ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# A NOVEL APPROACH FOR DESIGN AND IMPLEMENTATION OF SEQUENTIAL MULTIPLIER

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***ABSTRACT***

***This brief presents a novel architecture of sequential multiplier. It is based on add and shift algorithm. The sequential circuit design has the ability to control the data path, which is the main requirement for larger digital system design and implementation. These requirements lead to development of approach that reduces power consumption and area by introducing a multiplexer in the proposed design architecture such that it reduces the clocks per iteration. It describes a novel architecture of sequential multiplier using add and shift algorithm, that requires one clock cycle for both add and shift operation in contrast to conventional multiplier operation. In this design the focus is on reducing the area and clocks per iterations. The proposed design uses VHDL and implemented using Xilinx tools on Spartan-6 (xc6slx45-3-csg324) target device.***

***Index Terms - Sequential multiplier, Spartan-6, add and shift algorithm, VHDL, Xilinx, data path, controller.***

## I.INTRODUCTION

The multiplication operation is present in many parts of a digital systems or digital computers, most notably and many high performance systems such as microprocessors and digital signal processors.

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With advances in the technology, various techniques have been proposed to design multipliers, with high speed, low power consumption and lesser area. Thus making them suitable for various high speeds, low power compact VLSI implementations. These three parameters ( power, area and speed) are always traded off. Also the sequential circuit design has received great attention in last few years due to their ability to control the data path, which is the main requirement for larger digital system design and implementation. The proposed work mainly concentrates on designing a low power and area efficient sequential multiplier with a novel architecture.

Numerous algorithms and methods are proposed for efficient multiplier implementation such as Booth's Algorithm, Braun and Baugh Wooley. The Booth's algorithm works by multiplying two signed binary numbers using 2's complement notation. All these algorithms can be implemented both in combinational and sequential multipliers and these can be extended easily to the proposed architecture.

Among the various obstacles in designing an efficient multiplier, the main problem it faces is the power consumption. Many researches have been done for reducing the power dissipation of different multipliers. Contribution for the total power consumption in a multiplier is the generation of partial product. Among the multipliers, tree multipliers plays an important role in high speed applications such as in the implementation of DSP filters, but their biggest drawback is the requirement of larger area. The carry-select-adder (CSA)-based radix multipliers have lower area overhead, but this multiplier employs a greater number of active transistors for the multiplication operation leading to high power consumption. The design for higher radix multipliers are faster but consume more power due to the usage of wider registers, and due to their more complex logic, require more silicon area. These requirements lead to development of approach that reduces power consumption and area by introducing a multiplexer in the proposed design architecture such that it reduces the clocks per iteration.

The paper is organized as follows. Section II describes the basic approach of conventional multipliers and existing architecture. Section III describes the proposed sequential multiplier design based on multiplexer technique. Section IV comprises of Result and Discussion in which device utilization

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**International Journal Of Core Engineering & Management (IJCEM)**
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summary and computational path delay obtained for the proposed sequential multiplier (after synthesis) is discussed. Finally Section V comprises of Conclusion.

## II. CONVENTIONAL MULTIPLIER

### 2.1 Approach

Multiplication of two numbers in binary representation can be performed by a process of ADD and SHIFT operations. Since the binary number system allows only 0 and 1's, the digit multiplication can be replaced by ADD and SHIFT operation only, because multiplying by 1 shows the number itself and multiplying by 0 produces 0 only.

### 2.2 Existing architectures

#### 2.2.1 Hardware implementation: 1

Block diagram of a binary multiplier is shown below

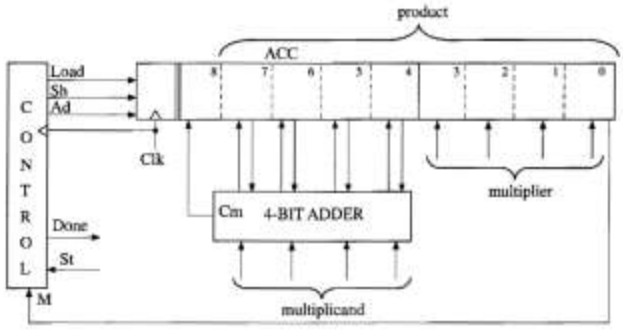


Figure 2.2.1: Binary multiplier1

Example showing the multiplication of two binary numbers 1010(10) and 1001(09) using add and shift algorithm

| | | | |
|---|---|---|---|
| Initial contents of product register | 0 0 0 0 0 | 1 0 0 1 | ← M (09) |
| (add multiplicand because M = 1) | 1 0 1 0 | | (10) |
| After addition | 0 1 0 1 0 | 1 0 0 1 | |
| After shift | 0 0 1 0 1 0 | 1 0 0 | ← M |
| Skip addition because M=0 | | | |
| After shift | 0 0 0 1 0 1 0 | 1 0 | ← M |
| Skip addition because M=0 | | | |
| After shift | 0 0 0 0 1 0 1 0 | 1 | ← M |
| (add multiplicand because M = 1) | 1 0 1 0 | | |
| After addition | 0 1 0 1 1 0 1 0 | 1 | |
| After shift (final answer) | 0 0 1 0 1 1 0 1 0 | | (90) |

Divide line between product and multiplier

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Figure 2.2.2: Multiplication procedure

### 2.2.2 Hardware Implementation: 2

The block diagram of binary multiplier2 is shown in the Figure 1

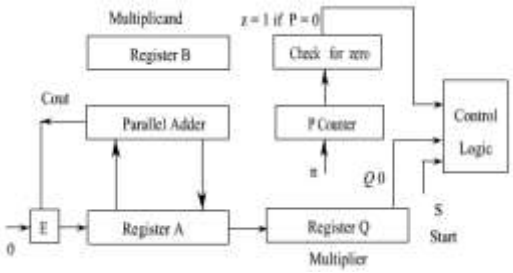


Figure 2.2.4**:** Block diagram of binary multiplier2

The multiplicand is stored in register B and the multiplier is stored in register Q. The partial product is formed in register A and stored in A and Q. The counter P is initially set to a number equal to the number of bits in the multiplier. The counter is decremented by 1 after forming each partial product. When the content of the counter reaches zero, the product is formed and the process stops. Initially, the multiplicand is in register B and the multiplier in Q. The register A is reset to 0. The sum of A and B forms a partial product- which is transferred to the EA register. Both partial product and multiplier are shifted to the right. The least significant bit of A is shifted into the most significant position of Q; and 0 is shifted into E. After the shift, one bit of the partial product is shifted into Q, pushing the multiplier bits one position to the right. The right most flip flop in register Q, designated by $Q_0$ will hold the bit of the multiplier which must be inspected next. If the content of this bit is 0, then it is not required to add the multiplicand, only shifting is needed. If the content of this bit is 1, then both addition and shifting are needed. After each shifter, value of counter P is decremented and the process continues till the counter value becomes 0. The final result is available in ( EAQ ) registers combination. To control the operation, it is required to design the appropriate control logic that is shown in the block diagram.

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The behavioral model of a multiplier for unsigned binary numbers described using VHDL. It multiplies a 4-bit multiplicand by a 4-bit multiplier to give an 8-bit product. The maximum number of clock cycles needed for a multiply is 10**.**

## III. PROPOSED SEQUENTIAL MULTIPLIER DESIGN

### 3.1 Proposed Design Specification

When designing multipliers there is always a compromise to be made between how fast the multiplication process is done and how much hardware we are using for its implementation. A simple multiplication algorithm that is considerably slow, but efficient in use of hardware is the add-and-shift algorithm.

The proposed design presents a hardware algorithm for binary multiplication, proposes the register configuration for its implementation, and then shows how to use HDL to design its data path and its controller. The design is proposed to multiply two 8*8 unsigned binary numbers. The conventional combinational circuit multiplier hardware developed to execute multiplication resulted in a many adders (half adders and full adders), AND gates, and requires large area of silicon as an integrated circuit. In contrast, in this design, a more efficient hardware algorithm results in a sequential multiplier that uses only one adder and a shift register. The savings in hardware and silicon area come about from a trade-off in the space (hardware)–time domain. A parallel multiplier uses more hardware, but forms its result in one cycle of the clock; a sequential multiplier uses less hardware, but takes multiple clock cycles to form its result.

The work presented in the paper describes a novel architecture of sequential multiplier using add and shift algorithm, that requires one clock cycle for both add and shift operation in contrast to conventional multiplier operation. In this design the focus has been on reducing the area and clocks per iterations. The two basic units involved in this design are data path and a controller.

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### 3.2 Design Configuration

Generally, large digital systems are partitioned into two units:

**1. Data Path**: It is a data processing unit. It includes both combinational and sequential modules of well-defined functions, e.g. registers, counters, adders, multiplexers, decoders, etc.

**2. Control Path**: It is a state machine or simply "controller" which controls the operations performed by the data path and the proper sequencing of these operations. The controller is implemented as an FSM that may be designed in the conventional manner.

This design describes the data path and controller of a 8-bit sequential multiplier. The design can be easily extended to an n-bit multiplier which uses the same controller and the same data path configuration but sizes of data path components (e.g., registers, adder) should be adjusted accordingly.

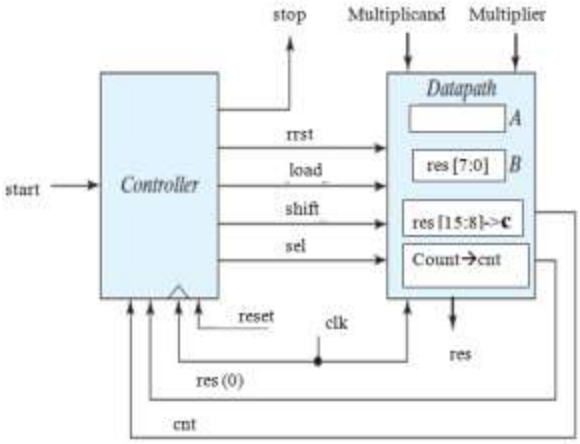


Figure 3.2.2: Detailed block diagram of sequential multiplier

### 3.3 Data path logic

A block diagram for the sequential binary multiplier and the register configuration of the data path is shown in Fig 3.3. The multiplicand is stored in register ***A***, the multiplier is stored in register ***B***. A parallel adder adds the contents of register ***A*** to MSB result register i.e. **res [15:8]** by appending '0' and the partial product of 9-bit is formed and stored in register **sum[8:0]**. The counter shown in figure is a 3-bit counter and initially set to 0's. This counter is incremented each and every time when the *shift* signal

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**International Journal Of Core Engineering & Management (IJCEM)**
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goes high. Whenever the count reaches maximum value the decoder output *cnt* signal will become high the product result is formed in the result register **res[15:0]**, and the process stops.

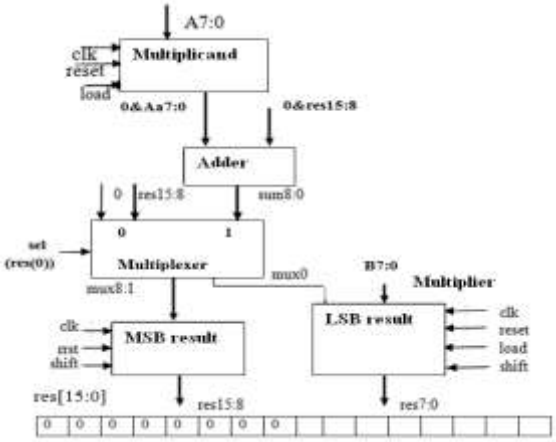


Figure 3.3.1: Data path configuration of registers in the sequential multiplier

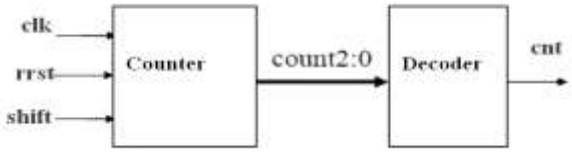


Figure 3.3.2: Counter to count number of iterations

The control logic stays in an initial state until *start* becomes 1. The system then start performs the multiplication operation by loading the multiplicand into *A* register, multiplier into *B* register (res7:0) and initializes res[15:8 ] to 0's. In each iteration the multiplexer checks the res(0) if it is '0' it simply re-circulates the res[15:8] by appending a '0' that is "0&res[15:0]" and loads res[15:8] with mux[8:1] and mux(0)&res[7:1] into res[7:0] by shifting away the previous res(0). If res(0) is '1' the multiplexer loads with adder output that is sum[8:0] and circulates the output same as the previous case. In this manner, the least significant bit of register *B*, designated by res(0), holds the bit of the multiplier that must be inspected next. The control logic determines whether to re-circulate MSB result or the adder output on the basis of this input bit res(0). The control logic also receives a signal, *cnt*, from a circuit that checks counter maximum state. The signals res(0) and *cnt* are status inputs for the control unit. The input signal *start* is an external control input. The outputs of the control logic launch the required operations in the

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**International Journal Of Core Engineering & Management (IJCEM)**
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registers of the data path unit. The operation of a sequential multiplier for the example of

| Time | start | State | rrst | shift | load | count | cnt | A | res[7:0] res(0) | Stop |
|---|---|---|---|---|---|---|---|---|---|---|
| t0 | 0 | S0 | 1 | 0 | 0 | 00 | 0 | 0000 | 0000 0 | 0 |
| t1 | 1 | S1 | 1 | 0 | 1 | 00 | 0 | 1001 | 0000 1 | 0 |
| t2 | 1 | S2 | 0 | 1 | 0 | 00 | 0 | 1001 | 0100 1 | 0 |
| t3 | 1 | S2 | 0 | 1 | 0 | 01 | 0 | 1001 | 0110 0 | 0 |
| t4 | 1 | S2 | 0 | 1 | 0 | 10 | 0 | 1001 | 0011 1 | 0 |
| t5 | 1 | S2 | 0 | 1 | 0 | 11 | 1 | 1001 | 0110 1 | 0 |
| t6 | 1 | S3 | 0 | 0 | 0 | 00 | 1 | 1001 | 0110 1 | 1 |

1001X1011=0110 0011 is shown below.

Table 3.3.1: Operation of a sequential multiplier

### 3.4 Control logic

The design of a digital system can be divided into two parts: the design of the register transfers in the data path unit and the design of the control logic of the control unit.

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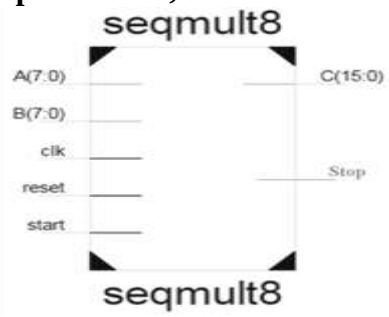
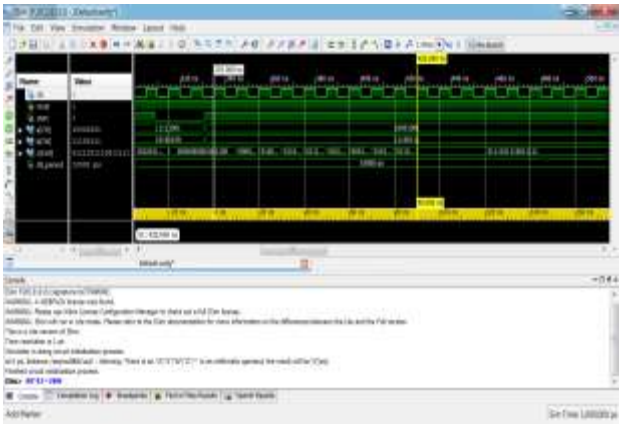



## IV. SIMULATION & SYNTHESIS RESULTS

During HDL simulation, the simulator software verifies the functionality and timing of the design or portion of the design. The simulator interprets VHDL or Verilog code into circuit functionality and displays logical results of the described HDL to determine correct circuit operation. The proposed design is verified through simulation and results are shown below for different cases.



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**Design summary**

Status of the design

| **seqmult8 Project Status (06/25/2015 - 13:03:55)** | | | |
|---|---|---|---|
| **Project File:** | mult8latest.xise | **Parser Errors:** | No Errors |
| **Module Name:** | seqmult8 | **Implementation State:** | Programming File Generated |
| **Target Device:** | xc6slx45-3csg324 | • **Errors:** | No Errors |
| **Product Version:** | ISE 14.7 | • **Warnings:** | 5 Warnings (0 new, 0 filtered) |

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| | | | |
|---|---|---|---|
| **Design Goal:** | Balanced | • **Routing Results:** | All Signals Completely Routed |
| **Design Strategy:** | Xilinx Default (unlocked) | • **TimingConstraints:** | All Constraints Met |
| **Environment:** | System Settings | • **FinalTimingScore:** | 0 (Timing Report) |

**Device Utilization Summary**

| **Device Utilization Summary** | | | | **[-]** |
|---|---|---|---|---|
| **Slice Logic Utilization** | **Used** | **Available** | **Utilization** | **Note(s)** |
| Number of Slice Registers | 51 | 54,576 | 1% | |
| Number used as Flip Flops | 51 | | | |
| Number of Slice LUTs | 93 | 27,288 | 1% | |
| Number used as logic | 92 | 27,288 | 1% | |
| Number using O6 output only | 60 | | | |
| Number using O5 output only | 25 | | | |
| Number using O5 and O6 | 7 | | | |
| Number used exclusively as route-thrus | 1 | | | |
| Number with same-slice carry load | 1 | | | |
| Number of occupied Slices | 42 | 6,822 | 1% | |

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| | | | | |
|---|---|---|---|---|
| Number of MUXCYs used | 28 | 13,644 | 1% | |
| Number of LUT Flip Flop pairs used | 95 | | | |
| Number with an unused Flip Flop | 45 | 95 | 47% | |
| Number with an unused LUT | 2 | 95 | 2% | |
| Number of fully used LUT-FF pairs | 48 | 95 | 50% | |
| Number of bonded IOBs | 19 | 218 | 8% | |

## V. CONCLUSION

The new approach presents above mainly concentrates on reducing the area and power dissipation allowing considerable amount of time. Compared to the conventional architectures the designed sequential multiplier uses modified add and shift algorithm and reduces the number of clocks per iterations to half with the introduction of a multiplexer in the register configuration of data path logic.

The number of slices and LUTs required for the design are very less compared to the conventional approaches and accomplish the first objective of the design. Well defined timing constraints reduces power dissipation and meets the objective of the low power design.

| **Clock Report** | | | | | **[-]** |
|---|---|---|---|---|---|
| **Clock Net** | **Resource** | **Locked** | **Fanout** | **Net Skew (ns)** | **Max Delay (ns)** |
| clk_BUFGP | BUFGMUX_X2Y4 | No | 26 | 0.059 | 1.271 |

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## REFERENCES

M. Mottaghi-Dastjerdi, A. Afzali-Kusha, and M. Pedram "BZ-FAD: A Low-Power Low-Area Multiplier based on Shift-and-Add Architecture" *IEEE Trans. on Very Large Scale Integration (VLSI) Syst.*, Vol. 17, No. 2, pp.302-306, Feb. 2009.

Prof Prasann D.Kulkarni, Prof.S.P.Deshpande, Dr.G.R.Udupi "low power add and shift multiplier design BZFAD architecture" *Int. J. Comput. and Electronics Research* Vol. 2, Issue 2, Apr. 2013.

C. N.Marimuthu, Dr. P. Thangaraj, Aswathy Ramesan "low power shift and add multiplier design" International Journal of Computer Science and Information Technology, Vol. 2, Number 3, June 2010.

K.N. Vijeyakumar, V. Sumathy Sriram Komanduri and C. Chrisjin Gnana Suji "Design of Low- Power High-Speed Error Tolerant Shift and Add Multiplier" Journal of Computer Science 7 (12): 1839-1845, 2011.

S. P.Valan Arasu, Dr.S. Baulkani "modified universal shift register based low power multiplier architecture" *Journal of Theoretical and Applied Information Technology*, Vol. 65 No.1., Jul. 10 2014.

Pavan Kumar U.C.S , Saiprasad Goud A, A.Radhika "FPGA "*Fundamentals of Logic Design*" sixth and seventh editions Charles H. Roth, Jr. University of Texas at Austin Larry L. Kinney University of Minnesota, Twin Cities.

"*Digital Systems Design Using VHDL*" by Charles H. Roth, Jr, The University of Texas at Austin.

"*Digital Design With an Introduction to the Verilog HDL*" fifth edition M. Morris Mano Emeritus Professor of Computer Engineering California implementation of high speed 8bit Vedic multiplier using barrel shifter" Energy Efficient Technologies for Sustainability*: IEEE 2013 Int. Conf.*, pp. 14-17.

Minu Thomas "Design and Simulation of Radix-8 Booth Encoder Multiplier for Signed and Unsigned Numbers" *Int. .l for Innovative Research in Science & Technology* ,Vol. 1, Issue 1, Jun. 2014.

V.Vijayalakshmi, R.Seshadri, Dr.S.Ramakrishnan "Design and implementation of 32 bit unsigned multiplier using CLAA and CSLA" *Emerging Trends in VLSI, Embedded System, Nano Electronics and Tele. System: IEEE Int.l conf.*, pp. 1-5.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
K.S. Ganesh Kumar, J. Deva Prasannam, M. Anitha Christy "Analysis of Low Power, Area and High SpeedMultipliers for DSP Applications" *Int. J. of Emerging Technology and Advanced Engineering*, Vol. 4, Issue 3, Mar. 2014.

R. Devarani, Mr.C.S.Manikandababu "Design and implementation of truncated multipliers for precision improvement" *Int. Conf. on Comp. Communication and Informatics (ICCCI -2013)*, Jan. 04 – 06, pp.1-6.

Addanki Puma Ramesh, A. V. N. Tilak, A.M.Prasad "An FPGA Based High Speed IEEE-754 Double Precision Floating Point Multiplier U sing Verilog" *Emerging Trends in VLSI, Embedded System, Nano Electronics and Telecommunication System (ICEVENT)*, 2013 Int. Conf., 7-9 Jan, pp. 1-4.

State University, Los Angeles Michael and D. Ciletti

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**International Journal Of Core Engineering & Management (IJCEM)**
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# PREVENTING HAZARDOUS DISASTERS IN OIL AND NATURAL GAS INDUSTRY BY GDUS AND GSM BASED TECHNOLOGY ALONG WITH WIRELESS PTZ CAMERAS

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***ABSTRACT***

***Oil and Natural Gas Industry today faces many challenges in day to day operation .One of them is transporting the products to customer premies or to the end user. It may be on land transportation or offshore transportation. Offshore it is through Vessels and on land through Road Trucks. But this is not profitable as this involves lot of expense. To reduce the cost of transportation, pipes lines are laid underground or under the sea depends on the origin of Exploration. This is economically viable only when the hydrocarbon production is more. In India also we have many pipe lines thousands of kilometers pipelines are laid to meet requirement of Hydrocarbons whether it may Oil pipelines or Natural Gas Pipelines. Oil Natural Gas Corporation Limited (ONGC) is one of such company which involves in Exploration and Production of hydrocarbons. After production of hydrocarbons, Oil is transported to Oil refineries and Gas is sold to Gas authority of India(GAIL) through pipe lines mostly.***

***On 27$^{th}$ of June 2014 Gas pipe line had met very huge disaster near Tatipaka in Andhra Pradesh. Where huge explosions taken place and nearly 20 number of civilians are charred to death near Gas pipe line. Total destruction happened in entire few acres of land. After detail study this had happened due to the corrosion of the pipe line Gas had leaked. Now to act on remedy measures to it removing and replacing the under ground corrosive pipelines incurs lot of expenditure. The raw Gas from the reservoirs have lot of moisture. If the moisture can be removed from the Gas before transporting through pipelines, many hazardous situations like***

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International Journal Of Core Engineering & Management (IJCEM)
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***leakage and seepage in Sea bed through pipelines can be arrested. And by controlling the flow of hydrocarbons through remote operating valves by directly visualizing valves of pipelines through automated systems have less manual operations, reliabilities are high and accurate.Most of the expenditure can be curtailed .***

## I. INTRODUCTION

Now a day's every system is automated in order to face new challenges in the present day situation. Automated systems have less manual operations, more flexibility saves man power. Hence every field prefers automated control systems. Especially in the field of Oil and Natural Gas business automated systems are doing better performance.

Probably the most useful thing to know about the automated is it can be operated from anywhere in the globe and available in Global standards. If you travel in parts of world, GSM is only type of cellular service available. Instead of analog services, GSM was developed as a digital system using TDMA technology.

## II. OBJECTIVE

The goal of this project is to develop a system, which uses Glycol Dehydration Unit (GDU) to remove moisture from Gas pipelines and control the flow valves of the pipe lines through GSM Mobile technology and visualize the flowlines opening and closing of valves through remotely operated PTZ

| **EQUIPMENT REQUIREMENT:** | **HARDWARE REQUIREMENT:** |
|---|---|
| 1.Glycol Dehydration Unit(GDU) | 1. MICROCONTROLLER (89S52) |
| 2.GSM based control Unit | 2. ULN2003.(Unbreakable Linex Network) |
| 3.PTZ Cameras | 3. POWER SUPPLY. |
| 4.Wire less R**adios** | 4. DC MOTOR. |
| **SOFTWARE REQUIREMENT:** | 5. DTMF HT9170B.(Dual Tone Multi Frequency) |
| 1.KEIL MICRO VISION-3 | 6. RELAYS |
| 2.MICRO FLASH | 7.Solonoid Valves |
| 3.Computers | |

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cameras with 5 Ghz wireless Radios.

## III. TECHNOLOGY & EXECUTION OF THE GDUS IN STAGE-A

The GDU contains the following systems:

1. Gas dehydration – Moisture removal by absorption

The gas is then fed into an absorber tower through which TEG is circulated. The moisture in the gas is absorbed by the constantly flowing TEG, which becomes rich after absorbing water, this TEG is fed into a closed circuit re-boiler where the TEG is heated and all absorbed water is expelled by vaporization. After the moisture absorption the dew point of water in gas falls below 0.00 Deg.C.

2. Joule Thompson Expansion – for removal of heavy Hydrocarbons Cooling of natural gas is achieved by expanding high pressure gas to a lower pressure across an expansion valve. The heavier hydrocarbon contents condense after expansion valve and the resultant gas has hydro carbon dew point of below 0.00 Deg. C. The liquids and gas are separated after expansion in a cold separator and liquids is drained to condensate storage / transfer tank.

The gas after the expansion has lost its pressure hence needs to be boosted up to required pressure by compression of gas.

**Triethylene glycol**, **TEG**, or **triglycol** is a colorless odorless viscous liquid with molecular formula $HOCH_2CH_2OCH_2CH_2OCH_2CH_2OH$.

## IV. TECHNOLOGY & EXECUTION OF THE COMMUNICATION SYSTEMSS IN STAGE-B

GSM Technology method control valves contains following systems:

1. **GSM control Module** – compromises of micro controller, GSM Mobile, Relay and Solonoid Valves. The relay is triggered by GSM Mobile through Micro controller which in turn controls the power to soloniod valve which controls the flow through inlet gas flow valve. And this can be viewed through PTZ camera connected and operated through 5Ghz wireless Radios or through broad band

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connectivity. Generally oil installation are located at remote locations where normal line communication facility available so wireless communication can be adopted in such cases.

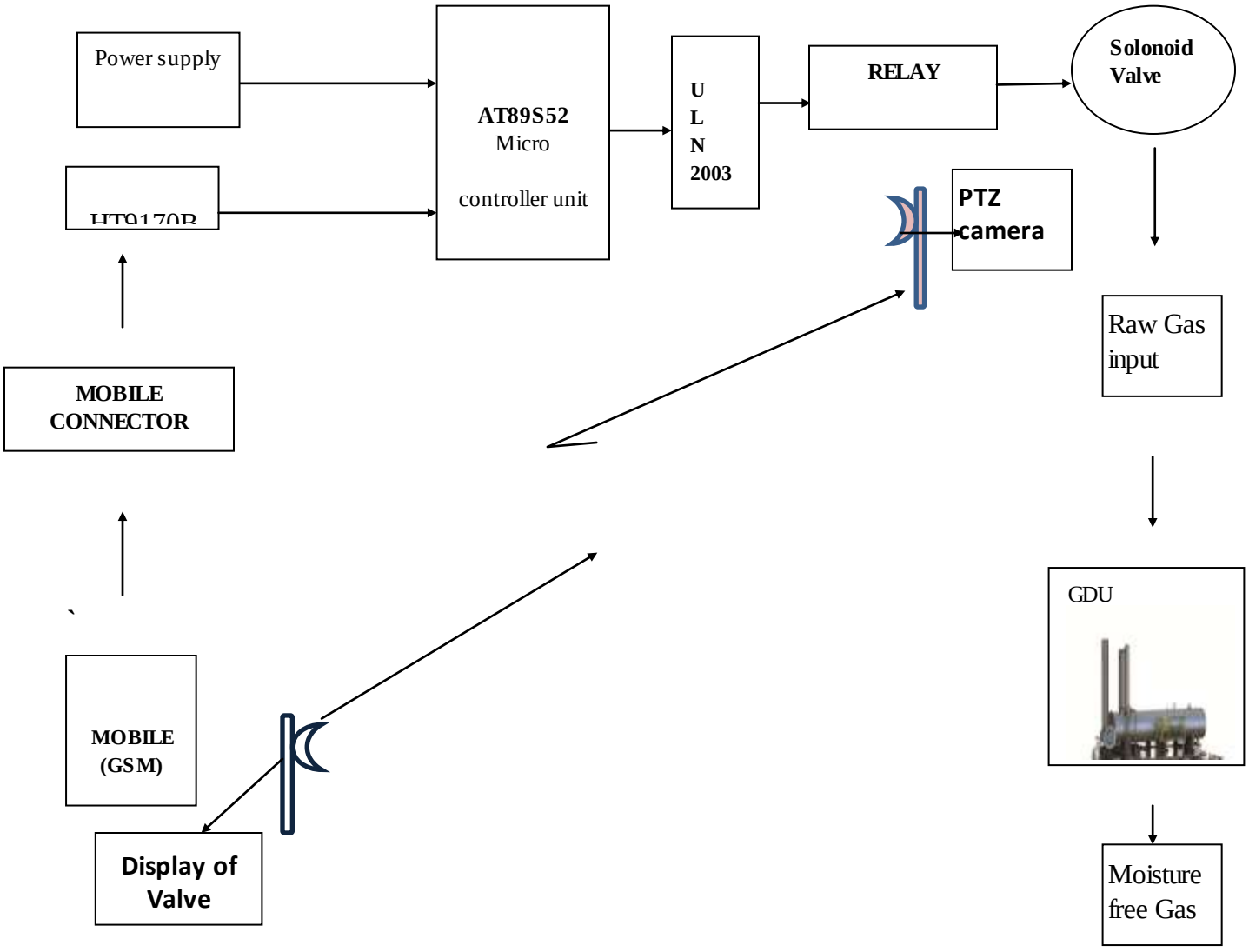
## V. CONCLUSION

In Oil and Gas industry the moisture in the flow has to be arrested to protect the pipelines from corrosion which in turn avoid many hazardous situations and saves huge amounts of money and time in replacing the pipelines. Enabling the latest technology Wireless Radios ensures the operation and minimise the man power.

## REFERENCES

**Gas Dehydration Field Manual** by Maurice Stewart And Ken Arnold. *Glenn Fleishman.*

**BLOCK DIAGRAM**



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# A WEB BASED GIS SOLUTION FOR MANAGEMENT OF IT PARKS IN CYBERABAD ZONE, RANGA REDDY DISTRICT, TELANGANA.

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***ABSTRACT***

***Geographic Information System (GIS) is a tool used for capture, storage, manipulation, query and presentation of spatial data that have applicability in diverse fields. Web GIS has put GIS on Web, that made it available to common public which was earlier used by few elite users. Web GIS is an advance technology to manage and display all geographical locations on the earth surface. In the present study, it includes Mapping of IT parks Financial district, Nanakramguda and Hi-Tech City Phase-2 Madhapur, Ranga Reddy District of Telangana State using QGIS software (FOSS) and developing a Web map for IT Parks. Free and Open Source Software (FOSS) has been used to develop Web maps. A Web GIS framework was considered in which QGIS and GeoExplorer have been used. FOSS has the advantages of low cost, high stability and security.This study also deals with spatial data information system for environmental analysis, maintaining IT parks in an eco-friendly manner, e-governance, etc., so that these types of information can be displayed using Geographical Information System (GIS) technique to portray about IT Companies and its activities in an IT park in a more realistic way. And to provide with a web based GIS solution for sustainable management of IT Park. This study highlight, the suitability to handle spatial and non-spatial attributes of IT park features and to display and publish in web based GIS platform. Hence there is a***

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***necessity of an open source Web-GIS application that should be both powerful for visualizing and cost effective.***

***Key Words: Geographic Information System (GIS), Web-GIS application, Spatial data.***

## I. INTRODUCTION

An open source application by definition is software that you can freely access and modify the source code for. Open source projects typically are worked on by a community of volunteer programmers. Free and Open source may be viewed by many as a revolutionary phenomenon that is capable of providing the software industry with an alternative and competitive way of doing business. Development of the web and expansion of the Internet facility provide two key capabilities that can greatly help to geoscientists. The web allows visual interaction with data by setting up a Web Server through which clients can produce maps, proper way of arranging the map and charts, publishing the non-spatial Attribute (data) on the Internet, so that other clients can view these updates and can help them to speed up the evaluation process. Second, because of the near universal nature of the Internet, the geospatial data can widely be accessible. Basically GIS is used to provide user with spatial information. In this study, IT Parks information has been used to show in the web application. In the case of the traditional GIS, these types of information are within the system or group of system. Hence this disadvantage of traditional GIS led to develop a solution of integrating GIS and Internet, which is called Web-GIS. The application provides access to mapping engine functionality, basic GIS capabilities, data storage solutions such as spatial database and additional tools enhance the GIS capabilities of the mapping engine. Free and Open source software can totally replace the commercialized GIS platform software in the small and medium projects with requirements for the relatively simple function.

## II. PURPOSE OF STUDY

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To portray about IT Companies and its activities in IT parks in a more realistic way. And to provide with a web based GIS solution for sustainable management of IT Parks.

## III. OBJECTIVES

- Mapping of IT companies of IT Parks of Cyberabad zone with relevant attribute data using open source GIS software.
- Developing web maps for IT Parks of Cyberabad zone using GeoExplorer.

## IV. STUDY AREA

The study area considered was IT Parks of Cyberabad Zone which are developed by Andhra Pradesh Industrial Infrastructure Corporation Ltd. (APIIC) includes IT Parks at Financial District, Nanakramguda and Hi-Tech City Phase-2, Madhapur, Ranga Reddy District of Telangana State. Financial district and Nanakramguda lies within

Longitude: 78°19'46''to 78°20'56''E

Latitude: 17°24'52''to 17° 25'41''N,

Covering an area of 314.67 acres and Hi-tech City Phase-2, Madhapur lies within

Longitude: 78°22'10''to 78°22'45''E

Latitude: 17°26'32''to 17°27'17''N,

Covering an area of 149.07 acres. In this study the IT Park information has been used to show in the web maps. In addition, some attribute layers have been added to provide geoservices through the Web, such as Web Map Services (WMS) and Web Feature Services (WFS). The study area map was shown in Fig 1.

## V. DATA USED

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- CAD drawings of IT parks of Cyberabad zone (Nanakramguda, Financial district, Hi-tech City Phase-2, Madhapur).

- Relevant attribute data of IT companies of IT parks of Cyberabad zone.

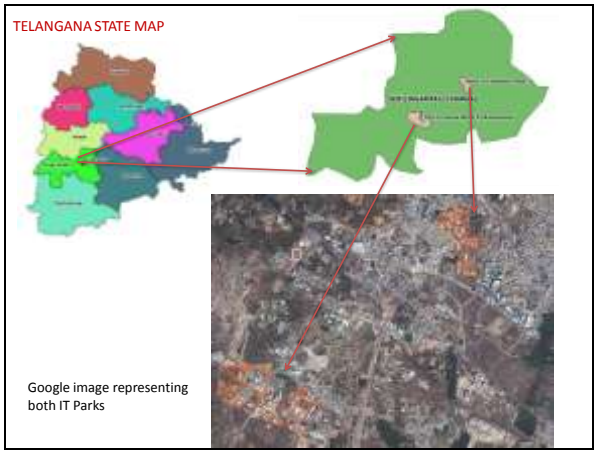


Fig: 1 Study Area Map

## VI. SOFTWARE'S USED

- QGIS
- Opengeo Suite 4.5
  - GeoExplorer

## VII. METHODOLOGY

*Task–1 GIS Mapping*

1. CAD drawings and its related data of IT parks were collected and converted into .tiff images.
2. Georeferenced .tiff images with reference to Google Earth using QGIS software.
3. The coordinate system was changed into projected coordinate system (EPSG: 32644 - WGS 84 / UTM zone 44N).

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4. Shapefiles of different layers were created like Industrial plots, roads and boundaries of IT parks and relevant data was inputted as attribute data.

*Task–2 Web Mapping*

1. The shapefile archive was converted into zip format and uploaded into GeoExplorer. File was loaded as a database table in PostGIS database, and this table was loaded into GeoServer as a Layer.
2. Any single layer from different sources such as Google Layers, Bing, MapBox Layers was selected and added to the map as a base layer.
3. A duplicate style of existing one was created and the rule was edited as required, and continued same with other layers to change styling.
4. The map composition was saved to generate a URL, which can be used to access the map later.
5. A small block of HTML code was generated using publish map, which can be embedded in any web page.
6. Embed maps of IT Parks were obtained by Copying and pasting the generated codes into web page or HTML-source.

## VIII. RESULTS AND DISCUSSION

*Task-1 GIS Mapping*

- Using Free and Open Source Software QGIS, shape files of park boundary, roads and Industrial plots are developed for IT Parks of Financial District & Nanakramguda, Hi-tech City Phase – II, Madhapur Layout maps of both parks are shown in Fig 2, Fig3.

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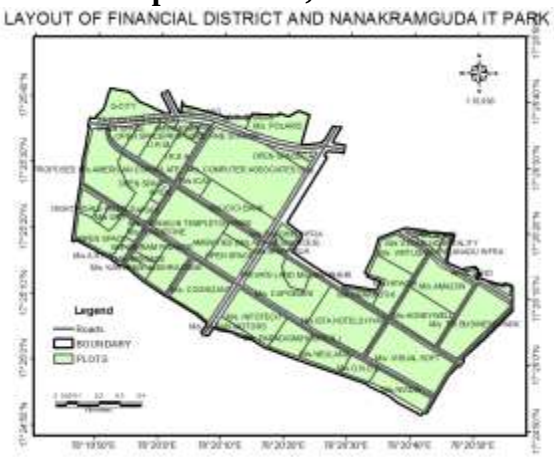


Fig: 2

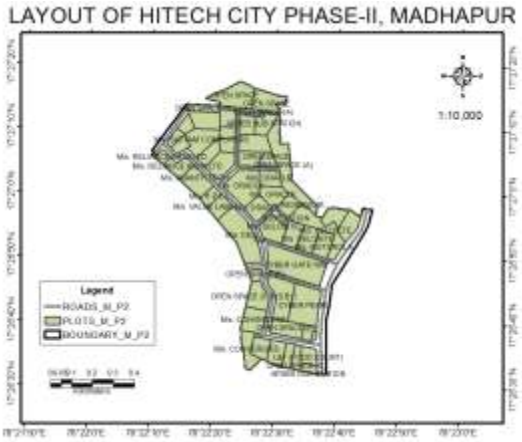


Fig: 3

*Task–2 Web Mapping*

Web maps were developed and published using GeoExplorer for both IT Parks and are shown in Fig 4& 5.

- *Web Map of Hi-tech City Phase – II, Madhapur IT Park*

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Fig: 4

- *Web Map of Financial District & Nanakramguda IT Park*


Fig: 5

## IX. CONCLUSIONS

Integrating FOSS Web service based applications to build spatial information systems is a promising alternative to solutions based on open source server software products. The present study has given the IT Parks information data storage integration pattern according to the characteristics of geographic data, and it also studies practically the process and methods of comprehensively using GeoExplorer and other

open source software to publish geographic information, verifying the technical feasibility of the using of open source software to publish spatial geographical information.

The web maps developed in this study through web-based GIS technologies can be improved by providing more attribute information about IT companies such as activities of IT companies related to environmental management like methodologies for solid waste management, e-waste management, waste water treatment technologies, zero waste management techniques, maintaining greenery, availability of cycle tracks, etc and much more information which can be used for further analysis and studies and these types of studies can be used to represent the IT Parks as eco-friendly parks. These web maps can also be used for efficient management of IT companies in IT parks of Cyberabad zone through e-governance methods.

## REFERENCES

http://suite.opengeo.org/opengeo-docs/webmaps/index.html

**AA. Alesheikh, H. Helali, HA. Behroz,** 2002. "Web GIS: Technologies and its Applications".

**Dr. Jyoti Sarup, Vimal Shukla,** 2012. "Web-Based solution for Mapping Application using Open-Source Software Server".

**Mir Mahammed Hussain Hashmi,** 2006. "Explore Hyderabad" An Interactive Web-based GIS Application Prototype.

**Sitender, Satish Kumar, Reena,** 2012. "Village Information System – A Case Study of Muklan Village, Hisar, Haryana (INDIA)"

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**International Journal Of Core Engineering & Management (IJCEM)**
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# SELECTING LOW POWER HIGH SPEED DIFFERENTIAL I/O FOR CONTINUOUS TIME SIGMA DELTA ADC ON VIRTEX-4 FPGA

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***ABSTRACT***

***This paper focuses on various differential I/Os performance and power analysis. FPGA I/Os are configured as comparator suitable for Sigma Delta Analog to Digital Converter architecture on FPGA. H-spice analysis is performed for verification of various differential I/Os performance. At different clock speeds the power calculations are done for LVDS, HSTL-II and LVPECL I/Os at different swings.***

***Keywords— FPGA, Input/Output Pins, Differential swing, Sigma Delta ADC.***

## I. INTRODUCTION

ASIC devices have undergone evolutionary changes increasing their performance. FPGAs competed with ASIC design with an additional feature of programmability. As the design standards evolved, there was a corresponding growth in the complexity of these FPGAs. FPGAs covered almost all the applications like wireless communications, DSP applications, Mixed Signal VLSI applications, Bio medical applications etc.,. Therefore, FPGAs became a major component in most of the applications. With improvement of technology, various FPGA vendors developed and

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marketed different FPGA families[1]. Altera and Xilinx FPGA families were the most familiarized for most of the applications.

In spite of FPGA family, all FPGAs were provided with hundreds of Input / Output pins. This paper focuses on various differential I/Os performance and power analysis. Differential I/Os can be configured as a comparator for Analog to Digital Converter (ADC) or Digital to Analog Converter (DAC). In concern to meet the physical and performance parameters of the design, FPGA needs to be carefully chosen. Virtex-4 FPGA is chosen and among its supports various differential I/Os viz., Low Voltage Differential Signaling, Low Voltage Positive Emitter coupled Logic, Mini-LVDS, Bus LVDS, High Speed Transceiver Logic, Reduced Swing Differential Signaling, Transition Minimized Differential Signaling, Point-to-Point Differential signaling [2]. Among various differential I/Os, the LVPECL and HSTL are known for their speed. Not only considering the literature the performance analysis was performed for LVPECL and HSTL I/Os and are compared with basic LVDS I/O [3]. Table I shown below provides the characteristics of the differential I/Os standards.

TABLE I. XILINX I/OS CHARACTERISTICS

| **Differential I/O** | **$V_H$** | **$V_L$** |
|---|---|---|
| LVDS | 1.25-0.125 | 1.25 +0.125 |
| LVPECL | 1.2 - 0.3 | 1.2 + 0.3 |
| HSTL-II | 1.5-0.3 | 1.5+0.3 |

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## II. SELECTING LOW POWER HIGH SPEED I/O

Selection of differential I/O standard effects the dc bias and the SD-ADC input signal peak value. H-spice analysis of LVPECL, HSTL-II and LVDS are carried out and the performance of these differential I/Os are checked for various differential swings [3]. With the analysis performed LVPECL works at a maximum frequency of 200MHz with a differential voltage swing of 300µV, at 148MHz with 250 µV swing, at 100MHz with 200 µV swing, 74MHz at 175 µV swing, 50MHz at 150 µV swing.

For LVDS I/O, there is performance degradation compared to LVPECL i.e., LVDS I/O with a voltage swing of 300 µV works at a maximum frequency of 180MHz. Continuing the same for lower swing i.e., LVDS I/O works at a maximum frequency of 130MHz at 250 µV swing, at 250 µV it works at 90MHz, with 175 µV it works at 65MHz and at 150 µV it works at 40 MHz. For HSTL-II, the maximum working frequency is a decreased value compared to LVPECL and LVDS. At 300µV, HSTL-II works at a maximum frequency of 170MHz and at 250 µV, 200 µV, 175 µV and 150 µV, HSTL-II operates at a maximum frequency of 125MHz, 88MHz, 58MHz and 38MHz respectively.

Comparing the performance of basic differential I/O, LVDS with LVPECL and HSTL-II which are known for high speed with swing of 300µV, LVPECL works at maximum frequency of 200MHz where as LVDS work at 180 MHz and HSTL-II at 170MHz. Hence selecting LVPECL I/O, taking the performance into consideration for the design of SD-ADC on FPGA, the power analysis is also carried out for better analysis. Table II shows the power analysis of three differential I/Os.

TABLE II. POWER ANALYSIS OF DIFFERENTIAL I/OS AT VARIOUS DIFFERENTIAL SWINGS.

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| Differential I/O | Differential Swing (µV) | Speed (MHz) | Power (mW) |
|---|---|---|---|
| LVPECL | 300 | 200 | 1.867 |
| | 300 | 170 | 1.65 |
| | 200 | 100 | 1.8 |
| | 200 | 88 | 1.55 |
| | 150 | 50 | 1.77 |
| | 150 | 38 | 1.43 |
| LVDS | 300 | 180 | 1.84 |
| | 300 | 170 | 1.82 |
| | 200 | 90 | 1.79 |
| | 200 | 88 | 1.78 |
| | 150 | 40 | 1.73 |
| | 150 | 38 | 1.72 |
| HSTL-II | 300 | 170 | 2.13 |
| | 200 | 88 | 2.13 |
| | 150 | 38 | 2.15 |

From table I, it can be incurred that LVPECL differential I/O compared to LVDS and HSTL-II exhibits the best performance for a given voltage swing with considerable average power.

**Power vs Max. Operating Speed at 150µV swing**

Fig.1 illustrates the operating frequency versus power for LVPECL, LVDS and HSTL-II I/Os at 150µV. The same analysis for the three differential I/Os is performed by changing the voltage swing

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at the input of the SD-ADC. With 150 µV input voltage swing, LVPECL works at a maximum operating speed of 50 MHz where LVDS and HSTL-II fails to work at this point. Along with this, from the chart as in Fig.1 it can be incurred that LVPECL average power is lesser compared to LVDS and HSTL-II.

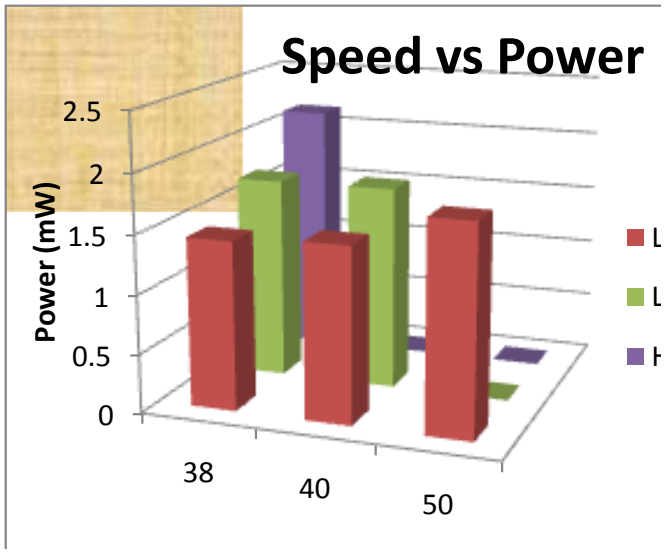


Fig.1 Speed versus Power with 150µV differential swing

**Power vs Max. Operating Speed at 200µV swing**

The same analysis for the three differential I/Os is performed at 200 µV and 300 µV and depicted in Fig.2 and Fig.3

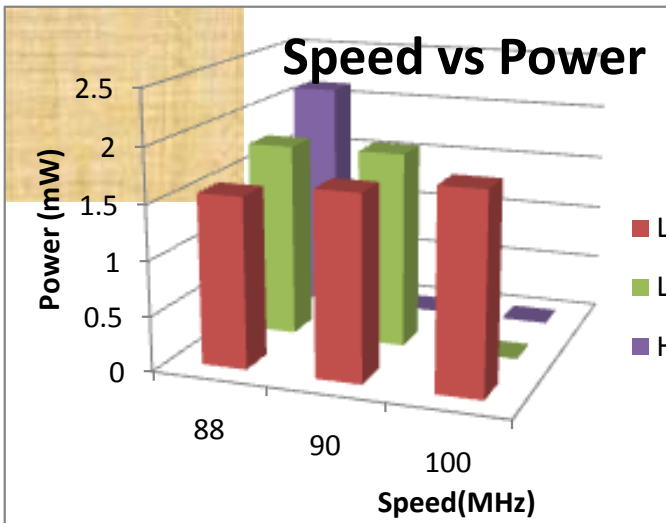


Fig.2 Speed versus Power with 200µV differential swing

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With 200µV input voltage swing, LVPECL works at a maximum operating speed of 100 MHz where LVDS and HSTL-II fails to work at this point. Along with this, from the chart as in Fig.2 it can be incurred that LVPECL average power is 1.8mW and is lesser compared to LVDS and HSTL-II differential I/Os.

