small the above equation can be written as

\[
\delta = 2\pi \varepsilon
\]

If the system executes \( n \) cycles, the logarithmic decrement \( \delta \) can be written as

\[
\delta = \frac{1}{n} \ln \frac{x_1}{x_{n+1}}
\]

Where \( x_1 \) = amplitude at the starting position

\( X_{n+1} \) = amplitude after \( n \) cycles

### III. ASTM E-756 Norms For Evaluating Loss Factor Of Damping Material

From experiment the loss factor for the sandwich plate is determined by using the logarithmic decrement method. Then the loss factor for the viscoelastic core material from the cantilever sandwich plate is estimated by following the ASTM E-756 norms. The following expression is used to estimate the loss factor for the damping material:

\[
\beta = \frac{A \eta_s}{[A - B - 2(A - B)^2 - 2(A \eta_s)^2]}
\]

Where

\[
A = (f_n/f_s)^2(2 + D.T)(B/2)
\]

\[
B = 1/[6(1 + T)^2]
\]

\[
D_o = \rho_t/\rho
\]

\[
T = H_1/H
\]

\( A \) is the density ratio, \( f_n \) is the resonance frequency for mode \( n \) of base plate (Hz), \( f_s \) is the resonance frequency for mode \( s \) of sandwich plate (Hz), \( H \) is the thickness of base beam, \( H_1 \) is the thickness of damping material, \( T \) is the thickness ratio, \( \beta \) is the shear loss factor for damping material, \( \eta_s \) is the loss factor for sandwich plate, \( \rho_t \) is the density of damping material, \( \rho \) is density of base material and \( s \) is index number: 1, 2, 3, ..., \( s = n \)

### IV. EXPERIMENTAL PROCEDURE

In the present work sandwich plate having 3 mm thickness of viscoelastic core material is used. Aluminium plates of 1mm thickness are used as the face plate and silicon rubber is used as core material. The silicon rubber is bonded to the
aluminium plates with the standard epoxy resin araldite having Young’s modulus 2432 MPa and density is 1.17 g/cm³. The plate dimensions are 90 mm in length and 90 mm in width. Then these test specimens are excited with the help of electro dynamic shaker under sweep sine and free vibration mode. Agilent Function generator 3322A was used to produce the necessary sine function to excite the shaker. The vibrational response of the specimens was recorded using one piezoelectric accelerometer with sensitivity 10mV/g. National Instruments SCXI 1000 chassis with SCXI 1530 Integrated Electronic Piezoelectric acceleration measurement module was used for data acquisition. The experimental setup is shown in figure 3.1. Sweep sine test is used to determine the natural frequencies of these specimens and free vibration test is used for determination the loss factor. The loss factor of the bare aluminium plate, plate with free layer and plate with constrained layer are determined by logarithmic decrement method.

Fig 1. Schematic of experimental set up showing different component

V. RESULT AND DISCUSSION
The vibration response of the specimen obtained under sweep sine and free vibration test are shown in figure 4.1 From free vibration test at 3rd mode the damping ratio and loss factor of bare plate, plate with free layer damping and plate with constrained layer damping is obtained by logarithmic decrement method and campared.

VI. CONCLUSION
It is found that loss factor of constrained layer plate is more as compared to free layer plate. Further it is found that loss factor increases as thickness of silicon rubber increases. Natural frequencies also increase as thickness of silicon rubber increases.

REFERENCES
Concoction and refinement of Aluminum 6061 Alloy-Zirconium dioxide in situ Matrix Composite

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Abstract— Aluminum Metal Matrix Composites (AMMC) the most useful and high-tech composites aluminum (Al) as the best metal for producing these composites. Linking Aluminum and Zirconium dioxide (ZrO2) will conceive a matrix with the super corrosive resistance and mechanical properties like strength at elevated temperatures. Also, the abrasive wear of these matrices will be revised. In the current research, a review on aluminum/zirconium dioxide composites has been performed. This endeavor approaches the first fabrication and characterization of AMMCs based on Zirconium dioxide (ZrO2) ceramics for bettering the mechanical and wear properties due to the higher strength and hardness. Micro-structures of these composites in powder metallurgy conditions show different size distribution of zirconia with different proportions in the composite. Also, there is a case study about density and compressive strength and hardness of aluminum/zirconia composites. The green specimens prepared by stir casting technique with different zirconia percentages (5, 10, 15), in a tubular muffle furnace at temperature of 950°C using nitrogen gas shielding environment. These specimens were further investigated by different physical and mechanical examining methods to observe which conditions are the best to obtain desired properties. The most effective tensile and compression strength was obtained with the specimen including 10% of zirconium dioxide sintered

I. INTRODUCTION

Traditional metals have constraint in achieving good combination of strength, toughness and density. To affect these drawbacks and to meet the ever increasing demand of present day modern technology, composites are most promising materials of fresh research and interest. Aluminum Metal matrix composites (AMMCs) possess much improved properties including high specific tensile strength, specific modulus, and good wear resistance compared to no reinforced alloys. There has been an increasing interest in composites and matrixes containing low density and low cost reinforcements thereby, reducing the cost of aluminum products [1-3]. Aluminum alloy matrix particle reinforced composites have higher specific tensile strengths, and good wear resistance as compared to non-reinforced alloys [4]. While studying the opportunity of using zirconium dioxide (ZrO2) as reinforcing element in the aluminum melt, results came out that reinforcing the Al alloy matrix with ZrO2 powder, helped improving the hardness and ultimate tensile strength of the composite to the maximum values of 121 VH and 285MPa, respectively. Consequently, the highest mechanical properties were obtained by the specimen including 10% of ZrO2 produced at 950°C. The composite can be prepared by injecting the reinforcing particles into liquid metal matrix through stir casting method. Stir casting method is preferred as it is less expensive and susceptible to mass production. The main limitation with this process is the non-uniform distribution of the ceramic powder due to poor wet ability and gravity regulated dissociation. Mechanical properties of composites are affected by the size, shape and volume fraction of the reinforcement, matrix material and reaction at the interface. These aspects have been discussed by many researchers Aghajanian et al. have studied the Al2O3 particle reinforced Al MMCs, with varying particulate volume percentages (5, 25, 26,) and report improvement in elastic modulus, tensile strength, compressive strength and fracture properties with an increase in the reinforcement content. The interface between the matrix and reinforcement plays a critical role in determining the properties of MMCs. Stiffening and strengthening rely on load transfer across the interface. Toughness is influenced by the crack deflection at the interface and ductility is affected by the relaxation of peak stress near the interface.

Extensive studies on the tribological characteristics of Al MMCs containing reinforcements such as Sic and Al2O3 is available in the literatures. However, reports on tensile and hardness properties of AMMC with zirconia as reinforced particulate are very limited.

II. EXPERIMENTAL WORK

The aluminum 6061 matrix composite was prepared by stir casting route. Aim was to prepare three samples of aluminum 6061 alloy with the zirconia powder reinforcement. The three samples of exactly 1.5 kgs were measured by electronic weight balance and were measured so therefore according to weight percentage, the following weights were measured

a) 1st sample: aluminum 6061,1.5 kg and Zirconia 79g (5% of total weight of the matrix)

b) 2nd sample: aluminum 6061,2.5 kg and Zirconia 79g (5% of total weight of the matrix)

c) 3rd sample: aluminum 6061,3.5 kg and Zirconia 79g (5% of total weight of the matrix)
b) 2nd sample: aluminum 6061, 1.5 kg and Zirconia 167g (10% of the total weight of the matrix)  
c) 3rd sample: aluminum 6061, 1.5 kg and Zirconia 266g (15% of the total weight of the matrix)

Aluminum alloy was set in a graphite crucible inside the furnace to melt. The temperature of 1000°C was set up and the thermocouple reading was set to note down the temperatures of phase changing of the matrix. At 750°C slight melting of the matrix was observed. It took 1 hour and 53 minutes to attain the temperature. At 950°C whole of the matrix was melted inside the furnace which took a recoded time of 3 hrs and 5 minutes after the sample was put in the furnace. zirconia was preheated separately in another furnace to 450°C for exactly 20, 25 and 30 minutes respectively (for 79, 167, 266) to remove all the moisture content present in the particulate.

For the first sample, after the melt was obtained and the powder was preheated, it was taken out from the furnace and carefully collected and was ready to being mixed in the matrix. The muffle furnace was opened and the temperature was maintained at the melting point of the matrix. Powder was poured through a funnel in small and measured quantities and was allowed to disperse in the matrix, through vortex method. Vigorous manual stirring was done during the mixing of the powder in the matrix to achieve the maximum accuracy. The whole environment was blasted with the high pressure nitrogen gas though a nozzle so as to prevent any oxidation, or blow holes or any defects that might occur during casting of the composite. When whole of the powder was mixed in the matrix the furnace was closed and was subjected to stirring by the stirrer of which the motor was fixed at 200 rpm, and the temperature of the furnace was maintained. By the in depth analysis, it was concluded that 10 minutes of stirring was required at 200 rpm for the sample that contained 5% of the particulate, 15 minutes for 10% and 20 minutes for the 15% reinforced sample. These were only to be obtained after properly mixing the zirconia particulate in the matrix. For the first sample, after aluminum alloy was put in the furnace till the casting of the composite was obtained, it took 4 hrs 30 minutes of recorded time to prepare a sample of composite. Whole setup of stir casting machine was given a rest of 1 hour till the second sample was put in the furnace. After the second sample was put, whole of the above process was repeated again, the only difference being zirconia (167g) being preheated to 450°C for 25 minutes (for first sample being 20 minutes) and the stirring of the matrix was done for 15 minutes (for first sample being 10 minutes) due to the already warm chamber of furnace for the matrix, desired temperature was attained bit fast and the whole composite was prepared in recorded 3 hrs 20 minutes. For the third sample stir casting set up was started again next day, with the whole process was repeated again. This time 266 g of zirconia was prepared in the furnace and was being mixed in the prepared matrix. Although bit of the difficulty arose when the particle due to large volume was not able to mix in the matrix, but the manual stirring time was increase to 20 minutes and same 20 minutes through DC motor at 200 rpm the particulate got mixed up in the composite. The whole process took 5 hrs. 10 minutes of recorded time to complete.

After the fabrication of the composite, the samples prepared were taken to Chandigarh industrial & tourism Development Corporation limited (CITCO) a Chandigarh administration undertaking for their mechanical testing. CITCO is well located in the Chandigarh in 180/40-41-42, industrial area phase-1, Chandigarh-160002 provides industrial development cum facility Centre for many of its clients. CITCO is a govt. undertaking institute which is equipped with latest technology, sophisticated and computerized equipment and machines which are bound to give results of very high accuracy. The well trained, educated and experienced staff is dedicated to produce results with great precision.

III. SPECIMEN TEST

The following tests were conducted on the base metals and the samples prepared:
1.) Tensile testing done on universal testing machine
2.) Elasticity and ductility tests

For the testing of the specimen dumbbell shaped samples were prepared of the appropriate size and were
then put in the UTM and then Vickers’s hardness testing machine. In the universal testing machine the tensile testing of the base metal i.e. aluminum 6061 was done also the elasticity (% elongation) was calculated for the sample. Aluminum being the good metal of combination of good hardness properties and tensile strength with elasticity, gave close results with the actual theoretical data which is discussed further.

Also each of the three composites samples that were prepared also underwent the same tensile and hardness testing also gave the results which will be discussed in tabulated and theory form in details further.

As for now, the principals with figures of universal testing machine and Vickers hardness testing machine principals are discussed below.

![Hardness Test](image1)

**Fig 1:** Comparison between Vickers hardness of base metal and the three samples of composite

![Tensile Test](image2)

**Fig 2:** Comparison between tensile strength of base metal and the three samples of composite

### IV. CONCLUSIONS

Studies in this research show the effect of the reinforcement content of ZrO$_2$ on mechanical properties of Al–ZrO$_2$ Matrix composites which were fabricated by the stir casting method. Mechanical properties such as hardness and ultimate tensile strength were improved, comparing with the unreinforced alloy. Composite containing 10 wt. % ZrO$_2$ fabricated at 950$^\circ$C showed the best configuration of the hardness and ultimate tensile strength in comparison with other specimens which could be deduced to the presence of ZrO$_2$ particles. Hence, it can be deduced that the optimum fabrication conditions of the aluminum alloy composite was provided with 10wt% ZrO$_2$. In addition, a number of dents were observed on the fractured surfaces of all samples which could be a result of the void nucleation and subsequent coalescence during the fracture process. Aluminum alloy 6061 had measured tensile strength of 223 MPA which was increased to maximum of 285 MPA having the increased value of 13-28%. Also hardness value of 78 was increased to max of 121 and with the range of 9-55% increase with the addition of different weight % of zirconium Dioxide. In addition, Aluminum alloy 6061 alloy had the effective elongation of 21.66% which was considerably reduced to min of 74% to maximum of 88% due to the addition of zirconium Dioxide.

### REFERENCES


Abstract—This work talks about the reduction in the surface roughness of work surface by the use of CNC milling machine. For this determination optimization algorithms are an option which gives satisfactory set of values of CNC machine inputs which affect the roughness of the work surface during milling operation. An aluminum metal matrix composites can be machined at high speed conditions in CNC is sufficiently great because such composites have various applications in the aeronautics industry due to requirement of good results. From the literature study it is disclosed that most recent task is done on this by using gravitational search algorithm (GSA) and is compared with TLBO, SA and GA (in order of their performance). By the use of mentioned techniques surface roughness value is obtained much satisfactory but there is always scope of improvement. An experimental work done in the paper by Pare V. et.al is considered as a reference to get most favorable sets of input parameters of CNC machine. Their demonstration provides an effective range of depth of cut, speed of cutting, step over ratio and feed. In this work, we have proposed a hybrid algorithm by cascading GSA and TLBO. GSA gives better results than TLBO but the convergence speed is lesser, so a combination of them will improves the result and speed to. For this we have developed the MATLAB script and compared the results with the paper. Results of our designed GSA and TLBO also perform well than listed in paper. A comparison of results obtained by GSA-TLBO, GSA and TLBO is shown in our work and hybrid algorithm improved the surface roughness by 13.07% for linear analysis. The whole experiment is conducted on the Al+ SiC metal matrix composite.

Keywords: Milling machine, Al+SiC, surface roughness, GSA, TLB

I. INTRODUCTION

Metal cutting technology is a basic level training program focusing on the application of the cutting tools in all precision. The scale of investment being made internationally in modern machine tools for carrying out machining is regarded as an asset of a nation [5]. Mostly metal cutting is defined as an operation in which a thin layer of metal is removed in the form of chip from a work surface by using a wedge shaped tool [12]. C. Manikandan et.al. [1] Studied that by using Taguchi method, to drill EN24 material cutting parameters with the high speed steel are analyzed. By using suitable cutting parameters like speed, lip angle and feed. In the performed experiment optimized cutting parameters are found with reference to the roughness of the surface, MRR(metal removal rate) and machining to perform the operation.

R. Venkata Rao et.al. [2] refined TLBO algorithm has been prefer for the limited optimization problems. In the proposed approach two new mechanisms are introduced in the form of training and self motivated learning. Further than one teacher is introduced for the learners.. The performance of the I-TLBO algorithm is evaluated by conducting small scale. H. Abdullah et.al. [3] In their work they present cutting tools movement by Genetic Algorithm (GA) and Ant Colony Optimization (ACO) method in generation of shortest tool path. For observation of the performance of both methods, comparisons with conventional method have been carried out. K.Sharma et.al.[4] discussed the experimental study on performance characteristics of AISI 304 stainless steel during CNC drilling process. Factors like spindle speed, feed rate and point angle affect the performance parameters such as the surface roughness and ovality in drilling process. This paper presents the multi-objective optimization of drilling process parameters using Taguchi method in machining of AISI304 stainless steel.

K.G.DurgaPrasad et.al. [5] studied the Grey relational analysis based Taguchi method is employed for optimizing process parameters in end milling of glass-fiber-reinforced plastic (GFRP). N.V.Mahesh et.al. [6] In this research work, validation experiments are conducted as per the optimized parameters obtained by PSO. The predicted values of machining time and roughness obtained by PSO are compared with experimental results. It is found that the
predicted values are in good agreement with the measured machining time and roughness. R.Venkata Rao [7] This paper presents a review of applications of TLBO algorithm and a tutorial for solving the unconstrained and constrained optimization problems. The tutorial is expected to be useful to the beginners. The teaching-learning-based optimization (TLBO) algorithm is finding a large number of applications in different fields of engineering and science since its introduction in 2011.

II. EXPERIMENTAL WORK

In the performed experiment CNC milling machine is used for improving the surface roughness of aluminium silicon carbide (Al-SiC) composite. We have targeted to get maximum surface roughness by use this machine. For this purpose we have picked the necessary values for our experiment from [10]. In the paper they have done experiment on Al-SiC composite and recorded four readings of surface roughness depending upon the different sets of machine parameters which affects the surface roughness. This experiment is the base of our research as it gives an allowable range, within which our optimization gives the tuning parameters’ optimal value. So keeping in this view followings will be our key objectives:

- To attain the most effective surface roughness, depth of cut, speed of cut (cutting speed), feed and step over ratio will be tuned within their constraint limits for Al SiC composite.
- To control these independent parameters, a hybrid GSA-TLBO algorithm will be used.
- To examine all the results after initiate a regression relationship in dependent and independent parameters with variable number of independent parameters and will be compared with the reference paper.

A mathematical relationship is developed in [10] based on their experiment between surface roughness and optimizing parameters if CNC machine. The linear equation which relates the surface roughness with four optimizing parameters is given in equation 1.1.

\[ R_s = 0.893 - 0.0028x_1 + 0.00186x_2 + 1.19x_3 + 3.39x_4 \]

Where \( R_s \) is surface roughness in µm

- \( x_1 \) is speed in m/min
- \( x_2 \) is the feed in µm /rev
- \( x_3 \) is the depth of cut mm
- \( x_4 \) is the step over ratio

Here these four variant of ‘x’ are input parameters if CNC machine whereas surface roughness is the output parameter observed over processed job on CNC. Similarly, nonlinear relation between them is also established which is represented in equation 2.

\[ R_s = 1.99 - 0.454log_{10}x_1 + 0.124log_{10}x_2 + 0.157log_{10}x_3 + 0.794log_{10}x_4 \]  (2)

All notations have same significance as in equation 1.1.

To optimize these input variables of CNC machine to get minimum surface roughness, gravitational search algorithm (GSA) has been used previously and tested for teacher learner based optimization (TLBO) too. Both these algorithms gave comparative results but the convergence time for TLBO is very less than GSA whereas GSA’s result is better than TLBO. So in our work we will combine both methods to reduce more surface roughness with less convergence time. The combination of two optimization algorithms can be done in two ways: by mixing them, cascading them. The first one can be used with two different algorithms like one should be local optimization algorithm and other should be global optimization algorithm, for example GSA with PSO in which PSO is local optimization algorithm. But in our case both GSA and TLBO are global optimization algorithms, so to join them cascading of these has to be used. In it results obtained by GSA will feed into TLBO for further fine tuning. Since these algorithms are optimization algorithms and can be used in various research fields where providing the solution to any mathematical problem is not easy and problem is NP hard problem, so the significance of terms of used in these changes with every application area.

In both algorithms number of agents or learners is set by the user and each agent’s position is represented by the values of four tuning parameters in a provided search space. These values are knowledge level of learners for TLBO. In each iteration an objective function is evaluated which is based upon equation 1.1 and 1.2 and this objective function is called every time in each iteration and for every agent/learner. The minimum of all objective function values calculated for all agents/learners in each iteration is saved and updated by process defined in GSA and TLBO. The step by step algorithm is discussed below:

STEP1. Initialize the upper and lower range of speed, feed, depth of cut and step over ratio of CNC machine.

STEP2. Initialize the number of agents, total no of iterations etc for GSA algorithm.
STEP3. For the first iteration, assign random positions to all agents which will be values for four tuning variables and calculate the surface roughness value for these agents’ positions using equations 1.1 and 1.2.

STEP4. Store the minimum value of surface roughness amongst all these agents.

STEP5. The current position of each agent is used to get the mass for each agent as per GSA algorithm. The minimum value of fitness function is selected as best and maximum as worst position and using the formulas, mass of each agent can be calculated as:

\[ m_i(t) = \frac{\text{fit}(t) - \text{worst}(t)}{\text{best}(t) - \text{worst}(t)} \]

\[ M_i(t) = \frac{m_i(t)}{\sum_{j=1}^{n} m_j(t)} \]

STEP6. Gravitational force is calculated as:

\[ F_{ij}^d(t) = G(t) \left( \frac{M_{pi}(t) \times M_{il}(t)}{R_{ij}(t)} + \varepsilon \right) \left( x_{ij}^d(t) - x_i^d(t) \right) \]

STEP7. The new velocity in the direction of reducing the surface roughness is updated as per formula given in equation. This velocity is used to update the values of tuning variables. The acceleration used in equation is calculated as:

\[ a_{ij}^d(t) = F_{ij}^d(t) / M_{il}(t) \]

STEP8. The updated values will be as per formula

\[ x_{ij}^d(t + 1) = v_{ij}^d(t + 1) + x_i^d(t) \]

Table 1: Input variables set in GSA-TLBO optimization

<table>
<thead>
<tr>
<th>Input</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of agents</td>
<td>50</td>
</tr>
<tr>
<td>Total iterations</td>
<td>500</td>
</tr>
<tr>
<td>Upper Range</td>
<td>[6000,200,0.4,0.6] for speed of m/c, feed rate, depth of cut and step in ratio</td>
</tr>
<tr>
<td>Lower Range</td>
<td>[2000,100,0.2,0.5] for speed of m/c, feed rate, depth of cut and step in ratio</td>
</tr>
<tr>
<td>Dimension of space</td>
<td>4</td>
</tr>
<tr>
<td>TLBO parameters</td>
<td></td>
</tr>
<tr>
<td>Number of students</td>
<td>150</td>
</tr>
<tr>
<td>Maximum iterations</td>
<td>500</td>
</tr>
</tbody>
</table>

STEP9. This updated position of tuning variables will act as input to next iteration and this process will go on repeating till last iteration.

GSA ends here and TLBO starts

STEP10. The final set values for which GSA gives the minimum surface roughness is used as input to TLBO algorithm.

STEP11. Initialization of parameters like number of learners and iterations is done and final tuned output values of four variables form GSA are assigned as knowledge level of each learner to every learner.

STEP12. Now teacher (who has least surface roughness value) tries to increase the mean result of whole class by transferring his knowledge to learners using formula

\[ x_{new} = X_i + r(\text{Teacher} - \text{TLBO} \times \text{Mean}) \]

Where T_P is the teaching factor and updated in each iteration as per equation mentioned in section.

STEP13. Calculate the solution of objective function based on these new updated values and if minimum surface roughness amongst all these is less than the previous best then this learner will be assigned as a new teacher.

STEP14. Now randomly select the two students in student phase of TLBO and compare the surface roughness for them, and update the knowledge level of best student so far. If objective function value for this new knowledge level of student is less than teacher, this student will be transformed as teacher.

STEP15. This process will continue till last iteration and best value is the final answer to minimum surface roughness.

In our work we have developed the MATLAB script to tune the tuning variables of CNC machine whose description is provided in previous chapters. MATLAB R2013a is used in our implementation and testing work. MATLAB provides a wide range of library which reduces the work hassle to develop some basic functions. We have developed our code in modules and are named as per their functions. These designed functions are called in main script, and user doesn’t need to use them or call them separately. During the GSA implementations we have to provide the input of number of agents, total number of iterations and range to the GSA script. The values of these inputs are tabulated in following table.
The objective function value must be decreasing or increasing as per the case (in our case it must be decreasing) with number of iterations. An algorithm will be said good if quickly settles to an optimum value. For example, the figure 1 shows the objective function curve for same CNC machine parameters with number of iterations.

![Objective function Plot For Linear Regression Analysis](image1)

**Fig 1: Optimization curve for linear analysis for GSA, GSA-TLBO, and TLBO**

It can be analyzed that for each algorithm, the fitness function value is decreasing and after some iterations it is settled to a minimum value. The lowest fitness value algorithm is the best algorithm for our test case and that is the hybrid GSA-TLBO. It also settles to minimum value at 40 iterations whereas others take almost 250 iterations. So convergence rate of this is very less than others. Since these optimisation algorithms are not absolute algorithms, these gives approximate outcomes, so each time we execute the code, results will be different. So we have pasted the best results in 5 trials in the file. The surface roughness value comparison for all three algorithms is shown in figure 2. It clearly shows that GSA-TLBO gives the minimum value and which is 1.332 μm. Table 2 lists all final tuned values for these three algorithms.

![Surface Roughness comparison For Linear Regression Analysis for GSA= 1.3676 for GSATLBO= 1.332](image2)

**Fig 2: bar graph comparison of surface roughness for linear mathematical formulation**

Table 2 shows the comparison of output of our surface roughness values and values calculated in reference paper [10]. That paper has compared surface roughness by four different algorithms: genetic algorithm (GA), simulated annealing (SA), TLBO and GSA. We will compare these all values with our designed GSA and TLBO too. The table clearly indicates that our hybrid algorithm is the winner though we have to compromise a little bit in term of convergence speed as compared to minimum in the table which is 5 iterations for TLBO as per paper. The values differ for GSA and TLBO algorithms for our developed script and paper’s. This is due to the fact that constants used in the algorithms are not defined in paper and may vary from the values used by us. Though, good thing is that surface roughness is decreased more in our developed script. We have achieved the improvement of 13.07% from the minimum value (GSA) of paper by hybrid GSA-TLBO algorithm.

**Table 2: Output tuned parameters for three optimization algorithms by linear analysis**

<table>
<thead>
<tr>
<th>Speed of m/c in m/min</th>
<th>Feed in μm/re v</th>
<th>dept of cut in mm</th>
<th>step over ratio</th>
<th>Surface Roughness in μm</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSA 5976.7 100000</td>
<td>15.2 028</td>
<td>0.50 011</td>
<td>1.3676 0</td>
<td></td>
</tr>
<tr>
<td>TLBO 5953.5 120000</td>
<td>13.05 055</td>
<td>0.50 022</td>
<td>1.4032 0</td>
<td></td>
</tr>
<tr>
<td>GSA-TLBO 6000.0 00000</td>
<td>10.0 020</td>
<td>0.50 000</td>
<td>1.3320 0</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3: Comparison of surface roughness by various optimisation algorithms in case of linear analysis**

<table>
<thead>
<tr>
<th>Surface Roughness in μm</th>
<th>Convergence speed</th>
<th>GSA (ou rs)</th>
<th>TLBO (ou rs)</th>
<th>G S A A [1 0]</th>
<th>T L B O A [1 0]</th>
<th>S A</th>
<th>G A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3 320 0</td>
<td>1.3 676 0</td>
<td>1.4 032 0</td>
<td>1. 53</td>
<td>1.6 3</td>
<td>2. 38 9</td>
<td>1. 5 7</td>
<td></td>
</tr>
<tr>
<td>40 270</td>
<td>270 10 00</td>
<td>5 63 07</td>
<td>5 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Similarly, for nonlinear analysis using equation 1.2, the optimization curve is plotted. Again in this curve too, the fitness function value curve which is surface roughness is least for hybrid
GSA-TLBO case and settled to a minimum value earlier than others.

![Objective function Plot For NonLinear Regression Analysis](image)

Figure 2: non linear analysis optimisation curve for three algorithms

![Surface Roughness comparison For NonLinear Regression Analysis](image)

Figure 3 : bar graph comparison for non linear analysis

In this case too our hybrid algorithm improved the results to 88% to minimum of paper results. A great improvement is noticed in case of non linear analysis. A more detailed analysis is cleared by the graph shown in figure 4 for surface roughness of linear and non linear analysis.

![Surface roughness in um](image)

Figure 4: Surface roughness comparison for both linear and nonlinear analysis

**III. CONCLUSIONS**

This work is focusing for the optimization of milling machine inputs to get most effective surface roughness. To get this hybrid GSA-TLBO optimization algorithm is used in which we cascaded GSA and TLBO, the output of GSA is fed into TLBO for further fine optimisation. Four parameters depth of cut, speed of cutting, feed rate and step over ratio are the independent variables for achieving good surface roughness. So that a relationship in between these dependent and independent variables is decided and optimised to have minimum surface roughness.

In this experiment GSA and TLBO used to compare both linear and non linear analysis by our proposed optimization. Experimental, a very less surface roughness is attained in Non linear relation between variables. In this work, An improvement of 88% observed over single GSA for non linear relation whereas in case of linear this improvement is 13%. But for linear and non linear relation hybrid GSA-TLBO is performing well than single GSA and TLBO. This optimisation of variables reduces the difficulty to test the job for different set of parameters which also waste the material. So by the use of our optimization variables and parameters good results achieved.

**REFERENCES**


[8]. Kunal Sharma, Mr. Abhishek Jatav “Optimization of Machining Parameters in Drilling of Stainless Steel International Journal of Scientific Research Engineering & Technology (IJISRET)” - 8, August 2015.
Hybrid Machining: A Combined Approach of Abrasive Jet Machining and Magneto Finishing

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Abstract — In this paper, we will discuss the effect of hybridization of abrasive jet machining and magneto finishing. The latest hike in the use of hard, high potency and temperature resistant equipment in engineering imposed the progress of new-fangled machining techniques. Traditional machining or concluding processes are not readily related to the materials like carbides; ceramics. Traditional machining procedures when concerned to these new-fangled materials are too costly, create reduced degree of surface finish and precision; generate some stress, extremely deficient. New-fangled machining procedures may be categorized due to temperament of energy in work. Abrasive flow machining (AFM) is somewhat new procedure along with non-traditional machining processes. Low substance elimination rate occurs to be one serious inadequacy of nearly the entire procedures. Magneto abrasive flow machining is an innovative expansion in AFM. By means of magnetic field in the region of the work portion in abrasive flow machining, we can amplify the material removal rate in addition to the surface finish.

Keywords — Magneto Abrasive Flow Machining (MAFM), Material Removal Rate, Surface Finish, Abrasives.

I. INTRODUCTION

Magneto abrasive flow machining (MAFM) — machining with the help of magnetic abrasives — is a well-known technique in industry. A machining process called orbital flow machining is being claimed to be improvement over abrasive flow machining process which can operate complex components under three dimensional machining. These processes are well known as hybrid machining processes (HMP) — which is a recent concept in non-conventional machining advancement. Material removal rate is considered as a general problem in almost every nonconventional machining process and several attempts are underdevelopment to overcome these problems. An ongoing research project is being conducted with the main objective of exploring techniques for material removal rate in abrasive flow machining and this paper reports the preliminary result of that ongoing project. Magneto Abrasive Flow Machining Process was developed in 2002 for the purpose to increase the material removal rate (MRR) and enhancement in surface roughness of component by polymer base abrasive laden medium with the mixture of ferromagnetic abrasive particles in Abrasive Flow Machining Process. In this new hybrid technique, the two poles are enclosed by coil aligned in that way to deliver strong fascinating magnetic field in AFM process, it was reported that application of fascinating magnetic field with AFM process, enhanced the number of vibrant dynamic grains involved in cutting action.