***Power vs Max. Operating Speed at 300µV swing***

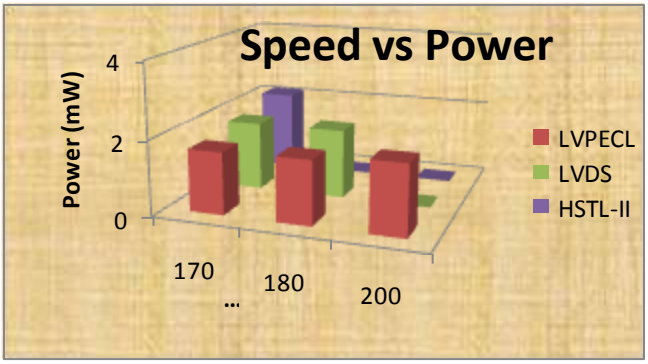


Fig.3 Speed versus Power with 300µV differential swing

With 300µV input voltage swing as depicted in Fig.3, LVPECL works at a maximum operating speed of 200 MHz where LVDS and HSTL-II fails to work at this point. Along with this, from the chart as in Fig.2 it can be incurred that LVPECL average power is 1.86 mW and is lesser compared to LVDS and HSTL-II differential I/Os.

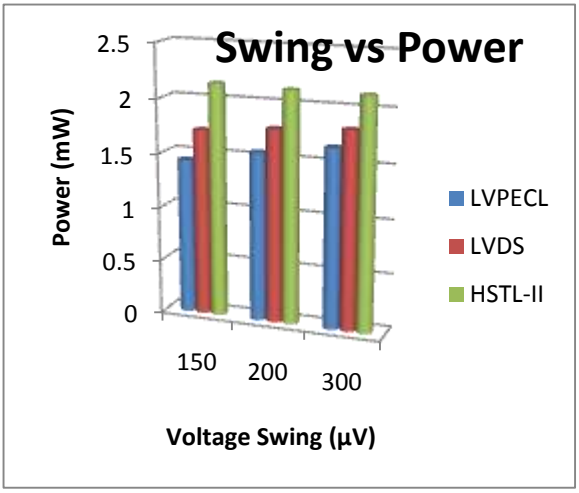

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Fig. 4 Differential Swing versus Power.

Fig. 4 illustrates the power analysis of LVPECL, LVDS and HSTL-II I/Os with respect to the differential swing applied at the input of the pins of FPGA. With the chart as in Fig.4, it is clear that LVPECL being a high performance I/O, it is exhibiting an average power less than 1.867mW. Hence LVPECL is the best choice for low power design for implementing high speed SD-ADC on FPGA.

## III. CONCLUSION

H-spice analysis is performed for verification of various differential I/Os performance. At different clock speeds the power calculations are done for LVDS, HSTL-II and LVPECL I/Os at different swings. LVPECL is the best choice for low power design for implementing high speed SD-ADC on FPGA. LVPECL I/O operates at a maximum operating speed of 200MHz with an applied differential swing of 300µV with an average power of 1.86mW.

## REFERENCES

Steve Kilts "Advanced FPGA Design" John Wiley & Sons, INC., Publications, First edition.

Jimmy Ma, “A Closer Look at LVDS Technology”, Pericom, 2001.

P.A. Harsha Vardhini, Dr. M. Madhavi Latha and Dr. C.V. Krishna Reddy, “ H-Spice modeling of FPGA Low Voltage Diferential I/Os: LVDS, HSTL-II & LVPECL for SD-ADC”, pp. 143-151, Vol.2 Issue.4, GJTE, April 2015.

Virtex-4 FPGA : DC and switching characteristics /documentation/data_sheets/ds302.pdf

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# PERFORMANCE AND EMISSION ANALYSIS OF MAMEY SAPOTE BIODIESEL WITH SWIRI GENERATION TECHNIQUE IN INTAKE MANIFOLD OF DIESEL ENGINE

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***ABSTRACT***

***The air motion in an Internal Combustion Engine is induced during the suction stroke and it is modified in the compression stroke. The efficiency of the compression ignition engine can be improved by many methods such as super charging, varying stroke length, turbo charging, avarying injection pressure and fuel air ratios. But in some of them, there are drawbacks such as environmental effects and majorly requires additional design. The objective of the present study is to know the ability of an air enhancement with swirl blades in increasing the performance and decreasing the emissions with the Mamey Sapote biodiesel. The investigation is conducted by an experiment on a Four Stroke Single Cylinder Diesel Engine by placing five blade converging air swirl device at the downstream of the air intake manifold. Mamey Sapote Biodiesel was blended at 5%, 10%, 15% and 20% ratio with diesel fuel in this analysis. The performance tests were carried out at different loads with different blends. The emissions from the engine were also tested***

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***after the setup installation to estimate the environmental effects. This study presents the comparative measures of brake power, brake specific fuel consumption, brake thermal efficiency, CO, $CO_2$, HC, NOx and smoke opacity.***

***Key words— Diesel engine, air swirl, emission control. intake manifold, biodiesel.***

## I. INTRODUCTION

Fossil fuels play a major role in development of any country in the present scenario. Petroleum derived products are the critical sources of energy for fuelling of automobiles for the entire world. But, these fossil fuels are depleting day by day and they are non renewable. It is also assessed that these sources will be depleted in a certain period of time and it is not possible to meet the future requirements. Hence there is a need for development of renewable energy sources to meet the requirements of future and it has become an essential to explore the reasonable substitution of diesel with alternative fuels within the country on a massive production for commercial usage. Alcohols (methanol/ethanol), Liquefied Petroleum Gas(LPG), compressed natural gas (CNG), Hydrogen, fruit & Vegetable seed oils have been tested for suitability on diesel engines in the past few years.

The advantage with vegetable oils is air fuel ratio is high in vegetable oil mixture because of oxygen content in the fuel and it is free from sulphur. The calorific value of these oils is almost 90% of the diesel fuel. Vegetable oils are costly than diesel oils in the present market, the viscosity is also one of the serious drawback associated with vegetable oils and this can be reduced by various methods. Those are transesterification, preheating, blending with alcohols /diesel, duel fuelling with liquid and gaseous fuels and use of additives.

Air swirl motion is required for better mixing of fuel and air in direct injection diesel engines. Diesel engine efficiency can be increased by improving combustion rate of fuel air mixture.[1]. Combustion rate can be increased by two methods; one is by modifying the combustion chamber to decrease contact between the flame and the surface of combustion

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chamber; and the second way is providing the inlet system to impart air swirl motion to the fresh air[2]. The swirl ratio and air motion can have a major effect on fuel air mixing, combustion rate, heat transfer and emissions. As the angular momentum decreases, the

swirl ratio also decreases in the compression stroke. At the top dead center, the swirl ratio varies accordingly as per the geometry of the combustion chamber [3]. When swirl ratio increases swirl at the top dead center and in turn the momentum of inertia of air lowers drastically. Due to this, increase in flow velocity contributes the fuel injection to spread out, which enhances the fuel air mixing and combustion rate in diesel engines. Benajes et.al[4] investigated the effect of swirl on combustion rate and emission of heavy duty diesel engines. He concluded that optimum air swirl decreases soot which mainly depends upon engine running conditions. Timothy[5] has discovered that over air swirl directs the inlet air away from the fuel, which causes incomplete combustion and soot formation. Due to the combined effect of swirl motion and squish flow in compression stroke, increases the turbulence in the combustion bowl by allowing mixing and evaporation of diesel.

## II. OBJECTIVE OF THE STUDY

The present work is aimed to investigate the five bladed nozzle air swirl device to improve the swirl motion in the intake manifold with Mamey Sapote Oil (MSO) blended with diesel for which the diesel engine produces better efficiency and lower emissions.

TABLE I. PROPERTIES OF MAMEY SAPOTE OIL

| S.No | Properties | MSO | Diesel | Units |
|---|---|---|---|---|
| 1. | Density @ 15 $^oC$ | 0.875 | 0.861 | $g/c^3$ |
| 2. | Kinematic viscosity | 4.65 | 2.95 | $mm^2/sec$ |
| 3. | Acid Value | 0.15 | 0.18 | Mg |

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| | | | | |
|---|---|---|---|---|
| | | | | KOH/g |
| 4. | Pour Point | -6 | 12 | ºC |
| 5 | Flash point | 173 | 48 | ºC |
| 6 | Calorific Value | 37.2 | 44.8 | MJ/kg |
| 7 | Cetane number | 52 | 51 | |
| 8 | Sulphur content | 0 | 350 | Mg/Kg |

### *A.Engine Software*

The 'Engine Soft' is Lab view based software package developed by Apex Innovations Pvt. Ltd. for engine performance monitoring system. Engine Soft can serve most of the engine testing application needs including monitoring, reporting, data entry, data logging. The software evaluates power, efficiencies, fuel consumption and heat release. Various graphs are obtained at different operating condition. While on line testing of the engine in RUN mode necessary signals are scanned, stored and presented in graph. Stored data file is accessed to view the data graphical and tabular formats. The data in excel format can be used for further analysis

### *B.Instrumentation*

Product is supplied with best quality instruments. The eddy current dynamometer is SAJ, Pune make. The components like Open ECU (PE USA), Combustion pressure sensor (PCB Piezotronics, USA), Crankangle sensor(Kubler, Germany), Fuel flow transmitter(Yokogawa, Japan), Pressure transmitter (Wika, Germany), High speed data acquisition device (National instruments, USA) are of MNC grades

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TABLE II. ENGINE SPECIFICATIONS

| **Make and Model** | **Research Engine Test setup code 240 PE Apex innovations pvt.Ltd.** |
|---|---|
| Type of Engine | Multi fuel |
| Number of Cylinders | Single cylinder, Four Stroke |
| Cooling Media | water cooled, |
| Rated Capacity | 3.5 KW @ 1500 rpm, |
| Cylinder diameter | 87.5 mm |
| Stroke length | 110 mm, |
| Compression ratio range | 12-18 |
| Injection variation | 0- 25 $^{o}$ BTDC |
| Dynamometer | Eddy current Dynamometer |
| Overall dimensions | W 2000 x D 2500 x H 1500 mm |

TABLE III. AVL FIVE EXHAUST GAS ANALYZER

| **Exhaust gas** | **Measurement range** | **Resolution** | **Accuracy** |
|---|---|---|---|

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| | | | |
|---|---|---|---|
| CO | 0-10% vol. | 0.01% vol. | % vol.: ± 0.03%, ≥0.6%vol.:± 5% of ind. val |
| HC | 0-20000 ppm | ≤ 2000:1 ppm vol. >2000: 10 ppm vol. | <2000 ppm vol.:± 10 ppm ≥2000 ppm vol:± 5% of ind. val. |
| $CO_2$ | 0-20%vol. | 0.1 % vol. . | <10%vol.:± 0.5 %vol. vo l.:± 0.5% of ind. val. |
| $O_2$ | 0-22%vol. | 0.01% vol. | vol.: ± 0.1%vol. ≥2% vol.:± 5%of ind. val |
| $NO_X$ | 0-5000 ppm | 1 ppm vol. | <500 ppm vol.:± 50 ppm. ≥500 ppm vol:± 10% of ind. val |

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|---|---|---|---|
| | | | |

## III. RESULT AND DISCUSSION

*A. Load Vs Brake thermal efficiency:*

Brake thermal efficiency of the diesel engine increases with the increase in load on the engine. From fig: 4.1 it observed that at full load B 15 MSO( Mamey Sapote Oil ) has the highest brake thermal efficiency which is 31.63%. This is 17.8% higher than the base line engine.

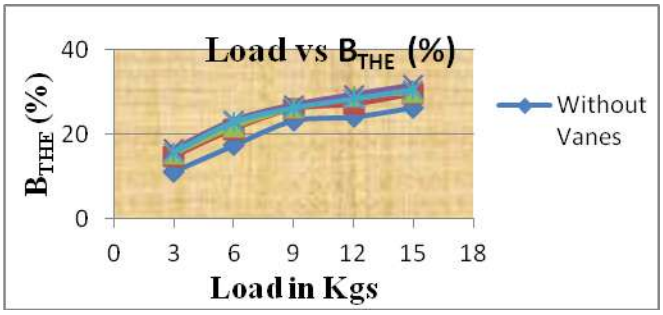


Fig: 4.1 Variation of brake thermal efficiency with variation of load

*B. Load versus Brake Specific Fuel Consumption (BSFC)*

Brake specific fuel consumption of the engine decreases with the increase in load on the engine. Due to the air swirl generation, there is an increase in the mixture quality of air & fuel in the combustion chamber before the initialization of ignition. Hence the amount of heat released is more, so that the fuel consumption is less for the all vanes nozzle when compared to the normal engine.Fig:4.2 illustrates that at full load the B15 blend consumes less fuel i.e 0.275 kg/kw-hr. It is observed that in B 15 oil there is a decrease of 16.6 % specific fuel consumption at full load when compared with the base line engine.

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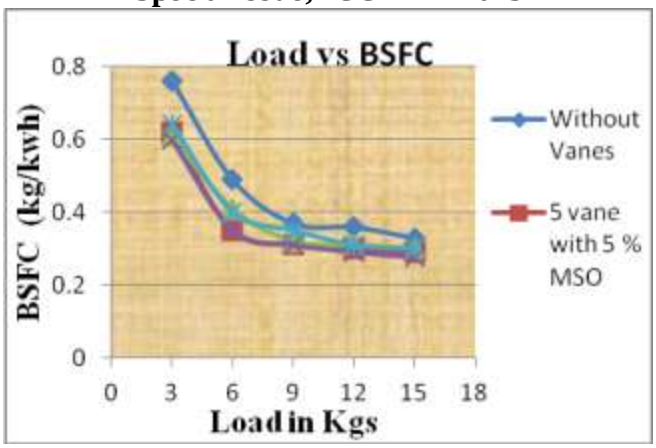


Fig: 4.2 Variation of brake specific fuel consumption with variation of load

*C.Load Vs Volumetric efficiency:*

The volumetric efficiency decreases with increase of the load. Fig: 4.3 shows that the volumetric efficiency of the diesel engine is more when 5 vane air swirl device is installed at the intake manifold than a base line engine without air swirl device. Due to this the brake thermal efficiency increases with installation of the air swirl device .At low load, the volumetric efficiency is high which is 83.29 % , which is 0.7% higher than without air swirl device.

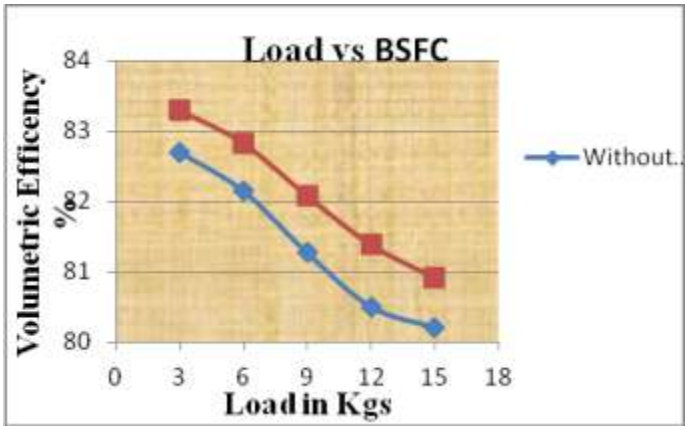


Fig: 4.3 Variation of Volumetric efficiency with variation of load

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*D. Load vs Hydro Carbons*

The biodiesel blends have more oxygen content than that of standard diesel. So, it involves in complete combustion process. The hydrocarbon emissions of the biodiesel blends are lower than the standard diesel due to complete combustion process. When percentage of blends of biodiesel increases, hydrocarbon decreases. Fig: 4.4 illustrate that, at full load with 5 vane air swirl, the HC emissions are less for 15% MSO , which is 31% less when compared with the base line engine without air swirl vanes.

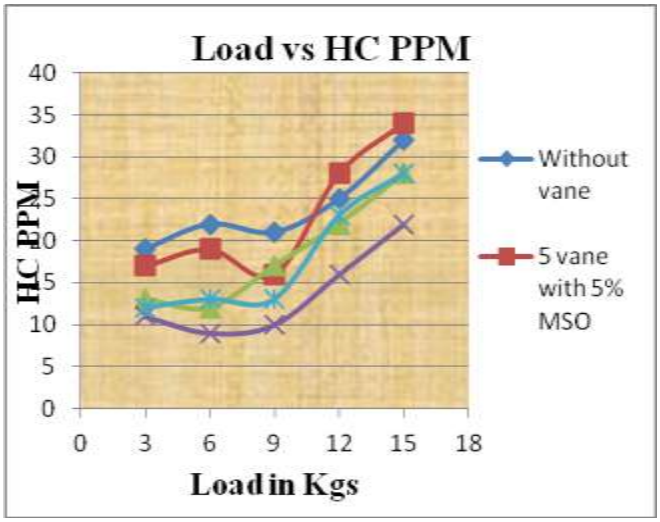


Fig: 4.3 Variation of Hydrocarbons with variation of load

*E. Load Vs Carbon monoxide (CO)*

The major reason to the CO formation is insufficient time and oxygen for oxidation of CO to $CO_2$.The carbon monoxide emission depends upon the oxygen content and cetane number of the fuel. As biodiesel has more oxygen content than the diesel fuel the biodiesel blends are involved in complete combustion process. Fig: 4.5 shows that at 12 Kg load 15 % MSO emits low carbon monoxide ( 0.08% in volume), which is 27.27% lower than the base line engine without air swirl device. The carbon dioxide emission depends upon the complete combustion of the fuel. The biodiesel blends have the 11.5% oxygen content, resulting in complete combustion. Due to the complete combustion of the biodiesel blends, carbon dioxide emission also increases. The carbon

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dioxide emission using diesel fuel is lower because of the incomplete combustion. The combustion of biodiesel also produced more carbon dioxide but crops are focused to readily absorb carbon dioxide and hence these levels are kept in balance.

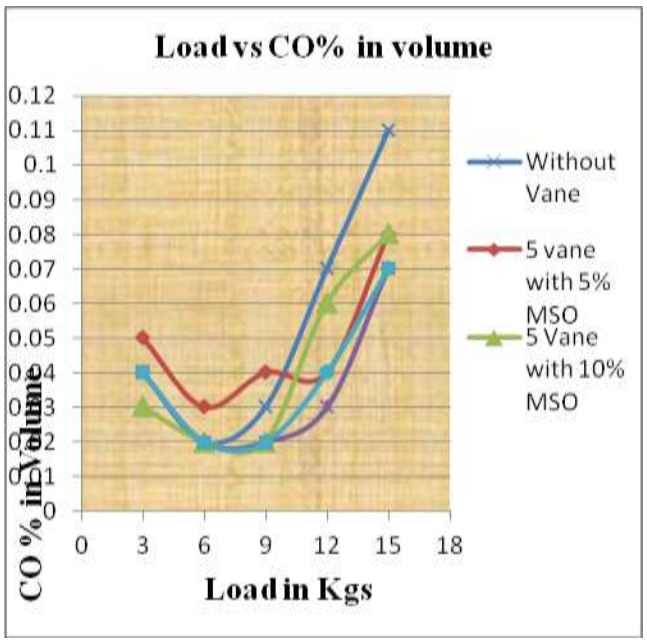


Fig: 4.5 Variation of Carbon monoxide with variation of load

*F. Load Vs Carbon dioxide ($CO_2$)*

The carbon dioxide emission depends upon the oxygen content and cetane number of the fuel. The biodiesel has more oxygen content than the diesel fuel. So the biodiesel blends are involved in complete combustion process. The maximum carbon monoxide emission was observed at full brake power of the engine. Fig: 4.6 illustrates that at full load with 5 vane air swirl device the carbon dioxide emissions are less in 15 % MSO (2.45% volume), which is 19.6% lower than the base line engine without the air swirl device.

*G. Load Vs NOx*

Nitrogen and oxygen react relatively at high temperature. Therefore high temperature and availability of oxygen are the two main reasons for formation of NOx. When the more amount of oxygen is available, the higher the peak combustion temperature the more is NOx formed. Fig: 4.6 shows that

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at peak load 15% MSO emits low NOx i.e 550 ppm, which is 22.5% lower than the base line engine without air swirl device.

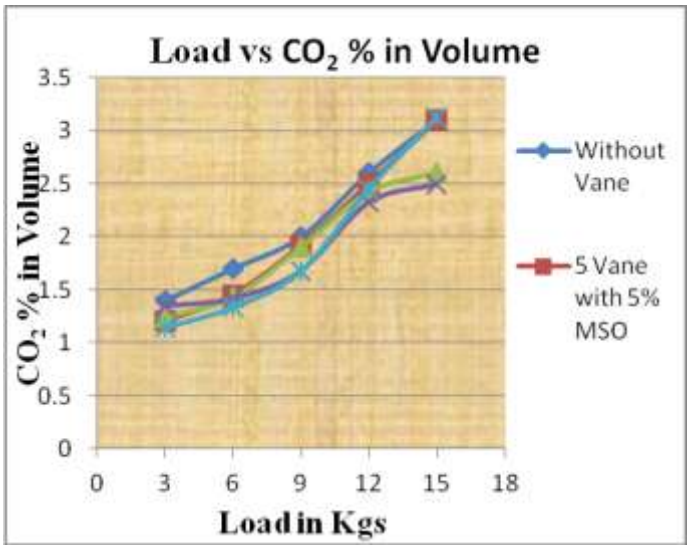


Fig: 4.5 Variation of Carbon dioxide with variation of load

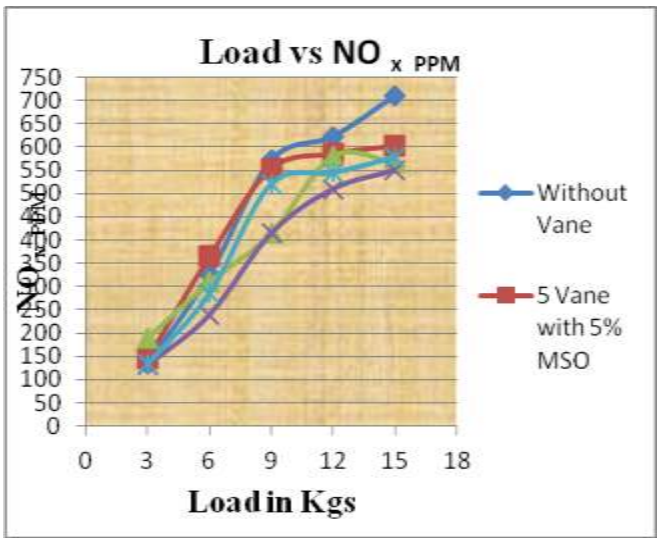


Fig: 4.6 Variation of NOx with variation of load

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*H. Load Vs Smoke Opacity*

Any volume in which fuel is burned at relative fuel-air ratio greater than 1.5 and at pressure developed in diesel engine produces soot. The amount of soot formed depends upon the fuel ratio and type of fuel. If this soot, once formed finds sufficient oxygen it will burn completely. If soot is not burned in combustion cycle, it will pass through the exhaust, and it will become visible. The size of the soot particles affects the appearance of smoke. Black smoke largely depends upon the air fuel ratio and increases rapidly as the load is increased and available air is depleted. Black smoke largely depends upon the air fuel ratio and increases rapidly as the load is increased and available air is depleted. It can be observed from the figure that smoke opacity for the blends of biodiesel comparable with that of diesel for all loads. In comparison with diesel, the smoke is less for biodiesel blends at all loads because of complete combustion. For over load the smoke opacity is maximum, which is due to incomplete combustion. Fig: 4.7 shows that at peak load 15% MSO emits less smoke which is13.48% lower than the base line engine without air swirl device.

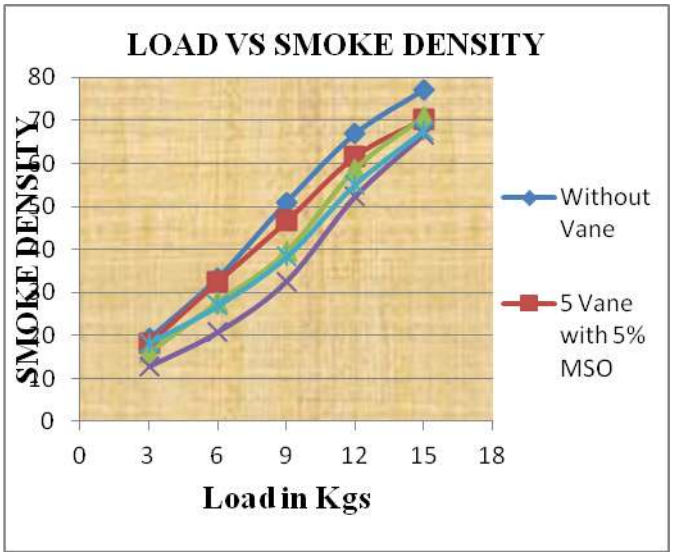


Fig. 4.7 Variation of smoke density with variation of load

## IV. CONCLUSIONS

Assessments pertaining to performance and emission characteristics have been carried out about the single cylinder, 4-stroke, uniform speed diesel engine at a Compression ratio of 18. The combustion

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along with performance and emission characteristics of single cylinder DI diesel engine fuelled with Mamey Sapote (MSO) biodiesel and its blends have been analyzed with five vane air swirl device and compared the same with the standard base line engine without air swirl device. Based on the experimental results, the following conclusions are drawn.

- At full load 15% MSO( Mamey Sapote Oil ) has the highest brake thermal efficiency which is 31.63%. This is 17.8% higher than the base line engine without air swirl device.
- At full load the B15 blend consumes less fuel i.e 0.275 kg/kw-hr. It is observed that in B 15 oil there is a decrease in 16.6 % of specific fuel consumption at full load when compared with the base line engine.
- At low load the volumetric efficiency is high which is 83.29 % , which is 0.7% higher than without air swirl device
- At full load with 5 vane air swirl the HC emissions are less for 15% MSO , which is 31% less when compared with the base line engine without air swirl vanes.
- At 12 Kg load 15 % MSO emits low carbon monoxide ( 0.08% in volume), which is 27.27% lower than the base line engine without air swirl device.
- At full load with 5 vane air swirl device the carbon dioxide emissions are less in 15 % MSO (2.45% volume), which is 19.6% lower than the base line engine without the air swirl device
- At peak load 15% MSO emits low NOx i.e 550 ppm, which is 22.5% lower than the base line engine without air swirl device.
- At peak load 15% MSO emits less smoke which is13.48% lower than the base line engine without air swirl device.

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**International Journal Of Core Engineering & Management (IJCEM)**
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**REFERENCES**

Myers P.S. and Uyehava O.A., "Efficiency, Heat transfer and preignition in I.C.engines", SAE 660130, Vol 75.

Yufing Li,et.al., "Effects of combinations and orientation of intake ports on swirl motion in DI diesel engine" SAE paper 2000-01-1823,2000.

Yub-Yih,et.al., "Investigation of realizing SDI with high swirl charge in motor cycle engine" International Journal of Energy, issue2, Volume.3, 2009.

Tippelmen,G.A. New method of investigation of swirl ports, S A E paper, 770404, 1977.

D.J.Timoey, SAE paper 851543, 1985.

V.CVS Phaneendra, V.Pandurangadu & M. Chandramouli,[6] " Performance Evaluation Of A Four Stroke compression Ignition Engine With Various Helical Threaded Intake Manifolds" , International Journal of Applied Research in Mechanical Engineering, July 2012 , pp. 53 - 60.

S.L.V. Prasad and V. Pandurangadu," Reduction Of Emissions By Intensifying Air Swirl In A Single Cylinder Di Diesel Engine With Modified Inlet Manifold", International Journal of Applied Engineering and Technology, October - December 2011, pp. 18 – 23.

Kratzeisen, M. and J. Muller, 2010. Influence of free fatty acid content of coconut oil on deposit and performance of plant oil pressure stoves, Fuel, 89: 1583-1589.

N.R. Banapurmath et al. 2008. Performance and emission characteristics of Compression Ignition engine operated on Honge, Jatropha and sesame oil methyl esters. Renewable Energy. 33: 1982-1988.

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# PHARMACEUTICAL DRUGS STORAGE IN DOMESTIC REFRIGERATORS INDIAN CONTEXT - LEGAL PERSPECTIVE

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***ABSTRACT***

***A good storage practice for Pharmaceutical products is essential as the storage condition will decide the shelf life of the product. Non compliance of storage specifications adversely affects the quality and potency of drugs. Pharmaceuticals to be stored at room temperature suffer a lot because from area to area, season to season the temperatures vary a lot. This article deals with the regulations in India with respect to the labeling of temperature sensitive Pharmaceutical formulations. Legal obligations imposed in respect of maintenance of the cool/cold storage conditions as per the Indian law and the Drugs and Cosmetics Act 1940 and Rules 1945 made there under. Accidental omission or intentional ignorance of storage conditions.***

***KEY WORD: Cold Storage Drugs, Drugs and Cosmetics Act 1940, Vaccine Vial Monitor.***

## I. INTRODUCTION

Pharmaceutical Drugs in India are losing their standards as they are not stored properly. If wholesale and retail traders are forced to follow the storage norms, they oppose with a fear of high electricity costs. Imposing mandatory maintenance of air conditioners in the medical shops hence, is nearly impossible in India. Non compliance of storage specifications adversely affects the quality and potency of drugs. Sub- standard Drugs ultimately affect Health. Health cannot be compromised. Indicator labels such as VVM (Vaccine Vial Monitors) affixing on all thermo sensitive Pharma drugs need to be made mandatory. Then traders thereby would safely handle the drugs because if not

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dealt properly loss is to their pockets alone. Deterioration of VVM indicator would alert and prevent the consumers from buying the improperly handled drug.

## II. THERMO SENSITIVE PHARMA - DRUGS STORAGE & INDIAN SCENARIO:

In India, the allopathic drugs manufacture, labeling, sale and distribution are governed by the Drugs and Cosmetics Act 1940 and Rules 1945. Manufacturers are required by law to label the temperature sensitive pharmaceuticals drugs with their temperature of storage as per Schedule P r/w Rule 96 (1) (vii) of the Drugs and Cosmetics Act & Rules 1945 only. It goes as follows Rule 96 Manner of labeling : (1) Subject to the other provision of these Rules , the following particulars shall be printed or written in indelible ink and shall appear in a conspicuous manner on the label of the innermost container of any drug and on every other covering in which the container is packed , namely:- (vii) Drugs specified in Schedule P and their preparations including combinations with other drugs shall bear on their label the date of manufacture and date of expiry of potency, and the period between the date of manufacture and the date of the expiry shall not exceed that laid down in the said schedule ( under the conditions of storages specified therein)[1]. It is Mandatory, but some manufacturers are found labeling the Cold Storage Indications on their products according to various pharmacopeias like IP, BP or USP or as they like and not as per the Schedule P conditions stated therein. The indications as well as the number of drugs for which indications are prescribed as per Schedule P, differ with those prescribed as per the official IP, BP or USP. The question is whether improper labeling of storage conditions on labels of pharmaceutical drugs constitutes an Offence? It is offence as Per Section 17 (b) punishable U/s 27 (d) of the said Act. (Punishment for a term which shall not be less than one year but which may extend to two years (and with fine which shall not be less than twenty thousand rupees [1]. Such improperly labeled pharmaceutical drugs fall under the ambit of definition "Misbranded Drugs" if they are not labeled in the prescribed manner. The question is whether prosecutions are launched for such violations? Rarely prosecutions are launched treating them as minor offences.

## III. IMPROPER LABEL INDICATIONS OF THERMO SENSITIVE DRUGS

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"Store in a Cool Dry & Dark Place" indication for example has been seen on label of even Paracetamol tablets of some firm. It is a known fact that Paracetamol tablets are not temperature sensitive drugs. These indications have not been prescribed as per Schedule P of the Act. It is an unnecessary printing. Some manufacturers are printing Cold /Cool storage indications on the label of drugs even when it is not required by the Law. Ignorance of Schedule P could not have been the reason because licensee employee is a technical & legal experts as per norms. Mostly it appears to be an act of extra precaution. It appears as a mind set to shift the 'Burden of Blame' on the traders the distributors/sellers, enforcement officials, testing laboratories for not storing the drugs in the manner as labeled to be stored. Motto of taking advantage in Courts of Law if situations of prosecutions/trials arise. During trial of accused in cases relating to manufacture of not of standard quality drugs, the prosecution needs to produce evidence to the satisfaction of the Courts, that at all stages the sample of drugs picked up for analysis by the regulatory officials have been kept in proper condition prior to analysis. This point of improper storage itself would be a sufficient reason for giving benefit of doubt to the accused paving for his acquittal in drug cases.[2] Pharmaceutical products to be stored at room temperature suffer a lot because from area to area, season to season the temperatures vary a lot. Sometimes even $45^0$ Centigrade is recorded as room temperature in some hot areas in India and this room temperature range is undefined in Indian Drug Law as a result room temperatures range got a larger flexibility and its depending on interpretations of people suiting to their advantage.[3] Usually in Judicial Courts with respect to pharmaceutical drugs cases instance of $30^0$ Centigrade is interpreted as room temperature.[3] While in other countries the room temperature is identified as temperature around $20^0$ to $22^0$ centigrade.[4]

The traders question is should the drugs to be stored in accordance with regulatory requirement of Schedule P or manufacturer recommendations? (Even if they are not labeled as per regulatory requirement). The traders are required by law under Rule 65 (17) of the Drugs and Cosmetics Rules not to stock the drugs in violation of any statement or direction recorded on such container, label or wrapper.(But not whether the drugs are indicated for special storage as per Schedule P.) If the manufacturer labeled the indication "Cool Place" in spite that no storage condition is prescribed for the drug as per law should the traders consider this as a drug to be stored in "Cool Place" and stock

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accordingly? The traders have no option. As per Law, the traders need to adhere to Rule 65 (17) and manufacturers to Schedule P. Traders have no option but to consider even such drugs to be stored in Cool Place. The drugs with Cool / Cold Storage indications arising out due to the extra precaution of manufacturers actions create confusion among traders as to which drugs are to be stored / not stored in refrigerator.

While seeking license to sell and distribute pharmaceutical drugs the applicant needs to fill up formats Form 19, Form 19 A and Form 19AA as per the said Act, wherein the applicant is required to provide the detail as to the particulars for special storage accommodation he is proposed to provide in the medical shop. As per the Act, a license in Form 20, 20B, 21 or 21B to sell stock or exhibit for sale or distribute drugs shall not be granted to any person unless the authority empowered to grant the license is satisfied that the premises in respect of which the license is to be granted are adequate, equipped with proper storage accommodation for preserving the properties of the drugs to which the license applies. If necessary cold storage facilities are not provided it would disqualify the applicants for grant of new license or Renewal of existing License.[5] Usually domestic Refrigerator is provided which do not have any segregated sections indicating various range of temperatures & temperature indicators. Unlike the issue of Pharma drugs; in the same Act under Schedule F which deals with Blood Bank the refrigerators with specific range of temperatures such as 2 to 6 degrees centigrade, 4 to 6 degrees centigrade with digital dial thermometer, recording thermograph and alarm device, with provision of continuous power supply is insisted upon. Such refrigerators are insisted and mandatory not only for stocking blood bags but also storing diagnostic kit and reagents which are thermolabile substances. The same type of stringency is not adopted in respect of refrigerator requirement for the various Pharma drugs.

The Pharma drugs for which licenses are granted commonly and mainly fall under four temperature ranges as per Schedule P. Viz: Cool Place 10 - 25 Degrees Centigrade; Cold Place < 8 Degrees Centigrade; Normal Room Temperature < 30 Degrees centigrade. Other temperatures specifically prescribed for some specific drugs are : At temperature not exceeding 5 Degrees centigrade, At a Temperature not exceeding 20 Degrees centigrade . In deep freeze, at temperature between 4 degrees centigrade and 6 degrees centigrade.etc.[1] As the domestic refrigerators with most of the

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traders in India lack temperature indicators in them. It is just a misconception that even the traders treated ideal in following storage conditions are in real sense not stocking the drugs as prescribed. Some drugs are indicated not to be stored in freezer but drugs are sometimes found in the deep freezer by the regulatory officials the Drugs Inspectors during inspections. This is however not intentional but because of the size of the refrigerator which happens to be the reason for constraint. Adequate shelving for appropriate storage of different category of drugs is usually not followed. Accessories like 'Digital Temperature Indicators' can be installed in the existing domestic refrigerators. The manufacturers of the refrigerators can be informed of the necessity in the market for refrigerators with temperature indicators as these are needed for the Medical Shops/Pharmacy in the whole Country. As many consumers are not aware of the storage indications or due to illiteracy the said aspect is not questioned.[6]

Rule 65 (17) violation detected in shops during inspections are for various reasons which are explained by the Licensee when show cause notices are issued to them by the licensing authorities: Some licensees in absence of pharmacists stock cool/cold drugs in racks shelves at room temperature instead of the refrigerators due to ignorance. It is notion that drugs Labeled cool place can be stored in shelves. Quantity of drugs with thermo sensitive indication versus insufficient space in the refrigerator. Usual practice of switching of the main power supply while leaving the shop at night daily and switching on in the morning only when shop is opened to avoid heavy electricity bills. The Whole sale shop usually offer discount on large scale purchase of certain Pharma drugs, vaccines etc. So large number/ fast moving drugs are bought in bulk to en-cash the discounts, but due to size of refrigerator the drugs are stocked in violation of storage indications. The licensees are usually not prosecuted in all cases for the violation of Rule 65 (17) in respect of stocking drugs in violation of label direction. Only departmental actions are usual practice in India. However, there are instances of prosecutions too when the said offence is one of the offence detected along with other grave offences. The temperature fluctuations of the cool /cold storage drugs encountered are not seen accounted. There is no mechanism or procedure even in law to account for the temperature parameter of thermo sensitive Pharma drugs not even during transportation.[7] Regulators checks regarding the storage aspects while the pharmaceutical drugs are in transit are all most nil.[7] There is

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dire need for low temperature handling and transportation facilities in respect of pharmaceutical drugs in India.[8]

## IV. CONCLUSION

Only the Drugs with Vaccine Vial Monitors (World's Smartest Sticker)[9] are seen accounted because the indicator gets spoiled /discolored perfectly only at the place and time where it has been mishandled fixing the liability specifically on the Violator. This is the only possible solution to make the Safe Thermo Sensitive Drugs available to the Consumer, but the manufacturers cannot be insisted to affix the indicator in India as it is 'Not Mandatory' not even for Unit dose Vaccines and multi dose Vaccines. These days Only Government Supply Multi dose Vaccines Vials are provided with these Vaccine Vial Monitors. The Cost of the Vaccine Vial Monitor could be affordable, Consumer paying thousands of rupees for Drugs could afford the extra coin towards cost of VVM from his pocket which guarantees him the Standard and Potency of the costly drug he purchases.

## REFERENCES

The Drugs and Cosmetics Act 1940 and Rules 1945.

Judgement of the Andhra Pradesh High Court in Criminal Appeal No.171 of 2012 Dated Date: 23-01-2012.

Judgement of the Andhra Pradesh High Court in Criminal Revision Case No.502 of 2006. Dated 16th July, 2012.

Room Temperature cited in wikepedia.org in ref. to The American Heritage Dictionary of the English Language.

Judgment of Bombay High Court in "Jaiswal Medical Stores" vs Assistant Drugs Controller Dated 8 July, 1959 Equivalent citations: (1959) 61 BOMLR 1531.

World Journal of Pharmacy and Pharmaceutical Sciences Volume 2, Issue 5, 2499-2515. Review Article ISSN 2278 – 4357 an overview: storage of pharmaceutical products.

www.who.int>vaccine_quality

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www.temptimecorp.com>indicators

www.path.org>projects>vaccine_vial

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# THE EFFECTS OF PROCESS PARAMETERS ON WELDING RESPONSE OF CORNER WELDED STEEL PLATES

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***ABSTRACT***

***In large steel fabrication industries such as shipbuilding, and high-speed train guideway, the problem of residual stresses and overall distortion has been and continues to be a major issue. In the last few decades, various research efforts have been directed at the control of the welding process parameters aiming at reducing the distortions and residual stress effects. Yet, in actual practice, large amounts of resources are still being spent in reworking welds, which in turn increases the production cost and delays work completion. It is assumed that in order to reduce the residual stresses and distortions from a welding operation, it is necessary to understand the effects of welding process parameters on the responses. In this thesis, a study has been conducted to assess the effects of heat input, speed rate, restraint, plate curvature, and gap on arc welding responses as applied to steel welding. A single pass corner joint arc welding has been chosen in this study.***

***Index Terms— Finite Element Method, Welding Simulation, Arc Welding, Process Parameters, Curved Plate, Welding Response.***

## I.INTRODUCTION

Generally, welding can be defined as any process in which two or more pieces of metal are joined together by the application of heat, pressure, or a combination of both. Most of the processes may be grouped into two main categories: pressure welding, in which the weld is achieved by pressure;

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and heat welding, in which the weld is achieved by heat. Heat welding is the most common welding used today. Arc welding, which is heat-type welding, is one of the most important manufacturing operations for the joining of structural elements for a wide range of applications, including guide way for trains, ships, bridges, building structures, automobiles, and nuclear reactors, to name a few. It requires a continuous supply of either direct or alternating electric current, which create an electric arc to generate enough heat to melt the metal and form a weld. The arc welding process is a remarkably complex operation involving extremely high temperatures, which produce severe distortions and high levels of residual stresses. These extreme phenomena tend to reduce the strength of a structure, which becomes vulnerable to fracture, buckling, corrosion and other type of failures. The most widely used arc welding processes are shielded metal arc, gas tungsten arc, gas metal arc, and submerged metal arc.

## II. PHYSICS OF ARC WELDING

The The physics of welding deals with complex physical phenomena associated with welding, including heat, electricity, magnetism, light, and sound. By the application of intense heat, metal at the joint between two parts is melted and caused to intermix. Generally, it is described by an electric field between the positive anode and the negative cathode surrounded by an ionization gas. In arc welding, the intense heat needed to melt metal is produced by an electric arc. On the metal, there is a thin layer of surface electrons, which are accelerated in the field towards the anode. These electrons collide with the atoms in the gas, causing impact ionization where the atoms are decomposed into electrons and positive ions, which cause further ionization. The current of electrically charged particles in the arc and the temperature are interrelated as high temperatures increase ionization causes the temperature rise due to the released energy. To obtain welding conditions the temperature or the current must initially be brought up to a certain level, which is done by igniting the arc. Arc ignition is accomplished by short-circuit current which occurs as the anode and the cathode are brought into brief contact. The short-circuit current shortly increases the temperature and the current and subsequently the arc can be maintained in the electric field existing under normal welding conditions. The arc is surrounded by a magnetic field directing the charged

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particles towards the center of the arc, causing the arc to localize in spots on the anode and the cathode. When the electrically charged particles impact on the anode and the cathode, the anode and the cathode spots are heated to high temperatures. The high temperature of approximately 3000 to 5000 C causes both the electrode and the welded metal to melt. Due to suction force of the plasma flow, droplets of the electrode material are deposited on the metal.

### A. Heat Affected Zone (HAZ)

A heat affected zone (HAZ) of a weld is that part of the welded joint has been heated to a temperature to the solidus of the parent material resulting in varying degree of influence on microstructure as a consequence heating and cooling cycle. When a metals and alloys without polymorphous transformation (e.g., Cu, Ni, Al) are welded, the microstructure in the HAZ remain unaltered through grain growth or recrystalization may take place, while in the case of metals and alloys with polymorphous transformations (e.g., steels), significant micro structural changes takes place in HAZ, that in turn influence the mechanical properties and consequently the service behavior of the welded joint. A welded joint consists of melt-pool zone (MPZ), heat affected zone (HAZ), and unaffected base metal. The HAZ is defined as the portion of the base metal that has not been melted, but whose mechanical properties or microstructures have been altered by the heat of the welding. The HAZ is crucial to the strength of the weldment since the cracking and fracture occur inside the HAZ region. During welding, the temperature at this region is very severe. As a result, it contains a variety of microstructures some of which have weak toughness and strength properties. Fig.2.1 depicts a melt-pool zone (MPZ) and heat affected zone (HAZ) in the weldment during welding process.

The effects of temperature distribution on microstructure of material in the HAZ have been reported by Weisman (1976). Fig.2.2 illustrates the relationships of HAZ and the iron carbon phase diagram. The HAZ can be divided into four regions; each of the regions is defined by a different type of material microstructure. In the first region of HAZ, rapid austenitic grain growth

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takes place when the temperature is close to the melting point. Hardenability in this region increases due to large grain size. If the cooling rate is high enough, it can readily transform to

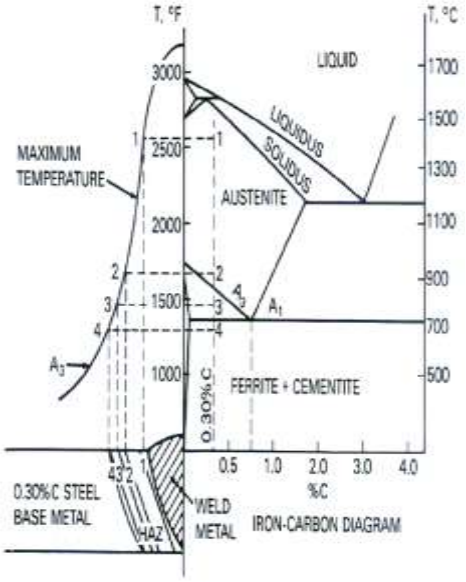


**Fig. 1** Approximate Relationships among Peak Temperature, Distance from Weld Interface, and the Iron-Carbon Phase Diagram (Weisman, 1976).

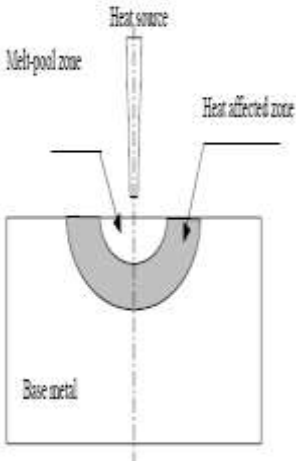


**Fig. 2** Illustration of Melt-Pool Zone and Heat Affected Zone (HAZ).

martensite. Region 2 of HAZ falls into lower austenite range. The material of this zone may also transform to martensite if the cooling rate is fast enough. The hardenability in this region will not be

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significantly increased by grain growth due to low temperature in order to promote grain growth. In region 3, some grains transform to austenite and some do not. A small amount of martensite may form in this region. This zone is normally not very hard, but if martensite exists, the material may be brittle. Lastly, in region 4, the metal is not heated enough to form austenite, but rather the heat source serves to temper the metal to a soft condition

**B. Type of Welding Deformations**

Any unwanted physical changes or departure from specifications in fabricated structure or component, as consequence of welding, is called welding distortion. Distortion is caused by the non-uniform expansion and contraction of weld metal and adjacent base metal during the heating and cooling cycle of cycle of the welding process. During such a cycle, many factors affect shrinkage of the metal and make accurate prediction of distortion difficult. These non-uniform heating and cooling cycles in the weld and adjacent base metal, which causes complex thermal strains. The stresses resulting from the strains produce internal forces causing shrinkage of the material. The stresses that would exist in a weldment after all external loads are removed are called residual stresses. Depending on the shrinkage pattern and the shape of the structure welded, various deformations such as bending, buckling and rotation take place. When steel structure parts connected by welding, they are accompanied by not only welding residual stresses but also distortion. The distortion found in the welded structures is caused by four fundamental dimension changes that occur during welding process.

• Transverse shrinkage of butt joints- dimensional reduction in a direction perpendicular to the welding line.

• Longitudinal shrinkage of butt joints- dimensional reduction in a direction parallel to the weld line. The amount of the longitudinal shrinkage is small in comparison to transverse shrinkage, about 1/1000 of the weld length as reported by Weisman (1976).

• Angular distortion of butt joints – an angular change that occurs due to a non-uniform thermal contraction through the thickness of the plate. The non-uniform thermal contraction originates from the uneven heating through the thickness during welding.

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• Angular distortion of fillet welds – similar to the angular distortion of welds in butt joints, the non-uniform thermal contraction through the thickness of the flanges creates a moment M about the flange neutral axes.

• Longitudinal bending distortion – produced by bending stresses induced by the longitudinal shrinkage forces of the welds not coinciding with the neutral axis of the weldment.

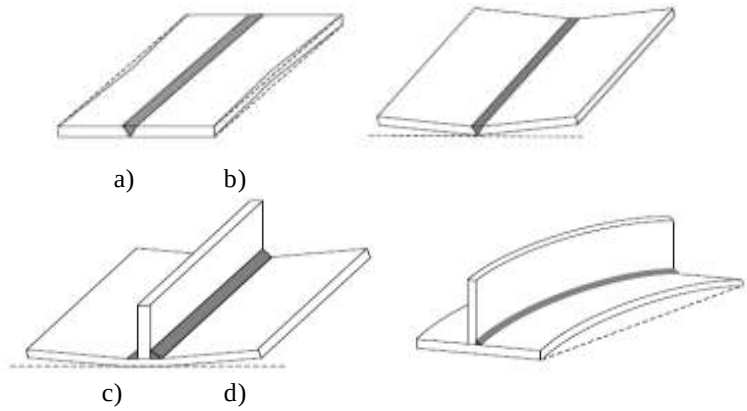


**Fig. 3** Various Type of Welding Distortion. (a) Transverse Shrinkage in a Butt-Joint
(b) Angular Change in a Butt-Joint
(c) Angular Change in a T-Joint (d) Longitudinal Distortion in a Fillet Joint.

## III. MODELING AND SIMULATION OF WELDING

### A. Overview of Welding Simulation

As presented by several researchers, finite element method (FEM) has been successfully used to evaluate thermo mechanical response of the complex welding process. In this present work the finite element (FE) package ANSYS® has been used to simulate the arc welding process. The finite element simulation of welding process requires two analyses; transient thermal analysis and elasto-plastic analysis. To simplifying the simulation procedure, uncoupled numerical simulations were used. In such uncoupled analyses, the results of the transient thermal analysis which include the

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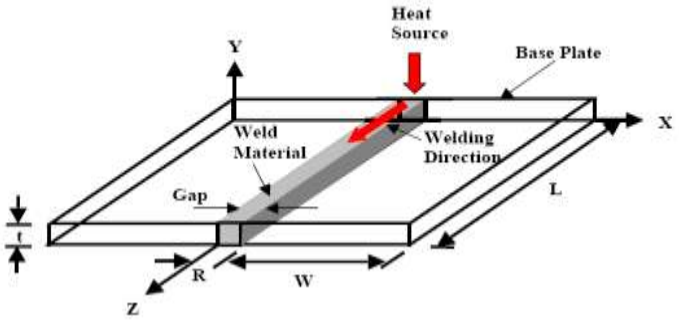
temperature distribution, will be used for the second analysis together with the temperature dependent mechanical properties of the material i.e., thermal expansion coefficient, modulus of elasticity, Poisson's ratio, etc. Density in this analysis is assumed constant. In this study, no experimental data were available to verify the simulation results. Instead, the results of the simulation were compared to numerical results obtained from previous researcher. Once the simulation results matched the numerical results, the same finite element formulations were used to simulate the welding process throughout this study.

### B. Verification of Butt Welding Process Using ANSYS®

In this study, a finite element simulation of a single-pass butt joint welding was verified using the work of Friedman (1975). To do this, a simple butt-joint welding whose welding parameters are consistent to those of Friedman's model; heat input Q=703 Watts, the characteristic length of heat flux r = 5.08 mm, and welding speed of 2.12 mm/sec was simulated using ANSYS® codes. The model then was verified by comparison of its temperature distribution at some chosen nodes with the Friedman's model. Fig.3.3 depicts plate geometry of the butt-joint welding which is similar to the Friedman's model. However, since the temperature distribution of the butt-joint welding is symmetric about the weld line, only half of the weldment needs to be modeled.




Notes: Drawing not to scale t = 2.54 mm R = 2.54 mm
W = 150 mm L = 250 mm

**Fig.4** Illustration of Butt-Joint Arc Welding Process

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### C. Finite Element Analysis of Single Pass Corner-Joint Welding

Single pass corner-joint welding of curved plates was simulated throughout this by applying finite element analysis using Ansys. However, since the heat distribution was not symmetric in curved plates, vertical and horizontal plates had to be included in the model. Fig.3.4 depicts a typical corner-joint with single pass weld, in which the torch travels constantly along the weld line of the steel plate. In this thesis, a 3D thermo-elasto-plastic analysis was performed on corner joint. In ANSYS® the heat transfer analysis was conducted using element type SOLID70. This element type has a three-dimensional thermal conduction capability and eight nodes with a single degree of freedom (temperature) at each node. The element is applicable to a three-dimensional, steady-state or transient thermal analysis. The element can also compensate for mass transport heat flow from a constant velocity field. Since only one surface load can be applied on solid element SOLID70, shell element type SHELL57 was also used to simulate heat lost through convection and radiation on the surface. The heat input from the welding electrode was modeled by using heat flux as the input for the heat transfer from the rod to the work piece.

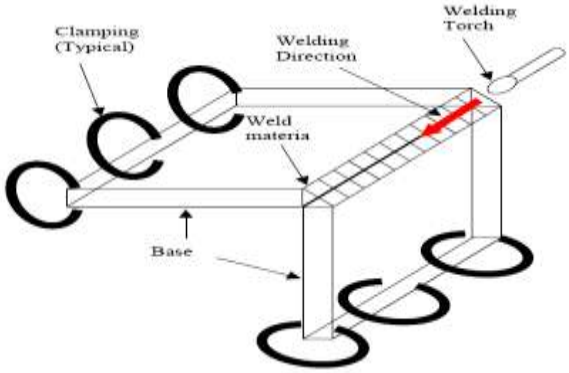


**Fig. 5** Illustration of Single-Pass Corner-Joint with Three Clamps on Each Plate.

This heat flux is based on the welder setting and the efficiency of the arc. Table 3.1 shows the design matrix of welding parameters used in the finite element simulation.

**Table 1** Design Matrix of Welding Parameters Used in the Finite Element Simulation

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| Case | Study of | Heat Input | Speed |
|---|---|---|---|
| 1 | Effect of Heat input | Changed* | 2.10mm/s |
| 2 | Effect of speed | 1200 | Changed |

Note: * low, medium, and high values were applied.

### D. Model description and Mesh

A steel plate with radius of curvature 400. The length of arc traveled and the thickness of the geometries are the same.

**Table 2** Dimensions of corner joint Used in the Analyses.

| Radius of curvature,r | Arclength (mm) | Width (mm) | Thickness (mm) | Angle |
|---|---|---|---|---|
| 400 | 279.25 | 100 | 6 | 40 |

The meshes used for all models are gradually refined from fine to coarse, according to the expected reduction in temperature gradient moving away from the heat source. A total of 1250 solid elements and 500 shell elements were used in the models. Nodes and elements numbers were consistent for all models.

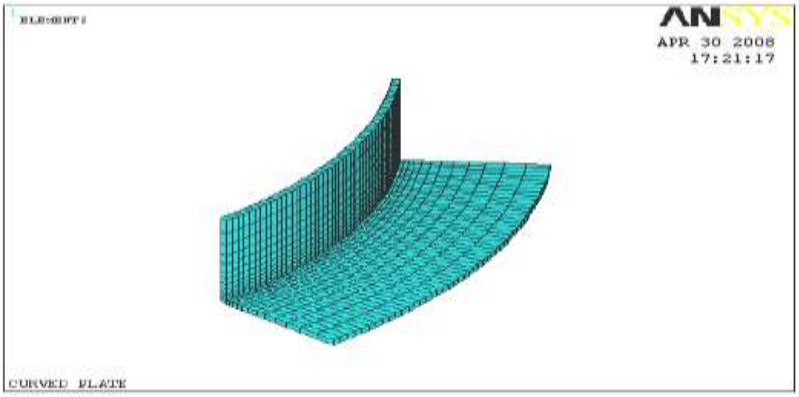


**Fig. 6** Finite Element Mesh of Three-Dimensional Curved Plates.

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### E. Material Properties

Several different materials have been used in structures where welding is involved, with low carbon steel being the most common. Table .1 shows the temperature dependent material properties used for the heat transfer and transient elasto- plastic analysis. For simplicity, the deposited weld material was also assumed to be, low carbon steel. Two sets of temperature dependent material properties were needed in the analysis. The heat transfer analysis requires thermal conductivity, specific heat, density (constant) and combined convection and radiation heat coefficient. On the other hand, the modulus of elasticity, Poisson ratio, and coefficient of thermal expansion are required for elasto-plastic analysis.

The modulus of elasticity is a measure of the stiffness of a material. A higher modulus material is more likely to resist distortion. The amount of expansion or contraction a metal will undergo during a heating or a cooling cycle depends on the coefficient of thermal expansion. Therefore, the possibility of distortion will be larger in metals having a higher coefficient of thermal expansion because they are expected to experience higher shrinkage during cooling of the weld metal and the adjacent metal. Thermal conductivity gives a measure of the ease of heat flow through a material. A metal with low thermal conductivity does not dissipate heat rapidly, and steep temperature gradients result. Hence, the shrinkage effect in the weld and in the adjacent plate increases.

**Table 3** Temperature-Dependent Material Properties for Both Steel Plate and Weld.

| Temperatures (Celsius) | Modulus of Elasticity (MPa) | Poisson Ratio | Thermal Ex. Coef. ($10^{-6}$/$^{o}$c) | Thermal Conductivity (w/m $^{o}$k) | Specific Heat (j/kg $^{o}$k) |
|---|---|---|---|---|---|
| 0 | 341 | 0.2786 | 10 | 51.9 | 450 |
| 100 | 349 | 0.3095 | 11 | 51.1 | 499.2 |
| 300 | 440 | 0.331 | 12 | 46.1 | 565.5 |
| 450 | 460 | 0.338 | 13 | 41.05 | 630.5 |
| 550 | 410 | 0.3575 | 14 | 37.5 | 705.5 |

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| | | | | | |
|---|---|---|---|---|---|
| 600 | 330 | 0.3738 | 14 | 35.6 | 773.3 |
| 720 | 58.8 | 0.3738 | 14 | 30.64 | 1080.4 |
| 800 | 58.8 | 0.4238 | 14 | 26 | 931 |
| 1450 | 1.29 | 0.4738 | 15 | 29.45 | 437.93 |
| 1510 | 1.0 | 0.499 | 15 | 29.7 | 400 |
| 1580 | .001 | 0.499 | 15 | 29.7 | 735.25 |
| 5000 | .001 | 0.499 | 15.5 | 42.2 | 400 |

## IV. RESULTS OF WELDING SIMULATION

### A. Transient Analysis

The result of the heat transfer analysis is the time dependent temperature distribution at each node of the element. The temperature distribution at various locations of vertical and horizontal base plate. Notice that the legends (i.e. "V-19.03, etc.) of both graphs represent the distances from the weld line. The graphs show that the temperature distributions on vertical and horizontal plates are almost identical although the geometry is not symmetric.

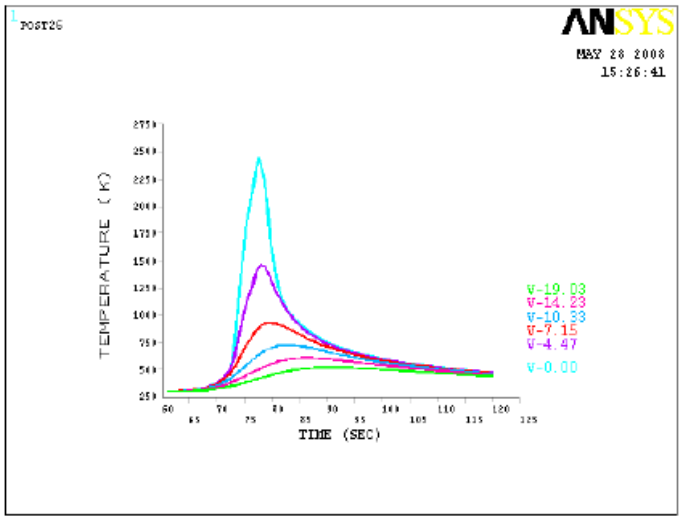


**Fig. 7** Temperature Distribution in the Vertical Plate

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### B. Thermo-Mechanical Analysis

The residual stress and plastic deformation were obtained after the model cooled down to room temperature. The displacements, stresses, and strains distributions. The maximum value could be found in the red region.

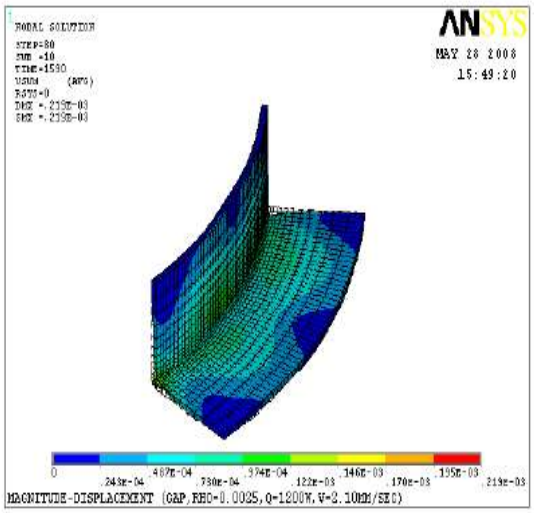


**Fig. 8** USUM Contour.

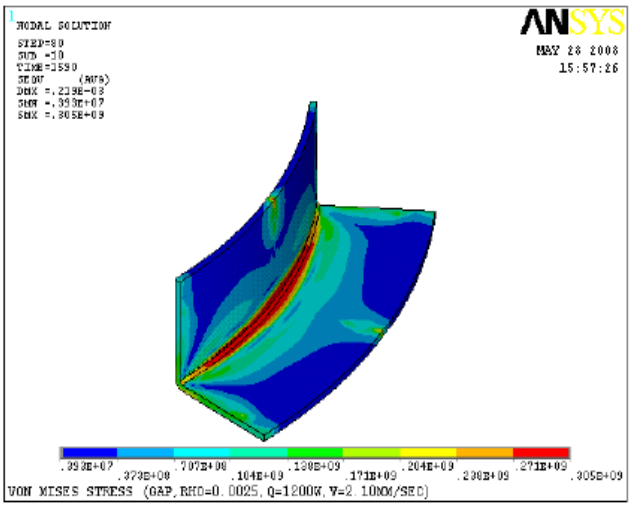


**Fig. 9 Von** Mises Stress Contour.

## IV. CONCLUSION

After completed this work, several conclusion can be drawn from the results of this:

I) A complex welding process phenomena can be simulated using a commercial finite element package, namely ANSYS®. A special feature of "birth and death" element has been used to simulate the deposition of weld material.

II) Based on the simulation results, distortion or shrinkage of the weldment can be predicted numerically. Thus, the experimental analysis, which might be costly, can be avoided.

III) Heat input, Welding speed, have a significant impact on the weld responses.

The conclusion that can be drawn from the simulation results are as follows:

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i) When the heat input increases, the responses such as displacements, stresses, and strains also increase. An increase of heat input results in a significant increase in the Y-displacement, X-stress, and X-elastic strain.

ii) On the other hand, the opposite response behaviour is observed when the welding speed increases. An increase of the welding speed, for instance, results a decrease of Y-displacement, X-stress and, of X-elastic strain.

iii) The critical longitudinal cross section, which has largest residual stress and maximum displacements are located about 5 mm away from the weld line.

## REFERENCES

Lancaster, J., Metallurgy of Welding, Chapman & Hall, 5th Ed., 1993.

American Welding Society, Structural Welding Code Steel-Steel, 1996.

Bonifaz E., "Finite Element Analysis of Heat Flow in Single-Pass Arc Welds", Welding Research Supplement, May 2000, P121-125.

Brown S., and Song H., "Implications of Three-Dimensional Numerical Simulations of Welding of Large Structures", Welding Journal, Feb. 1992, P55-62.

Brown S., and Song H., "Finite Element Simulation of Welding of Large Structure", Journal of Engineering for Industry, vol. 144, 1992, P 441-451.

Frewin M., and Scott D., "Finite Element Model of Pulsed Laser Welding", Welding Research Supplement, Jan. 1999, P 15-22.

Friedman E., "Thermo mechanical Analysis of the Welding Process Using the Finite Element Method", Transaction of the ASME, 1975, P 206-213.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Goldak J., Bibby M., Moore J., House R., and Patel B., "Computer Modeling of Heat Flow in Welds", Metallurgical Transactions B, vol. 17B, 1986, P 587-600.

Goldak J., Chakravarti A, and Bibby M., "A New Finite Element Model for Welding Heat Sources", Metallurgical Transactions B, vol. 15B, 1984, P 229-305.

Harwig D., Longenecker D, and Cruz J., "Effects of Welding Parameters and Electrode Atmospheric Exposure on the Diffusible Hydrogen Content of Gas Shielded Flux Cored Arc Welds", Welding Research Supplement, Sept. 1999, p 314-321.

Jang G., Kim H., and Kang S., "The Effects of Root Opening on MechanicalProperties, Deformation and Residual Stress of Weldments", Welding Research Supplement, March 2001, p 80-89.

Kamala V. and Goldak J., "Error Due To Two Dimensional Approximations in Heat Transfer Analysis of Welds", Welding Journal, Sept. 1993, p 440-446.

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# VIBRATION AND CFD ANALYSIS OF AIRCRAFT COMPOSITE WING IN SUBSONIC AIR FLOW

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***ABSTRACT***

***A wing is a type of fin with a surface that produces aerodynamic force for flight or propulsion through the atmosphere, or through another gaseous or liquid fluid. As such, wings have an airfoil shape, a streamlined cross-sectional shape producing lift. A wing's aerodynamic quality is expressed as its lift-to-drag ratio. The lift a wing generates at a given speed and angle of attack can be one to two orders of magnitude greater than the total drag on the wing. A high lift-to-drag ratio requires a significantly smaller thrust to propel the wings through the air at sufficient lift.The requirements for the aircraft wing are High stiffness, High strength, High toughness and Low weight. In this thesis, an aircraft wing is designed and modeled in 3D modeling software Pro/Engineer. The materials used for aircraft wings are mostly metallic alloys. In this thesis, the materials are replaced by composite materials Carbon Fiber and Aramid Fiber.Static analysis is done to determine the stresses produced by applying loads. Vibration analysis is done on the aircraft wing to determine the frequencies. CFD analysis is done on the wing to determine the lift and drag forces by changing angle of attacks. The angle of attack taken is $2^0$ and $4^0$. Analysis is done in Ansys.***

## I.INTRODUCTION

In the 1960s, ever larger aircraft were developed to carry passengers. As engine technology improved, the jumbo jet was engineered and built. Still primarily aluminum with a semi monocoque

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fuselage, the sheer size of the airliners of the day initiated a search for lighter and stronger materials from which to build them. The use of honeycomb constructed panels in Boeing's airline series saved weight while not compromising strength. Initially, aluminum core with aluminum or fiberglass skin sandwich panels were used on wing panels, flight control surfaces, cabin floor boards, and other applications.

A steady increase in the use of honeycomb and foam core sandwich components and a wide variety of composite materials characterizes the state of aviation structures from the 1970s to the present. Advanced techniques and material combinations have resulted in a gradual shift from aluminum to carbon fiber and other strong, lightweight materials.

These new materials are engineered to meet specific performance requirements for various components on the aircraft. Many airframe structures are made of more than 50 percent advanced composites, with some airframes approaching 100 percent. The term "very light jet" (VLJ) has come to describe a new generation of jet aircraft made almost entirely of advanced composite materials. It is possible that non composite aluminum aircraft structures will become obsolete as did the methods and materials of construction used by Cayley, Lilienthal, and the Wright Brothers.

## II. GENERAL

An aircraft is a device that is used for, or is intended to be used for, flight in the air. Major categories of aircraft are airplane, rotorcraft, glider, and lighter-than-air vehicles. Each of these may be divided further by major distinguishing features of the aircraft, such as airships and balloons. Both are lighter-than-air aircraft but have differentiating features and are operated differently. The concentration of this handbook is on the airframe of aircraft; specifically, the fuselage, booms, nacelles, cowlings, fairings, airfoil surfaces, and landing gear. Also included are the various accessories and controls that accompany these structures. Note that the rotors of a helicopter are considered part of the airframe since they are actually rotating wings. By contrast, propellers and rotating airfoils of an engine on an airplane are not considered part of the airframe. The most common aircraft is the fixed-wing aircraft. As the name implies, the wings on this type of flying machine are attached to the fuselage and are not intended to move independently in a fashion that results in the creation of lift. One, two, or three sets

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of wings have all been successfully utilized. Rotary-wing aircraft such as helicopters are also widespread. This handbook discusses features and maintenance aspects common to both fixedwing and rotary-wing categories of aircraft. Also, in certain cases, explanations focus on information specific to only one or the other. Glider airframes are very similar to fixedwing aircraft. Unless otherwise noted, maintenance practices described for fixed-wing aircraft also apply to gliders.

**There are five major stresses to which all aircraft are subjected**

- Tension
- Compression
- Torsion
- Shear
- Bending

Tension is the stress that resists a force that tends to pull something apart. The engine pulls the aircraft forward, but air resistance tries to hold it back. The result is tension, which stretches the aircraft. The tensile strength of a material is measured in pounds per square inch (psi) and is calculated by dividing the load (in pounds) required to pull the material apart by its cross-sectional area (in square inches). Compression is the stress that resists a crushing force. The compressive strength of a material is also measured in psi. Compression is the stress that tends to shorten or squeeze aircraft parts.

Torsion is the stress that produces twisting. While moving the aircraft forward, the engine also tends to twist it to one side, but other aircraft components hold it on course. Thus, torsion is created. The torsion strength of a material is its resistance to twisting or torque. Shear is the stress that resists the force tending to cause one layer of a material to slide over an adjacent layer. Two riveted plates in tension subject the rivets to a shearing force. Usually, the shearing strength of a material is either equal to or less than its tensile or compressive strength. Aircraft parts, especially screws, bolts, and rivets, are often subject to a shearing force. Bending stress is a combination of compression and tension. The rod has been shortened (compressed) on the inside of the bend and stretched on the outside of the bend.

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A single member of the structure may be subjected to a combination of stresses. In most cases, the structural members are designed to carry end loads rather than side loads. They are designed to be subjected to tension or compression rather than bending. Strength or resistance to the external loads imposed during operation may be the principal requirement in certain structures. However, there are numerous other characteristics in addition to designing to control the five major stresses that engineers must consider. For example, cowling, fairings, and similar parts may not be subject to significant loads requiring a high degree of strength. However, these parts must have streamlined shapes to meet aerodynamic requirements, such as reducing drag or directing airflow.

## Fixed-Wing Aircraft

### Fuselage

The fuselage is the main structure or body of the fixed-wing aircraft. It provides space for cargo, controls, accessories, passengers, and other equipment. In single-engine aircraft, the fuselage houses the powerplant. In multiengine aircraft, the engines may be either in the fuselage, attached to the fuselage, or suspended from the wing structure. There are two general types of fuselage construction:
truss and monocoque.

### Truss Type

A truss is a rigid framework made up of members, such as beams, struts, and bars to resist deformation by applied loads. The truss-framed fuselage is generally covered with fabric. The truss-type fuselage frame is usually constructed of steel tubing welded together in such a manner that all members of the truss can carry both tension and compression loads. In some aircraft, principally the light, singleengine models, truss fuselage frames may be constructed of aluminum alloy and may be riveted or bolted into one piece, with cross-bracing achieved by using solid rods or tubes.

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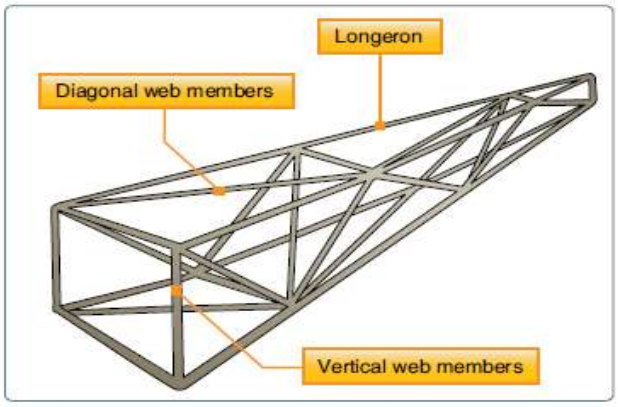


*A truss-type fuselage. A Warren truss uses mostly diagonal bracing.*

**The design may be divided into two classes:**

1. Monocoque
2. Semimonocoque

Different portions of the same fuselage may belong to either of the two classes, but most modern aircraft are considered The true monocoque construction uses formers, frame assemblies, and bulkheads to give shape to the fuselage. The heaviest of these structural members are located at intervals to carry concentrated loads and at points where fittings are used to attach other units such as wings, powerplants, and stabilizers. Since no other bracing members are present, the skin must carry the primary stresses and keep the fuselage rigid. Thus, the biggest problem involved in monocoque construction is maintaining enough strength while keeping the weight within allowable limits.

**Monocoque Type**

The monocoque (single shell) fuselage relies largely on the strength of the skin or covering to carry the primary loads.

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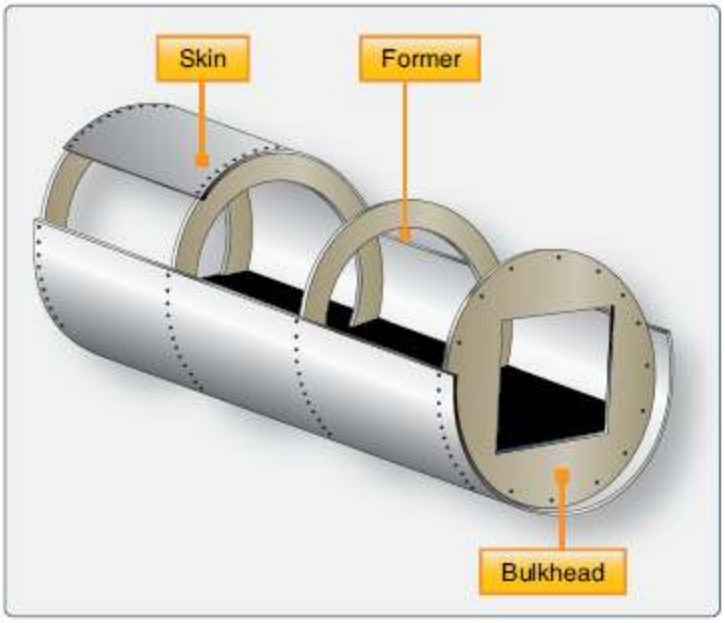


*An airframe using monocoque construction.*

**Semimonocoque Type**

To overcome the strength/weight problem of monocoque construction, a modification called semimonocoque construction was developed. It also consists of frame assemblies, bulkheads, and formers as used in the monocoque design but, additionally, the skin is reinforced by longitudinal members called longerons. Longerons usually extend across several frame members and help the skin support primary bending loads. They are typically made of aluminum alloy either of a single piece or a built-up construction. Stringers are also used in the semimonocoque fuselage. These longitudinal members are typically more numerous and lighter in weight than the longerons. They come in a variety of shapes and are usually made from single piece aluminum alloy extrusions or formed aluminum. Stringers have some rigidity but are chiefly used for giving shape and for attachment of the skin. Stringers and longerons together prevent tension and compression from bending the fuselage.

Other bracing between the longerons and stringers can also be used. Often referred to as web members, these additional must be noted that manufacturers use different nomenclature to describe structural members. For example, there is often little difference between some rings, frames, and

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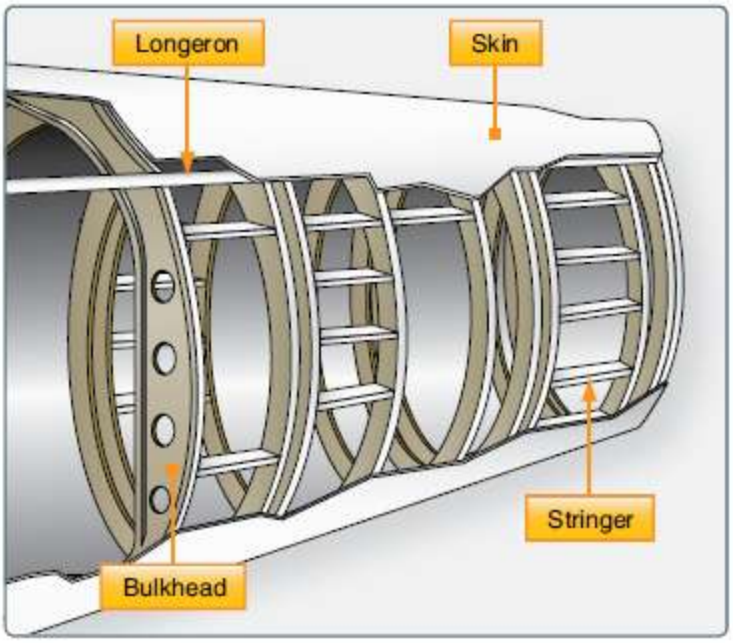
formers. One manufacturer may call the same type of brace a ring or a frame. Manufacturer instructions and specifications for a specific aircraft are the best guides.




*The most common airframe construction is semimonocoque.*

*Gussets are used to increase strength.*

**Pressurization**

Many aircraft are pressurized. This means that air is pumped into the cabin after takeoff and a difference in pressure between the air inside the cabin and the air outside the cabin is established.

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This differential is regulated and maintained. In this manner, enough oxygen is made available for passengers to breathe normally and move around the cabin without special equipment at high altitudes.

Pressurization causes significant stress on the fuselage structure and adds to the complexity of design. In addition to withstanding the difference in pressure between the air inside and outside the cabin, cycling from unpressurized to pressurized and back again each flight causes metal fatigue. To deal with these impacts and the other stresses of flight, nearly all pressurized aircraft are semimonocoque in design. Pressurized fuselage structures undergo extensive periodic inspections to ensure that any damage is discovered and repaired. Repeated weakness or failure in an area of structure may require that section of the fuselage be modified or redesigned.

## III. WINGS

Wings are airfoils that, when moved rapidly through the air, create lift. They are built in many shapes and sizes. Wing design can vary to provide certain desirable flight characteristics. Control at various operating speeds, the amount of lift generated, balance, and stability all change as the shape of the wing is altered. Both the leading edge and the trailing edge of the wing may be straight or curved, or one edge may be straight and the other curved. One or both edges may be tapered so that the wing is narrower at the tip than at the root where it joins the fuselage. The wing tip may be square, rounded, or even pointed. shows a number of typical wing leading and trailing edge shapes. The wings of an aircraft can be attached to the fuselage at the top, mid-fuselage, or at the bottom. They may extend perpendicular to the horizontal plain of the fuselage or can angle up or down slightly. This angle is known as the wing dihedral. The dihedral angle affects the lateral stability of the aircraft. shows some common wing attach points and dihedral angle.

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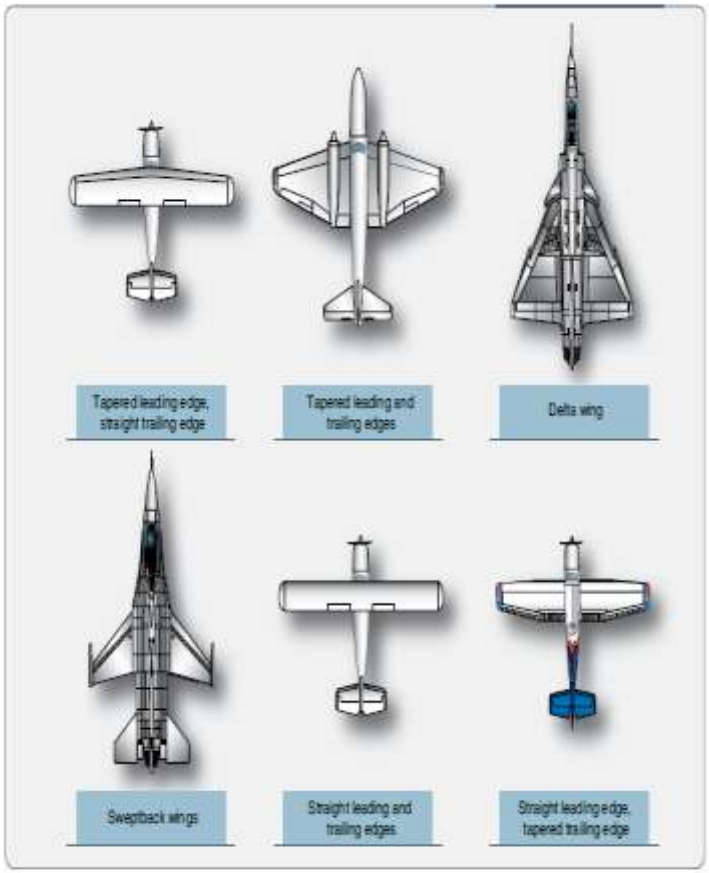
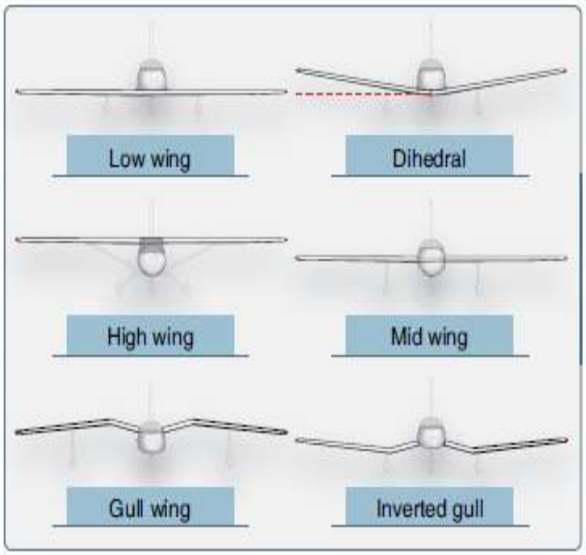



*Various wing design shapes yield different performance.*




*Wing attach points and wing dihedrals.*

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**Wing Structure**

The wings of an aircraft are designed to lift it into the air. Their particular design for any given aircraft depends on a number of factors, such as size, weight, use of the aircraft, desired speed in flight and at landing, and desired rate of climb. The wings of aircraft are designated left and right, corresponding to the left and right sides of the operator when seated in the cockpit. Often wings are of full cantilever design. This means they are built so that no external bracing is needed. They are supported internally by structural members assisted by the skin of the aircraft. Other aircraft wings use external struts or wires to assist in supporting the wing and carrying the aerodynamic and landing loads. Wing support cables and struts are generally made from steel. Many struts and their attach fittings have fairings to reduce drag. Short, nearly vertical supports called jury struts are found on struts that attach to the wings a great distance from the fuselage.

This serves to subdue strut movement and oscillation caused by the air flowing around the strut in flight. Figure shows samples of wings using external bracing, also known as semicantilever wings. Cantilever wings built with no external bracing are also shown. Aluminum is the most common material from which to construct wings, but they can be wood covered with fabric, and occasionally a magnesium alloy has been used. Moreover, modern aircraft are tending toward lighter and stronger materials throughout the airframe and in wing construction. Wings made entirely of carbon fiber or other composite materials exist, as well as wings made of a combination of materials for maximum strength to weight performance.

The internal structures of most wings are made up of spars and stringers running spanwise and ribs and formers or bulkheads running chordwise (leading edge to trailing edge). The spars are the principle structural members of a wing. They support all distributed loads, as well as concentrated weights such as the fuselage, landing gear, and engines. The skin, which is attached to the wing structure, carries part of the loads imposed during flight. It also transfers the stresses
to the wing ribs. The ribs, in turn, transfer the loads to the wing spars.

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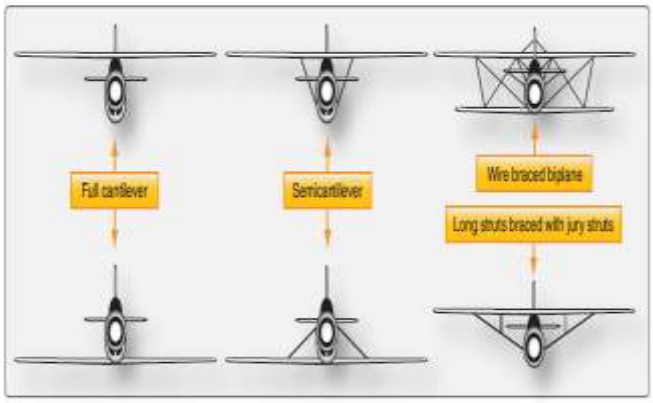
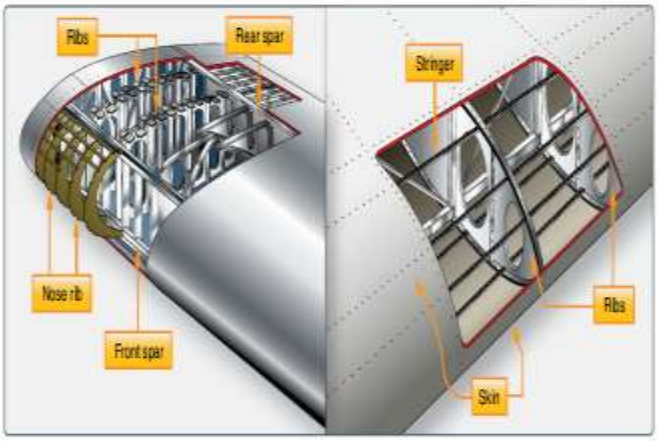
*"Left" and "right" on an aircraft are oriented to the perspective of a pilot sitting in the cockpit.*




*Externally braced wings, also called semicantilever wings, have wires or struts to support the wing. Full cantilever wings have no external bracing and are supported internally.*




*Wing structure nomenclature.*

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**In general, wing construction is based on one of three fundamental designs:**

1. Monospar
2. Multispar
3. Box beam

Modification of these basic designs may be adopted by various manufacturers. The monospar wing incorporates only one main spanwise or longitudinal member in its construction. Ribs or bulkheads supply the necessary contour or shape to the airfoil. Although the strict monospar wing is not common, this type of design modified by the addition of false spars or light shear webs along the trailing edge for support of control surfaces is sometimes used.

The multispar wing incorporates more than one main longitudinal member in its construction. To give the wing contour, ribs or bulkheads are often included. The box beam type of wing construction uses two main longitudinal members with connecting bulkheads to furnish additional strength and to give contour to the wing.

[Figure] A corrugated sheet may be placed between the bulkheads and the smooth outer skin so that the wing can better carry tension and compression loads. In some cases, heavy longitudinal stiffeners are substituted for the corrugated sheets.

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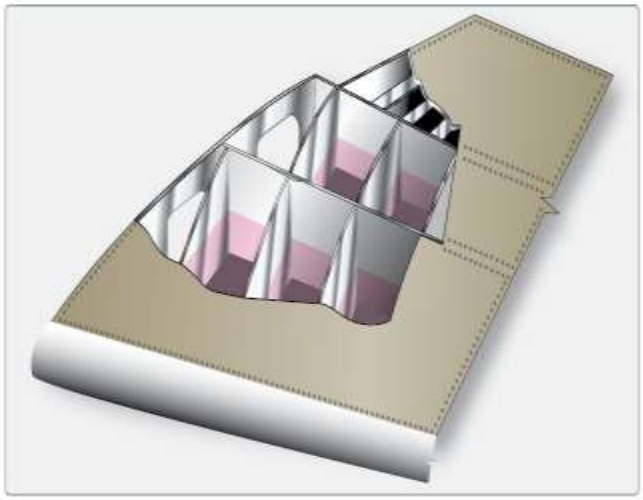

Figure Box beam construction.

A combination of corrugated sheets on the upper surface of the wing and stiffeners on the lower surface is sometimes used. Air transport category aircraft often utilize box beam wing construction.

## IV. AIRFOIL DESIGN

It has already been discussed in general terms the question of how an airplane wing can sustain flight when the airplane is heavier than air. Perhaps the explanation can best be reduced to its most elementary concept by stating that lift (flight) is simply the result of fluid flow (air) about an airfoil—or in everyday language, the result of moving an airfoil (wing), by whatever means, through the air.

Since it is the airfoil which harnesses the force developed by its movement through the air, a discussion and explanation of this structure will be presented.

Airfoil terminology

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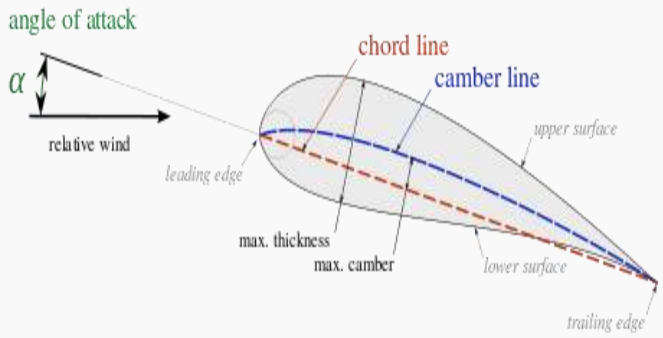
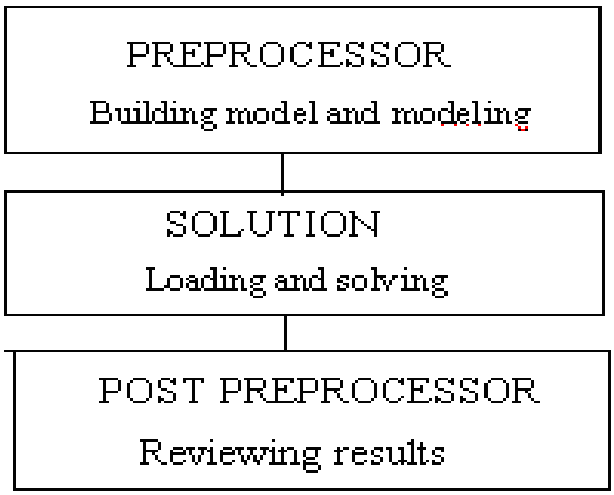



**Airfoil Nomenclature**

**Basic Steps in ANSYS:**




**Pre-Processing (Defining the Problem):** The major steps in pre-processing are given below

- Define key points/lines/ areas/volumes.
- Define element type and material/geometric properties
- Mesh lines/ areas/volumes as required.

## V.STRUCTURAL ANALYSIS OF WING

**ARAMID FIBER**

**Save Pro-E Model as .iges format**

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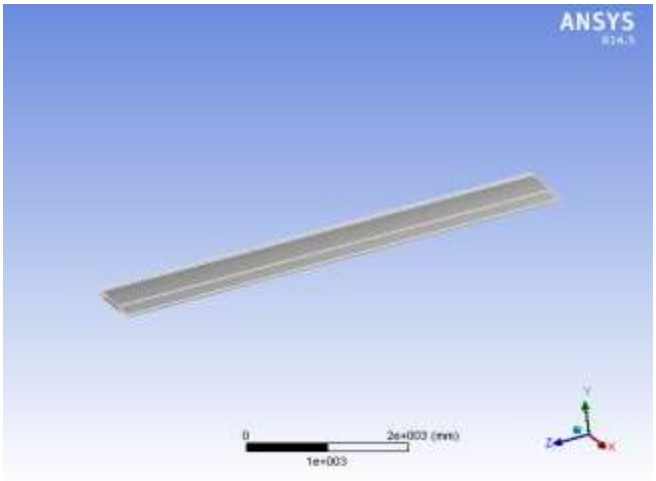
→→Ansys → Workbench→ Select analysis system → static structural → double click

→→Select geometry → right click → import geometry → select browse →open part → ok

→→ select mesh on work bench → right click →edit



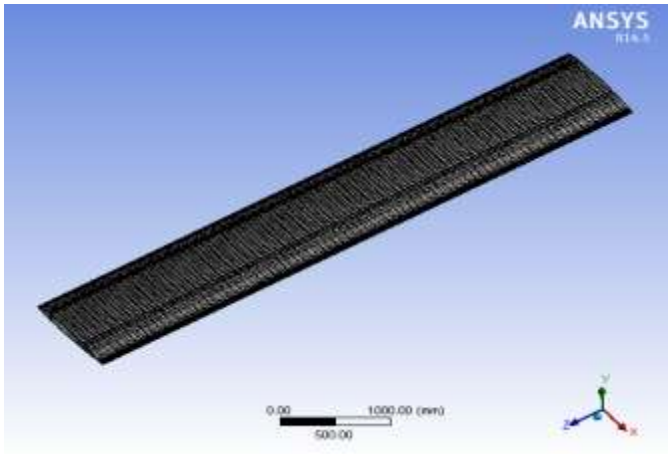

Double click on geometry → select MSBR → edit material →

Density : 1.52 g/cc

young's modulus : 4.83Mpa

passions ratio : 0.36

Select mesh on left side part tree → right click → generate mesh →




Select static structural right click → insert → select pressure and displacement →

Select displacement → select required area → click on apply → put X,Y,Z component zero →

Select pressure → select required area → click on apply → enter pressure value 0.02 $N/mm^2$ →

Select solution right click → solve →

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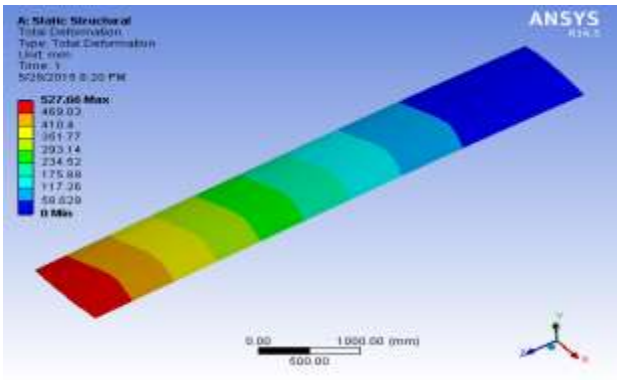
Solution right click → insert → deformation → total → Solution right click → insert → strain → equivant (von-mises) →

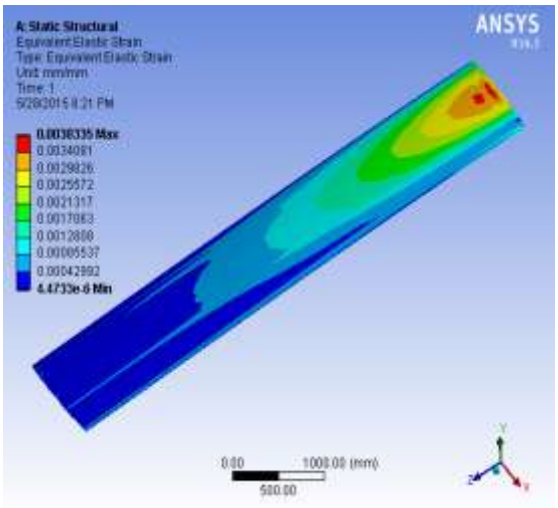
Solution right click → insert → stress → equivalentt (von-mises) →

Right click on deformation → evaluate all results

**DEFORMATION**




**STRAIN**




**STRESS**

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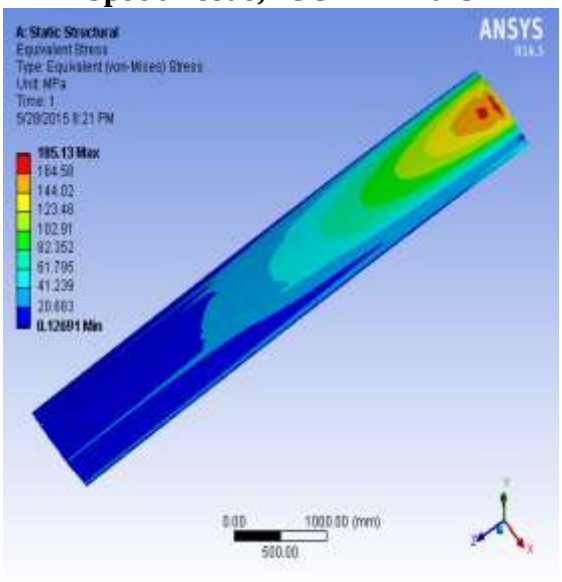


## RESULTS TABLE

### STRUCTURAL ANALYSIS

| | Deformation | Strain | Stress |
|---|---|---|---|
| **Aramid fiber** | 527.66 | 0.0038335 | 185.13 |
| **Carbon Fiber** | 127.67 | 0.00091668 | 183.23 |

### VI. VIBRATION ANALYSIS

| | Aramid fiber | | Carbon fiber | |
|---|---|---|---|---|
| | **Hz** | **mm** | **Hz** | **mm** |
| **Mode 1** | 3.6556 | 8.428 | 4.5161 | 7.8563 |
| **Mode 2** | 20.719 | 9.4287 | 25.608 | 9.453 |
| **Mode 3** | 23.049 | 15.828 | 27.693 | 17.384 |

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| | | | | |
|---|---|---|---|---|
| **Mode 4** | 25.09 | 14.58 | 29.219 | 14.372 |
| **Mode 5** | 27.77 | 15.237 | 32.734 | 14.739 |

**CFD ANALYSIS**

| | **Pressure** | **Velocity** | **Lift** | **Drag** |
|---|---|---|---|---|
| **At angle 2** | 2.03e+04 | 2.82e+02 | 128.07404 | 74.514945 |
| **At angle 4** | 2.04e+04 | 2.8e+02 | 244.14127 | 76.159145 |

## VII. CONCLUSIONS

In this thesis, an aircraft wing is designed and modeled in 3D modeling software Pro/Engineer. The materials used for aircraft wings are mostly metallic alloys. In this thesis, the materials are replaced by composite materials Carbon Fiber and Aramid Fiber. The advantage of using composite materials is their high strength to weight ratio.Static analysis is done on the wing by applying air pressure for two materials. By observing the analysis results, the deformation and stress are

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less for Carbon Fiber than Aramid Fiber.Vibration analysis is done on the aircraft wing to determine the frequencies. By observing the results, the frequencies are more for Carbon Fiber than Aramid Fiber, so the vibrations are more when Carbon Fiber is used.By observing both the results, the stress produced when Aramid fiber is used are slightly more than that of carbon fiber, but by vibration analysis, Aramid fiber is better. So it can be concluded that using Aramid fiber is better and also weight for Aramid fiber is less than that of carbon fiber.CFD analysis is done on the wing to determine the lift and drag forces by changing angle of attacks. The angle of attack taken is $2^0$ and $4^0$. By observing the results, the drag force is less for $2^0$ angle of attack. It is better if the drag force is reduced. So it can be concluded that by decreasing the angle of attack, the drag force is reduced.