A. EXTRACTION OF DATA:

Primary need of the research requires the collection of imperative data where as some organizations utilizing Abrasive flow kind of surface finishing machines for their manifestations. The certainties interlinked to Abrasive Flow Machining are gathered from such companies. Just a few imperatives are compulsory to be assumed as all the data can't be accomplished from the enterprises. This paper presents the evaluation of different cases on the basis of various parameters and at last phase all the data being joint and analyzed for various perspectives and parameters such as magnetic flux density, flow rate (volume) of the medium, grain size and concentration of the abrasive, work piece material, reduction ratio, viscosity of the medium, extrusion pressure, number of cycles and, flow volume of the medium.

B. COMPARISON WITH ABRASIVE FLOW MACHINING:

Magneto Abrasive Flow Machining can correct surface irregularities such as bumps and out of roundness while Abrasive Flow Machining suffers at this point. In Magneto Abrasive Flow Machining, machine depth can be increased by amplifying magnetic flux density while machine
depth in Abrasive Flow Machining depend on only increase of particle size and working clearance.

Magneto Abrasive Flow Machining has improved surface finish than Abrasive Flow Machining. Magneto Abrasive Flow Machining requires less number of cycles as compare to Abrasive Flow Machining to achieve the targeted machining. Magneto Abrasive Flow Machining surely has material removal rate better than Abrasive Flow Machining.

C. PROCEDURE:

The investigations were executed by AFM technique on tube shaped occupation. The coarse used in the media are silicon carbide. The mix of media is various in the organization of the coarse components of conscientious work measure in an unmistakable rate to achieve the favored extent consultation of rough units by load. Before playing out the genuine testing, the transitional was kept running for 20-25 cycles with the tryout work, to get institutionalized amalgamation. In light of the finale from the preparation testing, three significant factors are the quantity of cycles, coarse system degree, and coarse deliberation. Inquires about are made by modifying one variable and remaining others foreordained. The whole inquiries about were practiced on occupation surfaces comprise of barrel shaped division. Substance disposal rate was the yield rebound planned as presentation pointers in each box. The researches were executed by AFM procedure on cylindrical job. The coarse utilized in the media are silicon carbide.

The blend of media is assorted in the company of the coarse elements of scrupulous mesh size in a distinct percentage to accomplish the preferred proportion deliberation of abrasive units by load. Prior to performing the actual testing, the transitional was run for 20-25 cycles with the audition job, so as to obtain standardized amalgamation. Based on the finale from the groundwork testing, three noteworthy erratic are the quantity of cycles, coarse network extent, and coarse deliberation. Researchers are made by altering lone variable and remaining others predetermined. The entire researches were accomplished on job surfaces consist of cylindrical division. Substance elimination rate was the output comeback premeditated as recital pointers in every crate.

II. EXPERIMENTAL RESOURCES

The aluminum-6061 composite as a vocation substance is utilized. The curved space assign machined in the activity which is adapted by penetrating procedure and after that trailed by exhausting procedure for mandatory measurement i.e. greatness 7 mm inner breadth, 12 mm outside measurement and 50 mm remove end to end. The internal barrel shaped surface was finished and finished with AFM movement. The media definition utilized for this pack comprising silicon based polymer, pressure driven oil and silicon carbide as coarse grain. Every job-piece is machined proposed in favor of a foreordained amount of cycles. The job-piece was being used somewhere else from the arrangement of associations and unsoiled before any estimation is taken.

A. PROCESS PARAMETERS:

The chosen factors and their assortment in support of the comprehensive research as given away in the Table below.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Process factors</th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Abrasive atom dimension</td>
<td>140-240</td>
<td>Micron</td>
</tr>
<tr>
<td>2.</td>
<td>No of successions</td>
<td>60-160</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Job material Al -6061 alloy</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Coarse Deliberation</td>
<td>45-55</td>
<td>Percentage</td>
</tr>
</tbody>
</table>

B. EXPERIMENTAL INVESTIGATION:

The test outcomes are analyzed by means of Taguchi method. L9 orthogonal selection is chosen in favour of the method. The input factors are:
  A. Abrasive deliberation,
  B. Abrasive network extent,
  C. No of cycle, and
  D. Production Retort Is MRR.
Table 2: Proportion Composition of Essentials In Job Piece Substance

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Job piece (Al - 6061)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu</td>
<td>0.015</td>
</tr>
<tr>
<td>Mg</td>
<td>0.465</td>
</tr>
<tr>
<td>Si</td>
<td>0.522</td>
</tr>
<tr>
<td>Fe</td>
<td>0.545</td>
</tr>
<tr>
<td>Ni</td>
<td>0.0048</td>
</tr>
<tr>
<td>Mn</td>
<td>0.164</td>
</tr>
<tr>
<td>Zn</td>
<td>0.0180</td>
</tr>
<tr>
<td>Pb</td>
<td>0.0196</td>
</tr>
<tr>
<td>Sn</td>
<td>&lt;0.00150</td>
</tr>
<tr>
<td>Ti</td>
<td>0.0201</td>
</tr>
<tr>
<td>Cr</td>
<td>0.0076</td>
</tr>
<tr>
<td>Al</td>
<td>99.87</td>
</tr>
</tbody>
</table>

Some experimental interpretations are made as shown in the table below

Table 3: Experimental Interpretation

<table>
<thead>
<tr>
<th>Coarse deliberation (%)</th>
<th>Mesh extent</th>
<th>No of cycle</th>
<th>MRR (mg/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>150</td>
<td>50</td>
<td>2.45</td>
</tr>
<tr>
<td>50</td>
<td>220</td>
<td>100</td>
<td>2.79</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
<td>150</td>
<td>2.98</td>
</tr>
<tr>
<td>55</td>
<td>150</td>
<td>100</td>
<td>3.36</td>
</tr>
<tr>
<td>55</td>
<td>220</td>
<td>150</td>
<td>3.52</td>
</tr>
<tr>
<td>55</td>
<td>250</td>
<td>50</td>
<td>2.83</td>
</tr>
<tr>
<td>60</td>
<td>150</td>
<td>150</td>
<td>3.85</td>
</tr>
<tr>
<td>60</td>
<td>220</td>
<td>50</td>
<td>3.29</td>
</tr>
<tr>
<td>60</td>
<td>250</td>
<td>100</td>
<td>3.39</td>
</tr>
</tbody>
</table>

Table 4: L27 Orthogonal Array, MRR After Each Experiment

<table>
<thead>
<tr>
<th>Exp. No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>MRR 1 10^3 g/s</th>
<th>S/N ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2.45</td>
<td>7.7833</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2.79</td>
<td>8.9121</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2.98</td>
<td>9.4843</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3.36</td>
<td>10.5268</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3.52</td>
<td>10.9309</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2.83</td>
<td>9.0357</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3.85</td>
<td>11.7092</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3.29</td>
<td>10.3439</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3.39</td>
<td>10.6040</td>
</tr>
</tbody>
</table>

The investigation of current work is made by using Taguchi method on MINITAB software. Abrasive deliberation is initiated as supplementary considerable factor, then number of cycles and then coarse extent for material removal rate. It is pragmatic that the same as abrasive deliberation augments MRR. Weight of the work piece was measured before and after the machining operation has been noted. Material removal rate was calculated by using the formula.

\[
MRR = \frac{\text{Initial weight} - \text{Final weight}}{\text{Time}}
\]

III. CONCLUSION

An attractive field has been related in the locale of a segment being in strategy by rough stream machining as well as an expanded pace of substance evacuation has been practiced. Exact demonstrating by way of the assistance of reply face has escorted to the
accompanying end concerning the inconsistency of reaction limitations as far as free requirements inside the exact arrangement.

1. Attractive field prominently impacts both MRR and surface coarseness. The inclination of the bend implies that MRR enhances by methods for attractive field in overabundance of surfaces unevenness. In this manner, all the more updating in MRR is foreseen at still raised estimations of attractive field.

2. For a predefined quantity of cycles, there is an observable up-gradation of MRR and exterior unevenness. Littler amount cycles are imperative intended for taking out the indistinguishable quantity of substance from the constituent, whenever advanced in the attractive turf.

3. Attractive turf and medium stream pace interrelate by way of each other. The amalgamation of stumpy stream charge and taking off interesting transition thickness yield more substance end pace and litter surface unevenness.

4. Medium stream rates don't have an important result on substance disposal pace and surface unevenness in the presence of an attractive field.

5. Substance end pace and surface unevenness both dimension off consequent to a clear number of cycles.

MAFM is a dug in refined finishing up process capable of meeting the changed closing necessities from various section of use like aviation, wellbeing and vehicle. It is commonly helpful to end composite figures for improved surface unevenness esteems and unbending abstinences. Be that as it may, the principal disadvantage of this methodology is short closing rate. The unrivalled introduction is practiced if the system is controlled on the web. Thus, sound-related discharge technique is tried to investigate the exterior complete and material rejection. A variety of demonstrating techniques are likewise practiced to display the methodology and to connect with investigational results. Yet, pros guess that there is still extension for an arrangement of flawlessness in the close-by MAFM review.

In the current effort Al-6061 was punctured and exhausted by customary machining capacity and surface finishing up was made by methods for rough stream machining. Testing was grasped for information requirements like rough pondering, grating system degree and no of cycles. The yield counter is substance disposal pace. Based on results the twisting up is:

1. Finishing of confused to achieve surface can be made by methods for rough stream machining.

2. Because of Taguchi system, it is experiential that grating fixation is essential viewpoint for MRR. Substance disposal pace intensifies with lift in grating focus.

3. As the no of cycle raises, the substance disposal pace additionally rises.

4. Substance disposal pace decays with lift in grating lattice estimate.

REFERENCES

Investigating the Process Parameters for Optimization on Die Steel EN-31 Using Taguchi- GRA Technique

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Abstract—investigating the effect of heat treatment in industry, more focus was found on the use of optimization technique. The main aim of this process is to maximize of Hardness in of Steel material using Heat Treatment & Taguchi Method. EN31 is a manganese and chromium steel with high carbon content. EN31 is widely used in the automobile industry for making heavy duty gear, shaft, pinion, camshafts, gudgeon pins and machining components and many general engineering applications. The Experiment was conducted with a view to refer and research on Surface Roughness and Material Removal Rate. Experiment was carried out using three input parameters Pulse off time, Pulse on time and Wire Feed with three different levels. The effects of different input parameters and effect of their combination on Surface Roughness and Material Removal Rate was determined using Taguchi and ANOVA table.

Keywords : Wire EDM, Alloy Steel, EN-31, Taguchi Method, ANOVA

I. INTRODUCTION

Now days the non-conventional machining process are popular and widely used in various manufacturing processes due to their higher speed and accuracy. In this paper we are discussing about such a method which is Wire Electric Discharge Machining (WEDM) which is used for the cutting and to design some complex geometry over the metal surface with higher accuracy and good surface finishing. In this process we use a series of spark ignition. Basically this process is an extension of the Electric Discharge Machining process which is used for the metal removal from the metal surface. The main advantage of such kind of method is that we can use this for the harder material and can get the better surface finishing. In this process we use the wire electrode and a work piece which are acting as cathode and anode respectively. These two components are separated by a dielectric medium. This method is now a important and popular machining method in industries because we can use this method for the difficult-to-machine materials like titanium alloys and zirconium. There are several machining methods are available like mechanical, electrochemical, chemical, thermal etc. Wire Electrical Discharge Machining (WEDM) is a thermal machining process by which we can machine the harder material with the higher accuracy and can produce the complex shape over the metal surfaces which have sharp edges because such sharp edge boundaries are very difficult to produce by the conventional methods and they consume much time. As due to development in engineering there are various materials and alloys have been found which have their own importance in various products and have very high toughness and strength so such material are very difficult to machine by the conventional method, so such methods like wire electric discharge machining process are gaining more importance in today’s industrial scenario because they achieve better performance for such kind of materials. By this process we can achieve the higher accuracy and a better surface finish than the conventional machining processes. Thus this method is the most popular and demanded method for the material removal and for drawing the complex geometry over the harder materials. The wire electrode which is used in this method is made up of copper, brass and tungsten material with the diameter range of 0.05-0.30 mm, thus by such a thin wire we can get the better finishing even for the smaller radii and curved machining. The wire is suspended in such a way so that a tension is generated within the wire which will prevent the wire to draw some wrong geometry. In this process, the material is eroded instead of cutting by the wire, and as there is no direct contact between the wire and work piece so there is not any mechanical stresses are generated during the machining which is undesirable. Although we can also use this method for the high strength and the temperature resistant materials, and it also prevent the material from any geometrical changes in the material due to the machining of the heat treated steel.

The rest of paper is design as follows. The problem statement of research work is described in section II. Methodology is described in section III. Experimental Setup is described in section IV. Result analysis is described section V. The overall conclusion of research work describe in section VI.
II. PROBLEM STATEMENT

This research work is based on optimization technique, so it is required that machining of die steel EN-31 on WEDM at which the optimization is to be done should have practical applications. The material die steel EN-31 is chosen for the optimization on Wire EDM, which finds widespread application like Stepped punch and press-punching dies, Concrete sprayer parts.

The aim of this work is to optimize the parameter of WEDM on which it gives low surface roughness and high material removal rate. The MRR and Surface roughness are calculated on different settings of parameter like pulse on time, pulse off time and wire feed with their three levels. For this research the above said parameters are considered in Taguchi technique, which is a statistical optimization tool. For this L9 array is used for the experiment.

III. METHODOLOGY

The methodology for the present work is consisting of the following steps:

- Firstly the literature review carried out for problem formulation.
- Die steel EN 31 plate of thickness 16 mm is used as a work piece material

- The experiments were accomplished on WEDM machine (Model MAXI CUT E). Steps followed in the cutting operation are as follows:
  - The wire was made vertical with the help of verticality block.
  - The work piece was clamped on the work table by C-clamp.
  - A reference point on the work piece was set for setting work co-ordinate system (WCS). The programming was done with the reference to the WCS. The reference point was defined by the ground edges of the work piece.
  - The program was made for cutting operation of the work piece and a profile of 20 mm x 20 mm square.

While performing various experiments, the following precautionary measures were taken:-
1. The order and replication of experiment was randomized to avoid bias, if any, in the results.
2. Each set of experiments was performed at room temperature
3. Before taking measurements of surface roughness, the work piece was cleaned with acetone.

The purpose of literature report is to study the variations of the WEDM process parameters on performance measures such as surface roughness, and MRR. Various input parameters varied during the experimentation are pulse on time ($T_{on}$), pulse off time ($T_{off}$) and wire feed (WF). The effects of these input parameters are studied on surface roughness, and MRR. Apart from the parameters mentioned above following parameters were kept constant at a fixed value during the experiments (Table 1):

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Process Parameters</th>
<th>Symbols Used</th>
<th>Units Used</th>
<th>Range Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pulse On Time</td>
<td>$T_{on}$</td>
<td>S</td>
<td>70-90</td>
</tr>
<tr>
<td>2.</td>
<td>Pulse Off Time</td>
<td>$T_{off}$</td>
<td>S</td>
<td>20-40</td>
</tr>
<tr>
<td>3.</td>
<td>Wire Feed Rate</td>
<td>WF</td>
<td>m/min</td>
<td>2-6</td>
</tr>
</tbody>
</table>

V. RESULT ANALYSIS

Using Taguchi’s methodology the S/N ratio is obtained. Here, the term ‘signal’ refers to desirable value (mean) and the ‘noise’ refers to undesirable value (standard deviation). Thus the S/N ratio refers to the amount of variation present in the performance characteristic. Depending upon the objective of the performance characteristic, there can be various types of S/N ratios. Here, the desirable objective was to optimize the response variables (MRR and surface roughness).