## REFERENCES

Design and Structural Analysis of the Ribs and Spars of Swept Back Wing by Mohamed Hamdan A, Nithiya kalyani, International Journal of Emerging Technology and Advanced Engineering, (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 12, December 2014)

Optimal Topology of Aircraft Rib and Spar Structures Under Aeroelastic Loads by Bret K. Stanford, Peter D. Dunning, Journal of Aircraft

Two- Spar Wing Stress Analysis: An Investigation into the Effect of Flexibility of Ribs by W.J. Goodey, M.A., A.F.R. Ae.S, Aircraft Engineering and Aerospace Technology, ISSN: 0002-2667

Statistic and Dynamic Analysis of Typical Wing Structure of Aircraft using Nastran by Mr. Pritish Chitte, Mr. P. K. Jadhav, Mr. S. S. Bansode, International Journal of Application or Innovation in Engineering & Management (IJAIEM), Volume 2, Issue 7, July 2013

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Analytical and Numerical Investication of Critical Buckling Analysis of Composite Wing by P. Murugesan and P. Thirumurugan, International OPEN ACCESS Journal Of Modern Engineering Research (IJMER)

Design of An Aircraft Wing Structure For Static Analysis And Fatigue Life Prediction by A. Ramesh Kumar, S. R. Balakrishnan, S. Balaji, International Journal of Engineering Research & Technology, Volume/Issue: Vol.2 - Issue 5 (May - 2013), e-ISSN: 2278-0181

Preliminary Design Approach of the Wing Box by Vikas kumar, Pushpraj, Harpreet Singh, International Journal of Aerospace and Mechanical Engineering Volume 1 – No.1, September 2014, ISSN (O): 2393-8609

New aluminum lithium alloys for aerospace applications by Cindie Giummarra, Bruce Thomas and Roberto J. Riojam, Researchgate

Advanced lightweight alloys for aerospace applications by William E. Frazier Ph.D., Eui W. Lee Ph.D., Mary E. Donnellan M.S., James J. Thompson B.S, JOM, May 1989, Volume 41, Issue 5, pp 22-26

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# OPTIMIZATION OF PROCESS PARAMETERS FOR SURFACE ROUGHNESS IN CNC TURNING OF EN-36 MATERIAL USING TAGUCHI ROBUST DESIGN METHODOLOGY

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*ABSTRACT*

***The present paper outlines an experimental study to optimize the effects of selected cutting parameters i.e. Cutting Speed, Feed rate, Depth of cut and type of tool, for Surface Roughness of EN-36 steel alloy by employing Taguchi robust design methodology. Taguchi orthogonal array is designed with three levels of turning parameters and experiments are carried out using $L_9$ ($3^4$) orthogonal array. Taguchi method stresses the importance of studying the response variation using the Analysis of Variance (ANOVA), resulting the minimization of quality characteristic variation due to uncontrollable parameter. The surface roughness is considered as the quality characteristic parameter in the concept of "the smaller the better". The surface roughness values measured from experiment and their optimum value for surface roughness are calculated. Analysis of Variance suggests that the selected cutting parameters are significant and Feed rate has the most significant factor for the surface roughness.***

*Keywords- Cutting Speed, Feed rate, Depth of cut, Type of tool, Taguchi Robust Design Methodology, EN-36 steel alloy, Surface roughness, Analysis of Variance (ANOVA),etc.*

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## I. INTRODUCTION

The objective of the present work is to find out the set of optimum conditions for the selected Turning process parameters in order to reduce surface roughness using Taguchi Techniques. Taguchi method is used to determine the optimum cutting parameters viz. cutting speed, feed rate, depth of cut and type of tool at three different levels. The work piece material used is EN 36 steel alloy. Experiments are carried out using L9 ($3^4$) orthogonal array. The output parameter is surface roughness. Taguchi Robust design is an engineering methodology for improving productivity during design and development so that high quality products can be produced at low cost.

## II. LITERATURE REVIEW

A thorough study of literature [1-4] suggests that the machining of EN-36 Steel Alloy is very difficult, compared to other alloy materials. EN 36 is nickel- chromium high hardenability and heat treated steel, generally available in the annealed condition with a maximum brinell hardness of 255 with high core strength, excellent toughness and fatigue resistance properties. Very few works have been carried out in the machining of EN-36 steel alloy. The [5-8,10,12] study demonstrates detailed study of the proposed optimization technique i.e. Taguchi Robust design methodology; Hence the literature survey helped in proper selection of controlled parameters.

## III. EXPERIMENTAL SETUP AND DESIGN

The work material selected in the present work is EN-36 steel alloy in the form of round bar. The dimensions of the work piece selected are of Diameter 30mm and length 110mm. The turning operations (facing) are carried out on CNC machine. The machining tests are conducted under the different conditions of Cutting speed, Feed rate, Depth of cut and different types of tool using L9 ($3^4$) orthogonal array .

### A. Specifications of CNC Turning Machine:

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The experiments are conducted at BRD ROCK DRILLS, Cherlapaly, Hyderabad and the machine used is WASINO LJ-63m CNC TURNING MACHINE shown in Figure No.1.

**Figure No. 1: CNC Turning Machine**

**Table No. 1: Specifications of CNC Machine**

| | |
|---|---|
| Clamping surface | 420x180mm |
| Repeatability | +0.005mm |
| Positional accuracy | 0.010mm |
| Coolant tank capacity | 40 liters |
| Power rating | 415v |
| Spindle motor speed | 3500rpm |
| X,Y and Z axis drive | 6000rpm |
| Electrical motor | 14p 3phase |
| Pump | 4lpm |
| Pressure | 70bar |

## B. Work piece Material

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EN 36 is nickel- chromium high hardenability, case hardening (carburizing) steel, generally available in the annealed condition with a maximum brinell hardness of 255. The composition of En 36 Alloy is tabulated in the table no 2 and the corresponding alloy round bars of 30mm diameter and 110mm length shown in figure no.2.

**Table No. 2: Composition of EN-36 Steel Alloy**

| **Element** | **Weight percentage (%)** |
|---|---|
| C | 0.16 |
| Mn | 0.52 |
| Si | 0.31 |
| S | 0.040 |
| P | 0.040 |
| Cr | 1.05 |
| Ni | 3.62 |

**Figure No. 2: EN36 Steel Alloy Specimens**

### C. Cutting Inserts

The cutting inserts used are TNMG carbide tools of KORLOY Company, which are

- UNCOATED tool with grade ST15 (shown in Fig. 4 )
- PVD coated (TiAlN) with grade PC 9030(shown in Fig. 5)
- CVD coated (CVD Al2O3 film MT-TiCN + TiC + Al2O3) with grade NC 3010 (shown in Fig. 6)

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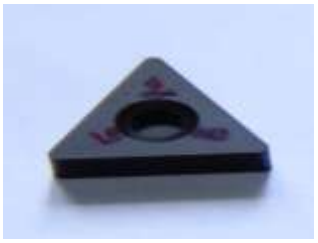

**Figure No.3: Uncoated Carbide Tool Insert**

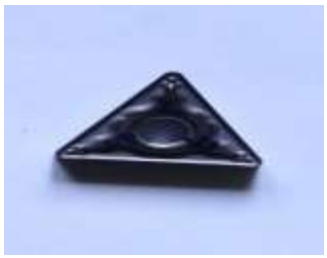

**Figure No.4: PVD Coated Carbide Tool Insert**

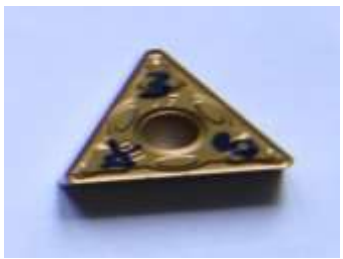

**Figure No.5: CVD Coated Carbide Tool Insert**

### D. Tool Holder

The specification of tool holder used for machining is BT30-ER16, side lock adapter system shown in figure no.6.

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**Figure No. 6: Tool Holder**

### E. Surface Roughness Tester:

Surface roughness measurement is measured using a portable surface roughness tester TR110. The measurement of surface texture is done by Pick up Type Piezoelectric method. The parameter evaluations are microprocessor based. The measurement results are displayed on an LCD screen. The Tester is placed on the surface of the specimen and switched on. When the pickup is driven by a driver is making a linear motion along the testing surface, the stylus which touches with the work surface moves up and down along the work surface perpendicularly. Its motion is converted into electric signal, which are amplified, filtered and transformed into digital signals through an Analogue to Digital. The signals are then processed by CPU and Ra values displayed on the screen shown in figure no. 7.

**Figure No. 7: Surface Roughness Tester**

## IV. Design Of Experiments

The four control factors are cutting speed (A), feed rate (B), depth of cut(C) and types of tool (D) selected with three levels and the corresponding orthogonal array are chosen with respect to its degrees of freedom [4].

**Table No. 3: Control Factors and Levels**

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| FACTORS/ LEVELS | SPEED (A) (m/min) | FEED (B) (mm/rev) | DEPTH OF CUT (C) (mm) | TYPE OF TOOL (D) |
|---|---|---|---|---|
| 1 | 60 | 0.2 | 0.5 | Un-Coated |
| 2 | 80 | 0.3 | 1 | PVD |
| 3 | 100 | 0.4 | 2 | CVD |

**Table No. 4: Experimental Design**

| EXPERIMENT NUMBER | COLUMN | | | |
|---|---|---|---|---|
| | SPEED (A) (m/min) | FEED (B) (mm/rev) | DEPTH OF CUT (C) (mm) | TYPE OF TOOL (D) |
| 1 | 60 | 0.2 | 0.5 | Un-Coated |
| 2 | 60 | 0.3 | 1 | PVD |
| 3 | 60 | 0.4 | 2 | CVD |
| 4 | 80 | 0.2 | 0.5 | CVD |
| 5 | 80 | 0.3 | 2 | Un-Coated |
| 6 | 80 | 0.4 | 1 | PVD |
| 7 | 100 | 0.2 | 2 | PVD |
| 8 | 100 | 0.3 | 0.5 | CVD |
| 9 | 100 | 0.4 | 1 | Un-Coated |

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## V. Data Collection

Steel bars of 30mm diaX110mm length are prepared for conducting the experiment. Using different levels of the process parameters the specimens have been machined in CNC Machine accordingly, as per the experimental design shown in table no.5. Then surface roughness is measured precisely with the help of a portable surface roughness tester TR110. The results of the experiments have been shown in table no 5.

**Figure No. 8: Machining of Work Piece EN 36 Alloy**

**Table No 5: Experimental Data Related To Surface Roughness ($R_a$)**

| EXP NO. | SURFACE ROUGHNESS(Ra) | | | S/N RATIO |
|---|---|---|---|---|
| | TRAIL 1 | TRAIL 2 | MEAN | |
| 1 | 2.1 | 2.02 | 2.06 | -6.2773 |
| 2 | 2.5 | 2.56 | 2.53 | -8.0624 |
| 3 | 5.99 | 5.67 | 5.83 | -15.313 |

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| | | | | |
|---|---|---|---|---|
| 4 | 1.38 | 1.12 | 1.25 | -1.938 |
| 5 | 2.63 | 2.69 | 2.66 | -8.497 |
| 6 | 3.04 | 3.19 | 3.115 | -9.869 |
| 7 | 1.25 | 1.28 | 1.265 | -2.041 |
| 8 | 2.60 | 2.61 | 2.605 | -8.3161 |
| 9 | 2.93 | 3.37 | 3.15 | -9.966 |

## VI. RESULTS AND DISCUSSIONS

Then surface roughness is measured precisely with the help of a portable surface roughness tester TR110 and the results are tabulated in table no 6 for two trails. For each experiment the corresponding S/N values are also tabulated. Optimization of surface roughness is carried out using Taguchi method. Confirmatory test have also been conducted to validate optimal results.

**Table No 6: Summary of S/N Ratios**

| **Factor** | **Level 1** | **Level 2** | **Level 3** |
|---|---|---|---|
| **Speed(A)** | -9.884 | -6.768 | -6.774 |
| **Feed(B)** | -3.418 | -8.291 | -11.716 |
| **Depth of Cut(C)** | -5.510 | -9.299 | -8.617 |
| **Type of Tool (D)** | -8.246 | -6.657 | -8.522 |

### A. Selection of Optimum Set of Conditions for Surface Roughness

The best condition for Spindle Speed factor is level 2 (80m/min), for Feed Rate is level 1 (0.2mm/rev), for Depth of Cut is level 1 (0.5mm) and Type of Tool is level 2 (PVD). Thus, the optimum conditions chosen were: **A2-B1-C1-D2**.

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**Table No 7: Optimum Set Of Control Factors**

| Factors/Levels | Speed(A) (m/min) | Feed(B) (mm/rev) | Depth of Cut(C) (mm) | Type of Tool(D) |
|---|---|---|---|---|
| Optimum Value | **80** | **0.2** | **0.5** | **PVD** |

### B. Prediction of Process Average for Optimum Condition for surface Roughness

From table no. 7 the following calculations are done, for all the cases the predicted value is calculated in the same procedure.

$\eta_{predicted}$= Y+ (A2-Y) + (B1-Y) + (C1-Y) + (D2-Y)

= A2+B1+C1+D2-3Y

= [(-6.768) + (-3.418) + (-5.510) + (-6.657)] – [3X (-7.808)]

$\eta_{predicted}$= 1.074

Therefore, the predicted average for optimum condition of surface roughness is 1.074.

### C. Performing Verification Test for Surface Roughness

A confirmation test is performed with the obtained optimum cutting parameters (spindle speed 80m/min, feed rate 0.2mm/rev, depth of cut 0.5mm and PVD type of tool). The surface roughness values are taken for two trials and the S/N ratio is calculated for this condition. The conformation test and the predicted values are tabulated in the table no 8 & 9.the corresponding ANOVA table in 10 & 11.

**Table No 8: Conformation Test Results**

| SURFACE ROUGHNESS(Ra) VALUES | S/N |
|---|---|

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| 1 | 2 | Average | RATIO |
|---|---|---|---|
| 1.58 | 1.745 | 1.665 | 0.946 |

**Table No. 9: Comparison Of S/N Ratios**

| $\eta$ predicted | 1.074 |
|---|---|
| $\eta$ conformation | 0.946 |

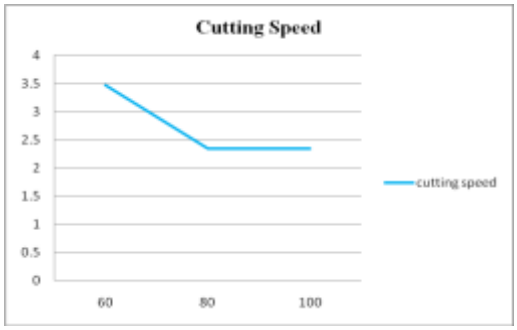
### D. Effect of Cutting Parameters on Surface Roughness

From Figure No 9, it is observed that, the surface roughness is high at low cutting speed and certainly decreasing from low cutting speed to moderate speed conditions, but from moderate to high cutting speeds, the surface roughness remains constant.

From Figure No 10, it is observed that, the surface roughness is low at low Feed Rate conditions and certainly increasing from low feed rate to moderate and from moderate to high feed rate, the surface roughness increases.

From Figure No 11, it is observed that, the surface roughness is low at small depth of cut and certainly increasing from small depth of cut to moderate depth of cut conditions, and from moderate to high depth of cut, the surface roughness increases

From Figure No 12, it is observed that, the surface roughness is high when CVD tool is used and roughness decreased when UNCOATED tool is used than to PVD tool, compared to CVD and UNCOATED tool PVD coated tool has low surface roughness.



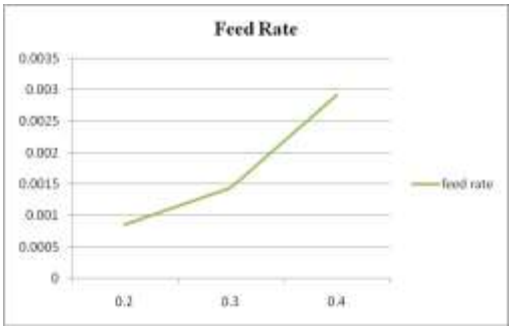




**Figure No. 9. Surface roughness V/s Cutting Speed** **Figure No. 10. Surface roughness V/s Feed Rate**

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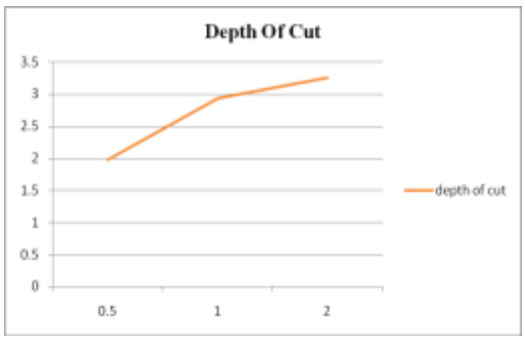


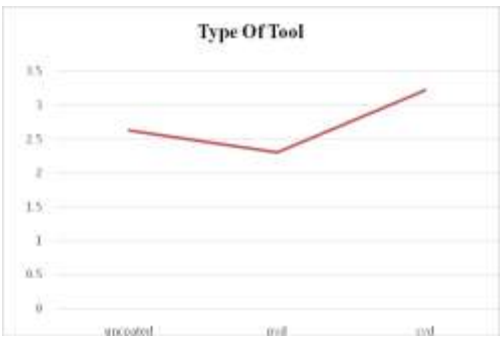


**Figure No. 11. Surface roughness V/s Depth of Cut** **Figure No. 12. Surface roughness V/s type of tool**

**Table No. 10: Basic Analysis Of Variance**

| FACTOR | S.S | D.O.F | M.S.S | F-RATIO (DATA) | F-RATIO (TABLE) | RESULT |
|---|---|---|---|---|---|---|
| SPEED<br>FEED<br>DEPTH OF CUT<br>TYPE OF TOOL | 5.130233<br>18.97973<br>2.800833<br>2.6481 | 2<br>2<br>2<br>2 | 2.565<br>9.489<br>1.40041<br>1.32405 | 102.4254<br>378.9315<br>55.91881<br>52.86948 | 4.26<br>4.26<br>4.26<br>4.26 | Significant<br>Significant<br>Significant<br>Significant |
| ERROR | 0.20035 | 9 | 0.02504 | | | |
| $S_t$ | 29.5589 | | | | | |
| MEAN | 133.0081 | 1 | | | | |
| ST | 162.767 | 18 | | | | |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | 3 | | | | | |

**Table No. 11: Analysis Of Variance**

| FACTOR | S.S | D.O.F | M.S.S | F-RATIO (DATA) | $SS^1$ | ρ % |
|---|---|---|---|---|---|---|
| SPEED<br>FEED<br>DEPTH OF CUT<br>TYPE OF TOOL | 5.130233<br>18.97973<br>2.800833<br>2.6481 | 2<br>2<br>2<br>2 | 2.5659.4891.40041.32405 | 102.4254<br>378.9315<br>55.91881<br>52.86948 | 5.080146<br>18.929655<br>2.750746<br>2.598013 | 17.1864.049.308.88 |
| ERROR | 0.20035 | 9 | 0.025004 | | | 0.60 |
| $S_t$ | 29.5589 | | | | | |
| MEAN | 133.0081 | 1 | | | | |
| ST | 162.7673 | 18 | | | | 100% |

The ANOVA calculation is performed for the results obtained i.e. Surface roughness values. The calculations are done manually and compared with the Minitab Statistical Software version 16 and it is verified. The model was checked at 95% confidence level for the adequacy. From the ANOVA it is observed that all the factors selected (Cutting speed, Feed rate, Depth of cut and type of tool conditions) are significant shown in Table No.10.

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## VII. CONCLUSION

The objective of the present work is to find out the set of optimum parameters in order to reduce surface roughness, using Taguchi's techniques considering the Turning selected parameters for the EN 36 Steel Alloy material.

Based on the results of the present experimentation the following conclusions can be drawn:

- Analysis of Variance suggests that the selected process parameters are significant in which the Feed rate has most significant factor for the surface roughness. Whereas, cutting speed, Depth of Cut and Type of tool appears to have very little effect over roughness value. An increment of Feed rate will result in better surface quality in terms of Surface roughness.
- In the present experimentation the optimum speed obtained using Tauguchi Robust Design Methodology is 80m/min. Similarly the results obtained for feed and depth of cut are 0.2mm/min and 0.5mm respectively. Hence it can be concluded that the parameters obtained are valid and within the range of EN 36 machining standards.
- The corresponding Type of tool is PVD coated.
- The S/N ratio of predicted value and verification test values are valid when compared with the optimum values. It is found that S/N ratio value of verification test is within the limits of the predicted value and the objective of the work is full filled.

## REFERENCES

Nirav M. Kamdar, Prof. Vipul K. Patel, "Experimental Investigation of Machining Parameters of EN36 Steel", International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622**.** Vol. 2, Issue 3, May-Jun 2012, pp.1833-1838.

Kaushal Pratap Singh and Girish Dutt Gautam:"Selection of Optimum Machining Parameters for EN36 Alloy Steel in CNC Turning Using Taguchi Method" International Journal of Scientific & Engineering Research, Volume 5, Issue 3, ISSN 2229-5518 – March 2004.

Manan Kulshreshtha: "Analysis of the Effect of Machining Parameters on Surface Roughness of EN 36 Nickel Steel", International Journal of Advanced Information Science and Technology (IJAIST) ISSN: 2319:2682 Vol.16, No.16, August 2013.

A .Venkata Vishnu, G. Guruvaiah Naidu, K B G Tilak, J.Ramakrishna, "Application of Taguchi Method in the Optimization of Turning Parameters for Material Removal Rate of En-36 Material", International Journal of Advance Engineering and Research Development E-ISSN (O): 2348-4470 P-ISSN (P): 2348-6406, Volume 2, Issue 8, August-2015.

Ballal, Inamdar and Patil P.V. "Application Of Taguchi Method For Design Of Experiments In Turning Gray Cast Iron " International Journal of Engineering Research and Applications (IJERA) Vol. 2, Issue 3, May-Jun 2012, pp.1391-1397.

G. Guruvaiah Naidu, A.Venkata Vishnu, G.Janardhana Raju "Optimization of Process Parameters for Surface Roughness in Milling of EN-31 Steel Material Using Taguchi Robust Design Methodology", International Journal of Mechanical And Production Engineering ISSN: 2320-2092, Vol.2 Issue 9, September-2014.

Mahendra Korat, Neeraj Agarwal, "Optimization of Different Machining Parameters of En24 Alloy Steel In CNC Turning by Use of Taguchi Method", International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 5, September- October 2012, pp.160-164.

A.Venkata Vishnu, K B G Tilak, G. Guruvaiah Naidu, Dr.G.Janardhana Raju "Optimization of Different Process Parameters of Aluminium Alloy 6351 in CNC Milling Using Taguchi Method",

International Journal of Engineering Research and General Science, ISSN: 2091-2730,Nepal, Vol.3 Issue 2, March-April-2015.

M.A. Lajis and T.L. Ginta,"Hot machining of Hardened Steels with Coated Carbide Inserts," American Journal of Engineering and Applied Sciences 2 pp. 421-427 (2009).

K. Adarsh Kumar, Ch.Ratnam, Bsn Murthy, B.Satish Ben, K. Raghu Ram Mohan Reddy, "Optimization Of Surface Roughness In Face Turning Operation In Machining Of En-8" [IJESAT] International Journal Of Engineering Science & Advanced Technology ISSN: 2250–3676, Jul-Aug 2012, Volume-2, Issue-4, pp.807 – 812.

HMT "Production Technology", Tata McGraw Hill, 2004.

Phillip j. Ross "Taguchi Techniques for Quality Engineering", Tata McGraw Hill, Second Edition, 2005.

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**International Journal Of Core Engineering & Management (IJCEM)**
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# EFFICIENT SECURITY PROOFS FOR TRUST WORTHY SERVICES IN MOBILE SOCIAL NETWORKS

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***ABSTRACT***

***Now a day, Web-based collaborations havebecome a key technology for a business. Such technology spans the interactions between people and services across the world. Service oriented system provides the services to help the various business processes. But it is limited to provide flexible interaction model required for developing business. For a successful business, human must be the part of the system. Mobile Social Network is network which allows mobile users to discover and interact with existing and potential friends. A Trustworthy Service Evaluation (TSE) system is a system that enables users to share service reviews in Service oriented mobile social networks (S-MSNs). Each service provider should independently maintain a TSE for itself that collects and stores users' reviews about its services without***

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***requiring any third trusted authority. In the S-MSNs, to establish the trust relationsbetween the service providers and the users is particularly important. We consider an S-MSN composed of static vendors and mobile users that interconnect opportunistically. Each vendor is equipped with a wireless communication device that has a large storage space.In this we extend the bTSE(basic TSE) to a Sybil-resisted TSE (SrTSE) which enable the detection of two typical sybil attacks. In SrTSE if a user generates multiple reviews toward a vendor in a predefined time slot with different pseudonyms, the real identity of that user will be revealed. Hence a Trustworthy Service in Mobile Social Network is introduces so that users can access services securely.After identifications with various grammars they are categorized in order and trustworthy service evaluation system is enabled for the users to share their reviews of a particular music sheet they are buying through their smart phones or tabs in service oriented mobile social networks(S-MSN)without any third trusted party. Since there are no third trusted parties there are many chances for Sybil attacks and other modification review attacks which are to be avoided.***

***Keywords- Mobile social networks trust evaluation, Sybil attack, and distributed system.***

## I. INTRODUCTION

In the S-MSNs, service providers offer location based services to local users and attract the users by various advertising approaches, for example, sending e-flyers to the nearby passengers via wireless connections. With a higher reputation, a service provider is likely to be chosen by the users. However, the S-MSNs are autonomous and distributed networks where no third trusted authority needed for bootstrapping the trust relations. Therefore, for the users in theS-MSNs, enable the trust evaluation of the service providers that is a challenging problem. Location-based services now emerge as an imperative need of mobile users. It can be integrated into various types of networks to obtain promising applications while their implementation has many outstandingand independent research issues.

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The explosion in web-based technology has led to increasing volume and complexity of knowledge, which stimulates the proliferation of virtual learning communities (VLCs). VLCs are information technology-based cyberspaces in which individuals and groups of geographically dispersed learners accomplish their goals of e-learning. One of VLCs' purposes is to encourage knowledge sharing so that valuable knowledge embedded in the network can be effectively explored. Most of the learners participate in VLCs with the expectations that they can acquire and share valuable knowledge to suit their needs. The emergence of VLCs over the past decade has stimulated research interests by academia and practitioners.

Trustworthy service evaluation [3] (TSE) system used for service provider or any third trusted authority to receive of user feedback is called review. Mobile Social networks have provided the infrastructure for a number of emerging applications in recent years, e.g., for the recommendation of service providers or the recommendation of files as services. In these applications, trust is one of the most important factors in decision making by a service consumer, requiring the evaluation of the trustworthiness of a service provider along the social trust paths from a service consumer to the service provider. However, there are usually many social trust paths between two participants who are unknown to one another. In addition, some social information, such as social relationships between participants and the recommendation roles of participants, has significant influence on trust evaluation but has been neglected in existing studies of online social networks. Furthermore, it is a challenging problem to search the optimal social trust path that can yield the most trustworthy evaluation result and satisfy a service consumer's trust evaluation criteria based on social information. Which allows Business professionals to analyze customers' conversations on social networking sites, and as a consequence, provides real-time status updates about their products and services accordingly. In the above situations, trust is one of the most important factors for participants' decision making, requiring approaches and mechanisms for evaluating the trustworthiness between participants who ;are unknown to each other. As an example, if a social network consists of lots of buyers and sellers, it can be used by a buyer to find the most trustworthy/reputable seller who sells the product preferred by the buyer. In social networks, each node

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represents a participant and each link between participants corresponds to the real-world interactions or online interactions between them (e.g., A→ B and A → C in Fig. 1). One participant can give a trust value to another based on the direct interactions between them. For example, a trust rating can be given by a participant to another based on the quality of the movies recommended by the latter at FilmTrust3. As each participant usually interacts with many other participants multiple trust path. For example, in Fig. 1, A&M are indirectly linked by two paths, A → B → E → M and A → D → M. If a trust path links two nonadjacent participants (i.e., there is no direct link between them), [6] the source participant can evaluate the trustworthiness of the target one based on the trust information of the target on of the trust based information.This process is called [5] trust propagation and the path with trust information linking

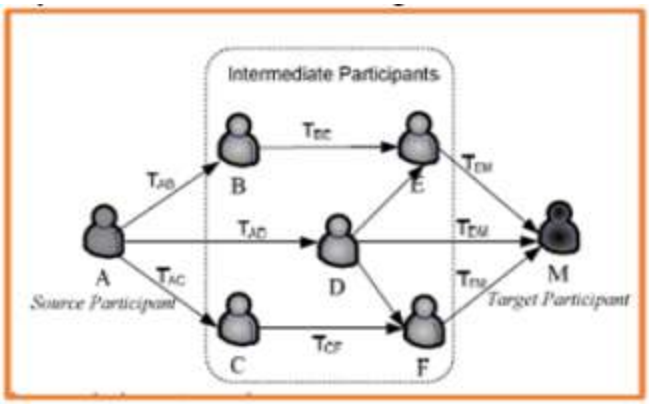


Figure 1: A social network

The source participant and the target one is called a social trust path For example, in Fig. 1, if A is a buyer and M is a seller, A can evaluate the trustworthiness of M using the social trust paths from A to M. We refer to A as the source participant and M as the target participant. This paper describes a new trace-based simulation technology that captures dependencies between social network messages observed in full-system simulation of multithreaded applications.

Bruckman (2002) found that the learning potential of the Internet technology can come from peers and elders. Jin (2002) provided a conceptual framework for the development of a prototype system of the virtual community-based interactive learning environment. Wachter et al. (2000) pointed out that an

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enhanced learning environment is possible only if one goes beyond mere online course delivery and creates a community of learners and other related resource groups. Wasko and Faraj (2005) found that knowledge sharing has been a motivation for participation in virtual communities. In addition, many web-based or agent-based models and software have been proposed to support interaction, discussion, and collaboration in VLCs (Taurisson & Tchounikine, 2004; Zhang & Tanniru, 2005; Matusov, Hayes, & Pluta, 2005; Avouris, et al., 2004). Prior studies have provided evidence that demonstrates the importance of knowledge exchange in enhancing learningperformance. They also have called for the attention of providing mechanisms to support knowledge sharing in VLC environments. However, knowledge sharing in some VLCs has not lived up to expectations. Two barriers preventing efficient and effective knowledge sharing are: (1) the difficulty in finding quality knowledge, and (2) the difficulty in finding trustworthy learning collaborators to interact with. The objective and contribution of this research is applying peer-to-peer (P2P) based social networks with trustmanagement mechanisms to overcome the aforementioned barriers. In order to help learners find quality content and trustworthy collaborators, we provide peer-ranking mechanisms and classify peers based on their content's quality. We have enhanced the typical keyword search with a keyword thesaurus search and a semantic search to improve the performance of content discovery. We have also enhanced conventional online group discussions by finding trustworthy collaborators who are more willing to share.To their friends and families [Haythornthwaite 2005]. The phenomenal growth of social network users in recent times has not gone unnoticed. Governments and enterprises have started exploiting the potential use of social networks as platforms for delivering and improving their services [Jaeger et al. 2007; Zappen et al. 2008]. However, there have been reports in the media of many incidents of breaching privacy of individuals through social networks [Gross and Acquits 2005]. Given the open nature of Web-based social networks and their current level of popularity, users are increasingly concerned about privacy, an important consideration for them. In order to balance the open nature of social networks and safeguard the privacy concerns of users, it is important to build trust communities, which we define as communities that create an environment where members can share theirs thoughts, opinions, and experiences in an

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open and honest way without concerns about privacy and fear of being judged. These communities are built on authenticity, open sharing, like-mindedness and mutual respect. We contend that social trust provides an ideal foundation for building trust communities. Therefore, trust becomes an important aspect of social networks and online communities. Trust has been studied in many disciplines including sociology [Helbing 1994; Mollering 2002; Molm et al. 2000], psychology [Rotter 1967; Cook et al. 2005], economics [Granovetter 1985; Huang 2007], and computer science [Maheswaran et al. 2007; Hughes et al. 2005]. Each of these disciplines has defined and considered trust from different perspectives, and their definitions may not be directly applicable to social networks. In general, trust is a measure of confidence that an entity or entities will behave in an expected manner. In this article, we review the definitions and measurements of trust from the prism of different disciplines, with a focus on social networks. The most important asset of any society or a social network is its social capital [Nahapiet and Ghoshal 1998; Moibus and Quoc-Anh 2004]. We consider the richness of the interactions between members in the social network as its social capital. In the context of social networks, trust is derived from social capital, which we call social trust.

## II. RELATED WORK

Mobile social networks extend social networks in the by allowing mobile users to discover and interact with existing and potential friends. Despite their promise to enable exciting applications, serious security and privacy concerns have hindered wide adoption of these networks [1].

An important capability offered by mobile social networks is that to allow mobile users to discover and interact with friends. Suppose you are waiting for your flight in an airport and your mobile phone discovers your friend's friend is in the next aisle and you can talk with face-to-face. Or you visit a new place and your mobile phone finds someone in your vicinity shares similar attributes as you so that you can interact with. Suppose you are waiting for your flight in an airport and your mobile phone discovers your friend's friend is in the next aisle and you can talk with face-to-face. Or you visit a new place and

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your mobile phone finds someone in your vicinity shares similar attributes as you so that you can interact with.

One way to address the privacy and security issues is to take advantage of a trusted central server, which collects information from individual users, computes and disseminates the proximity results on demand. Server-basedsolution is not suitable for mobile social networks for the following reasons. First, users in a mobile social network may not have direct access to a computer or the Internet.

For vehicle user's privacy preservation to improve key update efficiency of location based services (LBSs) in vehicular ad -hoc networks (VANETs), we propose a dynamic privacy-preserving key management scheme, called DIKE. We divide session into several time slots so t each time slot holds a different key, when no vehicle user departs from the service session. In this also integrate a novel dynamic threshold technique in traditional V-2-V and V-2-I communications to achieve session key's backward-secrecy. Performance evaluations for extensive simulations demonstrate the efficiency and effectiveness of the proposed DIKE scheme for low key update delay and fast key update ratio.

In this paper, we achieve vehicle user's privacy Preservation and to improve the key update efficiency. In this a Dynamic privacy-preserving Key management scheme, called DIKE, for the LBSs in VANETs. With this scheme, each user can use a pseudo-id to conceal its real identity during a service session. First, introduce a privacy-preserving authentication (PPA) mechanism, which can derive from an efficient group Signature. However, each vehicle user can hold multiple pseudonyms; so cannot prevent a compromised but unrevoked vehicle user to do double registration in the same session. That's why we divide a session into several time slots, and each time slot can hold a different session key. When no vehicle departs from the service session, each joined user use forward-secrecy technique to autonomously update new session key to reduce key update delay. To achieve backward-secrecy, we integrate a novel dynamic threshold technique in traditional V-2-V and V-2-I communications.

The Sybil attack was first introduced by Douceur in the context of peer-to-peer networks. In this, we investigate the Sybil attack, which is a harmful attack in sensor networks. In Sybil attack, a malicious node behaves like it was a larger number of nodes, like by impersonating other nodes or simply by

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claiming false identities. We propose novel techniques to defend against Sybil attack, and analyze their effectiveness properly. In this paper, we examine how the Sybil attack can used to attack several protocols in wireless sensor network. So first consider attacks on distributed storage an algorithm, similar to the Douceur describes in the peer-to-peer environment.

To defend the Sybil attack, we can value that each node identity is an identity presented by the corresponding physical node. There are two types to validate an identity we define the Sybil attack and establish taxonomy of that attack by distinguishing different attack types. The definition and taxonomy are important in understanding and analyzing the threat that defenses of Sybil attack. We present several novel methods by which a node can be verified whether other identities are Sybil identities.

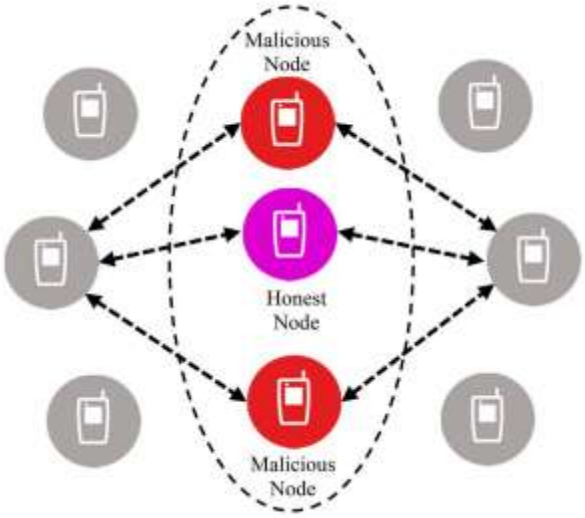


Fig. 2. Example of Sybil attack.

A Sybil attack is like computer hacker attack on a peer-to-peer (P2P) network. It is named by the novel Sybil, which recounts medical treatment of a woman with extreme dissociative identity disorder. The attack target only reputation system of the P2P program and also allows the hacker to have an unfair advantage in influencing the reputation and the score of files stored on the P2P network. Several factors determine that how a Sybil attack can be equally affects the reputation system and how easy it is to make an entity; finally whether the program accepts non-trusted entities and their input. Validating

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accounts can be the best way for administrators to prevent these kinds of attacks, but this sacrifices the anonymity of users.

## III. MOTIVATION

In this paper, we proposed trace – based simulation technique for TSE. TSE system is taken more time for message sending and receiving by user and vendor. That system provide secret key for verification both time ask verification no then process start in proposed [4] system used trace based simulation technique. Time taken is less than according to the existing system. A number of messages can be passing frequently.The [10] dependency information is stored along with packet data in the network trace. By enforcing the ordering constraints in a network simulator, the proposed technique can greatly increase the fidelity of trace driven evaluation with little impact on simulation speed. . Trace based simulation works on two component one that executes action and stores the result and another which reads the log files to trace and interpolates then to new scenario. In the case of large computer design the execution takes place on a small number of nodes and trace are left in log file .In propose system used trace- based simulation technique for increase the work fast. Some important point related to motivation.

- In this project proposed trace based simulation to enable user to share service review in service oriented mobile social network.
- Trace based simulation refers to system simulation performed by looking at trace of program execution or system component access with purposed of performance prediction.
- Trace based simulation works on two component one that executes action and stores the result and another which reads the log files to trace and interpolates then to new scenario.
- In the case of large computer design the execution takes place on a small number of nodes and trace are left in log file.

In this section, we evaluate the performance of the bTSE through trace-based custom simulations. We choose to compare the bTSE with a NCP (non-cooperative) system, where each user directly submits

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its review to the vendor without any synchronization constraint (use of tokens). We use the following performance metrics

- SR. It is defined as the ratio of the number of successfully submitted reviews to the total number of generated reviews in the network.
- SD. It is defined as the average duration between the time when a review is generated and the time when it is successfully received by the vendor.

Location-based services recently emerge as an imperative need of mobile users. It can be integrated into various types of networks to obtain promising applications while their implementation has many outstanding and independent research issues, such as content delivery [13], service discovery [14], security, and privacy problems [15]. Trust evaluation of service providers is a key component to the success of location-based services in a distributed and autonomous network. Location-based services require a unique and efficient way to impress the local users and earn their trust so that the service providers can obtain profits. Rajan and Hosamani used an extra monitor deployed at the untrusted vendor's site to guarantee the integrity of the evaluation results. Wang and Li [10] proposed a two-dimensional trust rating aggregation approach to enable a small set of trust vectors to represent a large set of trust ratings. Ayden and Fekri approached the trust management as an inference problem and proposed a belief propagation algorithm to efficiently compute the marginal probability distribution functions representing reputation values. Dasand Islam introduced a dynamic trust computation model to cope with the strategically altering behavior of malicious agents. In this paper, we enable mobile users to submit their reviews to a system maintained by the local vendor, where the reviews represent the evaluation results toward the services of the vendor. We consider the malicious behaviors by the vendor and the users including the review attacks and the Sybil attacks. Instead of using an extra monitor device on the vendor's site, we explore user cooperation efforts and make use of efficient cryptography-based techniques to increase SR, reduce SD, and mitigate the effect of the malicious behaviors.

## IV. PROPOSED PRINCIPLES

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In the proposed system, we are requiring service providers that will maintain the TSE by themselves. In this, we consider the users that participate in the TSE in a cooperative manner. So we are going to study possible malicious behaviors that are conducted by the service providers and users. Due to the proposed system, there are advantages that offer the user of the services, it identifies three unique review attacks, i.e., review link ability attack, review rejection attack, and review modification attack in the bTSE each user should firstly register in the social network and then they can use the services provided by the service provider. Similarly each service provider should also provide their credentials to register in a social network. After using the services the user should also provide reviews for every service. So that the users who wanted to use that services should get the idea about that service.

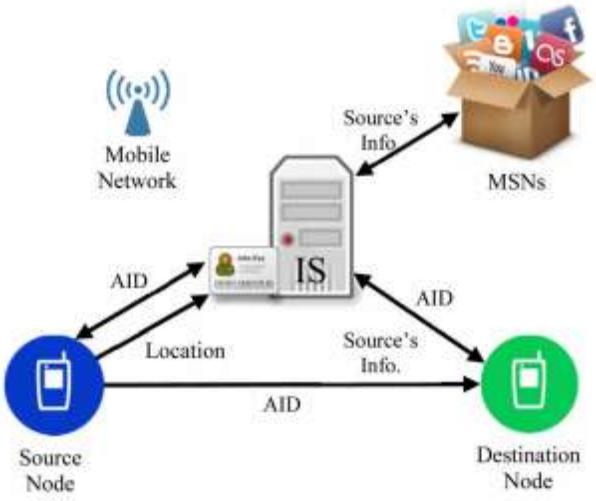


Fig .3. Identity confidentiality in MSNs.

As the system is trustworthy so each service provider and user should provide valid credentials. The system uses the Ranking technique for making the ranking easy. Using the TSE, service providers learn that the service experiences of the users and that are able to improve their service strategy in time. The collected reviews can then make available to the public, which are enhances service advertising and helpful the users in making wise service selections. They are important tools for service providers who

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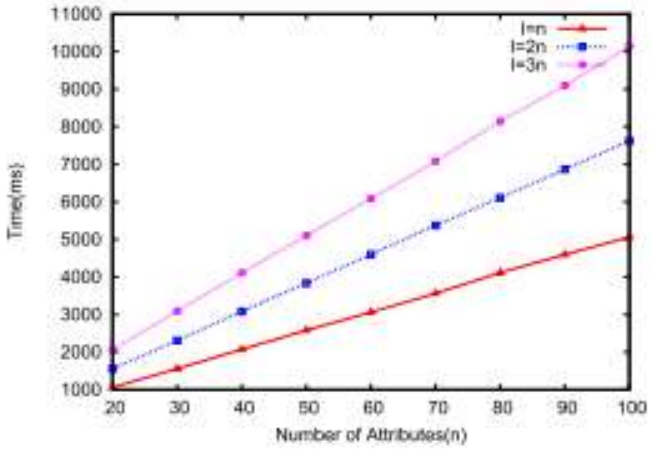
target the global market. In this, we move the TSE into the S-MSN settings. Each user should firstly register in the social network and then they can use the services provided by the service provider. Similarly each service provider should also provide their credentials to register in a social network. We develop security mechanisms for the TSE to deal with the attacks that are arise during mobile social network. The basic TSE (bTSE) is enables users to distribute and cooperatively should submit their reviews in an integrated chain form by using hierarchical and aggregate signature techniques. It restricts the service providers to reject, modify, or delete the reviews. Thus, the integrity and authenticity of reviews are improved. Further, we extend the bTSE to a Sybil-resisted TSE (SrTSE) to enable the detection of two types of Sybil attacks. In the SrTSE, if a user generates multiple reviews toward a vendor in a time slot with different pseudonyms, the real identity of the user will be revealed. Through security analysis and numerical results, we show that the bTSE and the SrTSE effectively resist the service review attacks and the SrTSE additionally detects the Sybil attacks in an efficient manner.Through performance evaluation, we show that the bTSE achieves better performance in terms of submissionrate and delay than a service review system that does not adopt user cooperation. First, users in a mobile social network cannot have direct Access to service providers or any third trusted authority to receive user feedback that is service reviews or simply reviews, such as compliments and complaints about their services or products.



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## V. RESULTS

To understand complete process of this technique first we add the user details i.e., ID's and create the group which has the both other vendors and the users. In the view of the one vendor other vendor who is in his group will be as a user vice versa.

**Input**: - provide services and send the acknowledgment token to the group members.


These can be seen in the users and vendors view services page. Before sending the review to particular vendor user need to select the type of user he is? The users can check the review of other users review and his reviews towards the different vendors in his local repository.

**Output**: - If the user is not malicious users the review will be updated in the vendors TPList. If the user is malicious user the Sybil attack will be activated and the vendor can easily find out the malicious users Id who send the bad reviews in his srTSE page.

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**1.Under no review rejection attacks: -** We first study the system performance in relation with SR (Submission Review). When SR goes up, the number of users who enter the service range and thus generate reviews increases. Recall that each user has a transmission range much smaller than SR. In the non-cooperative system, users have to move close enough to the vendor in order to submit their reviews. Hence, the system shows a decreasing submission rate and increasing submission delay with SR. We then look at how TN (Token Number) impacts the system performance. Intuitively, when TN goes up, users have increased opportunity to submitreviews, leading to raised system performance. We observe an arguable phenomenon: submission rate and delay both stabilize after TN is beyond certain value. When there are more tokens circulating in the network, initially users can easily get tokens and submit their reviews. Recall that users no longer participate in the review system once their reviews are submitted to the vendor or forwarded to others. Over time, the network of participating users becomes sparse and sparse, and these users have less and less chance to receive a token due to decreased network density.

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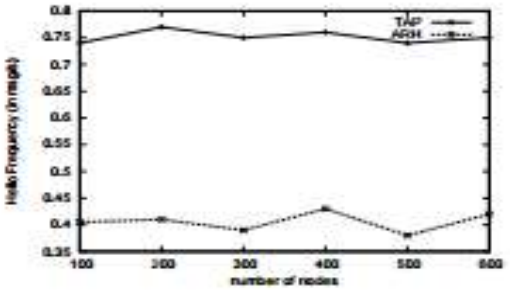
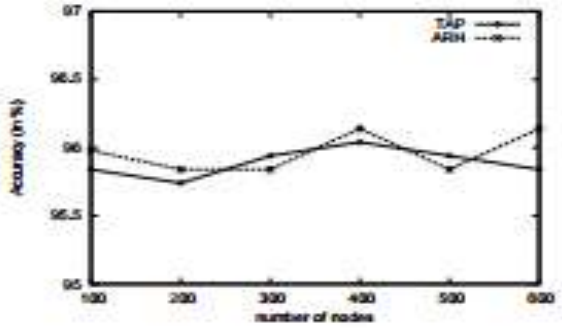



(a) Message overhead ('hello' frequency).