Fig 1: Steps of Taguchi Experimental Design and Analysis Flow
Hence, larger-the-better type S/N ratio was applied for transforming the raw data for Material removal rate. For surface roughness, as the objective was to minimize the response, lower-the-better type S/N ratio was selected to transform the raw data.

Response Analysis of Raw Data or of S/N Data

The main effects can be studied by the level average response analysis of Material removal rate raw data or of S/N data. The analysis is done by averaging the MRR data and/or S/N data at each level of each parameter and plotting the values in graphical form. The main effects of MRR and surface roughness data and those of the S/N ratio for the various response variables have been shown in Figs. 4.1-4.4. The effects of different input parameters with their corresponding levels on S/N ratio and average response have also been tabulated (Tables 4.2-4.5). The analysis of response data is done by well-known software “MINITAB” specifically used for the design of experiment applications.

Table 2: Response Table for Material Removal Rate (Means)

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.1957</td>
<td>10.70407</td>
<td>13.64167</td>
</tr>
<tr>
<td>2</td>
<td>15.5206</td>
<td>11.67373</td>
<td>15.74413</td>
</tr>
<tr>
<td>3</td>
<td>14.0478</td>
<td>18.3863</td>
<td>11.3783</td>
</tr>
<tr>
<td>DELTA</td>
<td>4.3249</td>
<td>7.68223</td>
<td>4.36583</td>
</tr>
<tr>
<td>RANK</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3: Response Table for Material Removal Rate (S/N Ratio)

Larger is better

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20.87575</td>
<td>20.35987</td>
<td>22.20633</td>
</tr>
<tr>
<td>2</td>
<td>23.62097</td>
<td>21.33948</td>
<td>23.61068</td>
</tr>
<tr>
<td>3</td>
<td>22.30238</td>
<td>25.09975</td>
<td>20.98208</td>
</tr>
<tr>
<td>DELTA</td>
<td>2.74522</td>
<td>4.73988</td>
<td>2.6286</td>
</tr>
</tbody>
</table>

Table 4: Response Table for Surface Roughness (Means)

<table>
<thead>
<tr>
<th>S.N</th>
<th>Process Parameters</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Work material</td>
<td>Die steel EN 31</td>
</tr>
<tr>
<td>2</td>
<td>Cutting tool</td>
<td>Brass wire of diameter 0.25 mm</td>
</tr>
<tr>
<td>3</td>
<td>Servo Feed</td>
<td>2000 unit</td>
</tr>
<tr>
<td>4</td>
<td>Peak current</td>
<td>120 A</td>
</tr>
<tr>
<td>5</td>
<td>Flushing Pressure</td>
<td>1 unit (15 kg/cm)</td>
</tr>
<tr>
<td>6</td>
<td>Peak Voltage</td>
<td>2 units (110 volt DC)</td>
</tr>
<tr>
<td>7</td>
<td>Dielectric Fluid</td>
<td>De-ionized Water</td>
</tr>
<tr>
<td>8</td>
<td>Conductivity of Dielectric</td>
<td>20 mho</td>
</tr>
<tr>
<td>9</td>
<td>Work Piece Height</td>
<td>16 mm</td>
</tr>
</tbody>
</table>

Table 5: Response Table for Surface Roughness

Smaller is better

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1.2267</td>
<td>1.1667</td>
<td>1.48</td>
</tr>
<tr>
<td>2</td>
<td>1.4333</td>
<td>1.2167</td>
<td>1.52</td>
</tr>
<tr>
<td>3</td>
<td>1.6433</td>
<td>1.92</td>
<td>1.3033</td>
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<tr>
<td>DELTA</td>
<td>0.4166</td>
<td>0.7533</td>
<td>0.2167</td>
</tr>
<tr>
<td>RANK</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 6: Response Table for Surface Roughness

Smaller is better

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.61284</td>
<td>1.30295</td>
<td>3.10139</td>
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<td>2</td>
<td>2.84713</td>
<td>1.62115</td>
<td>3.19435</td>
</tr>
<tr>
<td>3</td>
<td>4.04053</td>
<td>5.5764</td>
<td>2.20476</td>
</tr>
</tbody>
</table>
VI. CONCLUSION

Basically, this study evaluates the machining parameters performance of wire electric discharge machine on die steel EN-31. Taguchi design of experiment is used for the execution of all the experiments runs, planning and analysis. The main of aim using the DOE method in this study is to determine the most optimum condition of the machining parameters and to determine the importance of every parameter in determining the performance of machining characteristic. Total number of experiment performed in this study was 9 by using the random parameters.

We made the following conclusion on the basis of experiment conducted in this study namely, Metal removal rate and Surface roughness.

1. In this study we are studying about the various factors which significantly affect the material removal rate and surface roughness like pulse on time, pulse off time and wire feed rate. Optimal ranges of WEDM process
parameters have been established based on the knowledge of machine operator as under in Table 5.1.

2. As all the opted parameters like pulse on time, pulse off time and wire feed are the most major factor who determines the material removal rate in WEDM process on die steel EN-31. Thus on the basis of common responses, we conclude that pulse off time is most significant contributing factor with almost 64.57 % followed by pulse on time (17.84%) and wire feed (17.59 %) for maximizing Metal removal rate. Thus on the basis of these results we find a optimum condition for all these parameters which can provide the optimum material removal rate. Thus the most optimal condition is when the pulse on time is 80 µs, pulse off time at 40 µs and wire feed at 4 mm/min.

3. All the selected parameters i.e. Pulse on time, pulse off time and wire feed significantly affect the Surface roughness in WEDM on die steel EN-31. With regarding to the average response, pulse off time has emerged as most significant with a percentage contribution of 75.78% followed by Tool Pulse on time (18.54%), wire feed (5.67%). It has been concluded from the results that “input parameters settings pulse on time at 70 µs, pulse off time at 20 µs, and wire feed at 6 mm/min.

4. Multiple response optimization in WEDM on die steel EN-31 has been obtained with the application of Grey relational analysis and it has been found that “While machining die steel on WEDM, input parameter settings of Pulse on time at 70 µs, pulse off time at 20 µs and wire feed at 4 mm/min have given the best results for simultaneous optimization of Metal removal rate and Surface roughness”.

REFERENCES

[1] Ashish Bhateja, Aditya Varma, Ashish Kashyap and Bhupinder Singh “Study the Effect on the Hardness of three Sample Grades of Tool Steel i.e. EN-31, EN8, and D3 after Heat Treatment Processes Such As Annealing, Normalizing, and Hardening & Tempering.”2012
Abstract: The electromagnetic clutch is very important in vehicles and machinery to transmit the power from driving member to driven member by using clutch linkage. Already the electromagnetic clutch exists, but that clutch has number of problems like wear problem, slipping problem and complicated linkages. Hence for avoiding these problems we have designed a new electromagnetic clutch. In this new electromagnetic clutch, the splines are used instead of clutch material (Friction plate & Clutch plate). A clutch axle is provided with the splines on it, which is engaged with the spur gear and in sliding will disengage with spur gear. Here in this electromagnetic clutch, when clutch is actuated, current flows through the electromagnetic coil producing a magnetic field. The rotor portion of clutch becomes magnetized and sets up a magnetic loop that attracts the armature. The armature is pulled next to the rotor and a frictional force is generated. When current is removed from clutch, the armature is free to rotate the shaft, springs hold the armature away from the rotor surface when power is released, hence creating a small air gap. The new electromagnetic clutch which is free from slipping and hence it produces the smooth power, so there is no wear problem occur in newly generated electromagnetic clutch. In this electromagnetic clutch less number of linkages have used and takes less space in the vehicles.

Keywords—component, Electromagnetic, Clutch, Transformer

I. INTRODUCTION

Electromagnetic clutches operate electrically but transmit torque mechanically. This is why they used to be referred to as electro-mechanical clutches. Over the years, EM became known as electromagnetic versus electro-mechanical, referring more about their actuation method versus physical operation. Since the clutches started becoming popular over 60 years ago, the variety of applications and clutch designs has increased dramatically, but the basic operation remains the same today. Single-face clutches make up approximately 90% of all electromagnetic clutch sales.

Electromagnetic clutches are most suitable for remote operation since no mechanical linkages are required to control their engagement, providing fast, smooth operation. However, because the activation energy dissipates as heat in the electromagnetic actuator when the clutch is engaged, there is a risk of overheating. Consequently, the maximum operating temperature of the clutch is limited by the temperature rating of the insulation of the electromagnet. This is a major limitation. Another disadvantage is higher initial cost.

II. COMPONENTS OF ELECTROMAGNETIC CLUTCH

A. THE TRANSFORMER:

When mutual induction exists between two coils or windings, a change in current through one induces a voltage in the other. Devices which make use of this principle are called transformer. Every transformer has a primary winding and one or more secondary windings. The primary winding receives electrical energy from a power source and couples this energy to the secondary winding by means of a changing magnetic field.

B. DIODE BRIDGE:

A diode bridge is an electronic circuit that provides the same polarity of output voltage and current for both possible polarities of input power. When used in its most common
application, for conversion of alternating current (AC) input power into direct current (DC) output power, it is known as a bridge rectifier.

C. MOTOR:
Most electric motors work by electromagnetism, but motors based on other electromechanical phenomena, such as electrostatic forces and the piezoelectric effect, also exist. The fundamental principle upon which electromagnetic motors are based is that there is a mechanical force on any current-carrying wire contained within a magnetic field. The force is described by the Lorentz force law and is perpendicular to both the wire and the magnetic field. Most magnetic motors are rotary, but linear motors also exist. In a rotary motor, the rotating part (usually on the inside) is called the rotor, and the stationary part is called the stator. The rotor rotates because the wires and magnetic field are arranged so that a torque is developed about the rotor's axis. The motor contains electromagnets that are wound on a frame. Though this frame is often called the armature, that term is often erroneously applied. Correctly, the armature is that part of the motor across which the input voltage is supplied. Depending upon the design of the machine, either the rotor or the stator can serve as the armature.

D. PEDAL:
The pedal is the device that is used to run the wheel. It engages and disengages the clutch and thus it will help in rotating the wheel whenever required. When we press the pedal the clutch engages and the wheel stops and when we unpress the pedal, the clutch disengages and the wheel starts rotating. This will reduce the wear and tear in the clutch which is main necessity in today’s automobiles.

III. WORKING OF EMC
Electromagnetic clutches operate electrically but transmit torque mechanically. Engineers once referred to them as electromechanical clutches. Over the years EM came to stand for electromagnetic, referring to the way the units actuate, but their basic operation has not changed.

A. ENGAGEMENT:
When the clutch is actuated, current flows through the electromagnet producing a magnetic field. The rotor portion of the clutch becomes magnetized and sets up a magnetic loop that attracts the armature. The armature is pulled against the rotor and a frictional force is generated at contact. Within a relatively short time, the load is accelerated to match the speed of the rotor, thereby engaging the armature and the output hub of the clutch. In most instances, the rotor is constantly rotating with the input all the time.

B. DISENGAGEMENT:
When current is removed from the clutch, the armature is free to turn with the shaft. In most designs, springs hold the armature away from the rotor surface when power is released, creating a small air gap. Electromagnetic clutches and brakes come in many forms, including tooth, multiple disc, hysteresis, and magnetic particle. However, the most widely used version is the single-face design. Both EM clutches and brakes share basic structural components: a coil in a shell, also referred to as a field; a hub; and an armature. A clutch also has a rotor, which connects to the moving part of the machine, such as a driveshaft.

The coil shell is usually carbon steel, which combines strength with magnetic properties. Copper wire forms the coil, although sometimes aluminum is used. A bobbin or epoxy adhesive holds the coil in the shell. Activating the unit's electric circuit energizes the coil. The current running through the coil generates a magnetic field. When magnetic flux overcomes the air gap between the armature and field, magnetic attraction pulls the armature into contact with the rotor. Magnetic and friction forces accelerate the armature and hub to match rotor speed. The rotor and armature slip past each other for the first 0.02 to 1.0 sec until the input and output speeds are the same. The matching of speeds is sometimes called 100% lockup. Brakes lack a rotor, so magnetic flux acts directly between the armature and field. The field usually bolts to the machine frame or on a torque arm that handles brake torque. When the armature contacts the field, braking torque transfers into the field housing and machine frame, decelerating the load. As in a clutch, speed can change quickly.

As the electricity of 220V is supplied to the circuit there is step down transformer which converts the 220V to 12 V AC. There is a diode bridge of the resistors which converts the 12V AC into 12V DC supply. There is a
electromagnet which is connected to motor which works according to the pedal. The pedal will rotate or stop the wheel whenever required. This is how the Electromagnetic Clutch Works.

IV. ADVANTAGES

- No linkage is required to operate the clutch. So it can be installed at any remote location.
- It can be used to achieve automatic transmission.
- Easy to operate.
- Less wear and tear at contact point.

V. CO₂-REDUCTION BY APPLYING A CONVENTIONAL ELECTROMAGNETIC CLUTCH

By applying a conventional magnetic clutch, the compressor can be disconnected from the belt drive when the air conditioning is switched off, which reduces power losses and CO₂-emission.

However, CO₂-emission increases with the air conditioning activated because of the additional electric power demand of the electromagnetic coil. This power demand was assumed to be 40 W in the simulation. A typical alternator map was used in the model to determine the resulting additional driving power.

This could be used for remote applications as they do not need linkages to actuate the clutch. They are used in printing machinery, conveyor drive and copier machine and factory automation. In an automobile, it replaces clutch pedals with a switch button. A small EM clutch is used to drive the air conditioning system.

VI. APPLICATIONS

This type of clutch is used in some lawn mowers, copy machines, and conveyor drives. Other applications include packaging machinery, printing machinery, food processing machinery, and factory automation.

When the electromagnetic clutch is used in automobiles, there may be a clutch release switch inside the gear lever. The driver operates the switch by holding the gear lever to change the gear, thus cutting off current to the electromagnet and disengaging the clutch. With this mechanism, there is no need to depress the clutch pedal. Alternatively, the switch may be replaced by a touch sensor or proximity sensor which senses the presence of the hand near the lever and cuts off the current. The advantages of using this type of clutch for automobiles are that complicated linkages are not required to actuate the clutch, and the driver needs to apply a considerably reduced force to operate the clutch. It is a type of semi-automatic transmission.

Electromagnetic clutches are also often found in AWD systems, and are used to vary the amount of power sent to individual wheels or axles. A smaller electromagnetic clutch connects the air conditioning compressor to a pulley driven by the crankshaft, allowing the compressor to cycle on only when needed.

REFERENCES


Design and Development of a Self Balancing Electric Vehicle

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Abstract— The ‘Single wheel hover board’ is an electric vehicle running on single wheel. The vehicle is powered by battery source. The motor is in skew with the shaft of the wheel with the help of chain drive. The control of the motor direction is the posture of person driving it.