**2.Under review rejection attacks: -** The performance comparison of Trace based technique and the non-cooperative system when the vendor launches review rejection attacks. We observe that the non-cooperative system has a > 25% performance drop in submission rate. Indeed, it is not equipped with any security mechanism against the attacks and suffers performance degradation. Submission delay does not shown any noticeable change since only direct submission is engaged in the non-cooperative system and only successfully submitted reviews are considered during delay calculation. Compared with the case of no review rejection attacks, trace based technique only has slightly reduced (< 10% smaller) submission rate and nearly unchanged submission delay thanks to the user cooperation and review aggregation mechanisms. It is worth noting that trace based technique achieves significantly higher submission rate than the non-Cooperative system, up to 100%. These simulation results indicate that trace based technique is able to effectively resist review rejection attacks**.**




(b) Neighborhood accuracy.

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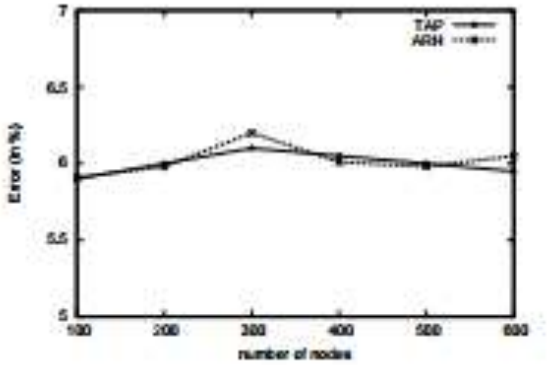


(c) Neighborhood error.

## VI.CONCLUSION

In this paper, we proposed a TSE system for S-MSNs. The system uses hierarchical signature and aggregate signature techniques to transform independent reviews into structured review chains. This transformation includes distributed user cooperation, which improves review integrity and significantly reduces vendors' modification capability. We have presentedthree review attacks which shows that the bTSE can effectively resist review attacks without relying on a third trusted authority. Construction of pseudonyms and the secret keys in the bTSE, and obtained a SrTSE system.

## REFERENCES

W. Dong, V. Dave, L. Qiu, and Y. Zhang, "Secure Friend Discovery in Mobile Social Networks," Proc. IEEE INFOCOM, pp. 1647-1655, 2011.

X. Liang, X. Li, R. Lu, X. Lin, and X. Shen, "Seer: A Secure and Efficient Service Review System for Service-Oriented Mobile Social Networks," Proc. IEEE 32nd Int'l Conf. Distributed Computing Systems (ICDCS), pp. 647-656, 2012.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
X. Liang, X. Li, T. Luan, R. Lu, X. Lin, and X. Shen, "Morality- Driven Data Forwarding with Privacy Preservation in Mobile Social Networks," IEEE Trans. Vehicular Technology, vol. 61, no. 7, pp. 3209-3222, Sept. 2012.

T.H. Luan, L.X. Cai, J. Chen, X. Shen, and F. Bai, "VTube: Towards the Media Rich City Life with Autonomous Vehicular Content Distribution," Proc. IEEE CS Eighth Ann. Conf. Sensor, Mesh and Ad Hoc Comm. Networks (SECON), pp. 359-367, 2011.

J.R. Douceur, "The Sybil Attack," Proc. Revised Papers First Int'l Workshop Peer-to-Peer Systems (IPTPS), pp. 251-260, 2002.

Newsome, E. Shi, D.X. Song, and A. Perrig, "The Sybil Attack in Sensor Networks: Analysis & Defenses," Proc. Third Int'l Symp. Information Processing in Sensor Networks (IPSN), pp. 259-268, 2004.

Quercia and S. Hailes, "Sybil Attacks Against Mobile Users: Friends and Foes to the Rescue," Proc. IEEE INFOCOM, pp. 336- 340, 2010.

R. Lu, X. Lin, X. Liang, and X. Shen, "A Dynamic Privacy- Preserving Key Management Scheme for Location-Based Services in VANETs," IEEE Trans. Intelligent Transportation Systems, vol. 13, no. 1, pp. 127-139, Mar. 2012.

R. Lu, X. Lin, T. Luan, X. Liang, and X. Shen, "Pseudonym Changing at Social Spots: An Effective Strategy for Location Privacy in VANETs," IEEE Trans. Vehicular Technology, vol. 61, no. 1, pp. 86-96, Jan. 2012.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
X. Boyen and B. Waters, "Full-Domain Subgroup Hiding and Constant-Size Group Signatures," Proc. 10th Int'l Conf. Practice and Theory Public Key Cryptography, pp. 1-15, 2007.

X. Liang, Z. Cao, J. Shao, and H. Lin, "Short Group Signature without Random Oracles," Proc. Ninth Int'l Conf. Information and Comm. Security (ICICS), pp. 69-82, 2007.

C. Gentry and Z. Ramzan, "Identity-Based Aggregate Signatures," Proc. Int'l Conf. Public Key Cryptography, pp. 257-273, 2006.

Y. Zhang, Z. Wu, and W. Trappe, "Adaptive Location-Oriented Content Delivery in Delay-Sensitive Pervasive Applications," IEEE Trans. Mobile Computing, vol. 10, no. 3, pp. 362-376, Mar. 2011.

H. Tsai, T. Chen, and C. Chu, "Service Discovery in Mobile Ad Hoc Networks Based on Grid," IEEE Trans. Vehicular Technology, vol. 58, no. 3, pp. 1528-1545, Mar. 2009.

Z. Zhu and G. Cao, "Toward Privacy Preserving and Collusion Resistance in a Location Proof Updating System," IEEE Trans. Mobile Computing, v

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**International Journal Of Core Engineering & Management (IJCEM)**
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# A FRAME WORK FOR QOS AWARE CLOUD SERVICES

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***ABSTRACT***

***One of the most significant current discussions in the Cloud Computing provisioning is the Service Level Agreement and its application in ensuring the supplied cloud computing services. The way of providing distributed services has been redefined as a consequence of using cloud computing which in turn has introduced new challenges to both providers and consumers. Measuring the quality of cloud computing provision from the consumer's point of view is important in order to ensure that the service conforms to the level specified in the agreement; this is usually referred to as Quality of Experience. This paper aims at supporting research in this area by providing a survey of the state of the art of QoS modeling approaches suitable for cloud systems. We also review and classify their early application to some decision-making problems arising in cloud QoS management.***

***Keywords – quality of services ;Cloud computing; Modeling; Qos management.***

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## I. INTRODUCTION

Cloud computing has grown in popularity in recent years thanks to technical and economical benefits of the on demand capacity management model [1]. Many cloud operators are now active on the market, providing a rich offering, including Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service(SaaS) solutions [2]. The cloud technology stack has alsobecome mainstream in enterprise data centers, where private and hybrid cloud architectures are increasingly adopted.

Even though the cloud has greatly simplified the capacity provisioning process, it poses several novel challenge sin the area of Quality-of-Service (QoS) management. QoS denotes the levels of performance, reliability, and availability offered by an application and by the platform or infrastructure that hosts it a. QoS is fundamental for cloud users, who expect providers to deliver the advertised quality characteristics, and for cloud providers, who need tofind the right tradeoffs between QoS levels and operational costs. However, finding optimal tradeoff is a difficult decision problem, often exacerbated by the presence of service level agreements (SLAs) specifying QoS targets and economical penalties associated to SLA violations [3].

Advances in networking, storage and processing technologies have given us software that is mind-boggling in size and complexity of structure. The combination of development, configuration and management complexity has resulted in software fragility and increased interest in autonomic software[1]. In the wake of organizational change, economic downturn and a demand for tightening the belt on IT costs, there is a trend toward moving large applications to the cloud. Organizations such as IBM [2] and Gartner[3] advocate cloud computing as a potential cost-saver as well as provider of higher service quality. Clouds, as made available by the major players like Amazon, Google and3Tera, use the Software-As-A-Service or Infrastructure-As-A-Service model. This means that payment for the services of the cloud are made on the basis of cpu-hours used as well as storage used [4], which is more economical than purchasing processors and storage devices. However cloud providers make no guarantees about the Quality of Service attributes being provided by them. We envisage that Quality

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Attributes like performance, security, availability, reliability will be important parameters that organizations would want to monitor and optimize. It is in this context, that self-optimization of applications distributed in the cloud, becomes important.

Usually, applications in the cloud are of the following types:

1) Web-applications that cater to diverse users across the internet and demand fast response times.

2) Enterprise applications that cater to different business units across the world and require large amounts of secure, reliable data transfer and high availability(99.999%).

3) Scientific applications that need raw cpu, or enterprises that perform batch processing

The third type of application has the natural advantage of 'cost associatively' offered by the cloud [5]. The first two types of applications represent a slice of systems that we depend on in our daily life; these need to be dependable and long-lived. By dependable, we refer to qualities like reliability, availability, and other non-functional requirements which need to be provided, maintained, evolved and monitored at runtime. These requirements often evolve in response to changes in users' needs, services, and the runtime environment.

Consequently, this will necessitate dynamic change, evolution, and self-optimization of applications hosted in the cloud with respect to the said requirements. Needless to say, evolution and self-optimization needs to be constrained by cost, available resources, and any other operational constraints specific to the cloud.

The applicability of current research on self-managing architectures to the cloud is doubtful. This is because these approaches assume that the system is a closed-loop and self management is done via a centralized component. As we will discuss in the section on Related Work, the environment of the cloud is sufficiently different (no control over physical topology, for instance), for centralized control and closed looptype feedback to be inapplicable. The contribution of this paper is as follows: we highlight existing work on self managing architectures and discusses their inapplicability to the case of the cloud. We turn to a motivating example to discuss the need for self-optimization in the cloud. We argue that Service Level Agreements (SLA) can assist the problem of self-optimization in the cloud. We introduce

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the idea of an application changing/optimizing its architecture by means of modifying its components and connectors, through the use of composable web-services, that automatically negotiate their cost versus feature offering via SLAs. We propose to use the emergent effect of simple self-optimizations at lower levels (feature level) to achieve a higher level optimization(application-wide) in the cloud. We model the simple self optimizations as solutions to the El Farol Bar problem.

## II. MOTIVATING EXAMPLE

We motivate the need for research in self-managing architecture of cloud-based applications by the following example:

Consider a new social networking site (myChaseBook),much like Facebook, but in addition to the Web it also incorporates new media like cellphones and online radio. MyChaseBook offers the following innovative services:

• Track friends geographically via cellphone, overlaid ona city map.

• Tagging of streaming radio.

• Recommend radio snippets to friends who can then choose to listen via cellphone and buy them from online stores.

• Cellphone-based access to photos, music tracks, friends and their recommendations based on the location of the user.

Suppose that myChaseBook becomes wildly popular and the creators of myChaseBook decide to move their site onto the Cloud. Their principal requirements are:

• Scalability: Cloud providers charge for their service on the basis of cpu-hours used, storage and bandwidth usage. Since my Chase Book is a startup and does not have too much cash in hand, in addition to scaling up, the application should also scale down in times of low demand.

• Availability: Users are turned off if the service is not available due to frequent over-loading. MyChaseBook should be resilient in times of increased traffic and always be available.

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• QoS: myChaseBook provides a lot of its services by composing several other web-services, that are created and controlled by third-parties. If these web-services fail to provide proper performance, then myChase-Book's reputation plummets. Hence, myChaseBookwould like QoS from these web-services to be guaranteed via Service Level Agreements (SLA)

• Cost: The cost of using other web-services could fluctuate depending on demand and supply. MyChaseBook should be able to automatically switch to a lower cost web-service, as long as it meets other requirements.

Using web-services in a composable manner to provide functionality is a typical instantiation of Service-Oriented Architecture.

Using SOA, myChaseBook should be able to dynamically evolve its architecture by modifying the web-services to which it connects. When organizational priorities change, and myChaseBook wants to optimize on dependability (say),it could search for a web-service that offers an SLA with high dependability and use that web-service instead of the high performance web-service that it is currently using. However, decisions like changing focus from one Quality Attribute to another (performance to dependability) will probably not be optimal for the entire myChaseBook application.

Each feature might want to optimize for a different Quality Attribute. For example, features like tagging of streaming radio and tracking of friends via cellphone might want to optimize for performance, while features like purchase of music tracks via cellphone might want to optimize for security. Further, all of these optimizations would have cost as a constraint as well. In this context, it is easy to see how different parts of an application might want to optimize differently, each realizing different tradeoffs.

*Layered Queuing Networks.* Layered queuing networks(LQNs) are an extension of queuing networks to describe layered software architectures. An LQN model of an application can be built automatically from software engineering models expressed using formalisms such as UMLor Palladio Component Models (PCM) [57]. Compared to ordinary queuing networks, LQNs provide the ability to describe

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dependencies arising in a complex workflow of requests and the layering among hardware andsoftware resources that process them. Several evaluation techniques exist for LQNs [58-61].

LQNs have been applied to cloud systems in [62], where the authors explored the impact of the network latency on the system response time for different system deployments. LQNs are here useful to handle the complexity of geo-distributed applications that include both transactional and streaming workloads.

Jung et al. [63] uses an LQN model to predict the performance of the RuBis benchmark application, which is then used as the basis of an optimization algorithm that aims at determining the best replication levels and placement of the application components. While this work is not specific to the cloud, it illustrates the application of LQNs to multi-tier applications that are commonly deployed in such environments.

Bacigalupo et al. [64] investigates a prediction-based cloud resource allocation and management algorithm. LQNs are used to predict the performance of an enterprise application deployed on the cloud with strict SLA requirements based on historical data. The authors also provide a discussion about the pros and cons of LQN identifying a number of key limitations for their practical use in cloud systems. These include, among others, difficulties in modeling caching, lack of methods to compute percentiles of response times, tradeoff between accuracy and speed. Since then, evaluation techniques for LQN stat allow the computation of response time percentiles have been presented [61].

*Hybrid models*. Queuing models are also used together with machine learning techniques to achieve the benefits of both approaches. Queuing models use the knowledge of the system topology and infrastructure to provide accurate performance predictions. However, a violation of the model assumptions, such as an unforeseen change in the topology, can invalidate the model predictions. Machine learning algorithms, instead, are more robust with respect to dynamic changes of the system. The drawback is that they adopt a black-box approach, ignoring relevant knowledge of the system that could provide valuable insights into its performance.

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Desnoyers et al. [43] studies the relations between workload and resource consumption for cloud web applications. Queueing theory is used to model different components of the system and data mining and machine learning approaches ensure dynamic adaptation of the model to work under system fluctuations. The proposed approach is shown to achieve high accuracy for predicting workload and resource usages.

Thereska et al. [65] proposes a robust performance model architecture focusing on analyzing performance anomalies and localizing the potential source of the discrepancies. The performance models are based on queuing-network models abstracted from the system and enhanced by machine learning algorithms to correlate system workload attributes with performance attributes.

A queuing network approach is taken in [66] to provision resources for data-center applications. As the workload mix is observed to fluctuate over time, the queuing model is enhanced with a clustering algorithm that determines the workload mix. The approach is shown to reduce SLA violations due to under-provisioning in applications subject to to non-stationary workloads.

## III. RELATED WORK

This section reviews previous work related to the use of metrics and Key Performance Indicators (KPI) to measure the

quality of cloud computing services. The review is divided into number of sections. We first review research related to general KPIs and then we focus on to QoS and QoE specific metrics.

### *A. Quality Models*

Quality models have been in use to measure quality of aservice for sometimes well before the inception of the cloud environments. In 1988 Parasuraman, et. al. [9] presented SERVQUAL as a quality model to measure the quality of traditional services to enable the retail businesses evaluate users' perceptions of the services. This model defined five quality dimensions which are: reliability, assurance, responsiveness, tangibles, and empathy. More recently, such models started to be used for measuring

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QoS in the cloud. For example, Zheng, et el [10] proposed Cloud Qual which is a quality model specified for cloud services, the model handled six dimensions which are: usability, availability, reliability, responsiveness, security, and elasticity. In this model usability considered as subjective metric, whereas the others were objective. Although this research submitted a quality model, however this model considered for cloud storage service whereas our system will consider the SaaS. Quality models have begun to take different forms and methods to measure the users' perception of the cloud services. Some are known as KPIs while others are referred to as QoS parameters or QoE metrics. The following sections describe the use of some of these.

***B. KPIs in cloud computing***

Many researchers have been submitted to define measurements for the KPIs in cloud environment. In terms of measuring the parameters of SLA in cloud computing, many efforts have been made. Several studies have produced measurements of SLA metrics with respect to QoS [10-17],most of the researches concentrated on measuring the performance of cloud computing through measuring parameters such as availability, reliability, scalability, response time, learn ability and easiness.

In terms of measuring availability, many researchers used a brief formula for the measurement of availability like [11-13] ,while those researches proposed using availability in IaaS, [14]handled this metric in PaaS.

The reliability has been addressed by [11, 13]. While [13] submitted a framework to rank the services in cloud computing taking into consideration the QoS attributes, the researchers dealt with IaaS environment. On the other hand, the a work in[11] suggested a technique to measure the quality of the services in the cloud. The work used SMI Cloud framework that calculates the Service Measurement Index (SMI) through measuring the quality of services.

Defining a formula to measure the elasticity was studied by many researchers. Surveys such that [15, 16] studied this parameter in the IaaS environment, [15] submitted a method to measure the elasticity of IaaS in cloud computing, the definition of elasticity derived from the definition of elasticity used in physics, [16] Presented a method to determine the value of the elasticity, they set a measure that reflects

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the financial penalty for a specific consumer. As a complementary to their work, researchers in [17] proposed many metrics to measure the elasticity in the PaaS.

Scalability studied in [11] in the IaaS environment, while [18]concentrated on the SaaS through proposing a metric to tests capability of SaaS applications in the cloud computing. Several attempts have been made to define a metric for the response time in cloud computing. For example [11, 13]submitted their studies in IaaS, while [14] submitted a framework to measure the performance in PaaS application staking into consideration the response time and [19] measured the response time in cloud gaming which considered as SaaS application.

Both learn ability and Easiness as measurements for the usability were studied by [13] , these metrics were defined for the case of IaaS. It is obvious that most of these parameters defined in the previous surveys were considered for IaaS, so an attention should be paid to use these metrics in PaaS or SaaS environment.

### *C. Measuring QoE in Networks*

Two basic methods are available to measure the QoE in net works. The first one is the subjective test, which is implemented by real users as a test panel. However, this test is deemed time-consuming and expensive, as it requires a large number of people to conduct the test and get the result, as well as the different views of users which affect the accuracy of there sult. The second test is the objective test, which is performed using some measurements and comparison techniques through predicting the user perception based on the properties of the reference and the outcome; however this method does not consider the user perspective. As an example of an objective test is the Perceptual Evaluation of Speech Quality (PESQ)standard which is used to quantify the voice quality in the Voice Over IP [8, 21].

## IV. A NEW QOE METRIC FOR SAAS IN CLOUD COMPUTING

### *A. A case study*

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A specific case study is used as a platform for applying the metric; the case study involves the use of a network simulator to be provided to users as a SaaS as shown in Fig. 1. The case study is used to derive a number of KPIs based on the requirements of the users.

In the proposed case study, the simulator engine will be hosted in the cloud, while students on the lab will get access to that engine through a user interface on each user's PC. Simulation jobs developed by the users (in the lab) will be submitted to the cloud and serviced by the software on the cloud, as a SaaS model. When simulations finish, results will be returned back to users.In our system the proposed metric will be used to make sure that users receive an appropriate service in accordance to their needs.

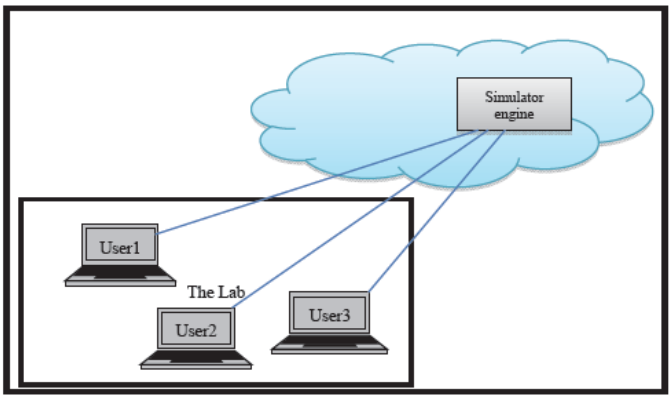


Fig1. The proposed case study

***B. The proposed metric***

This section presents the main proposed KPIs a new system for measuring QoE in SaaS cloud services. Seven main KPIs have been selected for this purpose, which are: Availability, Reliability, Scalability, Response time, Elasticity, Learn ability and Accuracy. These KPIs were selected based on the requirements of the simulator's users. These KPIs require the application to have acceptable level of availability, can scale up and down in response to the user's need for running variably sized simulation jobs (scalability and elasticity), produce experiment results in a timely manner (response time), deliver reliable service within accepted latency, support accuracy of responses to consumer's request and supports the capability to learn the application.

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In our study, we have deviated from the SMI model by not considering accountability, financial, security and as these categories are not intended by the users in the lab. In contrast, availability, Reliability, Scalability, Response time, Elasticity, Learn ability and Easiness are important to assure the consistency of experiments implemented in the lab which is the users' requirement in the proposed system. Therefore, the chosen parameters are thought to be enough to measure the performance of the system.

As the SaaS is an internet based applications, it is important to

take into consideration the impact of the network as well as the impact of running the application of the SaaS on the provider's side in defining the QoE for SaaS, Similar to end-to-end QoS for a network, we can define QoE for SaaS as a function of three quantities based on the time taken to provide the service to the user. This can be explained by defining three different regions depending on the level of delivering the service to the user as shown in Fig. 2. The three regions will be denoted as TP, TX, and TC where:

- TP: the time of preparation, this region represents the time consumed at the server side preparing the application to be used by the consumer (initialization time). This time also depends on the performance of the underlying virtual machines.
- TX: the time of transmission, the time delay as a result of network transmission, which represents the QoS network.
- TC: the time of consuming the contents, the time delay in using the application by the consumer.

Thus, the QoE is not only related to the consumption of the service at the user's side, but also the effect of the network's operating conditions. Therefore, according to our model and incase the cloud provider is not responsible for the delivery of the network, it would be unfair to penalise the cloud provider in the case of SLA violations due to degradation in the network's QoS.

By measuring these KPIs with corresponding QoS parameters and aggregating the values of QoE, Mean Opinion Score(MOS) and the acceptance level of the users and then comparing them to the SLA parameters, any violation of the SLA terms can be determined.

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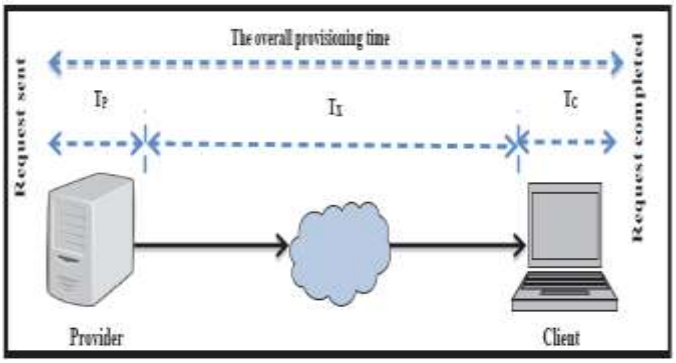


Fig.2. End-to-End QoE in SaaS environment

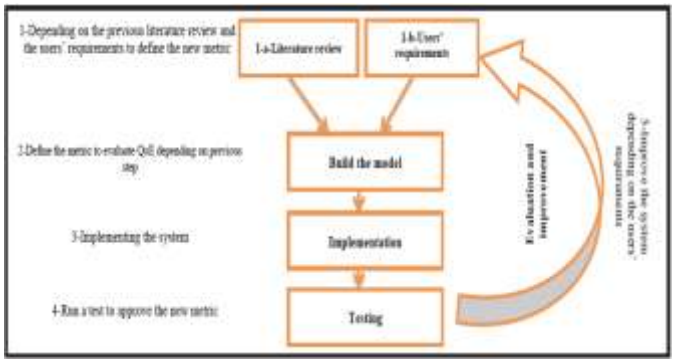


Fig.3. Guidelines for the QoE metric development

## V. RESULTS

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## VI. CONCLUSION AND FUTURE

We think that modeling of the problem in greater detail would be necessary to carry out any experimental evaluation. We will propose more precise application of multi-attribute utility theory to SLA negotiation. Also, modification strategies that a web-service can learn from, will be proposed. This would enable simulations of a cloud with negotiating web-services, thus allowing us to test our idea of low-level self-optimization leading to an emergent higher level optimized application state in the cloud.

This paper has investigated the measurement of QoE for SaaS applications in cloud computing. The paper reports a work-in-progress for proposing a quantifiable metric to measure the QoE of the SaaS applications in cloud computing. The metric is chosen to capture the user requirements taking into

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consideration the QoS parameters and SLA parameters in terms of KPIs. A prototype system to manage the measurement of KPIs and other parameters to be used for computing the QoE metric will be implemented. Consequently, one of the major challenges of this research is to develop a metric that is accurate as well as practical to be implemented. This research will serve as a basis for future studies for using this metric as a criterion to benchmark the SaaS applications in cloud environment.

## REFERENCES

Buyya, R., et al., Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility. Future Generation computer systems, 2009. 25(6): p. 599-616.

Sarna, D.E., Implementing and developing cloud computing applications.2010: Auerbach Publications.

Chauhan, T., et al. Service level agreement parameter matching in cloudcomputing. in Information and Communication Technologies (WICT),2011 World Congress on. 2011. IEEE.

Miller, M., Cloud computing: Web-based applications that change the wayyou work and collaborate online. 2008: Que publishing.

Mathur, P. and N. Nishchal. Cloud computing: New challenge to the entirecomputer industry. in Parallel Distributed and Grid Computing (PDGC),2010 1st International Conference on. 2010. IEEE.

Lee, H.-J., et al., QoS parameters to network performance metricsmapping for SLA monitoring. KNOM Review, 2002. 5(2): p. 42-53.

Hobfeld, T., et al., Challenges of QoE management for cloud applications.Communications Magazine, IEEE, 2012. 50(4): p. 28-36.

Rifai, H., S. Mohammed, and A. Mellouk. A brief synthesis of QoS-QoEmethodologies. in Programming and Systems (ISPS), 2011 10$^{th}$International Symposium on. 2011. IEEE.

Parasuraman, A., V.A. Zeithaml, and L.L. Berry, Servqual. Journal ofretailing, 1988. 64(1): p. 12-37.

Zheng, X., Martin, P. ; Brohman, K. ; Xu, L.D., CLOUDQUAL: AQuality Model for Cloud Services. IEEE Transactions on IndustrialInformatics, 2013(99).

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
Garg, S.K., S. Versteeg, and R. Buyya, A framework for ranking of cloudcomputing services. Future Generation Computer Systems, 2013. 29(4):p. 1012-1023.

Bruneo, D., A stochastic model to investigate data center performanceand qos in iaas cloud computing systems. IEEE Transactions on Paralleland Distributed Systems, 2014. 25.

Saravanan, M.K. and M.L. Kantham, An enhanced QoS Architecturebased Framework for Ranking of Cloud Services. 2013.

Shao, J. and Q. Wang. A performance guaranteeapproach for cloudapplications based on monitoring. in Computer Software andApplications Conference Workshops (COMPSACW), 2011 IEEE 35th Annual. 2011. IEEE.

Shawky, D.M. and A.F. Ali. Defining a measure of cloud computingelasticity. in Systems and Computer Science (ICSCS), 2012 1st International Conference on. 2012. IEEE.

Islam, S., et al. How a consumer can measure elasticity for cloudplatforms. in Proceedings of the third joint WOSP/SIPEW internationalconference on Performance Engineering. 2012. ACM.

Almeida, R.F., et al., On defining metrics for elasticity of clouddatabases. 2013.

Tsai, W.-T., Y. Huang, and Q. Shao. Testing the scalability of SaaSapplications. in Service-Oriented Computing and Applications (SOCA),2011 IEEE International Conference on. 2011. IEEE.

Chen, K.-T., et al., On the Quality of Service of Cloud Gaming Systems.2014.

CSMIC, Service Measurement Index Version 1.0. 2011, CSMIC.

Fiedler, M., T. Hossfeld, and P. Tran-Gia, A generic quantitativerelationship between quality of experience and quality of service.Network, IEEE, 2010. 24(2): p. 36-41.

García García, A., I. Blanquer Espert, and V. Hernández García, SLAdrivendynamic cloud resource management. Future GenerationComputer Systems, 2014. 31: p. 1-11.

Esfahani, M.D. and A. Abdul Rahman, TRIANGLE-BASED QOEMEASUREMENT MODEL FOR VOIP APPLICATION. InternationalJournal of Innovative Computing, 2011. 1(1).

Safdari, F. and V. Chang, Review and analysis of Cloud ComputingQuality of Experience. 2014.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
Casas, P. and R. Schatz, Quality of Experience in Cloud services: Surveyand measurements. Computer Networks, 2014.

Jarschel, M., et al., Gaming in the clouds: QoE and the users'perspective. Mathematical and Computer Modelling, 2013. 57(11): p.2883-2894.

Casas, P., et al. Quality of experience in remote virtual desktop services.in Integrated Network Management (IM 2013), 2013 IFIP/IEEEInternational Symposium on. 2013. IEEE.

Casas, P., et al. A first look at quality of experience in Personal CloudStorage services. in Communications Workshops (ICC), 2013 IEEEInternational Conference on. 2013. IEEE.

Casas, P., et al. YouTube & Facebook Quality of Experience in mobilebroadband networks. in Globecom Workshops (GC Wkshps), 2012IEEE. 2012. IEEE.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# OPTIMIZATION AND REGRESSION ANALYSIS FOR SURFACE ROUGHNESS IN MILLING OF EN-31 STEEL ALLOY MATERIAL

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***ABSTRACT***

***In the present work, by using Taguchi Robust Design methodology the End milling of EN-31 steel alloy is carried out in order to optimize the milling process parameters and to minimize the surface roughness. The selected milling process parameters are Cutting Speed, Feed rate, Depth of cut and coolant flow. Taguchi orthogonal array is designed with three levels, four factors and nine experiments using $L_9$ ($3^4$) orthogonal array. The nine experiments are performed and surface roughness is calculated. Results obtained by Taguchi Method, shows that the factors affecting the surface roughness are Significant and Cutting Speed is the most influence significant parameter. Multiple Regression equation is formulated for estimating the predicted values for surface roughness.***

***Keywords: Taguchi Robust Design methodology, Milling Process, EN-31 material, $L_9$ ($3^4$) orthogonal array, Multiple Regression Analysis etc.***

## I.INTRODUCTION

The present work is an extension [1], where the set of optimum values for the selected control factors

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are generated in order to reduce surface roughness using Taguchi's robust design methodology. Four control factors viz. cutting speed, feed rate, depth of cut and coolant flow are investigated at three different levels. The work piece material used is EN-31 steel alloy and the output parameter investigated is surface roughness using signal-to-noise at smaller the better.

In this work, ANOVA is performed for the selected factors, to be significant or insignificant and to develop the prediction models for the surface roughness considering the control factors using regression analysis. Regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables.

## II. LITERATURE SURVEY

As stated earlier the present paper is an extension work [1], where a thorough study of literature has been carried out in order to implement ANOVA technique [1-6] and Regression Analysis [7-10] successfully. The experiment setup and design of the present work is carried out through Taguchi robust design methodology for surface roughness considering all the variables where the optimum conditions are developed [1].

## III. EXPERIMENTAL SETUP AND DESIGN

The objective of the work is to find out the selected control factors is significant or not and to develop prediction models by using multiple regression analysis. The experimentation is carried out by using Taguchi Method considering $L_9$ ($3^4$) Orthogonal Array [1-2]. The details of experimental setup is tabulated in Table No.1

The four control factors selected are spindle speed (A), feed rate (B), depth of cut(C) and coolant flow (D). The machining is performed individually depending upon the lubricant conditions. The control

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factors and their alternative levels are listed in Table No.2. The experiments are planned and performed accordingly [1], the factor assignment is done as per the $L_9$ ($3^4$) orthogonal array and the surface roughness values are tabulated in Table No.3.

TABLE NO. 1: EXPERIMENT DESIGN AND SETUP

| | | |
|---|---|---|
| **VERTICAL CNC MILLING MACHINE** | The milling operations are carried out on a CNC milling MTAB [1-2] |  |
| **WORKPIECE MATERIAL** | The work piece material used is EN-31 Steel Alloy of length 49mm, height 49mm and thickness 12mm in the form of plates.<br>EN-31 Steel alloy consisting of 1.08% of carbon, 0.25% of silicon, 0.53% of manganese, 0.015% sulphur, 0.022% phosphorus, 0.33% of nickel, 1.46% of chromium, and 0.06% of molybdenum [1]. |  |

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| | | |
|---|---|---|
| **CUTTING TOOL** | The cutting insert used is brass coated carbide tool with diameter of 16mm.<br><br>The tool holder used for machining is BT30-ER16, side lock adapter system [1]. |  |
| **LUBRICANT/CUTTING FLUID** | The cutting fluid used in the machining is synthetic oil and water, maintained at the ratio of 1:20 [1]. | |
| **SURFACE ROUGHNESS TESTER** | The Surface roughness is measured using a portable stylus type Profilometer. The profilometer is portable self contained instrument for the measurement of surface texture (Ra) [1, 2]. |  |

TABLE NO. 2: CONTROL FACTORS AND LEVELS

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| Factors /Levels | Speed (A) (rpm) | Feed (B) (mm/min) | Depth Of Cut (C) (mm) | Coolant Flow (D) (lt/min) |
|---|---|---|---|---|
| 1 | 796 | 50 | 0.5 | 30 |
| 2 | 935 | 100 | 1.0 | 60 |
| 3 | 1094 | 150 | 1.5 | 90 |

TABLE NO. 3: EXPERIMENTAL RESULTS OF SURFACE ROUGHNESS & CALCULATED S/N RATIOS

| EXPERIMENT NUMBER | CONTROL FACTORS | | | | TRAIL 1 | TRAIL2 | MEAN | S/N RATIO |
|---|---|---|---|---|---|---|---|---|
| | SPEED (A) | FEED (B) | DEPTH OF CUT (C) | COOLANT FLOW (D) | | | | |
| 1 | 796 | 50 | 0.5 | 30 | 0.598 | 0.613 | 0.6055 | 4.357051 |
| 2 | 796 | 100 | 1.0 | 60 | 0.510 | 0.494 | 0.5020 | 5.984823 |
| 3 | 796 | 150 | 1.5 | 90 | 1.055 | 1.131 | 1.0930 | -0.77765 |
| 4 | 935 | 50 | 1.0 | 90 | 0.182 | 0.198 | 0.1900 | 14.41724 |
| 5 | 935 | 100 | 1.5 | 30 | 0.274 | 0.241 | 0.2575 | 11.76666 |
| 6 | 935 | 150 | 0.5 | 60 | 0.48 | 0.496 | 0.4900 | 6.195427 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 4 | | | |
| 7 | 1094 | 50 | 1.5 | 60 | 0.416 | 0.424 | 0.4200 | 7.53462 |
| 8 | 1094 | 100 | 0.5 | 90 | 0.170 | 0.172 | 0.1710 | 15.33993 |
| 9 | 1094 | 150 | 1.0 | 30 | 0.251 | 0.247 | 0.2490 | 12.07573 |

TABLE NO. 4: BASIC ANALYSIS OF VARIANCE

| FACTOR | S.S | D.O.F | M.S.S | F-RATIO (DATA) | F-RATIO (TABLE) | RESULT |
|---|---|---|---|---|---|---|
| **SPEED** | 0.767919 | 2 | 0.383959 | 784.5916 | 4.26 | Significant |
| **FEED** | 0.283111 | 2 | 0.141555 | 289.2577 | 4.26 | Significant |
| **DEPTH OF CUT** | 0.232897 | 2 | 0.116449 | 237.9535 | 4.26 | Significant |
| **COOLANT FLOW** | 0.046384 | 2 | 0.023192 | 47.39106 | 4.26 | Significant |
| **ERROR** | 0.003915 | 9 | 0.000489 | | | |
| **$S_t$** | 1.330311 | | | | | |
| **MEAN** | 3.516552 | 1 | | | | |
| **ST** | 4.850778 | 18 | | | | |

TABLE NO. 5: ANALYSIS OF VARIANCE

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| FACTOR | S.S | D.O.F ($D_f$) | M.S.S ($M_{SS}$) | F-RATIO (DATA) | $SS^1$ | ρ % |
|---|---|---|---|---|---|---|
| | | | 0.383959 | | | |
| **SPEED** | 0.767919 | 2 | 0.141555 | 784.5916 | 0.76694 | 57.6512 |
| **FEED** | 0.283111 | 2 | | 289.2577 | 0.282132 | 21.2079 |
| **DEPTH OF CUT** | 0.232897 | 2 | 0.116449 | 237.9535 | 0.231918 | 17.4333 |
| **COOLANT FLOW** | 0.046384 | 2 | | 47.39106 | 0.045405 | 3.4131 |
| | | | 0.023192 | | | |
| **ERROR** | 0.003915 | 9 | 0.000489 | | | 0.2942 |
| **$S_t$** | 1.330311 | | | | | |
| **MEAN** | 3.516552 | 1 | | | | |
| **ST** | 4.850778 | 18 | | | | 100% |

## I. RESULTS AND DISCUSSION

The experiments are conducted using different levels of the process parameters and the specimens have been machined accordingly, depending upon cutting speed, feed, depth of cut and coolant flow conditions. Then surface roughness is measured precisely with the help of a portable stylus-type Profilometer. The experiment results are tabulated in Table No.3.and the corresponding optimum conditions are found and confirmatory tests have also been conducted to validate optimal results [1].

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TABLE NO. 6: REGRESSION ANALYSIS FOR SURFACE ROUGHNESS

| S.No. | SPEED(A) | FEED(B) | DOC(C) | CF(D) | Y | Ŷ |
|---|---|---|---|---|---|---|
| 1 | 796 | 50 | 0.5 | 30 | 0.598 | 0.415 |
| 2 | 796 | 100 | 1 | 60 | 0.51 | 0.659 |
| 3 | 796 | 150 | 1.5 | 90 | 1.055 | 0.903 |
| 4 | 935 | 50 | 1 | 90 | 0.182 | 0.406 |
| 5 | 935 | 100 | 1.5 | 30 | 0.274 | 0.479 |
| 6 | 935 | 150 | 0.5 | 60 | 0.484 | 0.471 |
| 7 | 1094 | 50 | 1.5 | 60 | 0.416 | 0.196 |
| 8 | 1094 | 100 | 0.5 | 90 | 0.17 | 0.188 |
| 9 | 1094 | 150 | 1 | 30 | 0.251 | 0.261 |
| 10 | 796 | 50 | 0.5 | 30 | 0.613 | 0.415 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | 796 | 100 | 1 | 60 | 0.494 | 0.659 |
| 12 | 796 | 150 | 1.5 | 90 | 1.131 | 0.903 |
| 13 | 935 | 50 | 1 | 90 | 0.198 | 0.406 |
| 14 | 935 | 100 | 1.5 | 30 | 0.241 | 0.479 |
| 15 | 935 | 150 | 0.5 | 60 | 0.496 | 0.471 |
| 16 | 1094 | 50 | 1.5 | 60 | 0.424 | 0.196 |
| 17 | 1094 | 100 | 0.5 | 90 | 0.172 | 0.188 |
| 18 | 1094 | 150 | 1 | 30 | 0.247 | 0.261 |

In the present work, The ANOVA calculations are performed for the results obtained of Surface roughness values from the Table No.3. The calculations are done manually and the model was checked at 95% confidence level for the adequacy. From the ANOVA it is observed that all the factors selected i.e. Cutting speed, Feed rate, Depth of cut and Coolant flow conditions are significant shown in Table No.4.

A prediction model is developed for surface roughness using multiple regression analysis. The regression equation is also developed considering the control factors i.e. cutting speed, Feed rate, Depth of cut and Coolant flow conditions for the observed surface roughness values. Here the independent variables are the cutting speed, Feed rate, Depth of cut and Coolant flow conditions where all are quantitative

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variables which relates the dependent variable, surface roughness. The averages of the two trails are considered i.e. eighteen Ra values are taken and these are shown in Table No.6. To establish the prediction model, regression analysis has run in Excel which gives the Regression equation and the statistics related to ANOVA and regression.

## IV. CONCLUSIONS

The objective of the present work is to find out whether the selected control factors are significant or not and to develop prediction models for the control factors by using multiple regression analysis, Whereas the optimum values by using S/N Ratio in order to reduce surface roughness, is obtained and validated successfully [1]. Based on the results of the present investigations the following conclusions can be drawn:

- Analysis of Variance suggests that Cutting Speed is the most significant factor for the surface roughness followed by Feed rate. Whereas, Depth of Cut and Coolant Flow appears to have very little effect over roughness value. Hence it can be concluded that an increment of Cutting Speed will result in better surface quality in terms of roughness.
- Multiple Regression analysis has been successfully implemented to develop multiple regression prediction models using the predictors cutting speed (A), feed (B), depth of cut (C) and coolant flow (D) conditions, the regression equation is $\hat{Y}$ =1.357968-0.00149A+0.002055B+0.168C+0.0019D.
- The scatter plot from Fig No.1 shows the relation between the predicted values at Y axis and the observed values at X axis. From the graph it is observed that the prediction values obtained from final model and actual experiment data are efficiently in good agreement, this concludes the results were within acceptable limits.

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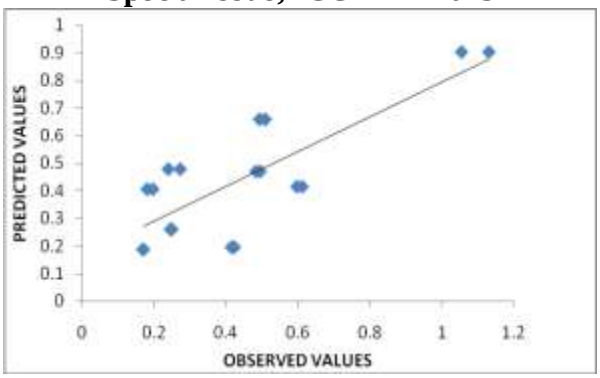


FIGURE NO.1: Predicted verses Actual Values

## REFERENCES

G. Guruvaiah Naidu, A.Venkata Vishnu, G.Janardhana Raju "Optimization of Process Parameters for Surface Roughness in Milling of EN-31 Steel Material Using Taguchi Robust Design Methodology", International Journal of Mechanical And Production Engineering ISSN: 2320-2092 Vol. 2 Issue 9, September-2014, pp.15-21.

A.Venkata Vishnu, K B G Tilak, G. Guruvaiah Naidu, Dr.G.Janardhana Raju "Optimization of Different Process Parameters of Aluminium Alloy 6351 in CNC Milling Using Taguchi Method", International Journal of Engineering Research and General Science, ISSN: 2091-2730,Nepal, Vol.3 Issue 2, March-April-2015.

Avinash A thakre, "Optimization of Milling Parameters for Minimizing Surface Roughness Using Taguchi's Approach", International Journal of Emerging Technology and Advanced Engineering Vol 3, Issue 6, June 2013, pp-226-230.

B. Lee, K.Y., Kang, M.C., Jeong, Y.H., Lee, D.W. and Kim, J.S., (2001), "Simulation of surface roughness and profile in high-speed end milling", Journal of Materials Processing Technology, Vol.113, pp.410-4125.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

A .Venkata Vishnu, G. Guruvaiah Naidu, K B G Tilak, J.Ramakrishna, "Application of Taguchi Method in the Optimization of Turning Parameters for Material Removal Rate of En-36 Material", International Journal of Advance Engineering and Research Development E-ISSN (O): 2348-4470 P-ISSN (P): 2348-6406, Volume 2, Issue 8, August-2015.

Kamal, Anish and M.P.Garg, "Experimental investigation of Material removal rate in CNC milling using Taguchi method "International Journal of Engineering Research and Applications (IJERA) Vol. 2, Issue 2,Mar-Apr 2012, pp.1581-1590

M. Venkata Ramana, A. Venkata Vishnu, G. Krishna Mohan Rao, D. Hanumantha Rao, "Experimental Investigations, Optimization Of Process Parameters And Mathematical Modeling In Turning Of Titanium Alloy Under Different Lubricant Conditions", IOSR Journal of Engineering (IOSRJEN) www.iosrjen.org ISSN : 2250-3021 Vol. 2 Issue 1, Jan.2012, pp. 086-101.

Manish Vishwakarma, Vishal Parashar, V.K.Khare "Optimization and Regression Analysis of Surface Roughness for Electric Discharge Machining of EN-19 Alloy steel using Tungsten Copper Electrode" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 Vol. 2, Issue 6, November- December 2012, pp.785-792.

Kodandaram K., Srinivasa Raju S .V.S.S., Chandrasheker J., Nagendra A, "Prediction of Surface Roughness in Turning Process Using Taguchi Design of Experiments and Developing Regression Model", 3rd Intl & 24th AIMTDR conference, Dec.2010, pp 379-384.

Douglas C. Montogomery, Elizabeth A. Peck and G.Geoffrey Vining "Introduction to Linear Regression Analysis" Arizona State University, 2001.

Phillip j. Ross "Taguchi Techniques for Quality Engineering", Tata McGraw Hill, Second Edition, 2005.

HMT "Production Technology", Tata McGraw Hill, 2004.

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ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# PERFORMANCE ANALYSIS OF PAYLOAD FAIRING OF A LM-3A LAUNCH VEHICLE

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***ABSTRACT***

***Design of payload fairing is one of the important criteria for spacecraft vehicle. Payload fairing is a nose cone which is used to overcome drag and withstand dynamic pressure as well as aerodynamic heating during the launch. If not designed properly, it can lead to massive failure of the entire spacecraft. This paper presents CFD analysis on payload fairing of a LM-3A vehicle launcher which has a 3350 mm external diameter with a height of 8887 mm. Study has been done to see the effect of nose cone and boat tail angles, on pressure distribution across the payload fairing. In order to achieve a delay in flow separation and to reduce the area of flow separation, analysis has been carried out with a set of combinations of different nose cone and boat tail angles which are the main parameters for causing shock waves and flow separations. The simulations are carried out using commercially available ANSYS software (v15.0) at Mach number 1 and compared with the theoretical results. The pressure increase across the shock is also studied using a standard k-epsilon model and the best combination of nose cone and boat tail angles is proposed where the flow separation and the shock generated is minimum.***

***Keywords: nose cone, boat tail, flow separation, shock***

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**Nomenclature**

ρ=density of fluid
g=acceleration due to gravity (9.81 m/s^2)
u =fluid phase velocity
μ= viscosity of fluid
ν= fluid velocity

Suffix notations I, j and k= Representations for x, y and z directions.
=Pressure.
P1 = Upstream pressure of shock.
P2 = Downstream pressure of shock.

=Turbulent Kinetic Energy
=Prandtl Number=1.30
=Dissipation Rate
=1.44
, =User defined Source Terms
=Production of k as a result of mean velocity gradients
=Production of k as a result of buoyancy
=Handout of varying dilatation
, =Turbulent Prandtl Numbers,

## I. INTRODUCTION

Payload fairings are used to protect the satellite or the payload from the external environment during the pre-launch operations, initial stages of the flight and to provide an aerodynamic forward surface. Payload fairing are designed in such a way that they must sustain low humidity, acoustic vibrations, aerodynamic loading, should be particle–free and be able to maintain a stable thermal environment inside it. A payload fairing consists of four parts namely, Nose cup, Nose cone, Cylinder and Boat tail. The payload fairing is jettisoned after reaching the altitude of approx. 125 kms from the sea level in about 340 seconds from the time of launch. Hence the analysis will be carried out using conditions corresponding to Mach number equal to 1, where the forces acting on the payload fairing would be critical, also the aerodynamic forces would be maximum. The design used for analysis is one of the 5 available LM-3A series launch vehicles [1] named as 3350, 3700Z, 4000F, 4200Fand 4200Z. The 3350 fairing which is being analyzed is designed to be encapsulated on pad. The basic design of 3350 fairing will be analyzed for different nose angles and boat tail angles in order find which combination will provide minimum shock strength and delay in flow separation.

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## II. LITERATURE

For a solid object moving through a fluid, drag is an opposition to the movement due to aerodynamic forces. Drag force is proportional to velocity for laminar flow and proportional to square of velocity for turbulent flow. It is seen that drag coefficient increases in transonic region and is maximum at Mach number 1. As the Mach number is increased further the drag coefficient decreases. Nose cone and boat tail angles are the main parameters for reducing area flow separation and strength of shock wave. If the nose cone and boat tail angles are increased, it will result in increased shock. As the boat tail angle increases, the area of flow separation increases causing reverse flow at boundary layer. The design should be optimized for reduced flow separation and shock considering dimensions of payload fairing [2]. Elastic deformation is occurred due to aerodynamic load and weight of payload fairing. Computational aero elasticity dynamics method is used for calculating deformation at different boat tail angles. For boat tail angles 0 to 25 degrees the deformation is seen at boat tail region and for boat tail angle greater than 25 degrees [3], the deformation is seen at cylinder region. When the air attacks at nose cup the dynamic pressure is very low. As the air moves towards nose cone, the dynamic pressure starts increasing slowly and at end of nose cone the dynamic pressure increases suddenly to a higher value forming shock wave. When air moves further on cylinder, the pressure decreases and at the end of cylinder pressure is increased. Shock strength is optimum near Mach number 1.Surrounding environment conditions also play a critical role. As we know that the density goes on decreasing as the altitude rises. Since the viscosity of the fluid purely depends on its density, which further gives rise to another phenomena known as viscosity heating. It gives a rise in temperature of the fairing surface and its surrounding fluid. The change in altitude also effects the velocity of sound due to which Mach no comes into the picture. Now our analysis is based on High speed flows around an object. Payload fairings are mainly designed to sustain structural loads and to prevent buckling and other failures. But later the design is again considered for acoustic loading. There are severe acoustics experienced during the launch operation of the rocket. For most launch vehicles the highest acoustic loading is obtained during liftoff, due the burn from the rocket engines during launch of the vehicle [4]. In order to reduce the effect of acoustic vibration the fairing is provided with a composite acoustic blanket made

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**International Journal Of Core Engineering & Management (IJCEM)**
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of different material properties at different cross sections, so that considerable noise reduction is obtained.

## III. GEOMETRY AND MODELING

### A. Geometry

We have carried out the analysis on 3350 fairing configuration for LM-3A series launch vehicles. The 3350 fairing configuration has an external cylinder diameter of 3,350 mm, height of 8887mm and a thickness of 175mm. Nose cone angle and boat tail angle are the main parameters used to reduce flow separation and total pressure distribution across the payload fairing are our focus of analysis . The effects of other parameters such as elastic displacement, forces, moments, thermal effects are assumed based on other research papers [2] [8].

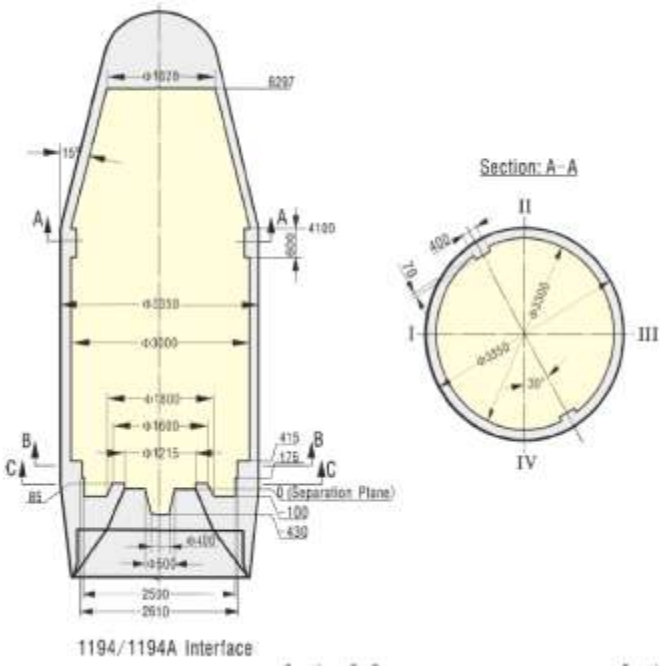


Figure1: Geometry Details

### B. K-epsilon Model

The K-epsilon Model is a type of Eddy-Viscosity Model. The eddy viscosity models are based on Boussinesq approach in which the unknown turbulent stresses are related with velocity

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Fluctuations/gradients. In K-epsilon model, the velocity scale is computed from the 'Turbulent Kinetic energy' which is a variance of fluctuations in velocity and the turbulent length scale is computed from using 'Turbulent Kinetic Energy' and 'Dissipation rate' which is the rate at which the fluctuations are dissipated.

Transport Equation for turbulent Kinetic Energy [5]

$$\frac{d(\rho k)}{dt} + \frac{\partial(\rho k u_i)}{\partial x_i} = \frac{\partial}{\partial x_j}\left[\left(\mu + \frac{\mu_t}{\sigma_k}\right)\frac{\partial k}{\partial x_j}\right] + P_k + P_b \quad (1)$$

Transport Equation for dissipation rate

$$\frac{\partial(\rho\epsilon)}{\partial t} + \frac{\partial(\rho\epsilon u_i)}{\partial x_i} = \frac{\partial}{\partial x_j}\left[\left(\mu + \frac{\mu_t}{\sigma_\epsilon}\right)\frac{\partial \epsilon}{\partial x_j}\right] + C_{1\epsilon}\frac{\epsilon}{k}(P_k + C_{3\epsilon}P_b) - (2)$$

## IV. RESULTS

Dynamic pressure distribution contours for nose cone angle 15 and for boat tail angles 14.25, 15, 15.75 is analysed on ANSYS Fluent.

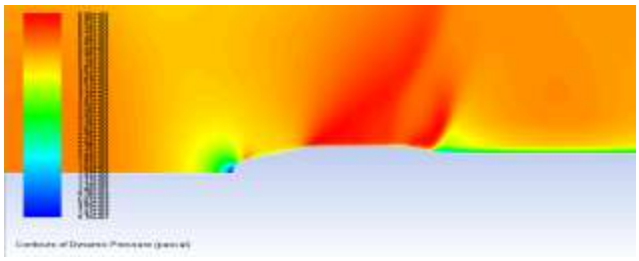

Figure 2: Nose cone angle 14.25

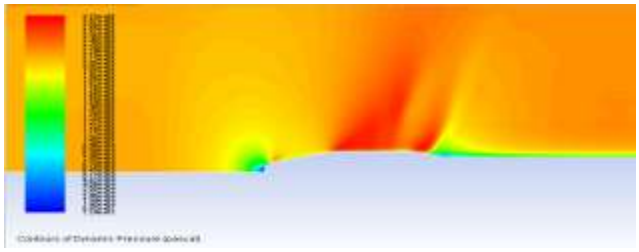

Figure 3: Nose cone angle 15.75

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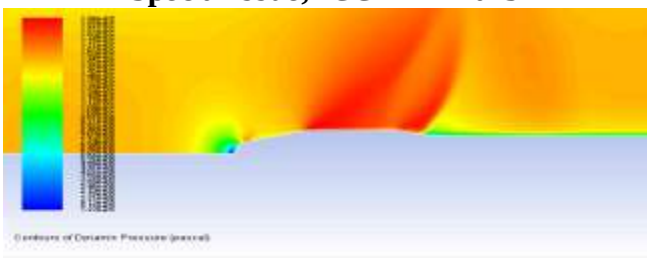

Figure 4: Boat tail angle 14.25

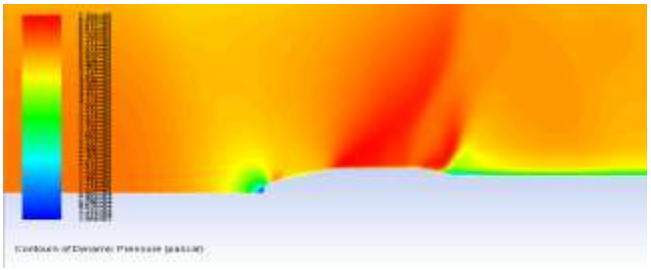

Figure 5: Boat tail angle 15.75

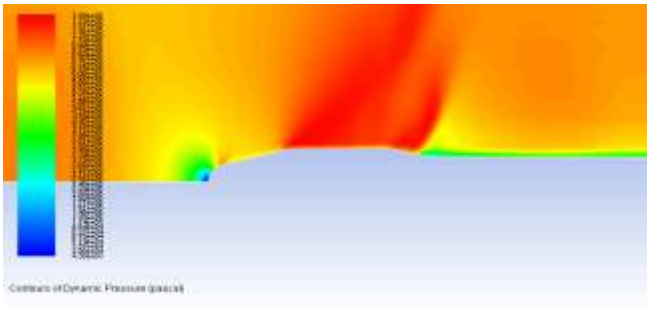

Figure 6: Nose cone and Boat tail angle 14.25

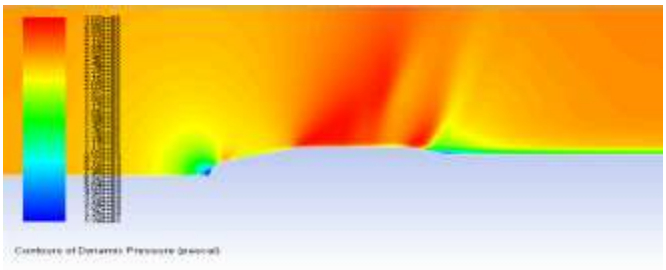

Figure 7: Nose cone and Boat tail angle 15

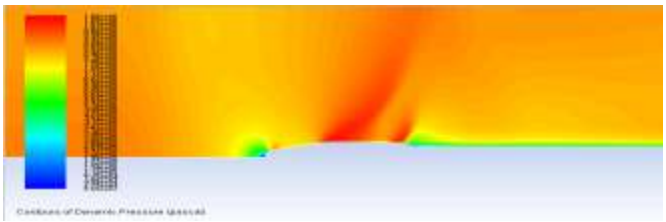

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Figure 8: Nose cone and Boat tail angle 15.75

The dynamic pressure [6] near nose cup abruptly reduces to very low value due to the presence of stagnation point. There is abrupt change in pressure when the fluid on the surface of the fairing interacts with the surrounding free stream velocity and produces shock wave at start of cylinder region and dynamic pressure tries to increase in cylinder region. At the end of the cylinder region flow separation takes place and pressure again decreases. Then again at the boat tail region pressure expansion is occurs due change in cross section. The dynamic pressure of surrounding air is found out to be 70.8 kPa. It is used to calculate shock strength by getting values of pressure by the relation shown below [7].

Shock strength

$$\xi = (P2 - P1)/P1 \quad (3)$$

Dynamic pressure relation

$$P=(\rho \quad )/2 \quad (4)$$

Velocity distribution contours are analysed to calculate flow separation at nose cone angle 15 and boat tail angles 14.25, 15, 15.75.

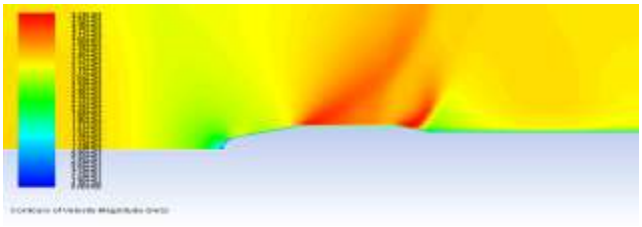

Figure9: Nose cone angle 14.25

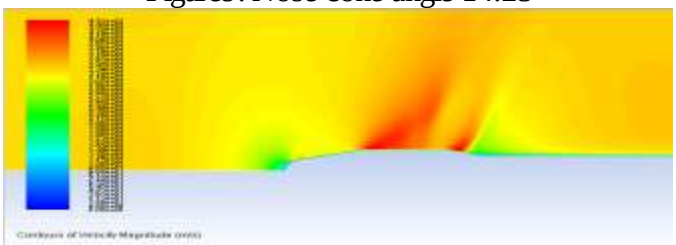

Figure 10: Nose cone angle 15.75

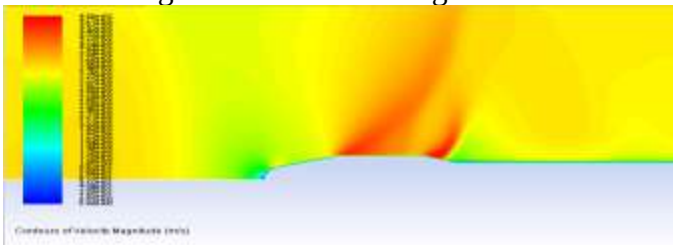

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Figure 11: Boat tail angle 14.25

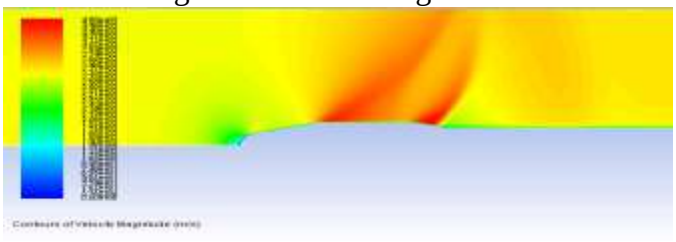

Figure 12: Boat tail angle 15.75

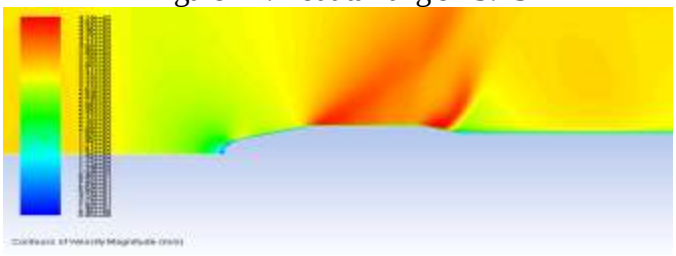

Figure 13: Nose cone and Boat tail angle 14.25

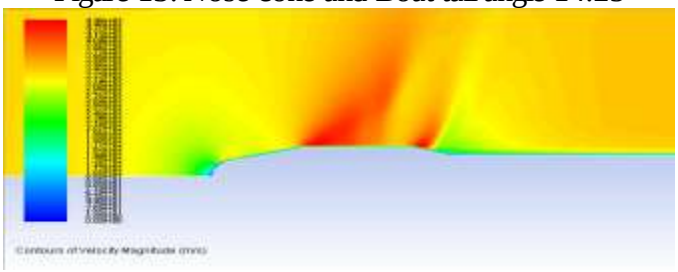

Figure 14: Nose cone and Boat tail angle 15

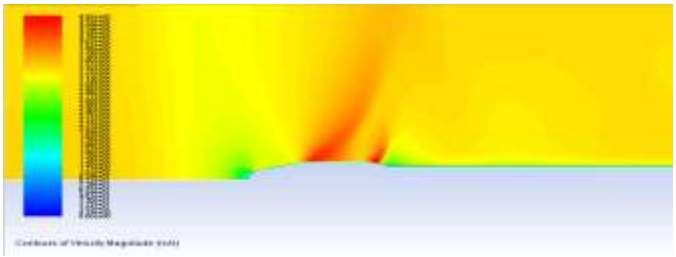

Figure 15: Nose cone and Boat tail angle 15.75

The velocity near the surface of the fairing is found out to be zero. Initially velocity decreases at nose cone and then suddenly increases to high value till boat tail. At boat tail end the velocity reduces. As the boat tail angle is increased the flow separation moves towards after end of boat tail.

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Pressure v/s X graphs

For Boat Tail angles 14.25, 15, 15.75 the graphs are plotted of pressure over the length to calculate shock strength.

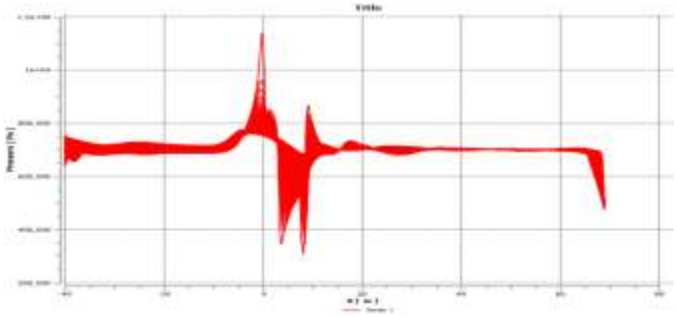

Figure 16: Nose cone angle 14.25

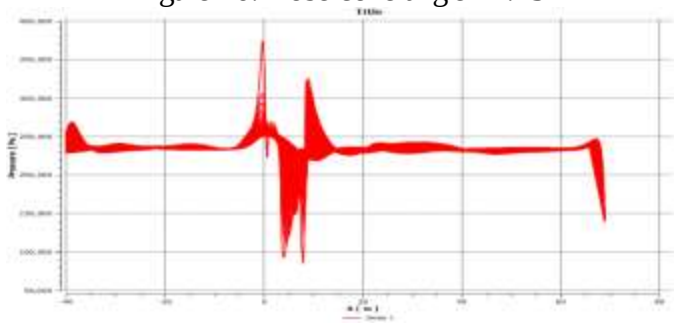

Figure 18: Nose cone angle 15.75

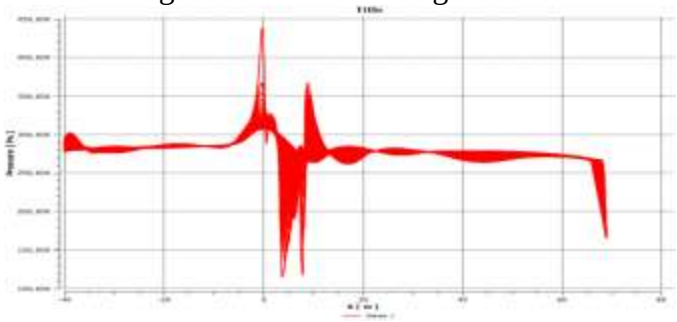

Figure 19: Boat tail angle 14.25

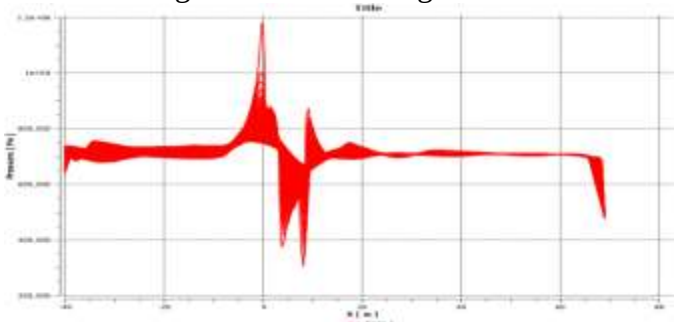

Figure 20: Boat tail angle 15.7

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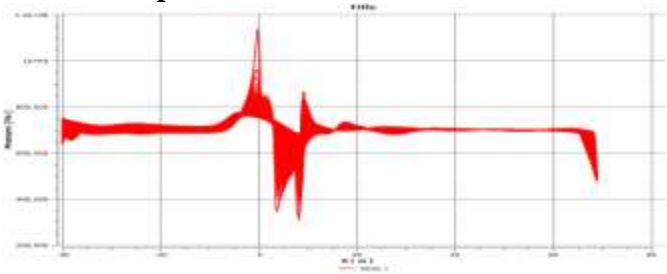

Figure 21: Nose cone and Boat tail angle 14.25

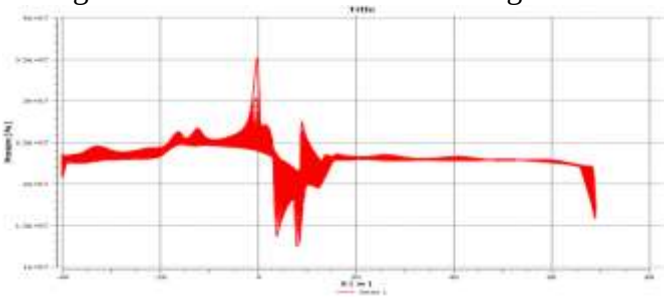

Figure 22: Nose cone and Boat tail angle 15

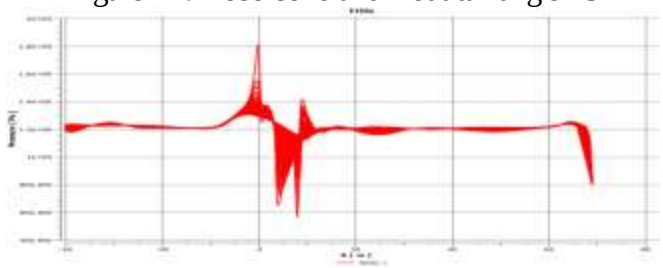

Figure 23: Nose cone and Boat tail angle 15.75

## V. CONCLUSION

For payload fairing Configuration of LM-3A launch vehicle with variation from 14.25 degrees to 15.75 degrees at nose cone and boat angles in steps of 0.75 degrees at Mach number 1. From the above analysis we observed the following.When the nose cone angle is increased, there is abrupt pressure change at nose cone.Due increase in pressure difference the shock strength increases. When the boat tail angle is varied, the change in pressure at nose cone almost remains the constant which means change in boat tail angle doesn't contribute to shock at large scale. If we increase the boat tail angle the surface area reduces which decreases the weight. Decrease in weight in turn increases the efficiency of fuel consumption.At Mach 1, flow separation always initiates at the start of boat tail angle and it is totally separated before the end of boat tail.From the above analysis, nose cone and boat tail angle 15.75 degree shows the most desired characteristics of flow separation. But

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the shock strength and change in pressure is very high in comparison with the other designs variations.Now by taking all essential parameters under consideration, the design with the configuration of Nose cone angle 15.75degrees and Boat tail angle 15degrees is an optimum design for structural loading of the Payload Fairing LM-3A launch vehicle.

## REFERENCES

Dynamic study of a typical payload fairing for different boat tail configurations, by V Ramamurti& G Venkateswara Rao.

LM-3A Series Launch Vehicle User's Manual, Chapter 4.

CFD Modeling and Analysis of an Arc-jet facility, ANSYS Fluent by Srikrishna C. Srinivasa.

ANSYS Inc. release 15.0 Notes; Fluent help; section; Theory Guide; Chapter 4, Section 4.9

ANSYS Inc. release 15.0 Notes; Fluent help; section; Theory Guide; Chapter 12 Turbulence model

Chung, T.J., 1978, Finite Element Analysis Fluid Dynamic, McGraw- Hill, New York.

Three Dimensional Flow Simulations with the Finite Element Technique over Multi stage Rocket by L. C. Scalabrin and J. L. F. Azevedo

AERODYNAMIC SHAPING OF PAYLOAD FAIRING FOR A LAUNCH VEHICLE by Irish Angelin, Senthilkumar

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**Special issue, ICCEMT-2015**

# LOW COST ECG SYSTEM

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***ABSTRACT***

***Cardiac or cardiovascular disease has been the serious cause for death worldwide since last few decades. One of the major reasons for cardiovascular death is the lack of monitoring the condition of heart at regular intervals particularly at the age 0f 40 years and above. Latest technologies are available in almost all health centers for monitoring the heart condition. The risk of heart-attacks may be reduced if detected early, i.e, prevention is more effective than treatment. An attempt has made in the paper for designing a low cost ECG (Electro cardiogram) system which can be used at patient residence. This will empower people to know and understand their heart condition so they can control illness or avoid them altogether. The construction details of proposed system has discussed in the paper. Sensors and signal conditioning elements are the essential parts of the low cost ECG. With the proposed system the functioning of heart can be monitored at regular intervals and can be analyzed at primary level, this will reduces the risk of heart-attacks. With the proposed method about 70% accuracy was achieved in RR interval measurement, which will be used in determining the heart rate.***

***Keywords*: *Electro cardiogram, Low cast ECG system, Signal conditioning element, sensors, cardio vascular diseases (CVD).***

## I. INTRODUCTION

### 1.1 OVERVIEW

According to the World Health Organization (WHO), by 2020, heart disease and stroke will become the leading cause of both death and disability in the world [1]. By 2020, chronic diseases will account for almost three fourths of all deaths (WHO, Geneva, 2003). About half of all deaths

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from CVD are from coronary heart disease (CHD), and nearly one-thirds of deaths are from stroke (British Heart Foundation, European Cardiovascular Disease Statistics, 2000 Edition). These Diseases are seen in the most productive years of life, and those afflicted rarely return to full productivity, particularly after a stroke. Cardiovascular disease is the leading global cause of death, accounting for 17.3 million deaths per year, a number that is expected to grow to more than 23.6 million by 2030.

### 1.2 HISTORICAL MILE-STONES

ECG has been included among the foremost monitoring standards by all recommending bodies around the globe. This is applicable for both general and regional anaesthesia techniques including the procedures under sedation [2]. The popularity it has gained among the clinicians is because of its non-invasiveness, moderate cost, simple to operate, continuous nature and minimal risk to the patient [3]. Historical milestones are given in table 1:

| Year | Scientist | Achievement |
|---|---|---|
| 1887 | Augustus Desire Waller | recorded electric current preceding cardiac contraction |
| 1903 | Einthoven | developed string galvanometer |
| 1911 | Sir Thomas | Published his pioneering work on ECG |
| 1929 | Dock | Use of Cathode ray oscilloscope for ECG |
| 1932 | Wolferth CC and Wood CC | Introduced Chest leads |
| 1942 | Goldberger E | Introduced uni-polar limb leads |

Table 1: Historical milestones in ECG [4]

The information gained by the anaesthesiologist from various preoperative sources of ECG is useful for optimal monitoring during intraoperative period. They are Preoperative test, Holter monitoring and stress test [5]. The information from different monitoring schemes is given in table 2.

a. Patient electrode interface

b. Electrodes and connecting leads

c. Filtering system

d. Display of ECG

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In general, electrocardiogram involves attaching a number of electrodes to the arms, legs and the chest of the patient to detect the electrical impulses from the heart. The ECG machine displays an ECG trace from the impulses form which an accurate diagnosis can be made. In this paper, a method has proposed for monitoring the ECG with a simple and cost effective technique. In first part of the paper, technical requirements for implementing simple and cost effective ECG, in the second part, comparison has made with the existing devices in the market are discussed.

| Monitoring method | Information available |
|---|---|
| Preoperative screening | 1. Ischemic events like unstable angina, variant angina and acute myocardial infraction<br>2. Valvular, myocardial and pericardial diseases<br>3. Conduction abnormalities and dysrhythmias<br>4. Pacemaker function<br>5. Pulmonary and some systemic diseases |
| Holter monitoring | 1. Transient ECG changes<br>2. Heart rate variability<br>3. ECG signal avarage |
| Perioperative monitoring | 1. Heart rate<br>2. Myocardial ischaemia<br>3. Dysrhythmia and conduction abnormality<br>4. Altered physiologic status<br>5. 5. Intra cardiac catheter placement |

Table 2: Monitoring schemes of ECG [4]

### 1.3 EXISTING TECHNOLOGY AND COMPONENTS FOR ECG

Information obtained from ECG is best optimized with attention to detailed technical application of the lead system. Heart is situated in the centre of the electric field which it generates. The electrical intensity diminishes as we go away from the heart. When the distance is more than 15 cm from the heart, the decrement is hardly noticeable and as all electrodes are placed at a greater distance than this, they are considered equidistant [6]. There are 12 conventional leads, 6 in frontal plane (I, II,

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III, avR,avL and avF) and 6 in horizontal plane ($V_1$ to $V_6$). For monitoring purpose they can be conventionally grouped into four systems [7]:

1. Three electrode system
2. Modified Electrode system
3. Five electrode system
4. Invasive and Epicardial leads

## II. PROPOSED METHOD

### 2.1 COMPONENTS AND BLOCK DIAGRAM

This project aims to design, construct and test an energy efficient ECG system of low cost. The block diagram of ECG comprises four main components as shown in Fig.1: the electrodes, instrumentation amplifier (IA) [13], Signal Conditioning systems [8] [9].

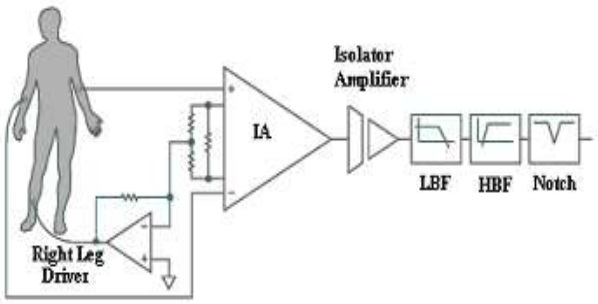


Fig 1: Block diagram of ECG system

ECG system can be designed by maximum use of widely available 'off the shelf' components and keeping the component count to an absolute minimum [10]. For impedance matching salt water was used as an electrolyte between the electrodes and the skin. ECG is simply a representation of the electrical activity of the heart muscle as it changes with time. This is mainly due to the Depolarisation and repolarisation of the heart muscle. Fig. 2 A typical ECG wave form

To fully optimize capabilities of ECG monitoring, particular attention is paid to the followings:

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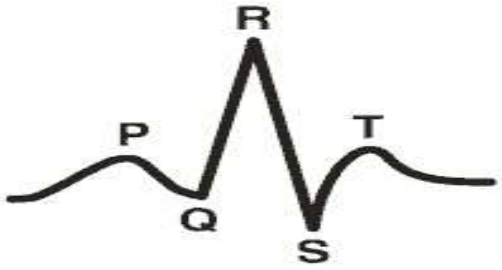


Fig. 2 Typical ECG

Fig.2 shows the inspection of the various parameters indicated in the waveform. Mainly, RR interval which determines the heart rate [14].

## 2.2 ELECTRODES AND DATA PROCESSING SYSTEM

The least cost ECG can be designed by replacing conventional high cost electrodes like Ag/AgCl with least cost scrap material like aluminium/Galvanised iron as electrode. In proposes method electrodes are used in lead I configuration [11] with one electrode on the right arm (negative), one on the left arm (positive) and another one on the right leg (ground).Although lead II can also gives the accurate results [12].

The signal strength from the chest electrodes usually in the order of milli volts [4] so signal conditioning components are imperative. A signal conditioning system in the proposed method includes an instrumentation amplifier with data presenting system. Designing of Instrumentation amplifier has shown in fig. 3

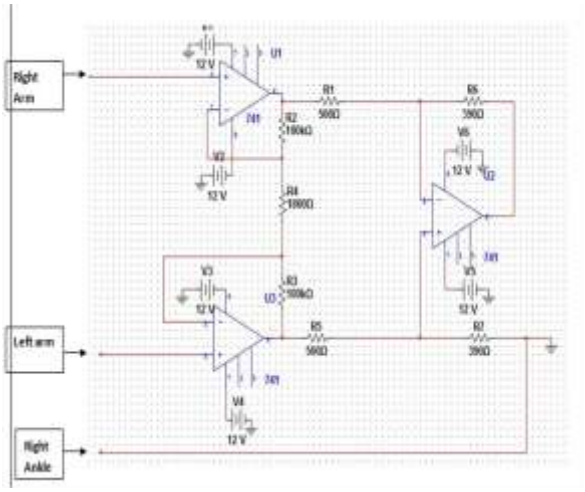


Fig. 3 Design of Instrumentation amplifier

## III. RESULTS AND DISCUSSION

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Electrode designed with the scrap material like aluminium/galvanized iron is tightened around the wrist with the help of piece of cloth shown in fig. 4.

Fig 4: Arrangement of electrode around the wrist with scrap material

With the proposed method using in lead I configuration, the observed ECG on conventional laboratory oscilloscope is shown in fig.5.

From Fig. 5 it has been observed that RR interval is close to the commercial ECG. The RR interval measured with different devices is given in table 3.

| S. No | Method of obtaining ECG | RR Interval (milliseconds) |
|---|---|---|
| 1 | ECG on PC using | 700 milli sec |
| 2 | ECG on PC using | 930 milli sec |
| 3 | Commercial ECG and | 680 milli sec |
| 4 | ECG on Scoped using | 650 milli sec |
| 5 | ECG on CRO using | 510 milli sec |

Table 3: Measurement of RR interval with different methods

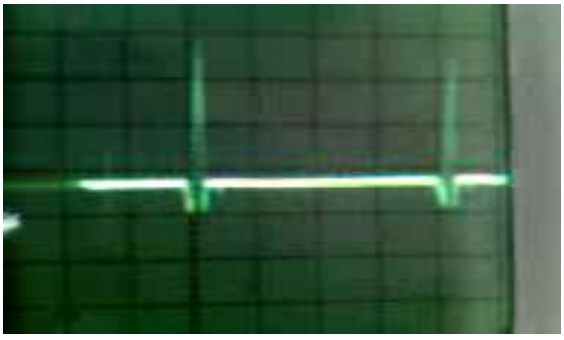

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Fig 5: Observe ECG on laboratory oscilloscope

## IV. CONCLUSIONS

About 70% of accuracy has achieved with the proposed method. If application of conducting gel than cotton cloth soaked in concentrated salt water would have improve the accuracy. Better noise rejection at different signal pick-ups would also improve the accuracy of the measurement.

## REFERENCES

https://www.who.int/cardiovascular_diseases/en/

Willian W Mushin, Peter L Jones, Electronics Physics for the Anaesthetist, Blackwell Scientific publications, 1987, 457-460.

R K Atkinson, G B Rushman, J Alfred Lee, notes on Physiology. A synopsis of Anaesthesia, Bombay. KM Vargue company, 1987, 51-52

Dr. P. K. Dash, Electrocardiogram monitoring, Indian Journal of Anaesthesia, 2002; 46(4):251-260.

Stephen, small monitoring clinical Anaesthesia procedures of Massachusetts general hospital: Little, Brown and company, 1993;115

Leo Schamroth, Basic priniciples an introduction to electro cardiography: Oxford university press, 1993;5-6.

Thomos M Skeehan, Daniel M Thys, monitoring the cardiac surgical patient, practice of cardiac Anaesthesia: Little, Brown and company, 1990;124-128

Avishek Paul, Jahnavi Jha, ECG signal acquisition and processing system, International Journal of Electrical, Electronics and computer engineering 2(2):62-65(2013), ISSN No:2277-2626

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
Naazneen M G, Sumaya Fathima, Syeda Husma Mohammadi, Sarah Iram L.Indikar, Abdul Saleem, Mohamed Jebran, Design and implementation of ECG monitoring and heart rate measurement system, International journal of engineering science and Innovative technology, 2(3), ISSN: 2319-5967

Brian A.Walker, Ahsan H.Khandoker, and Jim Black,"Low Cost ECG Monitor for Developing Countries," Electrical and Electronic Engineering, University of Melbourne.

https://ecg.utah.edu/lesson/1

J. Lee, "ECG Monitoring in theatre, "World Federation of Societies of Anaesthesiologists," Issus 11 Art.5, 2000.

https://www.robots.ox.ac.uk/~neil/teaching/lectures/med-elec/notes2.pdf.

https://courses.kcumb.edu/physio/eg%20primer/normecgcalcs.htm

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**International Journal Of Core Engineering & Management (IJCEM)**
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# DESIGN OF CONSTRUCTION MANAGEMENT SYSTEMS FOR EFFECTIVE SITE IMPLEMENTATION

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***ABSTRACT***

***Construction Management is the overall planning, coordination, and control of a project from beginning to completion. It is aimed at meeting a client's requirement in order to produce a functionally and financially viable project. For achieving the intended success, construction management has to be viewed as a system; a system consisting of several components in the form of sub systems, technologies, human resource, and structures- all of them are to be integrated for accomplishment of specific goals and targets in an effective way. This is a conceptual paper based on related published theory and research publications, along with the author's work experience in associated fields. The important managements systems that will contribute to successful construction management projects are: - design and implementation of: planning, monitoring, feedback and control subsystems; - resource management systems; - contract and sub contract management systems; - coordination procedures for site, suppliers, other agencies: - vendor selection, monitoring systems; - systems for safety and welfare measures. Ultimate success depends on generating and utilizing effective information system, committed workforce and matured practices and ethical culture of the organization. In this paper an attempt has been made to present and discuss such of the essential components and sub systems, along with suggested practices that are implementable.***

***Key Words: Monitoring, Planning, Resources, Systems, Technologies***

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**International Journal Of Core Engineering & Management (IJCEM)**
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## I. INTRODUCTION

Construction Management is a discipline of management systems specifically created to promote the successful execution of capital projects. Construction Management system facilitates managing planning, design, construction and post construction phases. They include: - Optimum use of funds; - Control of the work; - Project scheduling; - Optimum use human resources and talents; - Avoidance of delays, contractual disputes; - Enhancing design quality; - Effective procurement - Produce viable project. Responsibilities of the manager includes: - Project management: planning / monitoring/control; - Cost management, - Time management, - Quality management, - Contract administration, - Safety management. These aspects are discussed and suitable approaches for their implementation are presented here.

## II. CONSTRUCTION MANAGEMENTMODELS

Typically the construction industry includes three parties: owner, designer, contractor. The combinations and contractual arrangements among them generate the needed models.

**Model one**: In this there are two contracts between these parties. The first contract is the owner-designer contract; the second contract is the owner-contractor contract. An indirect, third-party relationship exists between the designer and the contractor.

**Model two**: This model is of with three contracts. They are owner-designer, owner-construction project manager, and owner- contractor. The construction project manager acts as an advisor to the owner.

**Model three:** It is a business model known as design-build contracts, in which the construction team is known as the design-builder; this model enables creativity and motivation for the builder.

**Model four:** Construction manager at-risk- is a delivery method which entails a commitment by the construction manager to deliver the project within a Guaranteed Maximum Price; this is a Not-To-Exceed Price contract where the contractor is compensated for actual costs incurred plus a fixed fee subject to a ceiling price. Contractor is responsible for cost overruns.

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## III. ORGANIZATIONAL COMPONENTS

### a) Project Participants

The corporate management of the owner sets the overall policy and selects the appropriate organization to take charge of a proposed project. Ethical culture of the organization plays a major role in creating and sustaining a successful organization. Its policy will dictate how the project life cycle is divided among organizations and which professionals should be engaged. Decisions by the corporate management will influence the strategy of project management.

### b) Uncertainty and Risks

The uncertainties in construction projects come from many sources and often involve many participants in the project. Since each participant agency tries to minimize its own risk, the conflicts among various participants can be detrimental to the project. The owner needs to moderate such conflicts as they hold the key to risk assignment through proper contractual relations with other participants. In recent years, the concept of risk sharing /risk assignment contracts has gained acceptance. Risk factors in the projects may be classified ae follows: -Socioeconomic factors - Organizational relationships - Contractual relations - Technological challenges - Construction occupational safety.

### c) Professional Management

Professional construction management refers to a project management team who will carry out the tasks of planning, design and construction in an integrated manner. Contractual relationships among members of the team are intended to minimize adversarial relationships. In complex projects, two types may be are considered: Owner-Builder Operation; Turnkey Operation

### d) Owner-Builder Operation

In this approach owner must have a steady flow of on-going projects in order to maintain a large work force for in-house operation. The owner may choose to subcontract portion of the project to outside consultants and contractors for both design and construction. The owner retains centralized decision making to integrate all efforts in project implementation.

### e) Turnkey Operation

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Owner delegate all responsibilities of design and construction to outside consultants in a turnkey project arrangement. Contractor agrees to implement the service on the basis of performance specifications set forth by the owner. The contractor may even assume the responsibility of operating the project if required. For the success of turnkey operation the owner must be able to provide a set of clear-cut performance specifications to the contractor.

**f) Key Success Factors**

- Well defined scope - Extensive early planning - Good leadership and first line supervision - Positive client relationship with client involvement - Proper project team chemistry - Quick response to changes - Engineering managers concerned with the total project

**g) Processes and Techniques**

Processes and techniques for effective management are:- The "life cycle" of costs and benefits should be considered for decision making - Optimizing performance at one stage of the process may not be of overall benefit - Fragmentation of project management among different specialists may be necessary with good communication and coordination - Productivity improvements on priority - Quality assurance is critical to the success of a project- Incentive needs to be on the basis of joint endeavour, partnership, accomplishment

## IV. INTEGRATED DESIGN

The relationship between design and construction need to be recognized. Design is a process of creating the description of a new facility; construction planning is a process of identifying activities and resources required to make the design a physical reality. Both the design and construction of a facility must satisfy the conditions of specific site. Because of complexity and market demands, changes of design during construction are likely. Review of designs with regard to their constructability can be carried out as the project progresses from planning to design. Innovation, technological, economic feasibility are to be considered appropriately

## V. PRODUCTIVITY FACTORS

Productivity is influenced by labour characteristics and project conditions. The characteristics include: - Age, skill and experience of workforce -Leadership and motivation. Project work

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conditions include: - Job complexity - site accessibility- Labour availability - Equipment utilization. - Contractual agreements. - Local climate - Local cultural characteristics.

## VI. PLANNING AND MANAGEMENT

### a) Strategic Planning

The programming of capital projects is shaped by the strategic plan of an organization, which is influenced by market demands and resources constraints. The process associated with planning and feasibility studies sets the priorities and timing for initiating various projects to meet the overall objectives of the organizations. The initiation and execution of projects demands: resources of the owner, and professionals, contractors to be engaged by the owner.

### b) Planning, Scheduling and Monitoring

Project management methodology is to be developed by: -Work breakdown structure - Project network of activities - Critical path method - Resource levelling & management

### c) Contracts Coordination System

The system is to facilitate smooth and efficient work flow among various agencies and to monitor adherence of agreement terms by contractors and client. Ultimately the system will help to reduce delays, disputes and damages.

### d) Functions of Construction Management

The management of construction projects requires knowledge of modern management as well as an understanding of the design and construction processes. It is the art of directing and coordinating human and material resources to achieve predetermined objectives of scope, cost, time, and quality. The functions of project management for construction generally include: - Specification of project objectives and plans project participants. – Optimization of efficient resource utilization - Implementation of various operations - Development of effective communications and mechanisms for resolving conflicts. Distinct areas requiring project manager's expertise are: - Project integration - Project scope - Project time - Project cost - Project quality - Project human resource management -Project communications - Project risk -Project procurement. Project manager should

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be aware of the strategic position of their own organization and the other organizations involved in the project.

## VII. SCHEDULING AND COST CONTROL

With the availability of computers and software, the techniques address some important practical problems, such as: -scheduling in the face of uncertain estimates on activity durations - integrated planning of scheduling and resource allocation, - scheduling in unstructured or poorly formulated circumstances - integrating scheduling with other project management procedures.

### a) Schedule Control

More generally, delays in construction represent additional costs due to late facility occupancy or other factors. Just as costs incurred are compared to budgeted costs, actual activity durations may be compared to expected durations. In this process, forecasting the time to complete particular activities may be required.

### b) Cost Savings

For cost savings in construction, steps are: - Competent core teams - Sufficient resources - Allow adequate time for project (failing may lead to poor quality) - Ensure adequate & proper Information to the team - Contractors and designers communication - Management skills to meet complexity - Adequate welfare facilities to workers - Improve workplace design- Design team complies with the set standards - Appoint management coordinator to supervise & monitor - Appoint principle contractor to plan, coordinate and manage works and have health & safety plans - Maintain health & safety file to be used for future requirements

## VIII. SCHEDULING TECHNIQUES

### a) Bar Charts

Bar chart is a list of activities with the start, duration and finish of each activity shown as a bar plotted to a time scale. The level of detail of the activities depends on the intended use of the schedule. The linked bar chart shows the links between an activity and its preceding activities which have to be complete before this activity can start.

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**b) Network Analysis**

Practically networks are more applicable to complex operations; the greater thoroughness imposed by the logic diagrams produce more realistic models of the proposed work. The steps in producing a network are: - Listing of activities- Producing a network showing the logical relationship between activities - Assessing the duration of each activity -producing a schedule, and determining the start and finish times of each activity and the available float-Assessing the required resources.

**c) Line of Balance**

The line of Balance is a planning technique for repetitive work. The basis of the technique is to find the required resources for each stage or operation so that the following stages are not interfered with and the target output can be achieved.

**d) Q - Scheduling**

The Q Scheduling technique reveals a relation between the sequence of doing a job and the cost to be incurred; it allows for a varying volume of repetitive activities at different segments or locations of the construction project

## IX. APPLICATION OF VALUE ENGINEERING

Value Engineering is an organized approach to providing the necessary functions at the lowest cost and does not affect the quality of the product; an approach to the identification and elimination of unnecessary cost, that provides neither use, nor life, nor quality.

**Tasks for Value Engineering**

- Preparing maintenance programs - Forecasting expenditure flows - Budgets - Cash flow forecasting - Advising on life cycle costing - Cost analysis - Cost benefit analysis – Estimating - Evaluating alternatives - Undertaking feasibility studies – Investment appraisal

## X. QUALITY SYSTEMS

Quality is fitness to purpose; in terms of Construction it is providing a building which provides an appropriate quality for the purpose for which it is intended. The price to be paid for a building is a reflection of the expectations of quality - The quality of timely delivery.

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**a) Total Quality Control**

Quality control in construction typically involves assuring compliance with standards of material and workmanship in order to insure the performance of the facility as per design.

**b) Stages in Quality Management**

-Setting the quality standard or quality of design required by client - Planning how to achieve the required quality, construction methods, equipments, materials and personnel to be employed - Construct the building right first time –Correct any quality deficiencies – Provide for long term quality control through establishing systems and developing a quality culture.

c) **Costs of Quality**

Costs associated with quality need to be identified for decisions. Costs include failure costs and improvement costs that are to be balanced. They are: costs of demolishing, rebuilding, cost of production time loss, delays due to worker changes; cost of inspection, prevention, costs of providing better designs, more training to reduce failure costs, more maintenance.

**d) Quality Assurance**

Quality assurance is a mechanism for ensuring that the construction process takes place within the framework of a quality management system. Faults that cause quality issues include: Misinterpretation of design data; incorrect use of data; not following quality standards; Lack of co-ordination between the designers; inappropriate specifications; drawings not to specifications; poor supervision; Management issues of construction quality.

## XI. SAFETY SYSTEMS

Largely, the construction industry has been experienced as an accident prone industry. The accident rates experienced closely correlate to the level and volume of activity within the industry, indicating that when work load is high, safety tends to receive less attention. It is important that construction management must have a prime focus for safety and therefore should have a moral, economic, and legal commitment to ensure workplace safety on sites. However the responsibility for safety must commence upstream of the construction phase of a project; architects and engineers must have the

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technical knowledge to design buildings which can be safely constructed, as well as a commitment to safe working conditions for site workers.

**a) Safety Tasks**

Work related injuries are exceedingly costly; - Direct costs (medical costs, premiums for workers' compensation benefits, liability and property losses); - Indirect costs (reduced worker productivity, delays in projects, administrative time, and damage to equipment and the facility). Managers and owners must address the task through development of practical site specific safety manual and ensuring its implementation along with quality standards.

**b) Scope of Safety System**

Elements of scope include: Formulation of safety policy; management of safety legislation; developing working procedures, codes of practice; Investigating accidents reports, analysis of safety records; Safety training; Assessment of site safety; Inspection of compliance

## XII. BEHAVIOURAL SERVICES AND LEADERSHIP

Project leadership must be able to exert interpersonal influence in order to lead the project team. The project manager gains the support of the team through the following: - Formal authority - Reward and/or penalty - Expert power as possessing special knowledge

**Interpersonal Behaviour**

Project manager must be a good leader, to lead the teams from different divisions of the same organization or from different organizations. Many issues require effective interventions, to be resolved and to enhance communication among groups, organizations. In large projects, professional behaviour scientists may be consulted for diagnosing and advising them.

## XIII. CONCLUSIONS

Owners and contractors have to have a common interest in creating successful projects in which quality, completion time and final costs are within agreed limits. It is important that the teams are watchful of key detrimental factors that end up into unsuccessful projects such as: - ill-defined scope - poor planning - communication gaps between teams - unrealistic schedules and budgets - frequent

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changes during course- lack of control; all efforts have to be made and every care has to be taken to avoid occurrence of such adverse factors at every stage. Then only practice of the systems and subsystems presented in the paper, will yield the desired results towards effective construction management.

## REFERENCES

Barrie, Donald S -Professional Construction Management, McGraw-Hill

Chris Hendrickson What Is Construction Project Management Carnegie Mellon University

Fundamentals of Construction Management - http://bookboon.com/en/fundamentals-of-construction-management-ebook

https://en.wikipedia.org/wiki/Construction_management

Handbook For project and construction management – http://www.viauc.com/horsens/programmes/fulldegree/constructing/Documents/handbook/

***Fundamentals of Construction Management***

http://www2.aku.edu.tr/~icaga/kitaplar/fundamentals-of-construction-management.pdf

Halpin, Daniel, Construction Management, John Wiley Sons

Kerzner H - P M: A Systems Approach to Planning, Scheduling and Controlling. Van Nostrand New York

Murray L. Aggarwal S, Construction Management Services, ASCE Journal of Construction, Vol. 107

PMI, a Guide to the Project Management Body of Knowledge, Pennsylvania

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**International Journal Of Core Engineering & Management (IJCEM)**
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# GROUNDWATER QUALITY AND ITS EFFECT ON ENVIRONMENT

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***ABSTRACT***

***Ground water is used for domestic and agriculture purposes. Its quality is important as it affects haling of people, animals and also influences environmental hazard. Ground water pollution is from domestic wastes, industrial wastes, sea water intrusion and use of pesticides in agriculture. The article focuses on the ground water quality deterioration of Patancheruvu industrial belt in Medak district. The pollution is from Fluoride, Arsenic, Chromium, Lead in the effluent water of pharmaceutical factories in Patancheruvu area. Further studies should be carried out because all the valance states of arsenic are not toxic in nature and it is essential to find out whether arsenic is present in the form of*** $As^{+3}$ ***or*** $As^{+5}$***. An integrated approach, planning and implementation are essential for the sustainable development and management of ground water. Measures like treatment of industrial pollution water is suggested for Patancheruvu area. The article suggests the formulation of action plans for effective, sustained and scientifically correct use of ground water resources.***

***KEYWORDS: Ground Water, Quality, Effluents, Pollution, Environmental Monitoring***

## 1.INTRODUCTION

Groundwater is an important source of water for meeting the irrigation, domestic and industrial requirements. Quantity and quality are two important parameters concerned to groundwater. Overexploitation of groundwater in several regions of the country has caused decline in quantity of

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water whereas the ground water quality has deteriorated due to developmental activities in a large scale. The main factors affecting ground water quality are agriculture, chemical industries, domestic wastes, sewage disposal, silt, disposal of wastes from nuclear plants. Presence of fluorides in groundwater has impact on human beings. Fluoride either occurs naturally in ground water or it is introduced by contamination from industrial effluents. In addition, pesticides, chemicals frequently contaminate the quality of ground water.