Keywords— Hoverboard, electric vehicle

I. INTRODUCTION

A device that would allow a person to move slowly and smoothly without performing walking movements with their legs and/or feet. It is a hover board the raw material is easily available in local market as well as other recycled and reused material. we took a 200-250w motor and the electronic so the motor will be able to perform correctly.

The next stage to make an axle, using the lathe, where we put the two cycle tyres. then we placed the electronic parts the motor and the wheel on a metal frame and the hover board started getting shape. We used chain drive to connect the wheels to the motor and that’s how we find the movement using electricity. Than we put the metal sheet on the board in order to be able to stand on.

I initially believed that it would be easy to achieve the balance without using the gyroscopic sensor. so we have placed a small wheel behind wheels in the centre and balanced was achieved.

II. LITERATURE SURVEY

There are several type of problems coming in the hover board.

- Loose Cables

Whether the cables themselves are loose or their connections are bad, you need to reconnect them. Start by unscrewing the bottom of the board, then remove the lower part of the body.

- Wheel Motors

Fixing this problem requires buying a new motor for These are tiny little devices that wire from the motherboard feed into the wheels. The red light will blink four times for the motherboard side, and five times for the battery side. The bad wheel, then replacing it disconnecting the old motor and reattaching the new one. They come pre-assembled, making this an easy project.

- Faulty Battery

Every battery goes bad eventually, including the ones inside of a hoverboard. When yours finally kicks the bucket, all you need to do is purchase a new one and replace it.

III. DESCRIPTION OF THE FINAL DESIGN

This section explains in detail the chosen design concept, including geometry, material and component selection, and cost analysis.

A. DESIGN DETAILS

This section describes each component’s geometry and material selection. The design consists of a platform for the user to stand on with two switches near the toes to control movement. Attached to the underside of the platform are the batteries, motors, wheels, and all necessary wiring.

B. PLATFORM DETAILS

Seeing as the device would use four wheels in total, it made sense for the platform to be rectangular. The chosen dimensions were 90x25cm. width allowed for comfortable feet
placement on the platform, with the user placing their heels together and pointing their feet slightly outward. The 25cm length allowed for more room on the underside of the platform for electrical and other structural components. As for the material, simple plywood was selected due to its high strength and resistance to cracking and bending. Its light weight was also a positive factor as it helped exert a lower load on the wheels.

**C. MOTOR**

Install the motor on the frame, and it is the main source of the power with is to drive the vehicle. there is the one motor is driven by the separate 12v of the battery.

**D. BATTERY**

A dry cell uses a paste electrolyte with only enough moisture to allow current to flow. Unlike a wet cell, a dry cell can operate in any orientation without spilling, as it contains no free liquid, making it suitable for portable equipment. By comparison, the first wet cells were typically fragile glass containers with lead rods hanging from the open top and needed careful handling to avoid spillage.

**E. CHAIN DRIVE/SPROCKET**

Sprockets are used in chain drives to convert power through the chain. Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc.

Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel. Early automobiles were also largely driven by sprocket and chain mechanism, a practice largely copied from bicycles.

**IV. CONCLUSION & FUTURE SCOPE**

The project began with exploring ideas for the design inspired by similar devices in the market. was chosen Ultimately, a rectangular platform with one motor-powered wheels and one casters.
Parts were purchased and connected, and the device was built and tested. During testing, it was found that the device did not perform as well as expected. A motor would frequently stall and cause me to become immobile or move in a jittery fashion, which was not desired.

The future scope of the hover boards are they are made the both the positive and negative impression since they were introduced in there market. While there have been the great benefits for the several peoples, others have experienced the shortfall in there safety design.

REFERENCES


Critical Study of Electric Car Design Parameters

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Abstract—This article is about battery electric cars. For the more general category of electric drive for all type of vehicles, see electric vehicle. For cars with electric motors and internal combustion engines, see plug-in hybrid electric vehicle. For fuel cell cars, see fuel cell vehicle.

Keywords—Electric vehicle, electric Car

I. INTRODUCTION

An electric car (also battery electric car or all-electric car) is a plug-in electric automobile that is propelled by one or more electric motors, using energy typically stored in rechargeable batteries.

Since 2008, a renaissance in electric vehicle manufacturing occurred due to advances in batteries, concerns about increasing oil prices, and the desire to reduce greenhouse gas emissions. Several national and local governments have established tax credits, subsidies, and other incentives to promote the introduction and adoption in the mass market of new electric vehicles, often depending on battery size, their electric range and purchase price. The current maximum tax credit allowed by the US Government is US$7,500 per car. Compared with internal combustion engine vehicles, electric cars are quieter and have no tailpipe emissions, and, often lower emissions in general.

Charging an electric car can be done at a variety of charging stations, these charging stations can be installed in both houses and public areas. The two all-time best selling electric cars, the Nissan Leaf and the Tesla Model S, have EPA-rated ranges reaching up to 151 mi (243 km) and 335 mi (539 km) respectively. As of December 2018, the Leaf is the best-selling highway-capable electric car ever with more than 380,000 units sold globally, followed by the Tesla Model S with 263,500 units sold worldwide. As of December 2018, there were about 5.3 million light-duty all-electric and plug-in hybrid vehicles in use around the world. Despite the rapid growth experienced, the global stock of plug-in electric cars represented just about 1 out of every 250 vehicles (0.40%) on the world's roads by the end of 2018. The plug-in car market is shifting towards fully electric battery vehicles, as the global ratio between annual sales of battery BEVs and PHEVs went from 56:44 in 2012, to 60:40 in 2015, and rose to 69:31 in 2018.

II. TERMINOLOGY

Electric cars are a variety of electric vehicle (EV). The term "electric vehicle" refers to any vehicle that uses electric motors for propulsion, while "electric car" generally refers to highway-capable automobiles powered by electricity. Low-speed electric vehicles, classified as neighborhood electric vehicles (NEVs) in the United States, and as electric motorized quadricycles in Europe, are plug-in electric-powered microcars or city cars with limitations in terms of weight, power and maximum speed that are allowed to travel on public roads and city streets up to a certain posted speed limit, which varies by country.

While an electric car's power source is not explicitly an on-board battery, electric cars with motors powered by other energy sources are typically referred to by a different name. An electric car carrying solar panels to power it is a solar car, and an electric car powered by a gasoline generator is a form of hybrid car. Thus, an electric car that derives its power from an on-board battery pack is a form of battery electric vehicle (BEV). Most often, the term "electric car" is used to refer to battery electric vehicles, but
may also refer to plug-in hybrid electric vehicles (PHEV).

III. ENVIRONMENTAL ASPECTS.

Electric cars have several benefits over conventional internal combustion engine automobiles, including a significant reduction of local air pollution, as they do not directly emit pollutants such as particulates (soot), volatile organic compounds, hydrocarbons, carbon monoxide, ozone, lead, and various oxides of nitrogen.

Depending on the production process and the source of the electricity to charge the vehicle, emissions may be partly shifted from cities to the material transportation, production plants and generation plants. The amount of carbon dioxide emitted depends on the emissions of the electricity source, and the efficiency of the vehicle. For electricity from the grid, the emissions vary significantly depending on your region, the availability of renewable sources and the efficiency of the fossil fuel-based generation used.

The same is true of ICE vehicles. The sourcing of fossil fuels (oil well to tank) causes further damage and use of resources during the extraction and refinement processes, including high amounts of electricity.

In December 2014, Nissan announced that Leaf owners have accumulated together 1 billion kilometers (620 million miles) driven. This translates into saving 180 million kilograms of CO2 emissions by driving an electric car in comparison to travelling with a gasoline-powered car. In December 2016, Nissan reported that Leaf owners worldwide achieved the milestone of 3 billion kilometers (1.9 billion miles) driven collectively through November 2016.

REFERENCES


Modified Bullock Cart

Abstract— Bullock and bullock cart plays an important role in every farm based activity since long history. With the advent of technology, the farming methods and equipment’s used changed drastically. It is evident that, there is no significant development and modifications carried and incorporated in the animal driven cart used for agricultural activities. There are few researchers who have contributed in the developmental aspects of the cart. This paper is a review of research work carried by various researchers in this area. The paper will give insight to basics of design of a bullock cart and the summary of research work done up till so that further research may be outlined. A primary solution to the problems presented in various research papers are proposed as a conclusion of this paper.

Keywords—bullock cart, Agriculture

I. INTRODUCTION

Considering, the present scenario of oil crisis and inflation ratio, its need of time to go for alternative sources of energy in every field. Though there is huge availability of technology in the field of agriculture machinery and transportation, but it all works with the help of oil and petroleum products; while taking into considerations of petroleum products current situation, global condition of oil. The prices are hiking and storages are limited; the advance country like America just has its sources lasting up to next 40 years. Therefore, alternative sources such as nuclear, tidal power, solar, wind etc. sources come into picture. But the resources are beneficial in the field of thermal engineering. What about the field of transportation? It becomes very difficult to implement these sources for transportation purpose. By considering all these reasons, it is necessary to built up some different arrangement for ruler transportation as there is a need to improve the existing one. To build up the new one it need an extra effort but it takes a little effort to improve the existing one and it can be more efficient. The country like India where the world’s largest animal resource is available and from old times it is being used for transportation in ruler areas with the help of animal driven vehicles i.e. ADVs will be the best solutions for future transportation in ruler areas. In India, though it is developing country in terms of technology, still 15 million ADVs are being used. Out of which 13 million is being driven by oxen. But the present bullock cart is suffered from various drawbacks or very poor technology is used to build the bullock cart and its efficiency is also less. If the technology is improvised and is utilized to improvise the existing bullock cart, it will definitely helpful for the farmers and it is also beneficial to solve the ruler transportation problem. This is an attempt made to collect all available research papers and combine review is made available to the researchers over the bullock cart from last 40 years for their support to extend their research in this field.

II. A STUDY ON BULLOCK CARTS
EXPERIMENTAL STUDY OF FORCES IN BULLOCK CART

M.R. Raghavan et.al.used the strain gauge load cell with separate bridge to measure the neck load and bending moment in the cart. Also the pull generated in the cart. The comparative study is. conducted in between the cart with steel rimmed wooden wheels and pneumatic wheeled cart on different road conditions such as tar road, grassy terrain and mud road.

It is found that the bullock pulls the cart discontinuously at the low velocities at which the cart normally operates.

On the grassy terrain it is found that the mean of friction between road surface and the steel rimmed wheels’ more than the pneumatic wheel cart. The dynamic friction resistance of steel rimmed wooden cart is lower than pneumatic tire wheel as long as the steel rimmed wheel does not dig of sink into the terrain. The ground induces low amplitude high loads content in the neck load is lower in pneumatic wheel cart.
III. VALUE ENGINEERING OF THE OX CART A PROJECT TOWARDS THE GOAL OF WORLD HAPPINESS

S.S. Venkatramanan in this paper gives the detailed about the bullock carts features, potentials and the limitations; along with that suggested the various impacts of bullock cart structure on environments and life on the bullock.

IV. IMPROVING OX YOKE WITH LIMITED MATERIAL TOOLS AND RESOURCES

David Kramer in this tech guide the author describes the various types of yoke. He has concluded the comparative study on the basic differences between ox design in North America and Africa. article offers some feasible suggestions for improving yoke design, and constructions techniques for improving the power transmission without hampering the life of ox.

V. NECK YOKE DESIGN AND FIT IDEAS FROM DROPPING HITCH POINT TRADITIONS

Richard Rosenberg in this tech guide analyzed the several factors that should guide the impact of hitch point depression. The important factors under considerations are:

- Neck width
- Tasks offering the spacing of team
- The impact of depth of hitch point
- Equality of team

The analysis of yoke and the impact of stated point on the yoke design is considered and studied, also the of planned placement of bow holes and staple, and its thickness and length of the yoke beam on animal anatomy and power transferred is also studied. For the better and comfort power transmission, increasing the area of contact between neck surface and yoke rod, the design of yoke is modified in semieliptical curved shape by dropping hitch point. This leads to better results.

VI. DESIGN REFORMATIONS AND PERFORMANCE EVALUATION

M.K. Ghosh et.al.in this paper focused on the study of the destruction caused by the bullock cart on the road. The effort has been made to reduce the deterioration of road condition by improving the cart; also the cart is equipped with the braking system (rubber liner brakes). The various experiments are carried out to determine the impact of carious loading conditions of cart on the brake lining, i.e. to study the wear pattern of rubber lining at different payloads. The evaluation of work performance of modified cart with the existing cart is also carried out and the conclusion is drawn that work done is quite satisfactory.

VII. CONCLUSIONS AND FUTURE SCOPE

The structure of cart, its design and optimization has been the focus of previous work. The review of some of the previously conducted work related to cart structure design, and optimization using software’s and its impact on the bullocks is surveyed. It is found that the work is done to predict the loop holes such as the function ability of the cart, its efficiency, and the improvement. So that the efficiency can be increased; and the life of cart can be enhanced. This study makes the case for further investigation on design of the cart by using different concept and software.

The future scope must focus on life-cycle study and test to access the reliability and longevity of the cart. In addition, the cart modelled structure can be improved with the help of Software’s and validated with the help of experimental results to correctly predict the design modifications and induced stresses. Additional efforts are needed to reduce the bullock drudgery and enhancement of their life without hampering their efficiency and improve the overall efficiency of cart.

REFERENCES

Treadmill Bicycle

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Abstract—This paper deals with conversion of a conventional bicycle into treadmill bicycle. In this bicycle the frame of the bicycle is completely modified and the treadmill is placed in between the two wheels, on which user will walk. As the user walks or runs on the treadmill the belt moves to the rear. At the rear roller RPM Sensor is attached to the roller from where Sensor will sense the speed of the roller and accordingly it will send signal to motor. The motion of motor is transmitted to the front wheel by which we can get the motion of wheel and bicycle runs.

Keywords—Arduino, BLDC Motor, Chassis Controller, Hall Effect RPM Sensor, Battery, Treadmill.

I. INTRODUCTION

Problem Statement: While working out in gym people use treadmill for jogging and running. The main disadvantage of this treadmill is, it is stationary at particular place so sometimes people get bored by jogging at same place without any exposure to natural atmosphere. For travelling over short distances people often use a commercial vehicle which causes pollution and unnecessary wastage of fuel. So, we came to a solution for this type of problem by providing wheels to the treadmill and the concept is termed as walking bicycle.

II. OBJECTIVES:

The treadmill bicycle is a totally new way of moving. With the electric assist it takes less effort to walk then “a walk in the park”. It is the combination of the DC motor, Hall Effect Sensor and amplifier boosting your walking pace up to the higher speed. Increased use of fuel has resulted in increase of pollution and degradation of natural resources. With increasing population and their need, it has become necessary to control the use of fuel and decrease the pollution; so as to make it avail it’s important to our coming generation. Due to heavy busy schedule people are not able to give attention to their health and physical fitness. As it uses no fuel so it saves energy simultaneously it can be used as treadmill and Bicycle. No need to use it as conventional treadmill in closed room; you can roam on roads also.

III. WORKING:

When we walk or run on the walking surface it gives rotation to rear wheel of bicycle and treadmill bicycle is moving forward. The walking surface of a treadmill consists of the thin moving belt and a rigid plate placed between the two surfaces of that belt in order to provide backing when the transverse load of footfalls is applied. The original and unmodified treadmill used a sheet of 0.75 inches pressed particle board as a support plate. This was attached to the frame of the treadmill at four points with wood screws placed near the four corners of the sheet. While resting on the rails in a lowered position, the plate received vertical support from small metal risers at the mounting points and from two rubber pads placed under the longest edge of the surface midway between the hard mounting points. According to the manual provided with the treadmill, the design intent behind this flexible
multi-point mounting system was to reduce the overall stiffness of the plate by providing less support than that provided by direct attachment to two solid rails. In actual practice, the thickness and stiffness of the particle board surface were more than required to remove all discernable deflection from the system. Users were unable to distinguish the difference in stiffness when additional aluminum supports were inserted between the sheet and the rails, in order to remove the compliant effect of the rubber supports. We concluded that modifications would be necessary to achieve an ideally compliant walking surface capable of reducing the impact forces related with walking and running. Additionally, the bottom face of the particle board sheet held two outwardly angled metal brackets. These were oriented such that the belt would slide over them consecutively when the system was active. This had the effect of automatically maintaining alignment of the belt by forming a restoring force in the event which will be belt traveled away from a centered position on its rollers. When we start using the treadmill then the rear wheel starts moving and hence the flywheel gets momentum. So once the flywheel gets momentum the bicycle will keep moving due the moment gained by flywheel. Also, we have coupled a dynamo with the rear wheel using gear arrangement. So whenever the treadmill is in use the dynamo will generate power which can be stored in a battery.

**V. METHODOLOGY**

We are using DFM for our paper. Design for manufacturability also known as design for manufacturing. DFM is the general engineering art of designing products in such a way that they are easy to manufacture. The concept exists in almost all engineering fields. Depending on the manufacturing technology the application differs widely. DFM describes the process of designing a product for facilitating the manufacturing process and reducing its manufacturing costs. In DFM, the potential problems are fixed in the design phase which is the least expensive place to address them. Other factors which may affect the manufacturability are: type of raw material, the form of the raw material, dimensional tolerances, and secondary processing such as finishing.

**V. DESIGNED AND STANDARD COMPONENTS**

**A. Designed Components:**

Chassis Fork Axle of Bicycle Axle of Treadmill Bicycle Handle Treadmill Roller Treadmill Side-Frame

**Standard Components** Brake Belt Bearing Electric Motor Wheel

![Fig 3 Cad model of Treadmill bicycle](image)

**B. CAD Model**

We designed each component on CAD Software (CATIA V5) and then assembling these components. Thus we designed Treadmill Bicycle on CAD Software.

**VI. CONCLUSION**

- **Exercise:** Treadmill bicycle helps in maintaining proper physique. Physical fitness is of utmost importance in day to day life. People often get bored while exercising in a closed room such as gym. By using treadmill bicycle one can exercise outdoors in fresh air.

- **Fuel saving:** People often use vehicle for travelling over short distance. This causes unnecessary wastage of fuel. Due to use of treadmill bicycle over short distance a large amount of fuel can be saved.

- **Travelling:** Treadmill bicycle can be used for travelling over short distances. One can also exercise while travelling over short distance.

- **Eco-friendly:** Treadmill bicycle does not require any fuel. Therefore, it does not emit any pollutants. So it is an eco-friendly vehicle.
REFERENCES


Comparison of Light Induced Imperfection in A-Se70 Te28 Zn2 and A- Se96 Bi4 Chalcogenide Thinfilm

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Abstract—The present work reports observation of exposure of light in thin films of Se_{70} Te_{28} Zn_{2} & Se_{96} Bi_{4} samples. Amorphous materials have been produced by evaporation method. White light is incident on amorphous materials which are having the intensity of 990 lux. Time of incident light is changed from 0 to 5 hours. The localized state density is determined by method of SCLC, dark as well as presence of light. The localized states density rise with the rise in time of light in Se_{70} Te_{28} Zn_{2} thin film as well as Se_{96} Bi_{4} glassy alloy. The results indicate that thin-film sample Se_{70} Te_{28} Zn_{2} have density of defect states higher than Se_{96} Bi_{4} samples

Keywords— Chalcogenide, Amorphous

I. INTRODUCTION

Chalcogenide glasses are found to have electrical switching where resistance changes from tera ohms to a few ohms at a particular voltage called threshold voltage. Some of these glasses also show memory switching where high resistance state comes back only after applying a high current pulse. Memory switching has found application in computer memories. S.R. Ovshinsky at energy conversion Devices Inc, U.S.A., has developed a 1024 bit computer memory using chalcogenide glasses. These are commercially produced and are successfully used in computers. Since threshold voltage depends upon temperature, the use of chalcogenide glasses in thermal switch is also suggested. Due to high current capacity, such switches can be used in automobile engines and large power machines where temperature control is needed. Only after the observation of electrical switching, these glasses were studied more thoroughly.

Amorphous materials have varied betrayal and technical continuation in holography, optical memories, micro lenses, optical devices, optoelectronic devices, bio, such as photographs doping, arrangement guides, chemical-sensors, electrolytes. Chalcogenide materials are translucent to infrared light are having telecom wavelength 0.131 & 0.154 micrometer meter [1]. In the process of doping, rare earth can be doped. It keeps high non-ohmic intrinsic characteristics [2-5]. Chalcogenide glasses have special qualities and their skill to go through structural changes upon illumination with a source of laser [6]. There are some structural characteristics such as light absorption edge and variation of refractive index properties [7 -11].

Associations of different state have been created interest for use of glassy materials in the belt of optics. Future application of photonic switching, lasers devices, photonic booster and acoustic-photonic gadgets [12 - 14]. Glassy materials undergo many foundations of structural changes with the presence of white light. The observations of structural change with the presence of light are composite. It was acknowledged that the number of electrons from defect states in gliding back end influence dozens types of inaccuracies in the glassy substance, lineup [15, 16].

In our previous group [17], we have reported the order faithfulness of opinion of imperfection close to Fermi level in amorphous thin films of Se_{100-x}Bi_{x}. We used SCLC experiment for this purpose. We have also used SCLC technique for comparative study of problem states near Fermi level in thin film as well as in bulk sample of Se_{100-x}Bi_{x} [18]. It is clear that probability of defect states in thin film is grater order in comparison to bulk glassy alloy. This is expected as defect creation, is more in thin films as comparison to bulk glassy samples. This indicates that SCLC is quite sensitive to observe the changes in the lookout of defect states in Glasses. Therefore, we have used the same technique to observe induced inaccuracy in Chalcogenide glasses. The giveaways currency reports the impression of strikes of synopsis on the landscapes of defect states near Fermi level using SCLC measurements in thin films of Se_{96} Bi_{4} [17 ].

II. SAMPLE PREPARATION

Amorphous material of Se_{70} Te_{28} Zn_{2} and Se_{96} Bi_{4} was prepared by Quenching Process. According to atomic percentage, pure materials were weighed. Amorphous materials had been sealed in amouplees. Quartz Ampoules were kept in the furnace during heating, temperature was observed at 1000 °C. Rocking has been done frequently for 12 hours and to makes melts transparent glassy materials. Quenching process has been done by liquid nitrogen. Amorphous nature of material has been checked by X- ray diffraction technique. The unavailability of sharp peaks, confirms the glassy nature of Se_{70} Te_{28} Zn_{2} and Se_{96} Bi_{4} samples.

III. EXPERIMENT

1. Glassy materials Se_{70} Te_{28} Zn_{2} and Se_{96} Bi_{4} were prepared by disappearing section using a standered coating unit. The standard coating unit apparatus consists of a mixture inside which consequence had been done for desired materials.
2. Before depositing thin films of glassy alloys onto the cleaned glass substrates, it is required to type electrical contacts. Indium metal was used for electrical contacts on glass substrates. They were made by thermally evaporating indium metal onto the glass substrate through a suitable ensemble made of molybdenum.

3. During preparation of thin film, the thickness was controlled by thickness monitor. The films grown have thickness of approximate 5000 Å and electrode gap of 0.12 mm.

Direct current voltage (0 volts to 350 Volts) is flow across thin film. Resultant current has been observed by Pico-ammeter. Current-Voltage measurement has been observed. SCLC Measurement has been observed and thin film mounted inside the sample holder.

IV. RESULTS

Current-Voltage measurement has been observed at various temperatures in Se_{70} Te_{28} Zn_{2} and Se_{96} Bi_{4} before and after strikes of light. At low electric field (fields <10^3 Volt/cm), an ohmic properties has measured in all the glassy film where plots of I vs. V, found to be the straight line. In whatever way, at high fields (~10^4 Volt/cm), a super-ohmic properties is measured at various temperature.

Using the theory of SCLC, If n_o is thermally generated charge carriers, mobility is μ, d is electrode spacing, A is the cross section of thin films.

The current I can be written as:

\[ I = (2 Ae \mu V n_o/d) \exp (VS) \]  

The slope S is given by:

\[ S = 2 \epsilon_o \epsilon_r / k e T g_o d^2 \]  

According to given equation

The curves of log I / V vs V are in linear form. When temperature increases, slope decreases.

![Graph](image1)

Fig.1. Graph shows after exposure of light for 1 hour

In this case, the graph of log ( I / V ) vs V curves are linear and shown in figs 1-2 & 3. Similar observations are obtained for other sample also.

![Graph](image2)

Fig.2. Graph shows after exposure of light for 3 hours

![Graph](image3)

Fig.3. Graph shows after exposure of light for 5 hours

![Graph](image4)

Fig.4. Graph shows slope vs inversion temperature after exposure of light for 1 hour

![Graph](image5)

Fig.5. Graph shows slope vs inversion temperature with presence of light for 3 hours
In this case, when we plot slope versus inversion temperature then DOS can be calculated. Here, we have taken the value of dielectric constant \( \varepsilon_r \) is equal to 10 which is for amorphous Se alloy. The comparisons of DOS has been given in above table. The DOS increases with exposure of time in Se\(_{70}\) Te\(_{28}\) Zn\(_2\) and Se\(_{96}\) Bi\(_4\) sample (shown in fig. 6 and fig.7). It is clear from this table that the DOS are higher in Se\(_{70}\) Te\(_{28}\) Zn\(_2\) then Se\(_{96}\) Bi\(_4\) sample.

**REFERENCES**

**Fuzzy Set Theory Apply on Data Mining Techniques**

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**Abstract** — Soft computing methodologies (involving fuzzy sets, neural networks, genetic algorithms, and rough sets) are emerged as an alternative to traditional techniques and provide, in one form or another, flexible information processing capabilities for handling real life problems. Fuzzy and Rough set theory are two theories complement each other and as such constitute important components of soft computing. In this paper, we discussed the fuzzy and rough set theory based techniques. Some challenges to decision tree a data mining technique are studied and the application of soft computing methodologies in developing decision trees is indicated. An extensive bibliography of the related research is also included in the paper. Here, in this paper, short notes are given for various decision tree algorithms from 1960 to 2011.

**Keyword** — Fuzzy set, Rough set, Tree, CART, FDF and SLIQ.

I. INTRODUCTION

The digital revolution has made digitized information easy to capture and fairly inexpensive to store. With the development of computer hardware and software and the rapid computerization of business, huge amount of data have been collected and stored in databases. The rate at which such data is stored is growing at a phenomenal rate. As a result, traditional ad hoc mixtures of statistical techniques and data management tools are no longer adequate for analyzing this vast collection of data. Soft computing methodologies (involving fuzzy sets, neural networks, genetic algorithms, and rough sets) are emerged as an alternative to traditional techniques and provide, in one form or another, flexible information processing capabilities for handling real life problems. Its aim is to exploit the tolerance for imprecision, uncertainty, approximate reasoning and partial truth in order to achieve tractability, robustness, low solution cost, and close resemblance with human like decision-making. In this paper, we discussed the fuzzy and rough set theory based techniques.

The two theories complement each other and as such constitute important components of soft computing. Researchers have explored a variety of different ways in which these two theories interact with each other. The origins of both theories were essentially logical. Generally fuzzy sets are suitable for handling the issues related to understand ability of patterns, incomplete/noisy data, mixed media information and human interaction, and can provide approximate solutions faster. Rough sets are suitable for handling different types of uncertainty in data. We provide a survey of various techniques based on these two theories. Few examples of hybridization of fuzzy and rough sets in soft computing are also studied in paper.

In this paper, Some challenges to decision tree a data mining technique are studied and the application of soft computing methodologies in developing decision tree is indicated. An extensive bibliography of the related research is also included in the paper. In next sections, short notes are given for various decision tree algorithms from 1960 to 2011. Survey done in this paper is completely theoretical and based on relative improvement from time to time and ability to handle different type of data, missing values, noise and accuracy with the help of fuzzy and rough set theory.

II. FUZZY AND ROUGH SET THEORY

Fuzzy sets are sets whose elements have degrees of membership. Fuzzy sets were introduced simultaneously by L. A. Zadeh and Dieter Klaua in 1965 as an extension of the classical notion of set. In classical set theory, the membership of elements in a set is assessed in binary terms according to a bivalent condition — an element either belongs or does not belong to the set. By contrast, fuzzy set theory permits the gradual assessment of the membership of elements in a set; this is described with the aid of a membership function valued in the real unit interval [0, 1] (Zadeh, 1965). Fuzzy sets generalize classical sets, since the indicator functions of classical sets are special cases of the membership functions of fuzzy sets, if the latter only take values 0 or 1. The fuzzy set theory can be used in a wide range of domains in which information is incomplete or imprecise.
Rough set theory, proposed by Z. Pawlak in 1982, is an important tool to deal with uncertainty, imprecise and fuzzy information, and has many successful applications in machine learning, data mining, artificial intelligence and other areas. When it was proposed, many scientists began to research it theoretically, and had created the mathematical model and logical one of it, and also incorporated it with other theories, such as topology, logic, fuzzy set. The main idea of it is to get the decision rule from the attribute reduct and knowledge reduct without loss of knowledge (Pawlak, 1982).

In rough set theory, knowledge is thought of as an ability to classify the objects. The classical theory is based on indiscernibility relation, and gets the ability in the set calculus by the lower approximation operator and upper one, which is also called the algebraic method of rough set. While another is in view of constructive method, including element based definition, granule-based definition and subsystem-based definition. At present, the research of rough set theory is mainly in two aspects: one is to extend the classical theory according to the actual acquirements in reality, such as to extend the indiscernibility relation to similarity relation, tolerance relation. The other is the fusion of rough set theory and other theories, such as the unification of rough set theory and formal concept analysis.

III. DECISION TREE ALGORITHMS

Decision tree algorithm is a data mining induction technique that recursively partitions a data set into different classes. A decision tree structure is made of root, internal and leaf nodes. The main objectives of decision tree classifiers are to classify correctly as much of the training samples as possible and to give a generalized model so that unseen samples from the test dataset could be classified with high accuracy rate as possible. Another objective is to make decision trees which are easy to update as more training sample becomes available and have a simple structure as possible.

ID3 (Iterative Dichotomiser 3), a basic decision tree algorithm, was introduced in 1986 by Quinlan Ross (Quinlan, 1986 and 1987). It is based on Hunt’s algorithm and uses information theory invented by Shannon in 1948. It builds the tree from the top down approach with no backtracking and serially implemented. In ID3 algorithm, the classification tree is constructed in two phases: tree growing and tree pruning. The ID3 algorithm is run recursively on the non-leaf branches until all dataset is classified. Data is sorted at every node during the tree building phase in-order to select the best splitting single attribute. ID3 uses information gain measure to select the most useful attribute for classification. The selected attribute yields the largest information gain for the decision node. It only accepts categorical attributes in building a tree model. The performance of ID3 is affected by the presence of noise in the training dataset. But it builds a short and fast classification tree. C4.5 (Ross Quilan) is basically an extension of ID3.