Indiscriminate disposal of industrial wastes have been causing pollution. Effluents in water bodies after affecting soils, extends to the groundwater system through downward gravitational movement and lateral dispersion. Fractures, Fissures, Joints etc., provide additional preferred pathways for fast migration of pollutants. With increase in industrialization & increasing use of groundwater, it is imperative to assess the water quality.

It has been identified that polluted ground water certainly transmit diseases viz typhoid, cholera, jaundice, dysentery etc. Micro-organisms namely Escherichia coli (E. Coli), Pathogenic bacteria and Protozoa contaminate the ground water. Pesticide contamination adds toxicity to the ground water and is carcinogenic when consumed by human beings. Disposal of such wastes is also responsible for water borne diseases and health problems.

Groundwater pollution is almost an irreversible process and can cause reduction in fresh water availability. Groundwater quality is also threatened by the excessive pumping, pollution arising from the discharge of untreated effluents from industrial units. Since the present article deals with the quality of groundwater, emphasis has been given for quality aspects and it is therefore obvious to control the ground water by using available scientific advancements.

Major industries in Patancheruvu include Asian Paints, Aurobindo Pharma, Fenner, Pennar Kirby Building Systems, Rotec Transmissions, Sandvik (MNC) etc are located in this area (Fig.1). The highest level of pollution in water was found in Patancheruvu due to pollution resulted from waste water dumped by the pharmaceutical manufacturers. There has been no proper waste disposal

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facilities in these areas, combined with this is the fact that industries have been disposing off their waste into water bodies. The industrial estates in Patancheruvu generate about 8 x $10^6$ ltr/day of effluents which are directly discharged into surrounding irrigation fields and surface water bodies viz Nakkavagu, Palmavagu, Peddavagu etc. The Nakkavagu stream that flows through the industrial estate in Patancheruvu bears the brunt of waste disposal of over 90 industries. Pollution to this stream has destroyed approximately 2000 acres of farmland besides contaminating well water to the depth of 40 m.

By the late 1980s, surface and groundwater, as well as the soil had become polluted in the two sub-basins, Nakkavagu and Palmavagu, (as per the Andhra Pradesh Pollution Control Board). This was mainly due to the presence of persistent organic pollutants, hazardous waste dumping, and organic and inorganic chemicals in industrial discharges along with sewage entering the Nakkavagu. In addition, the Palmavagu, Peddavagu and Nakkavagu streams, receiving sewage and industrial effluents and the CETP discharges, in turn joins the Manjira. This clearly illustrates that the ongoing environmental catastrophe at Medak district is indeed affecting a much larger population, in addition to the local community.

The studies reveal that arsenic is released by the industries in CETP through tankers. This arsenic is passed on to the water stream Peddavagu after so called treatment which takes care of COD, BOD and TDS and cannot reduce the toxic metals present in the effluents. A study reported in the journal Environmental Monitoring and Assessment states ‘A conservative estimate indicates that the effect of pollutants on the agricultural lands and water bodies extends 0.25 to 0.5 km to either side of the Nakkavagu river over a length of 25 km. In addition, the pollutants in the ground water especially in the downstream direction worsened the hydrological system and increased the possibility of geo-accumulation of pollutants in the biota. Open wells and tanks have become useless and redundant as the concentrations of Cu, Se, As, B, Cr and Fe have increased 5 to 20 times the permissible limits.

| | |
|---|---|
| Fig: 1 Map of Patancheruvu industrial area | Fig. 2: Map showing the study area form the |

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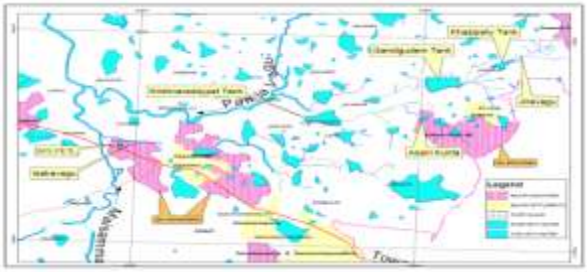
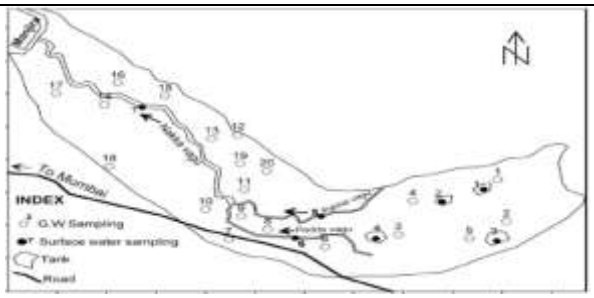
| | part of Patancheruvu area |
|---|---|
|  |   |
| *courtesy: AP Pollution Control Board, 2010 | *courtesy: Mushtaq Hussain et al 2013 |

Table: 1 Chemical Analysis of surface water from streams around Patancheruvu area

| **Area** | **Physico-chemical characterization of surface water of pre-monsoon 2010 in mg/L** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH | EC | TDS | TH | HCO3 | Cl | SO4 | Na | K | Mg | Ca | SAR | Na% |
| Palmavagu | 7.23 | 16300 | 10420 | 2050 | 547 | 4110 | 2019 | 3063 | 79 | 239 | 428 | 168 | 82 |
| Peddavagu | 7.45 | 13200 | 8450 | 1700 | 540 | 3100 | 1839 | 2234 | 90 | 193 | 365 | 134 | 81 |
| Nakkavagu | 7.35 | 24900 | 15180 | 3410 | 415 | 5880 | 3550 | 3909 | 289 | 375 | 750 | 165 | 79 |

source: Mushtaq Hussain and TVD Prasad Rao (2013)

| **Area** | **Physico-chemical characterization of surface water of post-monsoon 2010 in mg/L** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH | EC | TDS | TH | $HCO_3$ | Cl | SO4 | Na | K | Mg | Ca | SAR | Na% |
| Palmavagu | 7.44 | 11000 | 7050 | 1450 | 682 | 2625 | 1214 | 1921 | 121 | 217 | 225 | 129 | 82 |
| Peddavagu | 7.91 | 10600 | 6750 | 1390 | 510 | 2743 | 1058 | 1831 | 87 | 176 | 267 | 123 | 81 |
| Nakkavagu | 7.65 | 19100 | 12500 | 2880 | 425 | 5720 | 3100 | 3500 | 250 | 309 | 645 | 160 | 80 |

**Table: 2 Analytical Report of Pre-Monsoon Water Samples of Patancheruvu area, Medak District (June - 2014)**

| S.No | Particulars of the Sample Village | Particulars of the Sample Mandal | pH at 30 °C | Sp cond at 25°C mic.Sie / cm. | TDS Calculated mg/lit. | $CO_3$ as $CaCO_3$ | $HCO_3$ as $CaCO_3$ | CL | F | $NO_3$ as N | So4 | Na | K | Ca | Mg | T.H. as $CaCO_3$ mg/lit. | SAR | Classification | RSC meq / L | Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | mg/l. | mg/l. | mg/l. | mg/l. | mg/l. | mg/l. | mg/l. | mg/l. | mg/l. | mg/l. | | | | | |
| BIS Permissible limits | | | 6.50 to 8.50 | 1500=Safe 1500 to 2250= | 500-2000 | 200-600 | 200-600 | 250-1000 | 1.0-1.5 | 10.16 | 200-400 | No Guidelines | No Guidelines | 75-200 | 30-100 | 200-600 | (Excellent), 10-18 (Good), 18-27 (Doubtful), | | 0-1.25 (P.S.), 1.26-2.5 (M.R), 2.5 above (U.S) | |
| 1 | Patancheruvu | Patancheruvu | 8.49 | 700 | 448 | 80 | 125 | 60 | 1.47 | 2.1 | 48 | 51 | 1.7 | 24 | 44 | 240 | 1.44 | C2S1 | -0.70 | P.S. |
| 2 | Kistareddype t | Patancheruvu | 8.91 | 410 | 262 | 60 | 95 | 20 | 1.31 | 1.6 | 14 | 28 | 4.2 | 32 | 15 | 140 | 1.04 | C2S1 | 0.29 | P.S. |
| 3 | Rudraram | Patancheruvu | 8.95 | 910 | 582 | 140 | 193 | 40 | 1.29 | 9.7 | 26 | 61 | 99 | 48 | 19 | 200 | 1.88 | C3S1 | 2.65 | U.S. |
| 4 | Isnapur | Patancheruvu | 8.15 | 1770 | 1133 | 0.0 | 113 | 440 | 1.77 | 3.0 | 127 | 78 | 3.2 | 96 | 117 | 720 | 1.27 | C3S1 | -12.14 | P.S. |
| 5 | Patancheruvu | Patancheruvu | 8.44 | 580 | 371 | 80 | 152 | 20 | 0.75 | 5.2 | 8.0 | 15 | 0.8 | 40 | 39 | 260 | 0.40 | C2S1 | -0.56 | P.S. |
| **Analytical Report of Post-Monsoon Water Samples of Patancheruvu area, Medak District (Nov - 2014)** | | | | | | | | | | | | | | | | | | | | |
| 1 | Patancheruvu | Patancheruvu | 8.26 | 780 | 499 | 0.0 | 248 | 50 | 1.63 | 3.00 | 55 | 52 | 1.6 | 40 | 44 | 280 | 1.34 | C3S1 | -0.65 | P.S. |
| 2 | Kistareddype t | Patancheruvu | 8.91 | 410 | 262 | 60 | 95 | 20 | 1.31 | 1.6 | 14 | 28 | 4.2 | 32 | 15 | 140 | 1.04 | C2S1 | 0.29 | P.S. |
| 3 | Rudraram | Patancheruvu | 8.95 | 910 | 582 | 140 | 193 | 40 | 1.29 | 9.7 | 26 | 61 | 99 | 48 | 19 | 200 | 1.88 | C3S1 | 2.65 | U.S. |
| 4 | Isnapur | Patancheruvu | 8.15 | 1770 | 1133 | 0.0 | 113 | 440 | 1.77 | 3.0 | 127 | 78 | 3.2 | 96 | 117 | 720 | 1.27 | C3S1 | -12.14 | P.S. |

*courtesy: Office of the Deputy Director, Ground Water Department, Medak Dist.

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The analysis of the stream waters of Palmavagu, Peddavagu and Nakkavagu (Fig. 2) and Patancheruvu area water samples showed that both the stream and water samples have **$P^H$** of alkaline in nature in the range of 7.23–7.91 and 8.15-8.95 respectively. A wide variation in **EC** (10600 - 24900 and 410 - 1770) is noticed both from the stream and water samples. However, the EC values are in the safe permissible zone as per BIS limits. Similarly the **TDS** calculated mg/litre is also has wide variation in the range of 6750 – 15180 and 262 – 1133 both from the stream and water samples. **Total Hardness** as CaCO3 is recorded in the stream waters as 1390 – 3410 while it is in the range of 140 – 720 from various villages of Patancheruvu area. Wide variation is also noticed both from the stream waters as well as Patancheruvu water samples in terms of Cl, SO4, Na, K, Ca and Mg (refer Table 1 and 2). From the analyses of tables 1 and 2, the stream waters of Palmavagu, Peddavagu and Nakkavagu are highly contaminated whereas the water samples from Patancheruvu area are in the BIS Permissible limits.

After treating these effluents in Common Effluent Treatment Plant located in the area, the wastewater is discharged into Peddavagu and Palmavagu, which meets the main stream Nakkavagu flowing through Patancheruvu area. The discharged pollutants from the industries are entering the surface and groundwater system (aquifers) and are also migrating towards the Manjira further deteriorating the entire hydrological structure of the area. A point to be noted is that the Nakkavagu is a paleo-channel and the alluvial aquifer has a much higher transmissivity than the adjoining granite and hence transports the contaminated water of the river to very large distances invisibly underground. A National Geophysical Research Institute (NGRI) Study sponsored by the Central Pollution Control Board found high levels of heavy metals namely arsenic in stream water near Common Effluent Treatment Plant is as high as 40,000ppb. It clearly indicates that the source of arsenic is not from natural rocks but from the industrial effluents brought by different industries to CETP for treatment.

A study brought out by the Indian Institute of Chemical Technology states that people residing in the contaminated areas (Patancheruvu) are exposed to high levels of Arsenic pollution. The study revealed that there were elevated levels of arsenic in the blood, urine, hair and nail of the sample

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population. This was the result of consumption of industrially contaminated waters and vegetables grown in the soil. Exposure to such pollutants has resulted in various "Ailments like asthma, drowsiness, gastroenteritis, bronchitis and other pulmonary disorders and burning sensations in the eyes".

## II. CONCLUSIONS

The ground water resources must be managed in such a way that it should be protected from getting polluted due to industrial sector activities. The sustainable use of ground water requires proper treatment before its disposal and appropriate technologies are to be adopted for elimination of pollutants to restore the desired water quality.

Establishment of additional Common Effluent Treatment Plants are to be established by the industries in and around Patancheruvu area to reduce the contamination of the streams since the present Common Effluent Treatment Plant (CETP) could not achieve the desired results due to high TDS. Further, banning of establishment / expansion of certain polluting industries should be implemented on the recommendation of APPCB, the State Government vide GO Ms.No.62, dated 28.04.1999 and GO Ms.No.95, dated 21.09.2007.

It is recommended to carry out detailed environmental geochemical studies in the study area to monitor arsenic and other toxic metals in soil and water. Further studies should also be carried out because all the valance states of arsenic are not toxic in nature and it is essential to find out whether arsenic is present in the form of $As^{+3}$ or $As^{+5}$. An integrated approach, planning and implementation are essential for the sustainable development and management of ground water.

## REFERENCES

Sayaji Rao, B. Rajitha, G. Sunitha and E. Praveen (2014): SPECTRO-CHEMICAL Analysis of Ground water taken from four areas (BALAPUR, JEDIMETLA, PATANCHERU and

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
TARNAKA) of Hyderabad, World Journal of Pharmacy and Pharmaceutical Sciences, Vol:4, Issue 2, 548-552.

Mushtaq Hussain and TVD Prasad Rao (2013), Effect of Industrial Effluents on surface Water Quality – A case study of Patancheruvu, Andhra Pradesh, India, Current World Environment, Vol. 8 (3), 457-466

***A.***

Mason, Margie (26 January 2009). "World's Highest Drug Pollution Levels Found: In Indian Stream". *Huffington Post*. Retrieved, 15 October 2012.

Ajit Bhatnagar, 2008, Control and preservation of Ground water quality in Ground water Management edited by Meenu Bhatnagar

Shivkumar K et al. "Dirty Nakkavagu destroying farms, causing ill-health", Deccan Herald 19th August 1996;

A graphical approach. Environmental Monitoring and Assessment 1-24. 1996. Toxic trace element pollution in ground waters around Patancheruvu and Bollaram Industrial areas, Andhra Pradesh, India

Environmental pollution caused by Patancheruvu and Bollaram industrial estate in nearby villages of Medak district. Andhra Pradesh. National Environmental Engineering Research Institute, October 1991

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# INTERFACE BEHAVIOUR OF GEO-MATERIALS & GEO-SYNTHETICS

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***ABSTRACT***

***Soil is a highly complex particulate material, which is highly durable and abundantly available in nature. Due to this, soils are mostly adopted for construction of embankments, as base and sub-base coarse in pavements, filling low lying areas. Primitively, the embankments were constructed with very flat slopes, whereas, with the introduction of concept of retaining, many structures have been developed and designed as per the standard conditions. The most advance and widely adopted retainment systems is by mechanically stabilized earth (MSE) or reinforced earth, RE, technique, where the soil is reinforced to reduce the forces on the walls and in turn this reinforcement holds the wall and increases stability of the soil. One such reinforcement, termed as geo-synthetic material, is widely adopted, now-a-days, for increasing the stability of RE Walls. In RE walls, the selected geo-synthetic material will be sandwiched between two soil layers to enhance tensile strength of soil and hold the fascia panels in position. In such conditions, interface friction gets generated between geo-synthetics and soil. The interface depends on various parameters, such as type and gradation, type of soil, type and material of geo-synthetics, materials and drainage conditions. With this in view, the present work is proposed to study of the interface frictions between various types of geo-synthetics and different geo-materials including different soils and fly ash.***

## I.INTRODUCTION

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The word soil is derived from the Latin word "solium" and is used for the upper layer of mantle which can support plants. The term "soil" in soil engineering is defined as an unconsolidated material, composed of solid particles produced by the disintegration of rocks. Based on the weathering process, the physical and mechanical behavior of the soils can be altered from their parent material. Generally, soil is available in different particulate matrix, differentiated majorly by the size of the particles, vis-à-vis Gravel (20mm-4.75mm), sand (4.75mm-75µm), Silt (75µm - 2µm) and clay (< 2µm). The major properties and the characteristics of these soils depend predominantly on the particle size distribution.

Generally, the soil in nature is found to be in combination of one or more size of particles. Hence,soil is highly complex material both by the particle matrix and also its behavior. In the terms of engineering, the soil has been considered to be a material with good shear strength, compressive strength but weaker tensile strength. Due to its abundance and good strength, soil is considered as the top and easily available and first priority as a good engineering fill material in the major engineering structures like embankments, fills, retaining and mining facilities.

These days, retaining walls have been vastly constructed for major purposes such as decreasing width of the embankments, water retainment, mining retainment, stabilizing slopes. With the rapid changes in the retaining wall concepts and also due to introduction of different construction materials, the retaining walls have underwent a phase change in their design, construction and conceptualization. They have been started with typical high width embankments, later by conventional gravity walls, cantilever walls, sheet pile walls and most recent of these is the reinforced earth wall. In a reinforced earth wall, the tensile weaknesses in the soils have been countered by introducing some reinforcement elements such as steel straps, steel rules and timber/steel sheets. In the reinforced earth wall technology, the interaction between soil and reinforcement is of utmost importance for the design and performance of reinforced soil structures and this complex interaction depends on the nature and the properties of the reinforcement and soil. The principal requirements of reinforcements are strength and stability (low

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tendency to creep), durability, ease of handling high coefficient of friction and/or adherence with the soil, low cost and ready availability. With the various problems related to sustainability, durability and performance, the conventional reinforcements have been now replaced by "Geo-synthetics" which are made from various types of polymers (high density polyethylene, poly propylene, poly vinyl, jute fibers, etc.) to enhance, augment and make cost effective solutions for the geotechnical engineering problems.

### A. SOIL

The type and characteristics of soil depend largely on it origin. Soils are formed by the process of weathering of the parent rock. The process of weathering of the rock decreases the cohesive forces binding the mineral grains and leads to the disintegration of bigger masses to smaller and smaller particles. Transportation causes the sizes and shapes of the particles to alter and sort into sizes. Thus, the engineering properties, viz., permeability, consolidation and shear strength of soil deposit are governed by the mode of formation, stress history, groundwater condition and physico-chemical characteristics of the parent material. The capability of a soil to support a loading from a structure, or to support its own overburden, or to sustain a slope in equilibrium is governed by its shear strength.

### B. SHEAR STRENGTH

The shear strength of the soil can be defined as the maximum resistance offered by the soil against the shear stress. The shear strength of a soil is of prime importance for foundation design, earth and rock fill dam design, highway and airfield design, stability of slopes and cuts, and lateral earth pressure problems. It is highly complex because of various factors involved in it, viz., the heterogeneous nature of the soil, the water table location, the drainage facility, the type and nature of construction, the stress history, time, chemical action, or environmental conditions. There are various methods for determining the shear strength of the soils vis-à-vis Direct shear test, Triaxial test, Unconfined compressive strength and Vane shear test. The shear strength of the soil is majorly governed by type of soil, compaction

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parameters, normal stress and rate of strain. The shear strength of the soil is generally expressed with Mohr-Columb equation

$$\tau = c + \sigma tan\phi$$

Where,
$\tau$ is shear strength of the soil in kN/m$^2$
c is the cohesion in kN/m$^2$
$\sigma$ is normal stress in kN/m$^2$
$\phi$ is angle of internal friction in (°)
The parameters c, $\phi$ termed as shear parameters are fixed for a given soil. Hence, in broader terms, the shear strength of the soil is only affected by the normal stress.

## C. REINFORCEMENT

Various reinforcements are used to improve the tensile capacity of soils, especially in earth retaining structures, in the construction of reinforced earth walls, reinforced slopes, embankments on soft soils, landfills and other foundation soils. The different reinforcing materials used are: Plant roots, Steel bars (Wire grids), Steel strips, Steel/cast iron Sheets and Geosynthetics.

## D. GEO-SYNTHETICS

Geo-synthetics were first introduced as reinforcement material for reinforced soil structures (R.E walls) in the 1970's. Geo-synthetics are manufactured from various types of polymers (high density polyethylene, poly propylene, poly vinyl, jute, fibers etc.) to enhance, augment and make cost effective solutions for the geotechnical engineering problems. Geosynthetics are generally the polymeric, artificial fabric products used to solve civil engineering problems. The polymeric nature of the products makes them suitable for use in the ground where high levels of durability are required. Properly formulated geosynthetics can also be used in exposed applications. These products have a wide range of applications and are currently used in many civil, geotechnical, transportation, geo-environmental, hydraulic, private development applications and including roads, airfields, railroads, embankments,

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retaining structures, reservoirs, canals, dams, erosion control, sediment control, landfill liners, landfill covers, mining, aquaculture and agriculture.

They were used in roadway construction in Roman days to stabilize roadways and their edges. These early attempts were made of natural fibers, fabrics or vegetation mixed with soil to improve road quality, particularly when roads were built on unstable soil. They were also used to build steep slopes, several pyramids as well as walls in Egypt. A fundamental problem by using natural materials (wood, cotton, etc.) in a buried environment is the bio-degradation of material occurred by micro-organisms present in the soil. With the advent of polymers in the middle of the 20th century, a much more stable material became available. When they are properly formulated, lifetimes of centuries can be predicted even for harsh environmental conditions

## E. TYPES OF GEO-SYNTHETICS

Based on their function, the geo-synthetics are majorly grouped into several types they are:

- Geo-grids
- Geo-textile
- Geo-membranes
- Geo-cells
- Geo-containers
- Geo-pipes
- Geo-nets
- Geo-synthetic clay liners
- Geo-composites

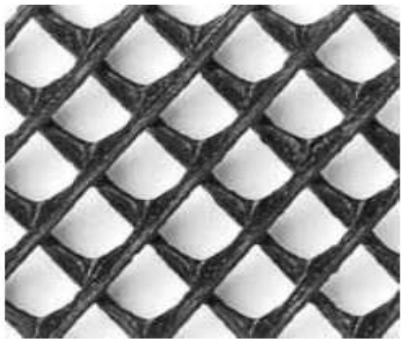

Fig.1.1. Geo-nets

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Fig.1.3.Geo-textile

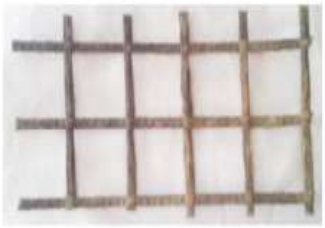

Fig.1.4.Geo-grid

Fig.1.5.Geo-synthetic clay liners

Fig.1.7.Geo-composite of geotextile and geogrid

Fig.1.6.Geo-pipes

Fig.1.2.Geo-membranes

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### F. R.E.WALL

R.E wall is also known as Mechanically Stabilized earth wall (MSE wall). Generally Retaining walls are relatively rigid walls used for supporting the soil mass laterally so that the soil can be retained at different levels either on two sides or one side. A failure plane, as shown in Fig. 1.8, will get developed in the retained soil due to which an active verge of soil will exert active earth pressure on the wall which causes tensile forces to get develop, as the soil is weak in tension a reinforcement material should be introduced to counteract the forces coming on to the wall as shown in the fig below. A retaining wall should be designed properly to meet stability (external and internal) and economic considerations. When the geo-synthetic material is used as reinforcing material, interface friction between soil and geo-synthetic material plays an important role in the design of R.E wall to safe guard the structure against pullout. Therefore it is important to know the behavior of interface friction between different soils and geo- synthetic materials along with the properties of soils such as unit weight of soil, angle of shearing resistance, cohesion intercept and angle of wall friction

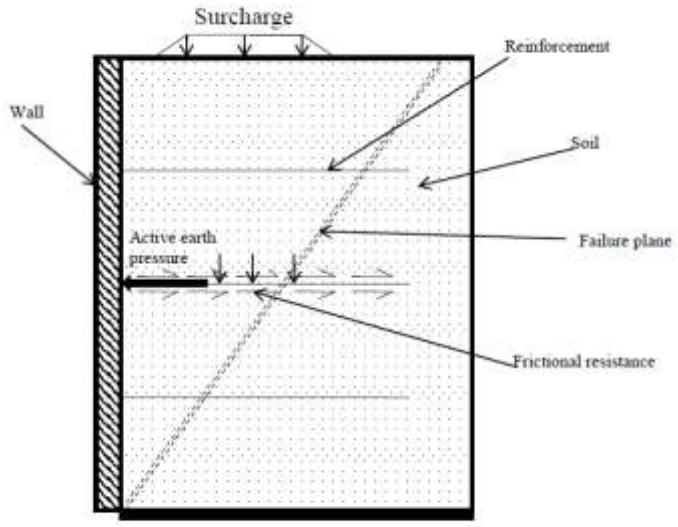


Fig. 1.8.Force diagram of R.E Wall

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## II. METHODOLOGIES

### A. GENERAL

The various tests performed for the study along with a brief about the procedure has been included in the following. The tests include the index tests for soil classification, the engineering tests to understand the behavior of the soils. These tests were performed on three materials namely Sand (S), locally available black cotton soil (C) and Flyash (F).

### B. Sieve Analysis (IS:2720(Part 4) -1985)

As per the guidelines given in IS 2720 (Part 4)-1985, a portion of the soil has been oven dried at 105-110°C. Sieves (4.75mm, 2.36mm, 1.18mm, 600µ, 300µ, 150µ, 75µ, pan) have been carefully brushed to ensure that all loose material was removed and were stacked in such a way that the sieve opening sizes range from the largest on the top to smallest at the bottom of the stack.

### C. Hydrometer Analysis (IS: 2720(Part 4) -1985)

A portion of oven dried sample has been made to pass through 75µ sieve and 50 g of sample was taken. Dispersing agent was prepared by diluting 4 g of sodium hexa-meta-phosphate, 2 g sodium carbonate in 100ml of water. Sample, dispersing agent were taken into 1000ml measuring jar, the mixture has been stirred until the soil is thoroughly wet, without voids then measuring jar has been filled upto 1000ml mark as shown in the fig 3.2. Readings have been taken at different intervals (0.5,1,2,4,9,30,60,90,120,min,24 and 48hrs) and recorded. The particle fractions and the corresponding sizes were computed, resorting to the stokes law, and the corresponding silt and clay contents have been determined.

### D. Standard proctor test(light compaction)(IS:2720 (Part VII)-1980)

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A sample of 3kg of oven dried soil is measured to an accuracy of 1g. The compaction mould, with base plate attached, has been weighed to nearest 1g.Water has been added to the sample of certain percentage of weight of sample and mixed thoroughly. The mould (1000 cc) has been placed on a solid base (concrete floor) and moist soil has been compacted into the mould, with the collar attached, in three layers of approximately equal mass, each layer being given 25 blows by the 2.6 kg rammer dropped freely from a height of 310 mm. The blows have been distributed uniformly over the surface of each layer. The extension shall be removed and the compacted soil shall be leveled off carefully to the top of the mould by means of straight edge. Then the mould and the soil have been weighed to an accuracy of 1g. Some portion of the sample is taken from the mould in a can and dried by keeping it in oven at a temperature of 105°-110°C to measure the water content. The above procedure has been repeated by increasing the water content until the weight of the mould with compacted sample has been observed to decrease. The computed dry densities and the corresponding water contents are then plotted to obtain the compaction characteristics and the maximum dry density(MDD)& corresponding optimum moisture content, OMC, has been determined.

**E. Unconfined Compressive Strength(IS:2720 (Part VIII)-1983)**

A portion of the sample has been oven dried at 105-110°C. A sample of 5kg is measured to an accuracy of 1g.The mould with base plate attached has been weighed to nearest 1g.Water has been added to the sample of certain percentage of weight of sample and mixed evenly. The mould (2250 cc) has been placed on a solid base (concrete floor) and moist soil has been compacted into the mould, with the extension attached, in three layers of approximately equal mass, each layer being given 56 blows by the 4.9 kg rammer dropped from a height of 450 mm. The blows have been distributed uniformly over the surface of each layer.The extension shall be removed and the compacted soil shall be leveled off carefully to the top of the mould by means of straight edge. Then the mould and the soil have been weighed to an accuracy of 1g. Some portion of the sample is taken from the mould in a can and

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dried by keeping it in oven at a temperature of 105°-110°C to measure the water content. A sample (D: 38 mm, H: 76mm) has been extruded using sample extruder. The sample has been placed in unconfined compressive strength testing machine, the load has been applied at a constant strain rate of 1.25 mm/min until failure and the corresponding load, deformation values has been noted and thus, the unconfined compressive strength and also the cohesion of the soil has been determined, corresponding to the moisture content.

**F. Liquid Limit & Plastic Limit (IS: 2720 (Part V)-1985)**

A portion of oven dried sample has been passed through 425µm sieve and 120 g of passed sample is taken into porcelain bowl (crucible). Casagrande apparatus has been cleaned, dried and ensured its workability. Soil sample has been mixed with certain amount of distilled water evenly, placed in the cup above the spot resting on the base, squeezed down and spread into required position with few strokes of the spatula. Later, the soil in the cup is trimmed to a depth of one centimeter at the point of maximum thickness. A groove has been made at the centre using a grooving tool IS: 9259-1979. The cup has been dropped by turning the crank at a rate of 2rev/sec until the two halves of the soil cake come in contact with each other and the number of blows has been noted. A portion of this sample has been taken into a can and dried in oven for 24hrs to determine the corresponding water content. The above procedure has been repeated by adding water to sample and the relative blows and water contents have been plotted. From the plot, the water content corresponding to 25 blows have been read, which corresponds to Liquid limit of the soil.

A portion of oven dried sample has been passed through 425µ sieve and 30 g of passed sample is taken into porcelain bowl (crucible). The soil sample shall be mixed with distilled water in an evaporating dish till the soil mass becomes plastic enough to be easily moulded with fingers. The soil is then rolled into a thread of about 3 mm in diameter, such that the soil is about to crumble upon further rolling as shown in fig 3.5. These threads, sufficiently long, has been taken into a can and dried in oven

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for 24hrs in order to determine corresponding water content, which is considered as the plastic limit of soil.

### G. Specific Gravity (IS:2720(Part III/Sec 1)-1980)

Specific gravity of the soils has been determined by employing pycnometer as per ASTM D – 850 as shown in the fig 3.6. In this method, empty weight of pycnometer (W1) has been taken and a portion of oven dried sample has been filled up to 1/3rd of the pycnometer and weighed (W2). Further, water has been filled up to an extent and stirred thoroughly to clear voids and then filled up to tip of cap till a proper meniscus has been formed and the weight(W3) has been determined. Later, the pycnometer has been cleaned properly and filled up with clear water to tip of cap till the meniscus is formed and then weighed (W4). Specific gravity, of the soil has been calculated as per the eq.

$$G = \frac{(W2 - W1)}{(W2 - W1) - (W3 - W4)}$$

### H. Direct Shear Test (IS: 2720(Part 13)-1986)

A portion of oven dried sample has been taken into a tray, mixed with corresponding optimum moisture content (OMC) uniformly. In this method, porous grid plate, sample, plane grid plate were placed one above the other with sufficient compaction of each layer and confirmed that the serrations of grid plates are at right angles to the direction of shear. The loading pad has been placed on the top grid plate and the whole assembly was placed in the direct shear apparatus as shown in the fig 3.7. The test was conducted by applying horizontal shear load up to failure of the sample. The shear load readings indicated by the proving ring assembly and the corresponding longitudinal displacements were noted at regular intervals. A minimum of three tests were performed on same sample compacted to its corresponding optimum moisture content (OMC) separately and readings were noted accordingly. Cohesion and Internal frictional angle of corresponding sample were estimated. Apart from these tests, tests were majorly performed on the geo-material and the geosynthetics in order to understand their

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interface behavior. The tests have been conducted on the direct shear apparatus, with a few modifications. The modifications and procedure of the test has been discussed in the following.

### I. Modified Direct Shear Test

In order to cater for the need of the experimentation for the present study, the conventional direct shear test has been slightly modified. With the modification, the shear properties of the soil, sandwiching a geosynthetic (Geo-textile or Geo-grid) has been determined. For this, a portion of oven dried sample has been taken into a tray, mixed with corresponding optimum moisture content (OMC) uniformly. In this method, the lower half was compacted with sample above porous grid plate by fixing the geosynthetic material between the two halves, compact the upper half with sample and place the shear grid plate above it. The loading pad was placed on the top grid plate and the whole assembly was placed in the box of the modified direct shear apparatus as shown in the fig 3.8. The test was conducted by applying horizontal shear load up to failure of the sample. The shear load readings indicated by the proving ring assembly and the corresponding longitudinal displacements were noted at regular intervals. A minimum of three tests were performed on same sample compacted to its corresponding optimum moisture content (OMC) separately and readings were noted accordingly. Cohesion intercept and angle of internal frictional corresponding sample geosynthetic interface were arrived at.

## III. RESULTS AND DISCUSSIONS

The analysis of the results obtained from the various tests performed on the geomaterial is included in this paper.As the part of the study,three geo-material, i.e. sand (S), Clay (C), Flyash (F) has been considered and the geosynthetic material, Non-Woven Geo-textile (GT), Geo-Composite (GC) and Geo-grid (GG) have been used as the reinforcement material.

**Table 1: Properties of the geo-material**

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| | Geo-materials | | |
|---|---|---|---|
| | **sands** | **clays** | **Flyash** |
| Classification | SP | CI | Silt Sized particles |
| specific gravity | 2.58 | 2.41 | 2.31 |
| optimum moisture content(%) | 6% | 16% | 16% |
| maximum dry density (g/cc) | 1.66 | 1.71 | 1.373 |
| liquid limit(%) | _ | 42 | _ |
| plastic limit(%) | | 33% | |
| angle of internal friction (°) | 51 | 0 | - |
| Cohesion (kg/cm$^2$) | 0.22 | 0.44 | - |

It can be observed that the geo-materials considered for the study covers a wide range of soil size ranges, including Sand, Silt (Flyash) and Clay (Black Cotton Soil). Also, the geosynthetic products used in the study are the different types of material used for the reinforcement of the backfill material in RE walls. Also, in order to observe the effect of layers of soil, Flyash (widely available fill material) has been considered in the layers. Hence, the effect of the layers of sand/clay and flyash and vice versa has been considered for the analysis. So, four combinations of such layers, sand on top box and flyash in bottom box (SF) and vice versa (FS), Clay in the lower box and flyash in top box (CF) and vice versa (FC) has been considered for the study as depicted in this results.

**A. Influence of geo-material on the shear stress:**

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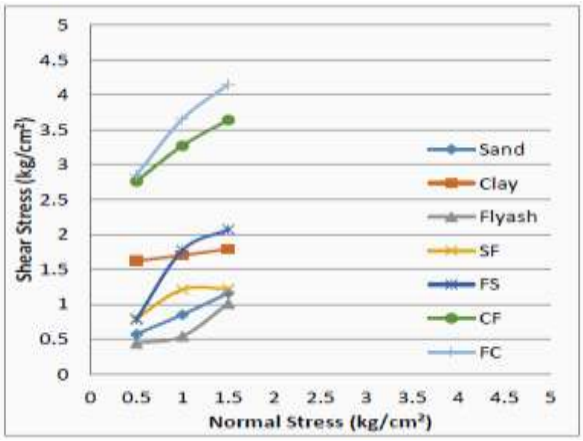


Fig.3.1: Effect of geo-material on the shear strength

**B. Influence of geo-synthetics on the shear strength of sand:**

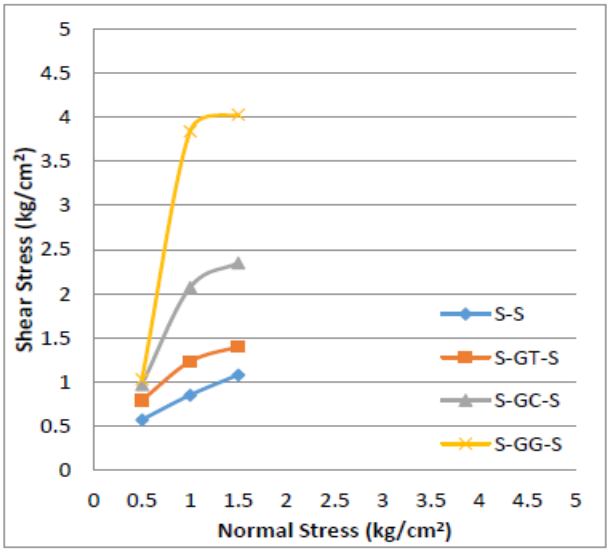


Fig.3.2. Effect of Geosynthetics on the shear strength of sand

**C. Influence of geo-synthetics on the shear strength of Clay:**

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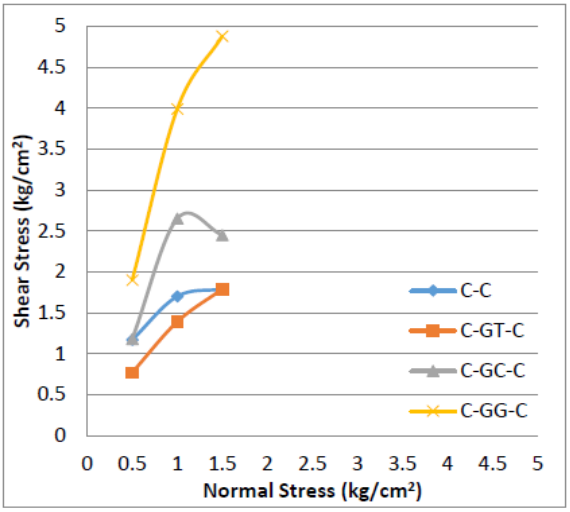


Fig.3.3 Effect of Geosynthetics on the shear strength of clay

**D. Influence of geo-synthetics on the shear strength of fly ash:**

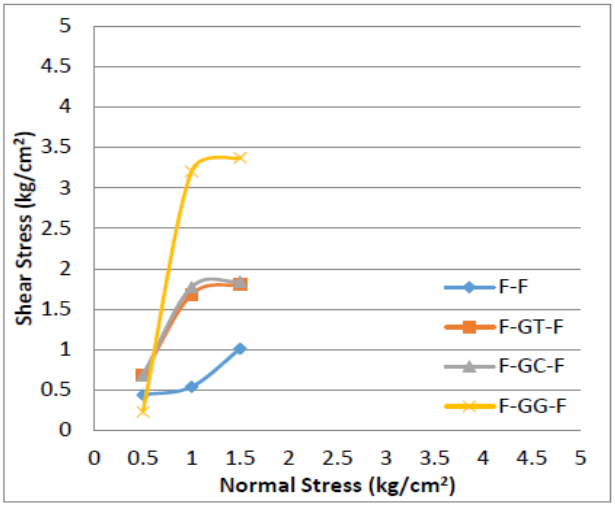


Fig.3.4 Effect of Geosynthetics on the shear strength of fly ash

**E. Influence of geo-synthetics on the shear strength of Sand-flyash interface**

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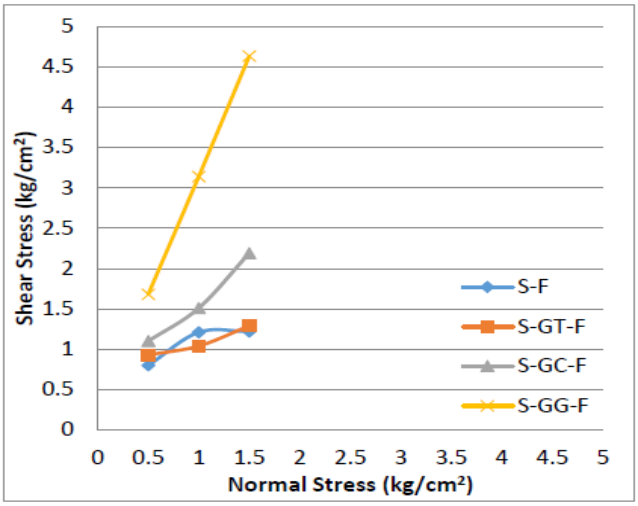


Fig.3.5 Effect of Geosynthetics on the shear strength of Sand Flyash interface.

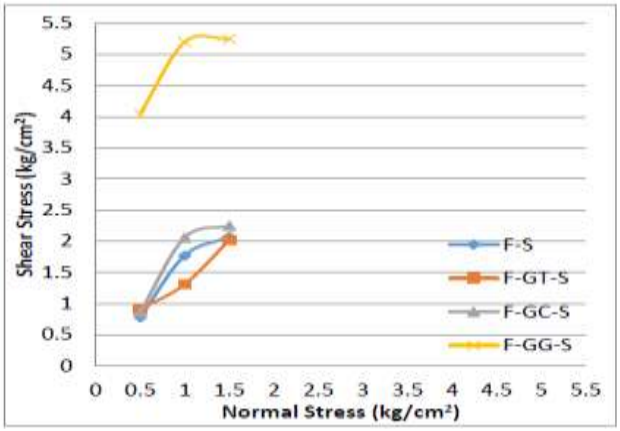


Fig.3.6 Effect of Geosynthetics on the shear strength of Flyash Sand interface

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**International Journal Of Core Engineering & Management (IJCEM)**
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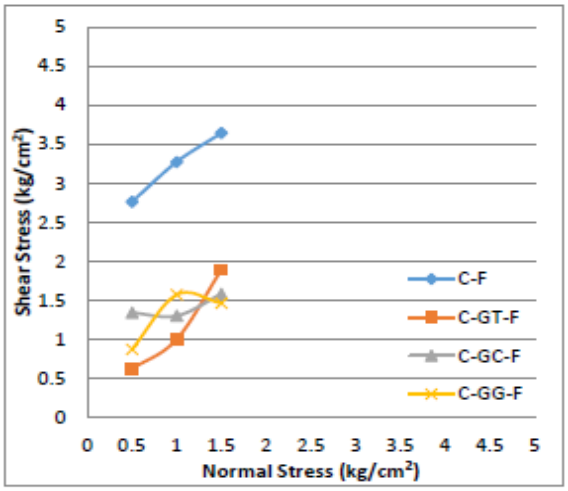
Fig.3.7 Shearing at the interface of a) F-GC-S and b) S-GC-F

### F. Influence of geo-synthetics on the shear strength of clay-flyash interface



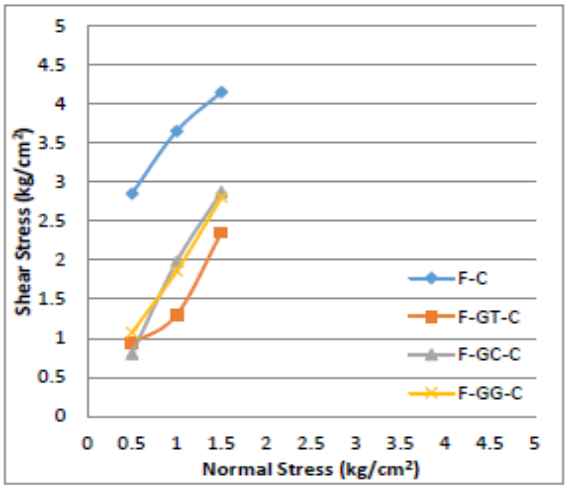



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Fig.3.9 Effect of Geosynthetics on the shear strength of Clay-Flyash interface &Flyash-Clay interface

(a) (b)

Fig.3.10 Shearing at the interface of (a) F-GC-C and

(b) C-GC-F

The shear strength of the material has been observed to decrease with the geo-synthetic material irrespective of their type. This can be attributed to the fact that the bonding between the flyash and the clay as explained in the tabular form has induced higher shear resistance than the obtained values using geosynthetics.

| Direct Shear Results of Interface Friction | | | | | |
|---|---|---|---|---|---|
| 0Material | Normal Stress (kg/cm²) | | | c(kg/cm2) | Θ□ |
| | 0.5 | 1 | 1.5 | | |
| | Shear stress (kg/cm²) | | | | |
| Sand | 0.57 | 0.85 | 2.16 | 0 | 57.8 |
| Clay | 1.17 | 1.7 | 1.79 | 0.93 | 31.8 |
| Flyash | 0.44 | 0.54 | 1.01 | 0.09 | 29.7 |
| SF | 0.8 | 1.21 | 1.22 | 0.66 | 22.8 |
| FS | 0.78 | 1.77 | 2.07 | 0.25 | 52.2 |
| CF | 0.76 | 3.27 | 3.64 | 0 | 70.9 |
| FC | 2.85 | 1.65 | 4.15 | 1.58 | 52.4 |
| S-GT-S | 0.79 | 1.23 | 1.4 | 0.53 | 31.4 |
| C-GT-C | 0.77 | 1.39 | 1.79 | 0.3 | 45.6 |
| F-GT-F | 0.68 | 1.68 | 1.81 | 0.09 | 48.5 |
| S-GT-F | 0.93 | 1.04 | 1.29 | 0.73 | 19.8 |
| F-GT-S | 0.91 | 1.31 | 2.02 | 0.3 | 48 |
| C-GT-F | 0.62 | 1 | 1.89 | 0 | 51.8 |
| F-GT-C | 0.93 | 1.3 | 2.35 | 0.11 | 54.8 |
| S-GC-S | 0.97 | 2.07 | 2.35 | 0.42 | 54.1 |
| C-GC-C | 1.18 | 2.65 | 2.45 | 0.49 | 51.8 |
| F-GC-F | 0.68 | 1.77 | 1.84 | 0.27 | 49.2 |
| S-GC-F | 2.3 | 1.51 | 3.19 | 1.44 | 41.7 |
| F-GC-S | 0.86 | 2.06 | 2.25 | 0.33 | 54.3 |
| C-GC-F | 1.34 | 1.3 | 1.58 | 1.17 | 13.5 |
| F-GC-C | 0.8 | 1.98 | 2.87 | 0 | 64.2 |
| S-GG-S | 1.03 | 4.03 | 3.84 | 0.16 | 70.4 |
| C-GG-C | 1.9 | 3.99 | 4.88 | 0.61 | 71.4 |
| F-GG-F | 0.23 | 3.2 | 3.37 | 0 | 72.3 |
| S-GG-F | 0.56 | 1.16 | 4.63 | 0 | 76.2 |
| F-GG-S | 4.05 | 5.2 | 5.25 | 3.63 | 50.2 |
| C-GG-F | 0.87 | 1.57 | 1.46 | 0.71 | 30.5 |
| F-GG-C | 2.8 | 1.07 | 1.86 | 2.85 | 0 |

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## IV. CONCLUSIONS

From the above study, the following conclusions can be made

1) From the studies conducted on different material and a combination of the layers, it has been observed that the clay-flyash and flyash-clay layers have yielded higher shear strengths. Hence, it can be deduced that the inclusion of flyash as layers not only enhances the interface shear strength but also reduces the lateral pressures substantially.

2)It has been observed that the inclusion of geosynthetics, i.e. geotextile, geocomposite and geogrid in the order of increase of tensile strength, have been detrimental in improving the shear resistance, with an anomaly for clay flyash mixtures. Also, it can be concluded that the shear strength at the interface increases with the tensile strength on the geosynthetic material.

3)In the combinations of the different material layers and geosynthetic interface, it has been observed that the shear strength of the sand-geosynthetic-flyash has increased shear strength than the sand-geotextile-sand. But, the converse has been observed for the clay-geosyntheticclay interface with more shear resistance than that observed for clay-geosynthetic-flyash layers.