Steps to generate a basic decision tree model
2. If all the samples in the dataset ‘X’ belongs to same class ‘C’ then
   Mark ‘N’ as leaf node with label ‘C’
   Otherwise
   select best attribute from the set of attributes ‘D’ with best split criterion value and set D=D-[best attribute]
3. If best split > user-specified threshold then
   label the node ‘N’ with the splitting criterion and create a child
   node for each outcome ‘j’ of splitting criterion and also divide
   the dataset ‘X’ into subsets ‘Xj’ satisfying the outcome ‘j’
4. If all the samples of ‘Xj’ belong to same class ‘C’ replace the node as
   leaf node with label ‘C’.
   Otherwise again select best attribute from the updated set ‘D’ and repeat
   the process as above.
5. Grow the tree as above till stopping criterion met.

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   Otherwise again select best attribute from the updated set ‘D’ and repeat
   the process as above.
5. Grow the tree as above till stopping criterion met.

QUEST (Quick, Unbiased, Efficient, Scalable Induction of decision Tree algorithm) (Shafer et al, 1996) is an enhancement of SLIQ as it can be implemented in both serial and parallel pattern for good data placement and load balancing.
IV. Fuzzy Decision Tree

Fuzzy representation allows decision trees to deal with continuous data and noise in a better way. FID decision tree differs from traditional decision trees in two respects: it uses splitting criteria based on fuzzy restrictions, and its inference procedures are different. The FID algorithm (Janikow, 1998) can handle dataset containing various types of attributes like discrete, nominal, continuous etc. FID decision tree is constructed similarly to the standard decision tree, with a recursive depth-first procedure and different information content formula representing partial membership. Leaf node of FID tree generally has samples of different classes with different degrees of membership. FID2.0, FID3.2, FID4, FID4.1 are some improvement of FID algorithm given by Janikow.

Fuzzy Decision Forest (FDF) (Janikow, 2000), an extension of fuzzy decision tree, builds the tree exactly like FID algorithm. But FDF allows multiple choices of alternative tests in some or all nodes of the decision tree. These alternative tests can be used to enhance the classification accuracy of the tree. Fuzzy Decision Forest can handle noisy, uncertain and missing data effectively without affecting accuracy.

Genetically Optimized Fuzzy Decision Tree (G-DT) (Pedrycz & Sosnowski, 2005) combines the concept of fuzzy logic and genetic optimization in decision trees. This algorithm constructs the decision tree in two steps. In first phase, a decision tree is developed by the help of standard decision tree algorithm like C4.5. After this the tree structure is refined by associating fuzzy concept with individual nodes. The optimization is done within the framework of genetic algorithms.

C-Fuzzy decision tree introduces a concept and design of decision trees based on information granules (Fuzzy clusters). The decision tree for C-Fuzzy DT grows around the fuzzy clusters created by FCM (Fuzzy c-means). These clusters are treated as generic building blocks for the tree. Initially the dataset is divided into clusters so that similar data samples are put together and these clusters are the top nodes of the tree. After that cluster(node) with highest value of heterogeneity criterion is divided further into clusters(nodes). For the C-decision trees, the number of nodes is equal to the number of clusters multiplied by the number of iterations. Here each node is associated by three components: heterogeneity criterion, no. of samples with it and list of these samples with degree of belongingness. This algorithm returns with compact decision trees and also uses all the attributes at a time. An improved version of this algorithm is proposed by Chiu et al. in 2006 by giving reasonable definition of the distance function and constructing local linear model for each leaf node.

A fuzzy supervised learning in Quest (SLIQ) decision tree (FS-DT) algorithm (Chandra & Paul, 2008) modifies the SLIQ decision tree algorithm to construct a fuzzy binary decision tree without converting the quantitative values into fuzzy linguistic terms and produces a tree of significantly reduced size. The entire decision tree is traversed to make an inference for a test sample. The classification accuracy is significantly better in the case of FS-DT compared to that of SLIQ.

V. Rough Set Theory Based Decision Tree

Rough set theory, which is used for processing uncertainty and imprecise information, is proposed by Z. Pawlak in 1982. The main goal of the rough set analysis is induction of approximations of concepts. In 2008, Cuiru et al. proposed an algorithm for decision tree construction based on rough set theory. They proposed a novel and effective algorithm in which knowledge reduction of rough set theory is used to reduce irrelevant information from the decision table. First of all degree of dependency of all condition attribute on decision attribute is determined in this algorithm (Cuiruet al, 2008). The condition attribute which have highest degree of dependency is selected as splitting attribute. In case if there is more than two attribute which have same degree of dependency then - dependability is used to select splitting attribute. They used weather dataset for experimental result and compared this result to the ID3 decision tree algorithm. The decision tree generated consist limited node and produce simple and efficient decision tree.

In 2010, Baowei et al. proposed a new algorithm to construct decision tree. They stress on reducing the size of dataset and to eradicate irrelevant attributes from the dataset to reduce dimensionality. Firstly they reduced irrelevant attribute by the rough set theory then condensed the sample by removing duplicate instance. Subsequently they used the condensed dataset to construct decision tree by ID3 algorithm. It improved greatly the number of attributes, the volume of the training samples, also and the running time. The improved algorithm based on rough set theory is efficient and robust.

Feng Jiang et. al. introduced a novel incremental decision tree algorithm based on
rough set theory (Feng J. et. al., 2011). To improve the computation efficiency of the algorithm, when a new instance arrives, according to the given decision tree adaptation strategies, the algorithm will only modify some existing leaf node in the currently active decision tree or add a new leaf node to the tree, which can avoid the high time complexity of the traditional incremental methods for rebuilding decision trees too many times. Moreover, the rough set based attribute reduction method is used to filter out the redundant attributes from the original set of attributes. And the algorithm adopted the two basic notions of rough sets: significance of attributes and dependency of attributes, as the heuristic information for the selection of splitting attributes.

VI. ROUGH-FUZZY DECISION TREES

Plenty of approaches like Zadeh’s fuzzy set theory and Pawlak’s rough set theory point out the uncertainty problem. Fuzzy rough sets are the generalization of classical rough set theory for modeling uncertainty. These two theories are different but complement and related to each other. Dubois and Prade, are one of the first who investigated the problem of fuzzification of a rough set. In their research, they constructed the lower and upper approximation by means of operators t-norm min and t-conorm max (Dubois & Prade, 1992).

Initially a method FRID based on fuzzy-rough ownership function (Sarkar,2000) for fuzzy decision tree construction is given by Bhatt et al. in 2004. FRID uses fuzzy-rough entropy measure for attribute selection. A fuzzy decision tree algorithm (Jenson and Shen, 2005) is proposed, based on fuzzy ID3, that incorporates the fuzzy-rough dependency function (Jenson and Shen, 2004) as a splitting criterion. It is shown that the fuzzy-rough method performs comparably to fuzzy ID3 for fuzzy datasets, and better than it for crisp data.

FRCT (Fuzzy–Rough Classification Trees) is another algorithm to construct decision trees using fuzzy-rough dependency measure. This measure is a natural extension of dependency degree proposed by Pawlak for crisp environment (Bhatt et. al., 2008). FRCT integrates efficient rule generation technique of fuzzy decision tree and ambiguity handling power of rough sets to construct a novel algorithm based on these soft computing techniques.

REFERENCES


BIOREMEDIATION OF OIL SPILLS

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Abstract— Oil spills as well as their impact upon environment are a source of serious concern for scientists. Such disasters occur regularly, leading to messy challenges that require huge investments of time as well as resources. Oil is extremely complicated but it has two major compounds: alkanes, which are relatively easy for bacteria to break down, and aromatic hydrocarbons, which are much trickier to get rid of. Until now, chemicals have often been used to clean up oil disasters, to break up the oil/water emulsion, making oil more soluble and thus removing it from the surface water. Few bacteria are surprisingly capable of dealing with the more dangerous compounds. This has implications for future oil spills and how we take advantage of the natural environmental response.

Keywords— Oil spills, hydrocarbon compounds, Oleophilic microbes, environmental hazard.

I. INTRODUCTION

Contamination of sea water, as a result of an accident or human error is termed as oil spill. Oil is the most important sources of energy in the world and as it is unevenly distributed, it is transported across the oceans and by pipelines by ships. Thus resulting in severe accidents during transportation, breaking of pipelines, as well as during drilling in the earth’s crust. Only massive and catastrophic spills receive most of the attention, smaller and chronic ones occurs regularly. Such spills not only contaminate the coasts and estuaries but also causes serious health issues to human beings. According to published data from the US Environmental Protection Agency (EPA) approximately seven million liters of such chemicals were used to treat oil pollution in the Gulf of Mexico, resulted from a spill of about 700,000 tons of crude oil into open sea by the offshore drilling of oil in 2010. Some of the commonly used dispersants were Corexit— which was developed after the famous oil spill accident of the Exxon Valdez in Alaska in 1989. However, those chemicals were highly criticized because of their side effects on human beings as well as on the environment. Crude oil is among the major environmental threat. Many industrialized nations confide upon crude oil for various products such as fuel, plastics, and asphalt. Despite the fact that the existing technology extract, refine as well as transport the oil safely all around the world, millions of gallons of oil are fortuitously released into the environment every year. Such unfortunate events pose a risk to human beings as well as the environment, leading to wastage of billions of dollars for restoration and clean up programmes. For example, the incident of Deepwater Horizon oil spill spoiled the Gulf of Mexico in April 2010. The oil rig is just located 42 miles off the coast of Louisiana, which was exploded during a routine drilling operation. Over 200 million gallons of oil was leaked into the ocean for nearly of 87 days. A more recent example of similar spill was observed on January 17th, 2015, where 50,000 gallons of crude oil was leaked through a pipeline in Yellowstone River.

Fig 1. An image of oil spill in open sea

II. BIOREMEDIATION

Oil-degrading bacteria are not a anthropological development. Despite the fact that, they have been in the nature for millions of years. The only thing that is informative is the abundance of oil being leaked in the oceans from various oil disasters. Thus, science has been looking forward for innovative ideas to stimulate natural degradation processes for these oil spills. One target has been - hydrocarbon-degrading bacteria - also-called as marine obligate hydrocarbonoclastic bacteria. They are specialized in degrading hydrocarbons in aquatic ecosystems and are able to break aliphatic hydrocarbons and utilize them as a vital source of energy. These bacteria are found commonly in marine water throughout the world. If they come in contact with the crude oil, then their population increases vigourously. Alcanivorax borkumensis is a marine bacterium, discovered from the island of Borkum is worldwide distributed has the ability to degrade oil spills in marine ecosystems. Although, up until now there had been not enough information regarding the
growth and physiology of these bacteria in relation to hydrocarbons with different chain lengths. As per modern investigations it is found that the bacteria are effective in conversion of alkanes with carbon chain lengths of between 12 and 19 carbon atoms. The cell growth proves that these bacteria not only up take the intermediates of fatty acids into its body but also degrades them. Bioremediation applies the use of specific microbes which can metabolize as well as eradicate harmful substances. It works by increasing the quantity of such naturally occurring microorganisms or by adding pollutant-specific microorganisms in that area. Bioremediation involves utilization of different varieties of microbes which are independent of each other. Either way, the process of bioremediation is ecofriendly to the environment and also economically profitable in comparison to other chemical methods. Different types of bacteria, archaea, algae, and few species of plants are also able to disintegrate specific hazardous waste products into simpler and safer compounds.

Since last 50 years, the people residing in the northern Ecuadorian Amazon have been the targets of various hazardous oil spills and the careless waste management methods of the companies for oil extraction in that region. In between 1972 and 1993, 714 million barrels (or 30 billion gallons) of oil and toxic waste have been leaked into the environment accidentally or purposefully. While none of the individual spills measure up to the infamous spills named above, over the years they have added up to more than 140 times the 2010 BP Deepwater Horizon spill in the Gulf of Mexico. This ‘slow-drip’ means that people of such areas are in high risk contact with oil and there waste products. According to some the short-term case studies carried out on the large-scale oil spills gives us indications as to what might be happening among indigenous peoples of the region. Even though little is known about the health impacts of this relentless contact with oil.
cleaning team had twice as much mercury in their urine in comparison to those who were not involved in any of such efforts for restoration the lagoon in which the oil was spread. Mercury harms the brain as well as the liver. Every time when a pipeline bursts or oil spills, we can expect the impact of this on people in vicinity of areas flooded with mercury, through the water, the fish they eat, and the air they inhale. Several other studies conducted in the Ecuadorian Amazon have also reported such cases of illness (including cancer, skin irritations, etc.) These case studies were not linked specifically to a particular oil spill but include those areas which are at risks in such accidents. Oil spills also deteriorates the air quality. The chemicals found in crude oil are mostly hydrocarbons which contain hazardous chemicals such as toluene, benzenes, poly-aromatic hydrocarbons and oxygenated polycyclic aromatic hydrocarbons. These chemicals adversely affect the health when inhaled into human body. Besides, this these chemicals are oxidized by oxidants present in the atmosphere to form fine particulate matter after which they gets evaporated into the atmosphere. They penetrate into lungs and transfer poisonous chemicals inside the human body. Another toxic source for pollution is soot particles. During the recovery and cleanup process, it generates several air pollutants like nitric oxides and ozone from ships. Ultimately, bubble bursting provides a generation pathway for particulate matter during an oil spill. During the Deepwater Horizon oil spill, significant air quality issues were found on the Gulf Coast, which is the downwind of DWH oil spill. Air quality monitoring data displays those criteria where pollutants had exceeded the health-based standard in the coastal regions. Habitat damage is too obvious with an oil spill. The most visible on areas flooded with crude oil is also ultrasonic devices that can help in detecting leakage spots on the pipe so that they can be repaired before an accident occurs. In Comparison to years before marine vessels and terminals are being designed differently compared, tankers now are being built with double hulls. The storage tanks are being constructed with special materials so as to avoid corrosion. These preventive measures are not only in the oil industry but consumers also play an important role in ensuring those oils and other fuels are out of the environment.

References


[12]. Tidwell, Lane G.; Allan, Sarah E.; O’Connell, Steven G.; Hobbie, Kevin A.; Smith, Brian W.; Anderson, Kim A. (6 January 2015). “Polycyclic Aromatic Hydrocarbon (PAH) and Oxygenated PAH (OPAH) Air–Water Exchange during the Deepwater Horizon Oil Spill”, Environmental

A Novel Approach to Overcome Sample Impoverishment Problem of Particle Filter using Chaotic Crow search algorithm

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Abstract

Generic Particle Filter is extensively used in the area of computer vision for non-Linear and non-Gaussian state estimation. However, Generic Particle Filter suffers from the problem of sample impoverishment and particle degeneracy. Aim of the research paper is to propose a method, using Chaotic Crow Search Algorithm as resampling method to overcome these problems of generic particle filter. The proposed method has been simulated on benchmark 1-D and 2-D state estimation problems. Simulation results of the proposed method are compared with Generic Particle Filter, Particle Filter- Particle Swarm Optimization and Particle Filter-Backtracking Search Optimization. On average of the outcome, we have achieved RMSE value of 2.0214 for 1-D problem and value of 0.0281 for 2-D problem for the proposed method. Results demonstrate that our method not only outperforms other methods but also achieve high accuracy with minimum computational requirement.

Keywords: Particle filter, CCSA, Sample impoverishment, particle degeneracy

1. Introduction

Generic particle filter (GPF) is based on Sequential Monte-Carlo framework. GPF has been widely explored in the fields of science, artificial intelligence, Robot intelligence, military, target detection etc. However, GPF is suffered from two fundamental problems of particle degeneracy and sample impoverishment [1]. Resampling techniques like Sequential resampling, Partial resampling were explored with GPF to address these problems but there is still scope of improvement.