4) In the study, it has been observed that the clay flyash interface, which has yielded higher shear strength without any geosynthetic has shown an negative impact, i.e. decrease in the shear strength at the interface with the addition of geosynthetic, irrespective of the type or the tensile strength of the material.

From the total study, it can be concluded that an R E wall, with a combination of sand-Flyash layers reinforced with geo-grid has the maximum stability than any other combinations.

## V. FUTURE SCOPE OF STUDY

Based on the plan of the study, the following points can be considered as the possible region to explore for more studies in this arena.

1) To study the effect of particle size and grain size.

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2) To study the effect of angularity and sphericity of the particles on the interface friction by resorting to various materials such as glass beads, ceneospheres, angular material.

3) To study the effect of coverage ratio of geogrids, tensile strength and opening size of geosynthetics.

4) Efforts can be also made to include the effect of compaction and moisture contents on the interface behaviour.

**REFERENCES**

Alfaro, M.C., Miura, N., Bergado, D.T. (1995), "Soil geogrid reinforcement interaction by pullout and direct shear tests", Geotechnical Testing Journal Vol: 18 (2), pp. 157–167.

Anubhav and Basudhar, P.K. (2013), " Interface Behavior of Woven Geotextile with Rounded and Angular Particle Sand", Journal of Materials in Civil Engineering, Vol. 25, pp. 1971-1974.

Ellithy, G.S. and Gabr, M.A. (2000), "Compaction moisture effect on geomembrane / clay interface shear strength", Geotechnical Special Publication, Vol: 103, pp. 39-53.

Goodhue, M.J.,Edil, T.B. and Benson, C.H. (2001), "Interaction of Foundry Sands with Geosynthetics", Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, No. 4, pp.353-362.

K.C. Awdhesh and A. Murali Krishna (2011), "Soil-Geosynthetics Interaction Properties for Different Types of Soil", Proceedings of Indian Geotechnical Conference, December 15-17, 2011, Kochi (Paper No.J-282), pp.585-588.

Manoj.J, "A Method for Measuring Smooth Geomembrane / Soil Interface Shear Behaviour Under Unsaturated Conditions", M.Sc. Thesis, University Of Saskatchewan, Saskatoon, Canada.

Vaid, Y.P. and Rinne, N. (1995), "Geomembrane Coefficients of Interface Friction",Geosynthetics International, Vol. 2, No. 1, pp. 309-325.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
Liu, C.H., (Jorge G. Zornberg, M.ASCE,) Chen, T.C., Ho, Y.H., and Lin, B.H. (2009), "Behavior of Geogrid-Sand Interface in Direct Shear Mode", Journal of Geotechnical and Geoenvironmental Engineering, Vol.1863, pp. 1-9.

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International Journal Of Core Engineering & Management (IJCEM)
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# SEISMIC PERFORMANCE OF POST-TENSIONED FLAT SLABS – A STATE OF THE ART REPORT

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***ABSTRACT***

***Flat Slab structures are becoming increasingly common in the recent past, particularly in the Indian context. While the various advantages they offer have made them popular, their seismic performance has been raising doubts. Post-tensioned flat slabs are relatively the most recent practice and are thought to be of great advantage over the conventional flat slab systems. However, even these systems have their own problems such as failure of corroded tendons, practical difficulties in executing the slab-column junctions etc.***

***This paper presents a state of the report on the merits and demerits of Post-tensioned flat slabs, the various practical aspects in executing them and their seismic performance. It is argued that PT flat slabs have all the potential to become an alternative for seismic retrofitting of existing flat slab structures.***

***Key words: Seismic Performance, Post-Tensioned Flat Slabs, Seismic Retrofitting***

## I. INTRODUCTION

Reinforced Concrete Slabs have almost established as essential components of modern RC buildings. As large volumes of concrete goes in to slabs in a building, a careful analysis and design of slabs considering all their criticalities will go a long way in contributing for the safety and economy of a building . RC flat slab systems have become popular and are frequently used in the recent times , owing

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to their relative advantages such as, architectural flexibility, effective use of space, possibility of spreading uniform m work and shorter construction time etc.,.

However, the seismic performance of buildings with flat slab systems is reported to be not encouraging due to many reasons such as the absence of beams, inadequate lateral resistance and possibility of excessive deflections. Thus the advantages of flat slab systems are offset due to their seismic vulnerability, particularly in high seismic zones. Post-Tensioned flat slabs are a relatively recent addition to the construction field, are becoming increasingly common these days, replacing the conventional flat slab systems. Popularly known as PT Flat slabs, thee slab systems are reported to be not only replacing the flat slab systems as a newer choice, but also are becoming a retrofitting choice for the existing flat slab systems .

This paper reviews the problems in the seismic performance of conventional flat slab systems, presents a state of the art report on the advantages of PT flat slabs, their seismic performance and their applications in retrofitting the existing flat slab systems .

## II. SEISMIC PERFORMANCE OF FLAT SLAB SYSTEMS

M.A.Erberic and A.S.Elnashai (2004) have developed fragility curves for a 5 storeyed building with flat slab structure. These curves were compared with those for moment resisting RC framed building. Their studies revealed that the building with flat slab system was more fragile. Takako Niwa et.al. (2004) conducted experimental investigations on the falt slabs with pre-cast elements with a specific objective of knowing the punching shear behavior around a column. Their study revealed that failures were occurring around the column mainly because of inadequate shear reinforcement and that the pre-cast panels were not producing any negative effect . R.P.Apostolska et.al.(2008) have studied the seismic risk involved in having a flat slab system and compared with another system having flat slabs with peripheral beams . Their study has shown that Flat slab systems with peripheral beams are having less risk. Uttamasha Gupta et.al.(2012) have compared the seismic performance of beam slab system , Flat

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slab system with drops and a flat slab system plus part shear walls . Their study revealed that the column reinforcements increased considerably in building with flat slab when compared with a beam slab system . Provision of part shear walls was also not helpful in severe seismic zones . Aswini . R ( 2015 ) has compared the seismic performance of a beam slab , flat slab and grid slab systems for a ground+10 storeyed building . Their study revealed that flat slab systems were more vulnerable to seismicity.

In addition to these studies, it is well known that during 1960s flat slab structures have displayed serious problems during earthquakes. Figure 1 shows the collapse of a Flat slab building in Bangalore, India (2008).

Figure 1: Collapse of a flat slab building in Bangalore (2008)

## III. SEISMIC PERFORMANCE OF PT FLAT SLABS – A REVIEW

Post–tensioned (PT) flat plate construction has long been popular not only in developed countries but in developing countries like Thailand for medium–rise to high–rise buildings such as office buildings,

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hospitals, residential buildings, university, and parking buildings. As a general design practice, flat plate structures are designed primarily for gravity loads, while they are coupled with concrete shear walls for resisting lateral wind load. The flat plate structures are normally neither designed for lateral seismic load nor checked for deformation compatibility with the shear walls to ensure their ability to undergo the maximum earthquake–induced lateral drift without losing of the gravity load carrying capacity. It is widely known that the slab–column connection is a critical component in the flat plate system. Under a strong earthquake ground motion, brittle punching shear failure may occur in this critical zone due to a combination of direct gravity shear and eccentric shear from earthquake–induced unbalanced moment between slab and column. In addition, extensive cracks in the connection region caused by repeated reversals of large lateral drift may result in a significant deterioration of the shear capacity of the connection. The punching shear failure may lead to a progressive collapse of the whole flat plate building, as the one shown in figure-1.

Although numerous experimental studies on the seismic performance of slab–column connections have been carried out over the past two decades, most of these works focused on the seismic response of reinforced concrete (RC) flat plates. A limited number of studies investigated the seismic capacity of PT flat plates (Hawkins 1981, Foutch et al. 1990, Qaisrani 1993, Martinez–Cruzado et al. 1994, Kang and Wallace 2006, Gayed and Ghali 2006). All tested PT specimens were hitherto made to represent unbonded flat plate connections.

## IV. PT SLABS AS AN OPTION FOR RETROFITTING THE EXISTING FLAT SLABS

### A. Retrofitting of Concrete Structures Using Unbonded Post Tensioning

The objective of retrofitting a structure is to modify or improve the strength and serviceability of the existing member. The options of strengthening an existing RC flat slab system for gravity loads include the following:

- Adding drop caps, drop panels, or beams at the slab soffit

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- Slab overlay that supports the existing slab dead load
- Increase in or jacketing of existing beams, girders, and columns
- Adding columns or remove and replace existing columns
- Adding a grid work of beams at the slab soffit
- Attaching externally applied metal plates to the existing concrete slab

The application of external pre-stressing for non pre-stressed or pre-stressed flat slab systems is a widely used retrofit option for gravity-load strengthening and serviceability.

**B. External Pre-stressing for Gravity-Load Strengthening**

Using an external unbonded post- tensioning retrofit scheme, there are two principal approaches to compensate for the strength shortfall of the existing structure—namely, direct-member strengthening (for one-way slabs and beams) and indirect-member strengthening (for two-way slabs).

***Direct-member strengthening*** is typically used for one-way members such as one-way slabs and beams. First, the engineer should establish the capacity of the existing member and scale the strength shortfall by comparing the established capacity with the load demand. The strength-shortfall compensation may be readily supplied by attaching externally stressed unbonded tendons on each side of a beam. The tendons should be profiled (typically, harped with one or two deviators) so as to uplift or unload the beam equal to or more than the amount of load that the existing capacity cannot safely sustain. The external tendons are only intended to supplement the existing capacity. It may be difficult to establish the capacity of damaged structures or members with highly deteriorated reinforcing. In such cases, the external post-tensioning may be considered to take all loads, where anchors are attached to columns or beams, the applied load is retained in the form of pre compression in the existing member. The installation of deviators (deflector saddles) or anchors should miss all main member reinforcing.

**Indirect-member strengthening**, typically used for two-way slabs and thus flat slabs takes advantage of the possibility of alternate load passes by using the capacity of the existing structure. Initially, a two-

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way member may be examined, to establish the failure mechanism and locations of hinge formation. The objective is to search for and select an alternative failure mechanism that is capable of safely sustaining the factored loading. Through the addition of external applied post-tensioning upward forces, the failure mechanism may be altered to accomplish this objective. External pre stressing, if used to supplement the strength of the member, should be encased in fire-retardant material that meets the fire-resistivity or rating requirements for the particular application.

### C. External Prestressing for Serviceability

When a structure reflects signs of serviceability shortcomings, such as excessive deflections or cracking, external pre-stressing has been effective as a corrective retrofit. For example, the installation of tendons at the underside of a slab or at each side of a beam, profiled to result in upward forces where desired, may be an effective and economical retrofit solution. For cracks or deterioration of members, additional work may be required beyond the application of external post- tensioning. The retrofitting of non-pre-stressed members, using external forces to counteract excessive elastic deflection and plastic deformation, may have to be analyzed using specialized software to model the time-dependent creep deformation. If the application of external tendons is used solely for the purpose of improving serviceability shortcomings in a structure with adequate strength to sustain the code- predicted factored loading, then the tendons may not require corrosion protection if they are aesthetically acceptable.

### D. Retrofit Application of External Unbonded Post-Tensioning

The principal considerations for the selection of a retrofit scheme are performance, durability, economy, and appearance. External tendons may be threaded through existing concrete members (such as walls or beams), directly attached to existing elements, or routed over deflector supports.

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When selecting a particular tendon layout support system, access, available space, fire protection requirements, and aesthetics must be considered.

### E. Case study of a Beam Retrofit

Excessive post elastic deformation and concrete cracking were recorded during the course of evaluating the non-prestressed beams of a private parking in woodland hills of California, USA . The use of bundled unbounded tendons on each side of the beam, with one deviator at mid span was selected to utilize the upward force component to instantly neutralize the elastic deflection and to remove the post construction (plastic) deformation to a near zero within a period of 10 years after the retrofit was successfully installed .A time dependent analysis was performed to establish the deformation of the non-pre-stressed beams during their predicted useful life.

### F. Case study of a slab retrofit

During the final construction stages of a hybrid structure (a three-story residential wood framing over a one-story concrete garage) located in Glendale, California, excessive deflection and cracking of the elevated concrete slab were recorded. An initial document review revealed that inadequate reinforcement was specified in the original design.

The non pre-stressed cast-in-place concrete slab was supported on an array of orthogonally spaced concrete columns. The first-mode failure mechanism of parallel hinge line formation was altered by the introduction of external upward forces along said hinge line. The upward force was calculated, utilizing the existing slab's capacity, allowing for an alternative failure mechanism with a significantly higher capacity limit. Three principal external tendon layout support systems were proposed.

## V. CONCLUSIONS

In view of the known seismic vulnerability of flat slab systems and a number of instances of their failures during seismicity alternative systems which can either replace them or strengthen the existing ones must

ISSN: 2348 9510
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be thought of. Post-tensioned flat slabs are the emerging structural slab systems which have the potential for replacing the flat slab systems and as the best alternative for retrofitting the existing flat slab systems.

**REFERENCES**

M.A.Erberic and A.S.Elnashai "Fragility analysis of Flat slab structures " , Engineering structures , vol.23, 2004, pp.937-948,Elsevier.

Takako Niwa et.al. "Seismic performance of flat slab systems with pre cast panels connecting to perimeter column ", paper no.129 , 13th world conference on earthquake engineering 2004, Vancouver , Canada.

R.P.Appostolska et.al. "Seismic performance of Flat slab building structural systems" 14th world conference on Earthquake engineering 2008, Beijing, China.

Uttamasha Gupta et.al " Seismic behavior of buildings having flat slabs with drops" ,International journal of emerging technology and advanced engineering , vol.2, 2012, issue 10.

Aswini R., (2015)," Comparative studies on a 11 storeyed building with Beam slab, Grid slab and Flat slab systems ",a dissertation submitted to Osmania University , Hyderabad.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# EFFICIENT CACHE LEVEL MANAGEMENT APPROACHES IN EMBEDDED SYSTEMS

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*ABSTRACT*

***Design and efficiency of a system always maintains a trade-off relation. The data cache level have come with an introduction of reducing the addressing time to locate the effective storage, which directly shows a proportionality in time and energy access. However, at stages of mapping the level of expected speed reduces due to overwhelmed page clusters or repeated called and pending access layers. Many replacement approaches have shown their essence in improvising the mapping standards. This paper has two level of presentations, as one choses a choice of prominent algorithm in mapping speed and other to show energy reduction by showing speed enhancement. The techniques are near to precise in lowering and minimizing the number of times of addressing during the cache handling. This allows suitable energy reduction with very least performance challenges. The results are given with comparisons of various algorithms and energy utilizations.***

***Key Words: APCLRU, WBLRU, L1 Cache, L2 Cache, FTL, TLB, NAND Flash memor***

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
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## I. INTRODUCTION

Embedded application real-time industries, such as robotics, avionics, bio metrics, railway and space, have steadily growing demands for greater computing power and stricter cost containment [8]. Real-time system designers respond to this need by using processors with high-performance features. In particular, cache memories have been shown to be a key feature to improve average performance. In comparative cases, their usage challenges the performance of the WCET worst-case execution time estimates [2], which is mandatory in real-time systems to prove that the timing constraints of the system are met. Various cache framing methodologies have been proposed to explore the comparisons among design and performance. As caches are mostly and adversely set-associative, almost many design techniques focus on minimizing the activated data arrays as well as the number of tags at an access, this helps in reducing the power consumption. Energy consumption can be reduced greatly because at most only one data array corresponding to phased caches [13]. The access tag arrays and data arrays in two different phases get to the matched tag, if any, is accessed. The phased caches show their effect in lower level memory, mostly to be the L2 cache, it happens because of the increase in access cycles.

Table I: Hardware Approach In Updating $C\ S$ And $Nc_{cs}$

| F | E | H/M | Action |
|---|---|---|---|
| 1 | 0 | 0 | Add a cluster, $C\ S \quad C_i$ , $NC_{CS}$ + + |
| 0 | 1 | 0 | Replace a cluster, $C_i \leftrightarrow C_j$ |
| 0 | 1 | 1 | Remove a cluster, $C\ S - C_i$ , $NC_{CS} - -$ |
| D | 0 | 1 | No action |

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*F: free or busy signal. E: evicting signal. H/M: hitting or missing signal.

Unfortunately, these properties are not met by current processors due to their deterministic nature. For instance, from the representation of Table I if we run a given program fed with the same input data several times on the same processor, we will observe some variation in its execution time due to, for instance, the fact that it is allocated in different locations in memory resulting in different execution times. However, those execution times are not necessarily suitable, i.e., cannot be modelled with random variables. At the cache level, the deterministic work of the placement (e.g., modulo) and replacement (e.g., least recently used or LRU for short) policies makes memory operations.

Most of work on the write buffer exploits temporal and spatial locality to improve the hit ratio of the write buffer. However, the write buffer alone can only explore limited temporal and spatial locality with the limited size of random access memory (RAM) available. In order to better exploit temporal and spatial locality[3]–[12], this paper proposes to reorder the write sequences sent to the write buffer, which come from the upper memory hierarchy, namely, virtual memory.

Plenty of management methodologies have been proposed [11], [19] on virtual memory regarding for Flash-based memories in embedded systems. On the basis of providing secondary memories with respect to devices like hard disks, many approaches including optimal method, stack method and least and most significant recently used page method, show their effect. The least recently used (LRU) algorithm when compared is mostly used as the replacement algorithm. However, when Flash memory is applied as the secondary storage, an asymmetry arises in read and write operations. The time taken in representing a read operation is far less when stated in a row of comparison with write operation. When a write operation is initiated the availability of empty spaces is more required, so basically a search for empty block or locality is done and if it suffers through any unavailability then clearing of any level of pages or cluster or block is done. The approaches like buffer aware algorithm, clean first less used algorithm have their own benefits and flaws but they improve the system performance by reducing the number of write activities on the Flash memory. The write buffer to make it not only improve the performance but also work seamlessly

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with the management approach of virtual memory. Finally, the performance of these two designed approaches is evaluated.

## II. BUILT IN SELF TEST IN WBLRU

Flash memory is equipped with a write buffer to improve its write performance. A Flash Translation Layer of cache is integrated into the Flash based memory controller. However, when it comes to the concept in the flash translation layer in this paper can be any kind of block-mapping- or hybrid-mapping- based FTLs, such as BIST-aided scan test [17] and FAST [6]. On the whole the Flash memory storage system is an in-house layer of the virtual memory. Write operations take the unwanted pages from the virtual memory into the write buffer and evacuate the unrequired data. Read operations read data from both the provided write buffer and available Flash memory. The on-chip RAM as the write buffer here can be a battery-backed DRAM or emerging nonvolatile memories [1]–[3], such as phase change memory [12] and magneto resistive random access memory [21], [15], in order to avoid data loss when systems power is off.

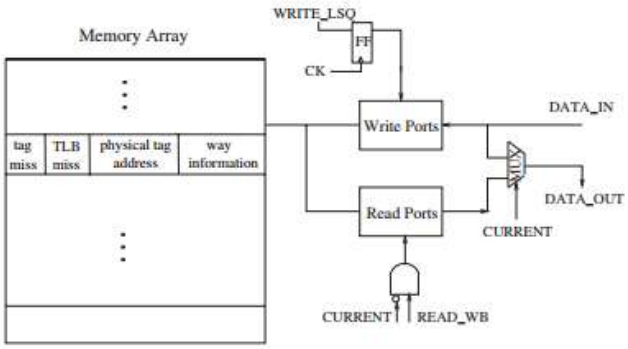


Fig 1 Implementation of TLB and Tag operations

This paper proposes a new management approach for virtual memory, which makes use of the state information of the write buffer to reorder the write sequences. Fig 1 presents the proposed cooperating management approach on virtual memory.

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## III. CACHE-AWARE BUFFER MEMORY MANAGEMENT

As stated in the previous sections, a write buffer has been provided in Flash level based systems to improve the write performance. However, current work on virtual memory is not aware of the existence of the write buffer. Conventional managements on virtual memory consider hard disks as the storage media. The aim of these approaches is to improve the hit ratio of the virtual memory. Taking LRU as an example, it exploits the locality of applications by keeping the most recently used data in main memory. However, when the storage medium is changed to flash memory, the scenario becomes different. There are situations of unmatched speeds of read and write operations. This characteristic is explored by CFLRU [11], which delays write operations in virtual memory as long as possible to minimize the write operations to the category of write buffer provided in Flash .

Similar to CFLRU, there is a window for WBLRU to select the victim pages to evict. Window size is a very important parameter for WBLRU. If the window size is too large, a large number of additional read activities would be induced. However, if a very small window size is set, there would be little benefit for WBLRU to exploit the write sequences as represented in Fig 2. Two approaches are proposed to determine the window size for WBLRU.

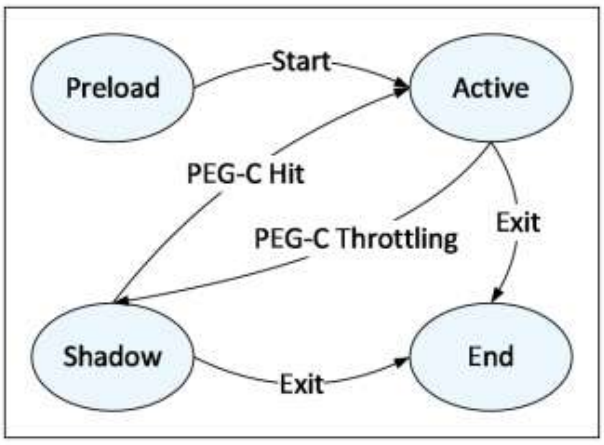


Fig 2 State level representation of cache access

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1) *Static Window Size*: Same as CFLRU, this approach sets the window size statically. We pre-execute all the applications while setting window size from 10% to 100% of virtual memory and identify the best results for all the target applications. We select the result with the minimal additional overheads on Flash memory as the best result. The additional overheads include erase operations, read operations, and copy operations during garbage collection the Flash memory. With this approach, a suitable window size for the target application can be identified.

2) *Dynamic Window Size*: This approach sets the window size dynamically. We do not need to pre-execute all the applications. Different from the dynamic window approach in CFLRU, setting the window size in WBLRU takes the number.

In the SRAM design the role of Load/ Store Queue is mush to be focused. The instruction may reside in the LSQ stage for greater than one clock cycle of the sequence. This leads to the requirement of a better enhancement in the L1 cache, the supplement stages maintain their information to hold until the suitable load and store instruction is assigned to the cache and that too predominantly to the first level i.e.L1 cache. This stage treated as L1 data cache, works in the pursuit of providing an effective positioning of the instruction. The accessing of the information buffer has the similar number of alignments as the queue of load and store. In each of the entered writings, the tag miss and TLB miss bits ("1" for hit and "0" for miss) represent the status of page accesses, respectively. It first reads the translation page fixed with the necessary mapping point in flash memory, and then it evacuates the one mapping indicated item to flash memory. The main required physical tag address is produced by searching the queue TLB. Significantly this lower the of the address mapping table compared with page-level translation layers. However, this may still suffer from a large random access memory footprint problem due to the increasing capacity of flash memory. From the Load store queue, the matter will be transferred into the information buffer after one clock cycle. Therefore, the write signal of the LSQ is passed to the level L1 data cache.

In a supporting way, however, both the instruction in the LSQ and its quick prior destination way information are read out from the queue list and information buffer, respectively, at the same time.

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Regardless of whether the buffers and queue are obtained for instructions or full programs, they cannot be derived with current deterministic architectures since events affecting execution time, e.g. cache hits/misses. For example, when a page gets accessed first and is completely utilized by the executing end and transferred back to the cluster level storage, the time of retrieving the page again for number of times makes a straight relation with the cluster block management. This leads to further drafting the page from its current location makes a essence in the various algorithm approaches. The presence of the accessed page is preferred in L2 to L1 cache data levels.

The instruction present in the queue will be still needed to be moved to the L1 data cache also with providing a solution to the delay problems. This rises an issue of more load on performance treated as penalty to the performance. When it makes a greater difficulty in finding an empty space but the padding methodology shows some improvising effect. When instruction in the LSQ is available to be processed while the needed location is away, a side route method helps the information buffer and send the pages to the write buffer, APCLRU works seamlessly with WBS since WBS may prematurely evict dirty pages from the virtual memory to the write buffer. APCLRU has better I/O performance (measured in milliseconds) than BPLRU and CLC in most cases. WBLRU shows significant improvement over LRU, CFLRU, and CFDC. Some other approaches, such as CCFLRU [22] and LRU-WSR [19], are orthogonal to the proposed approach.

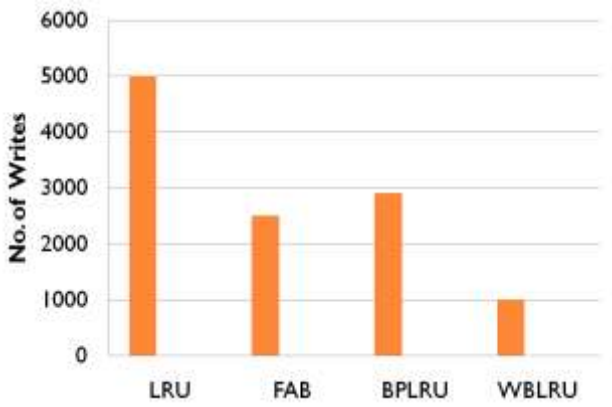

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Fig.3 Comparison Analysis

Table II: Efficiency rate in saving the access time

| Name of the Algorithm | Write vs Erase count analysis(100) | Efficiency (%) |
|---|---|---|
| FAB | 76 | 57% |
| BPLRU | 81 | 54 % |
| WBLRU | 44 | 76% |

## IV. COMPARISON ANALYSIS

At selected sizes of memories the given results out show the Comparisons and staged results for the algorithms at size of 4 MB data cache. We assume a hybrid mapping approach as selected in Fig 3, as it has better tradeoffs between the mapping table size and Flash memory performance. The Table II is presented taking into consideration the correlation between write patterns and merge operations in hybrid FTL, the goal can be enhanced APCLRU is to organize the write buffer in a way that produces suitable write patterns for FTL to increase the possibility of switch merge operations and reduce the possibility of full merge operations.

## V. CONCLUSION

This paper proposed is focused on energy and design efficient in the Flash-based systems. Performance Enhanced Cache is to provide better predictability with guaranteed performance enhancement while improving the average-case performance by

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exploiting both temporal and spatial locality just like a regular cache. This approach is designed to improve the performance of Flash-memory-based systems. Unlike previous work, where virtual memory and write buffer managements are designed separately, this paper proposed a new replacement algorithm for virtual memory, which cooperates with the write buffer and reorders the write sequences sent to the write buffer. A replacement algorithm on the buffer management of write operations was also proposed to work effectively with the proposed approach in virtual memory. Simulation results showed that significant improvement in I/O performance and reduction in the number of applied erase & write operations leading to the standard level approach by preserving the access time and un-affecting the design strategy .

**REFERENCE S**

T.-W. Kuo, Y.-H. Chang, P.-C. Huang, and C.-W. Chang, "Special issues in flash," in *Proc. IEEE/ACM Int. Conf. Comput.-Aided Design*, Nov.2014, pp. 821–826.

K. Lee and A. Orailoglu, "Application specific non-volatile primary memory for embedded systems," in *Proc. 6th IEEE/ACM/IFIP Int. Conf. Hardw./Softw. Codesign Syst. Synth.*, 2013, pp. 31–36.

C. Li Dee and K. Tin-bei, "Efficient management for large-scale flash- storage systems with resource conservation," IEEE *Trans. Memory Storage*, vol. 3, no. 1, pp. 381–413, 2011.

N. Agrawal, V. Prabhakaran, T. Wobber, J. D. Davis, M. Manasse, and R. Panigrahy, "Design tradeoffs for SSD performance," in *Proc. USENIX Annu. Tech. Conf.*, 2008, pp. 57–70.

L.-P. Shang and T.V Moh, "A non processed approach for flash memory storages in embedded systems," in *5th IEEE Embed. Technol. Appl. Symp.*, Nov. 2006, pp. 118–128.

Y. Huang, T. Liu, and C. Xue, "Register allocation for write activity minimization on non-volatile main memory," in *Proc. 16th ACM Asia South Pacific Design Autom. Conf.*, Jan. 2011, pp. 129–134.

Y. Hsang, T. Lidu, and C. K. Luue, "Register management for write reduction on secondary storage for embedded systems," *Embedd comp.*, vol. 56, no. 1, pp. 73–93, 2008.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
L. Shi, C. J. Xue, J. Hu, W.-C. Tseng, X. Zhou, and E. H.-M. Sha, "Replacement reduction on flash memory by least used cache," in *12th Symp. In VLSI Syst.*, 2011, pp. 121–134.

M. Mo, T.L. Shang, G. Lark, J. Shim, and I. Mhee, "The FAB maintenance policy for non-stationary storages" *IEEE Trans. Computer Electron.*, vol. 25, no. 5, pp. 48–55, May 2009.

H. Kim and S. Ahn, "BPLRU: A buffer management scheme for improving random writes in flash storage," in *Proc. 6th USENIX Conf. File Storage Technol.*, 2008, pp. 1–14.

S.-Y. Park, D. Jung, J.-U. Kang, J.-S. Kim, and J. Lee, "CFLRU: A replacement algorithm for flash memory," in *Proc. Int. Conf. Compil., Arch. Synth. Embed. Syst.*, 2006, pp. 234–241.

L. Shi, J. Li, C. J. Xue, C. Dang, and X. Mhou, "CFLRU: A unified write cache management for flash memory," in *Proc. ACM Int. Conf. Embed. Softw.*, 2011, pp. 339–348.

J. Mik, J. M. Kate, S. Hon, S. L. Min, and Y. Cho, "A space-efficient flash translation layer for compactflash systems," *ACM Trans. Computer Elect.*, vol. 48, no. 2, pp. 366–375, May 2010.

S.-W. Lee, D.-J. Park, T.-S. Chung, D.-H. Lee, S. Park, and H.-J. Song,"A log buffer-based flash translation layer using fully-associative sector translation," *IEEE Trans. Embedded. Syst.*, vol. 6, no. 3, pp. 1–12,2007.

S. Kang, S. Park, H. Jung, H. Shim, and J. Cha, "Performance trade-offs in using NVRAM write buffer for flash memory-based storage devices," *IEEE Trans. Comput.*, vol. 58, no. 6, pp. 744–758, Jun. 2009.

D. Seo and D. Shin, "Recently-evicted-first buffer replacement policy for flash storage devices," *IEEE Trans. Consumer Electron.*, vol. 54, no. 3, pp. 1228–1235, Aug. 2008.

J. Seol, H. Shim, J. Kim, and S. Maeng, "A buffer replacement algorithm exploiting multi-chip parallelism in solid state disks," in *Proc. Int. Conf. Compil., Arch., Synth. Embed. Syst.*, 2009, pp. 137–146.

X.-Y. Hu, E. Eleftheriou, R. Haas, I. Iliadis, and R. Pletka, "Write ampli- fication analysis in flash-based solid state drives," in *Proc. SYSTOR: Israeli Experim. Syst. Conf.*, 2009, pp. 1–9.

H. Jung, H. Shim, S. Park, S. Kang, and J. Cha, "LRU-WSR: Integration of LRU and writes sequence reordering for flash memory," *IEEE Trans. Consumer Electron.*, vol. 54, no. 3, pp.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

1215–1223, Aug. 2008.

Y. Ou, T. Härder, and P. Jin, "CFDC: A flash-aware replacement policy for database buffer management," in *Proc. 5th Int. Workshop Data Manage. New Hardw.*, 2009, pp. 15–20.

L. Shi, C. J. Xue, and X. Zhou, "Cooperating write buffer cache and virtual memory management for flash memory based systems," in *Proc. 17th IEEE Real-Time Embed. Technol. Appl. Symp.*, Apr. 2011, pp. 147–156.

Z. Li, P. Jin, X. Su, K. Cui, and L. Yue, "CCF-LRU: A new buffer replacement algorithm for flash memory," *IEEE Trans. Consumer Elec- tron.*, vol. 55, no. 3, pp. 1351–1359, Aug. 2009.

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# A CASE STUDY ON ECONOMICAL CURING

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***ABSTRACT***

***Concrete structures are cured for 7-28 days so as to have strength, stability and durability obtained fully. The two objectives of curing are to prevent loss of moisture and to control the temperature till the concrete attains desired strength. Curing methods include ponding (immersion), spraying or fogging, membrane curing in temperate zones. In cold climatic areas steam curing is done. Chemical compounds are used for curing for speedy construction but the cost is high. In traditional practice, curing is done uneconomically where valuable water is lost in slabs, beams and columns. Water available for hydration process is not more than 20% depending on method of curing. Curing of concrete is for hydration process under given set of temperature and humidity after placement of concrete into formwork. Hydration process takes place satisfactorily under saturation and stops when vaporpressure of water in capillaries fall below 80% of saturation humidity. There is good relation between compressive strength and time of curing. ACI committee 209 proved that up to 28days cement hydration is rapid and there is increase in strength. Of all, moist curing is most preferable method rather than spraying in open air. Cracks develop due to thermal shrinkage, if curing is ineffective. A critical study is made on water used for curing a pavement of one kilometer two lane(7KM wide) pavement for 28 days by constructing small ponds. Alternately membrane curing was placed on the pavement. Water saving was found to be 60% in membrane method. Membrane curing is economical in temperate regions and steam curing in cold regions***

***KEYWORDS: Hardening, RCC structures, Anhydrous, membrane, Curing***

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## I. INTRODUCTION

With advent of cement, most of the structures like buildings, bridges, dams, pavements are being constructed easily and strongly .As concrete is strong in compression and weak in tension, reinforcement became necessary to take tensile stresses. Thus reinforced cement concrete structures are popular and quality of cement and manufacturing process of concrete have become important. Concrete manufacture with ingredients of coarse and fine aggregates mixed with water becomes a heterogenous compound When mixed with water, chemical reaction takes place and heat is generated . The chemical reaction is exothermic. The process of chemical reaction is called hardening . In order to facilitate the process of hardening of cement, sufficient quantity of water has to be added so to create ambient temperature and humidity. This process of adding water is called curing .

Curing of concrete is an important phase of construction of RCC structures. Strength, stability, and durability of these structures are influenced by the quantity of curing water, duration and method of curing . .Quantity of water used for curing has less importance .If curing is ineffective, shrinkage cracks develop in the concrete ,structures deteriorate with time and fail to take loads and ultimately collapse may take place. It is therefore necessary to understand the mechanism of curing on strength of concrete. The methods of curing are a) Immersion b)Ponding c)Spraying or fogging d)Wet covering e)Use of chemical compounds

## II. MECHANISM OF HYDRATION OF CEMENT

Anhydrous cement ( Dry cement )does not bind with coarse and fine aggregates .It acquires adhesive property when mixed with water . The chemical reaction that takes place between cement and water is called hydration of cement. On hydration, some products are formed . These products are important because they have cementing or adhesive values .The quality ,quantity ,continuity ,stability and rate of formation of hydration products are important. Hydration process is in two ways namely **“Through solution”** and **“Solid state”**

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In through solution cement compounds dissolve to produce a supersaturated solution from which different hydrated products get precipitated . In solid state process water attacks cement compounds in solid state converting the compounds into hydrated products starting from surface and proceeding to interior of compounds with time .It is probable that both through solution and solid state types of mechanism occur during the course of reaction of cement and water . The former mechanism may predominate in the early stages while the latter mechanism may operate during later stage of hydration .

The reaction of cement with water is exothermic .Considerable quantity of heat is called heat of hydration is liberated .Different compounds in cement react at different rates and liberate different quantities of heat C3S (Tricalcium silicate) ,C2S (Dicalcium silicate ) ,C3A (Tricalcium aluminate ) and C4AF ( Terra calcium alumino ferrite ) are the major compounds and these compounds play a vital role in hydration and liberate different quantities of heat .The compounds are called Bogue's compounds (named after R . H Bogue . Tornbohm called these compounds as Alite ,Belite , Celite and Felite .

Heat of hydration generated by these four compounds as per Verbec and Foster is given below;

| **Compound** | **Heat of hydration(calories/gram )** | | |
|---|---|---|---|
| | 3 days | 90 days | 13 years |
| C3S | 58 | 104 | 122 |
| C2S | 12 | 42 | 59 |
| C3A | 212 | 311 | 324 |
| C4A | 69 | 98 | 102 |

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C3A liberates more heat. Hydration process is not instantaneous. The reaction is faster in early period and continues indefinitely at a decreasing rate. Complete hydration cannot be obtained even in one year. It has been observed that after 28 days of curing cement grains have hydrated to a depth of 4μ (0.004 mm). This is the reason, curing is generally done upto 28 days in RCC structures so as to have 60 to 70 percent hydration completed.

## III. CURING METHODS AND EFFECT OF TEMPERATURE AND HUMIDITY ON CURING WATER QUANTITY

There are 4 methods of curing RCC structures.

a) Water curing

b) Membrane curing

c) Application of heat

d) Miscellaneous

a) Water curing : Water curing is done in four ways. 1) Immersion 2) Ponding 3) Spraying or fogging and 4) Wet covering.

The precast concrete items are normally immersed in curing tank for certain duration. Pavement slabs, roof slabs are covered under water by making small ponds. Vertical retaining wall or plastered surfaces or concrete columns are cured by spraying water. In some cases, wet covering such as wet gunny bags, jute matting, straw are wrapped to vertical surface for keeping the concrete wet. For horizontal surfaces, saw dust, earth or sand are used as wet covering for longer time.

b) Membrane curing : Sometimes water is not available sufficiently for curing. Lavish application of water is not possible for reasons of economy. Curing does not mean only application of water. It means creation of conditions for promotion of uninterrupted and progressive hydration. Technically the amount of water mixed to make concrete is more than sufficient to hydrate cement, provided this water is not allowed to go out from the body of concrete. For this reason membrane curing is done

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which will effectively seal off the evaporation of water from concrete. Membrane is a sealing compound. Membrane curing is good method of maintaining satisfactory state of wetness in the body of concrete when original water cement ratio maintained is not less than 0.5. To achieve this,membrane is applied after 1 or 2 days of actual wet curing (spraying). For effective curing, membrane of good quality should be applied effectively. 2 or 3 coats may be required for effective prevention of evaporation of water.

Water scarcity, non-availability of labour have encouraged membrane curing. It is 80% efficient as compared to water curing. Water curing is ideal in theory. But in practice more than 60 to 80% ware is lost in spillage to ground and air and evaporation.

c) Steam curing : It is advisable only when presence of moisture is sufficiently made available along with heat for hydration .Steam curing is advisable in cold climatic regions.

d) Miscellaneous methods of curing

Calcium chloride is used either as surface coating or as an admixture . is used as curing medium satisfactorily . Calcium chloride is salt and absorb moisture from atmosphere retains at surface .This absorbed moisture prevents curing water from evaporation and keeps concrete wet for long time and form work prevents escaping moisture from concrete particularly in case of beams and columns .Keeping form work intact and sealing the joint with wax or another sealing compound prevents evaporation.

## IV. STUDY CONDUCTED IN A TYPICAL AREA

A critical study is made on the amount of water used for curing a pavement of one kilometer two way lane ( 7 meters wide ) for 28 days , by constructing small ponds . Alternatively membrane curing is placed on the pavement . Saving was found to be 60 % in membrane curing .

Total area of pavement studied = 7000 sq meters

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Depth of water applied in ponds per day =7000 x 0.03 = 210 cubic meters

Depth of water applied in membrane curing = 700 x0.01 =70 cubic meters

Saving of water per day = 210 -70 = 140 cubic meters

Saving of water for 28 days =140 x28 =3920 cubic meters

Saving of water per square meter =3920/7000= 0.56 cubic meters =560 liters

This water is sufficient for one family of 5 members for domestic purpose including drinking for one day .

## V. PERIOD OF CURING

Curing is intended to keep concrete wet and not allowed to dry .After 24 hours of completion of concreting, curing can commence and to continue for 28 days. Curing time is influenced by prevailing temperature ,humidity ,wind velocity, type of cement ,fineness of cement ,water cement ratio used ,size of member etc; For general guidance ,curing is continued till 70% of specified strength is attained .

## VI. CONCLUSIONS

Curing of concrete in RCC structures like buildings, bridges, dams, pavements is intended for complete chemical reaction of cement and water called hydration.

Hydration process is complex process due to different types of chemical compounds formed during chemical reaction .Each compound liberates heat of hydration differently .Curing is intended for preventing heat of hydration and gaining specified strength without causing shrinkage cracks .Curing is influenced by the temperature and humidity in the atmosphere in the area at the time of construction .

There are various methods of curing like water curing ,membrane curing, steam curing and miscellaneous types of curing .Of all, membrane curing (applying chemical compounds as coating) is ideal for curing and saves precious water and it is an effective method for large

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RCC structures. Curing is recommended immediately after 24 hours of completion of work and continue till 70% of strength is attained.

## REFERENCES

ICI Journal, July- Sep 2015: Expended Energy based damage assessment of RCC Structures.

Concrete on Micro structures, Properties and materials by A K Mehta & Paulo J. K. Antario (2012).

Concrete Technology by A R Shantha Kumar (2007)

Concrete Technology by M S Shetty (2005)

Indian |Standard Code 456:2000 for plain and Reinforced Concrete

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**International Journal Of Core Engineering & Management (IJCEM)**
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# IDENTITY PRIVACY-PRESERVING PUBLIC AUDITING FOR SHARED DATA IN THE CLOUD

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***Abstract***

***Cloud data services, it is commonplace for data to be not only stored in the cloud, but also shared across multiple users. Unfortunately, the integrity of cloud data is subject to skepticism due to the existence of hardware/software failures and human errors. Several mechanisms have been designed to allow both data owners and public verifiers to efficiently audit cloud data integrity without retrieving the entire data from the cloud server. However, public auditing on the integrity of shared data with these existing mechanisms will inevitably reveal confidential information—identity privacy—to public verifiers.***

***In this paper, we propose a novel privacy-preserving mechanism that supports public auditing on shared data stored in the cloud. In particular, we exploit ring signatures to compute verification metadata needed to audit the correctness of shared data. With our mechanism, the identity of the signer on each block in shared data is kept private from public verifiers, who are able to efficiently verify shared data integrity without retrieving the entire file. In addition, our mechanism is able to perform multiple auditing tasks simultaneously instead of verifying them one by one. Our experimental results demonstrate the effectiveness and efficiency of our mechanism when auditing shared data integrity.***

***Index Terms—Public auditing, privacy-preserving, shared data, cloud computing.***

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## I. INTRODUCTION

Cloud able data storage services with a much lower marginal service providers offer users efficient and scalcost than traditional approaches. It is routineforusersto leverage cloud storage services to share data with others in a group, as data sharing becomesastandard feature in most cloud storage offerings, including Dropbox, iCloud and Google Drive.The integrity of data in cloud storage, however, is subject to skepticism and scrutiny, as data stored in the cloud can easily be lost or corrupted due to the inevitablehardware/ software failures and human errors.To make this matter even worse, cloud service providers may be reluctant to information users aabout these data errors in order tomaintain the reputation of their services and avoid losing profits.

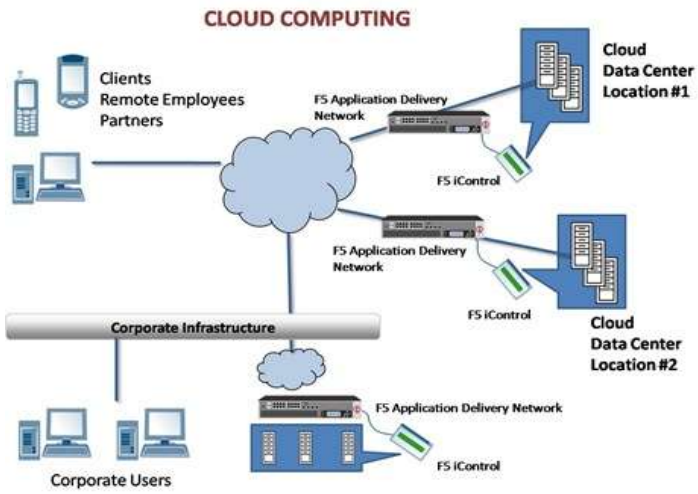


Fig:Structure of Cloud Computing

Therefore, the integrity of cloud datashouldbe verified before any data utilization, such as search or computation over clouddata.

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The traditional approach for checking data correctness is to retrieve the entire data from the cloud, and then verify data integrity by checking the correctness of signatures (e.g., RSA ) or hash values (e.g.,MD5)of the entire data. Certainly, This conventional approach is able to successfully check the correctness of cloud data.There exist various tools and technologies for multicloud, such as Platform VM Orchestrator, VMware vSphere, and Ovirt. These tools help cloud providers construct a distributed cloud storage platform (DCSP) for managing clients' data. However, if such an important platform is vulnerable to security attacks, it would irretrievable losses to the clients.For example, the confidential data in an enterprise may be illegally accessed through a remote interface provided by a multi-cloud,o rrelevant data and archives may be lost or tampered with when they are Stored into anA preliminary version of this paper appeared under thetitle"Efficient Provable Data Possession for Hybrid Clouds.Security (CCS), uncertain storage pool outside the enterprise. Therefore, it is indispensable for cloud service providers (CSPs) to provide security techniques for managing their storage services.Provable data possession (PDP) (or proofs of retrievability (POR)) is such a probabilistic proof technique for a storage provider to prove the integrity and ownership of clients' data without downloading data.

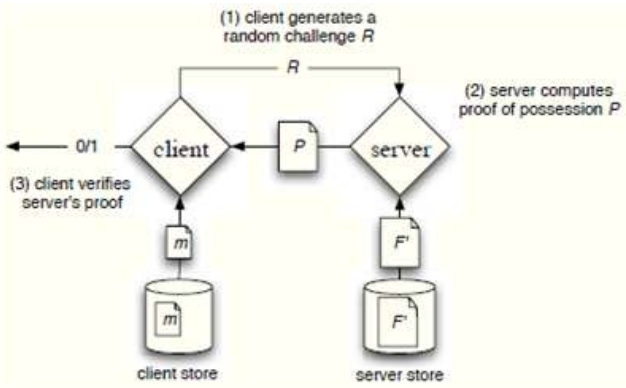


Fig. Provable Data Possession at Untrusted Stores

The proof-checkingwithout downloading makes it especially important for large-size files and folders (typically including manyclients'files)to check whether these data have been tampered with or

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deleted without downloading the latest version ofdata. Thus, it is able to replace traditional hash andsignature functions in storage outsourcing. Various PDP schemes have been recently proposed, such as Scalable PDP and Dynamic PDP. However, these schemes mainly focus on PDP issues at untrusted servers in a single cloud storage provider andare not suitable for a multi-cloud environment.Recently, many mechanisms , have been proposed to allow not only a data owner itself but also a public verifier to efficiently perform integrity checking without downloading the entire data from the cloud, which is referred to as public auditing . In these mechanisms, data is divided into many small blocks, where each block is independently signed by the owner; and a random combination of all the blocks instead of the whole data is retrieved duringintegrity checking . A public verifier could be a data user (e.g., researcher) who would like to utilize,The owner's data via the cloud or a third-party auditor (TPA)who can provide expert integrity checking services . Moving a step forward, Wang et al. designed an advanced auditing mechanism so that during public auditing on cloud data, the contentof private data belonging to a personal user is not disclosed to any public verifiers. Unfortunately, current public auditing solutions mentioned above only focus on personal data in the cloud . We believe that sharing data among multiple users is perhaps one of the most engaging features that motivates cloud storage. Therefore, it is also necessary to ensure the integrity of shared data in the cloud is correct.

### 1.1 Motivation

Toprovide a low-cost, scalable, locationindependent platform for managing clients' data, current cloud storage systems adopt several new distributed file systems, for example, apache hadoop distribution file system (hdfs), google file system (gfs), amazon s3 file system, cloudstore etc. These file systems share some similar features: a single metadata server provides centralized management by a global namespace; files are split into blocks or chunks and stored on block servers; and the systems are comprised of interconnected clusters of blockservers.Those features enable cloud service providers to store and process large amounts of data. However, it is crucial to offer an efficient verification on the integrity ease of use.

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## II. PROBLEM STATEMENT

### 2.1 System Model

As illustrated in Fig. 2, the system model in this paper involves three parties: the cloud server, a groupofusers and a public verifier. There are two typesofusersina group: the oiginal user and a number of group users.The original user initially creates shared data in the cloud, and shares it with group users. Both the original user and group users are members of the group. Every member of the group is allowed to access and modify shared data.Shared data and its verification meta data(i.e.,signatures) are both stored in the cloud server. A public verifier, such as a thirdparty auditor providing expert data auditing services or a data user outside the group intending to utilize shared data, is able to publicly verify the integrity of shared data stored in the cloudserver.When a public verifier wishes to check the integrity of shared data, it first sends an auditing challenge to the cloud server. After receiving the auditing challenge,the