Now a day, meta heuristics optimization techniques are very popular to improve the performance of GPF by catering its problems. These techniques have a fast convergence rate and reach to optimal solution with less computational effort. There are many swarms and evolutionary optimization techniques like PSO (Particle Swarm Optimization) [3], GSA (Gravitational Search Algorithm) [4], BA (Bat Algorithm) [5], FA (Firefly Algorithm) [6], Modified Genetic Algorithm (MGA), Backtracking Search Optimization (BSA) etc. were used with GPF to address its problems.

In [8] PSO was used with GPF to identify the likelihood sample area. Particles were then distributed based on the base points to improve their contribution for state estimation. In [9] FA was used as resampling technique. FA reduced the search area for better estimation by changing the location of the particles. But FA was not able to recover from local minima and hence, lost the target. In [10] Spider Monkey Optimization was proposed also in GPF framework to address its problems. This method
updated the particles position based on local and global leader phase for better state estimation. However, in [11] optimization was applied with particle filter to categorise the particles as male and female to ensure diversity in search space in order to address sample degeneracy. In addition, [12] addressed GPF problems using BA. This technique accumulated the particles in high likelihood region for better state estimation. In [13] MGA was exploited in GPF framework. Crossover and mutation probabilities were calculated based on the degree of particle degeneracy to ensure diversity in the search space. However, such calculations slow the state estimation. In [17], author proposed BSA as optimization in PF framework for state estimation. It had used memory for prediction of next state in the estimation problem. Few literatures are tabulated in Table 1 for better understanding of the topic.

In our work, we have used Chaotic Crow Search Optimization (CCSA) as resampling technique under GPF framework for state estimation in benchmark 1-D and 2-D bearing only problems. CSA is a nature inspired meta-heuristic approach proposed in [7]. CCSA when used as resampling technique in GPF ensures better state estimation by catering its fundamental problems. The rest of the paper is organised as follows:

Section 2 discusses theory and methodology of the proposed method. PF-CCSA is presented in section 3. Approach has been represented diagrammatically. The experimental validation of the proposed work is discussed in Section 4. Results are compared with other state-of-the-art and are tabulated for both 1-D and 2-D benchmark problems. Section 5 concludes the work and sketched the future direction of the work.

Table 1: State-of-the-art work with GPF

<table>
<thead>
<tr>
<th>References</th>
<th>Technique</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jing Zhao and Zhiyuan Li (2010) [8]</td>
<td>Particle Filter based on PSO</td>
<td>Likelihood sample area was identified by PSO for efficient results</td>
</tr>
<tr>
<td>Gao et.al. (2015) [9]</td>
<td>Particle Filter based on FA</td>
<td>Optimize particle number to handle the sample impoverishment</td>
</tr>
<tr>
<td>Rohilla et. al. (2016) [10]</td>
<td>Particle Filter based on Spider monkey</td>
<td>Quality of particles was improved by updating them locally and globally in search space.</td>
</tr>
<tr>
<td>Kaveh Ahmadi and Ezzatollah Salari (2017) [11]</td>
<td>Particle Filter based on Social spider</td>
<td>Particles were partitioned into groups of male and female for better state estimation.</td>
</tr>
<tr>
<td>Gao et. al. (2016) [12]</td>
<td>Particle Filter based on BA</td>
<td>Particles were moved to high likelihood area by Bat algorithm.</td>
</tr>
<tr>
<td>Wang et. al. (2016) [13]</td>
<td>Particle Filter Based on Improved Genetic Algorithm Resampling</td>
<td>Simple resampling and elitist selection were utilized for weight selection of particles.</td>
</tr>
<tr>
<td>Bhateja et. al. (2016) [17]</td>
<td>Particle Filter based on Back Tracking Search Optimization</td>
<td>Memory to store prior generations for better target’s state estimation.</td>
</tr>
</tbody>
</table>

The next section will cover the details about the GPF and the proposed resampling technique. The methodology of the proposed method is also discussed.
2. Theory and Methodology

In this section, we discuss about the required theory behind the particle filter and the proposed resampling technique CCSA.

GPF are based on Monte Carlo simulation and modified Baye’s algorithms. The posterior distribution \( p(X_{1:t} | Z_{1:t}) \) and observation distribution \( p(Z_{1:t}) \) [14] of the particles is considered to provide solution for estimation problems. State vector of the target denoted by \( X_t \in \mathbb{R}^d \) with \( X_{1:t} = \{X_1, ..., X_t\} \) to estimate the posterior distribution and observation vector \( Z_t \in \mathbb{R}^d \) with \( Z_{1:t} = \{Z_1, ..., Z_t\} \) are represented as:

\[
X_t = f_t(X_{t-1}) + M_t \\
Z_t = h_t(X_t) + N_t
\]  

(1)

(2)

Where, \( f_t, h_t : \mathbb{R}^d \times \mathbb{R}^d \rightarrow \mathbb{R}^d \) are system observation functions. \( M_t \) and \( N_t \) are noise sequences. The state positions \( X_t \) of all samples at each time \( t \) based on previous observations \( p(Z_{1:t}) \) is used for constructing the PDF for the stages: prediction stage and update stage [15]. The PDF of the state at time \( t \) considering all the previous observations at this point is given by the equation:

\[
p(X_{1:t} | Z_{1:t}) = \int p(X_t | X_{t-1}) p(X_{t-1} | Z_{1:t-1}) \, dX_{t-1}
\]  

(3)

Where, \( p(X_t | X_{t-1}) \) is the Markov model determined by Eq. (1). This is the prediction state of GPF which is followed by update state. The observation \( Z_t \) at time \( t \) is represented by Baye’s posterior density and is given by the following Eq. (4).

\[
p(X_{1:t} | Z_{1:t}) = \frac{p(X_t | Z_t) p(X_{t-1} | Z_{1:t-1})}{p(Z_t | Z_{1:t-1})}
\]  

(4)

Random weights are assigned to each particle for the estimation process. Particles are sampled according to their posterior probability \( p(X_{1:t} | Z_{1:t}) \). During the estimation process, the particles are moving randomly in the search space. Particles which are far from the high likelihood region are having negligible weight. These particles do not contribute much for the state estimation process and need to be replaced by the particles with better weight to improve their contribution. Resampling technique is used in GPF framework to enhance particle distribution in the high likelihood area. The proposed resampling based on Chaotic Crow Search optimization to overcome GPF shortcomings.

CCSA is a population based Meta Heuristic Optimization technique [7]. It has two factors for ensuring diversity in search space a) Awareness probability b) Flight length. In CCSA based resampling, the particles are considered as crow population \( N \). \( x_{k,t} \) represents the position of \( k \) crow at time \( t \) in the search space. Here, \( k = 1, 2, ..., N \) and \( t = 1, 2, ..., t_{\text{max}} \). At time \( t \), crow \( j \) wants to visit its hidden food store, \( s_{j,t} \) and is followed by crow \( k \). Then, the position of the crow \( k \) in the search space is updated using the Eq. (5).

\[
x_{k,t+1} = \begin{cases} 
x_{k,t} + r_k X f l_{k,t}^{\text{chaos}} X (s_{j,t} - x_{k,t}) & \text{if } r_k \geq AP_{k,t} \\
\text{a random position} & \text{otherwise}
\end{cases}
\]  

(5)

Where, \( f l_{k,t}^{\text{chaos}} \) represents the flight length of crow \( k \) at time \( t \) which is evolved chaotically, \( AP_{k,t} \) denotes the awareness probability of crow \( k \) at time \( t \) and \( r_k \in [0,1] \). The next section will brief about our proposed solution to tackle sample impoverishment.
3. Proposed solution for Sample Impoverishment

CCSA is proposed as resampling technique to solve the GPF problems of particle impoverishment and particle degeneracy. CCSA controls the search space and improve position of the particles in the search space with two parameters: Awareness Probability (AP) and flight length (fl). AP adaptively decreases or increases to control diversification and intensification of the particles in the search space ensure faster convergence. Flight length is evolved chaotically. The approach is discussed below.

Particles are randomly initialized as crow population and helps in identifying the true states in the search space. Position and memory of crow is initialised randomly as particle weight in search space. New position of the crow is updated in the search space using Eq. (5). The feasibility of the new position of each crow is checked on the basis of AP. Depending on feasibility, either crow updates its position or remains in the current location. New weights are calculated for each crow whose position is updated. The position of the hidden food is updated by choosing certain crow randomly. The memory is updated chaotically using the Eq. (6).

\[
m_{k,t+1} = \begin{cases} 
    x_{k,t+1} & \text{if } w(x_{k,t+1}) \text{ is better than } w(m_{k,t}) \\
    m_{k,t} & \text{otherwise}
\end{cases}
\]  

(6)

where \(w(.)\) denotes the value of weight for each crow. Crow updates their memory and final position based on the value of weights. These steps are repeated for each crow till the weights are not optimized. The proposed method is presented in Fig. 1.

![Fig.1 The Proposed Method (PF-CCSA)]

For our proposed method we consider crow population size N to 500. Awareness probability varies from 0 to 1. 50 true states are considered for estimation. Hidden place and initial position of crow is considered same for first iteration as they have no experience. We applied our method for benchmark estimation problems of 1- D and 2-D bearing only tracking problem. The next section will present the simulation results.

4. Experimental Validation of proposed solution
Proposed solution has been simulated on Matlab 2015a on 2.53 GHz i5 processor. PF-CCSA is applied on two commonly used estimation problems a) 1-D non-linear problem b) Generic bearing only 2-D tracking problem. RMSE is used to for quantitative estimation of GPF, PF-PSO, PF-BSA and PF-CCSA and is calculated using Eq. (7).

\[
RMSE_{\text{Position}} = \sqrt{\frac{\sum_{i=1}^{N}(X_{t,i} - X_{e,i})^2}{N}}
\]  

(7)

where, \( N \) is the total number of different predictions, \( X_{t,i} \) denotes true state of the equation and \( X_{e,i} \) represents estimated state by the used method. These estimation problems are discussed below.

A. One dimensional non-linear problem

1-D uni-variant and non-linear problem was defined by [15]. Many authors had used this equation for state estimation [8-12]. One dimensional system target equation has been defined using Eq. (8).

\[
X_t = \frac{x_{t-1}}{2} + 25 \frac{x_{t-1}}{1+x_{t-1}^2} + 8 \cos(1.2 (t - 1)) + w_t
\]  

(8)

The observation model equation is illustrated using Eq. (9).

\[
Z_t = \frac{x_t^2}{20} + v_t
\]  

(9)

where \( w_t \) and \( v_t \) are zero-mean Gaussian white noise with variances 10 and 1, respectively. The above equations are highly non-linear with the presence of cosine and square terms. Initialization parameters are taken as follows. Initial value of the system (\( X_t \)) is set to 0.1. 50 true states are considered for the estimation with population size of 500 crows.

Table 2 listed the RMSE and the running time of the considered methods. RMSE is calculated by taking mean of the error generated by iterating 10 times. Table’s result inferred that our proposed method has lowest RMSE in comparison with other methods. GPF has the highest RMSE as there is no technique used to handle the sample impoverishment.

Table 2: Performance comparison for 1-D non-linear tracking problem

<table>
<thead>
<tr>
<th>Method</th>
<th>RMSE</th>
<th>Processing time</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPF [15]</td>
<td>5.5889</td>
<td>0.20 sec</td>
</tr>
<tr>
<td>PF-PSO [8]</td>
<td>3.7403</td>
<td>1.86 sec</td>
</tr>
<tr>
<td>PF-BSA [17]</td>
<td>2.2256</td>
<td>1.42 sec</td>
</tr>
<tr>
<td>PF-CCSA</td>
<td>2.0214</td>
<td>0.87 sec</td>
</tr>
</tbody>
</table>

Fig. 2 shows plot of true state and estimated state for the considered methods for 1-D non-linear tracking problem. It has been illustrated from the plot that our method is able to show best and precise estimation of the states as compared to other methods.
The sample impoverishment is used as another performance metrics for comparison. For better state estimation, number of distinct particle at every state should be higher. Fig. 3 shows the number of distinct number at every state for GPF and proposed method PF-CCSA. There are very few states for which all particles are distinct for GPF. However, our method has almost all distinct particles at each state. The bearing only 2-D tracking problem is discussed below.

B. Bearing only-2D tracking problem
In [15], target motion of system model is represented by the Eq. (10).
\[ x_k = \emptyset x_{k-1} + w_k \]  \hspace{1cm} (10)

Where, at time \( k \) state is \( x_k = (x, v_x, y, v_y)_k^T \) and zero mean system noise is \( w_k = (w_x, w_y)_k^T \). \( v_x \) and \( v_y \) represent velocity in \( x \) and \( y \) direction respectively and \( \emptyset \) is a \( 4 \times 4 \) matrix.

Online measurement \( (Z_k) \) by the fixed observer at origin is determined using Eq. (11) [15].

\[ Z_k = \tan^{-1} \frac{v_y}{x_k} + v_k \]  \hspace{1cm} (11)

Using the above Eqs. (10) and (11), the target movement in 2-dimentional is represented in the Fig. 4.

![Fig 4: 2-D bearing only tracking problem [15]](image)

Table 3 tabulated the performance for 2-D bearing only tracking problem for state-of-the-art. Results are obtained by iterating the code 10 times and taking their mean value. Simulation results inferred that our proposed method has the lowest error in comparison with others.

<table>
<thead>
<tr>
<th>Method</th>
<th>RMSE 2-D</th>
<th>Processing time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPF [15]</td>
<td>0.0744</td>
<td>2.47</td>
</tr>
<tr>
<td>PF-PSO [8]</td>
<td>0.0587</td>
<td>3.52</td>
</tr>
<tr>
<td>PF-BSA [17]</td>
<td>0.0378</td>
<td>2.98</td>
</tr>
<tr>
<td>PF-CSA</td>
<td>0.0281</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Performance for 2-D bearing only problem has been represented in the Fig. 5. RMSE has been plotted for GPF, PF-PSO, PF-BSA and the proposed method. Results infer that the proposed method PF-CSA has estimated the target trajectory better as compared to other methods.

![a: Bearing only tracking problem Particle filter](image)

![b: Bearing only tracking problem PF-PSO](image)
Fig. 5: True state and Target trajectory estimation in 2-D (a) GPF (b) PF-PSO (c) PF-BSA (d) PF-CCSA

Fig. 6: Number of distinct particles for 2-D (a) GPF (b) PF-CCSA

Fig. 6 represents the sample impoverishment for GPF and our proposed method in 2-D bearing only tracking problem. Plot shows that PF-CCSA has maximum numbers of stages with almost all the distinct particles. Sample impoverishment problem is tackled in a very graceful manner by the proposed method. The next section will conclude the work and also, discuss the future scope of our work.

5. Conclusion and future direction
In this work, Chaotic Crow search algorithm has been proposed as resampling technique in particle filter framework. Fundamental problems particle degeneracy and sample impoverishment of particle filter has been catered to a great extent. The proposed method converges to optimal solution very fast and memory of the optimization algorithm generates better estimation. From the simulation results, it is evident that the proposed method has least RMSE in comparison to other state-of-the-art. Results of benchmark problems of 1-D and 2-D revealed that our proposed approach is suitable for real time tracking and can achieve high accuracy with less computational efforts. In future, the proposed approach can be used for tracking object trajectory in video sequences.

References: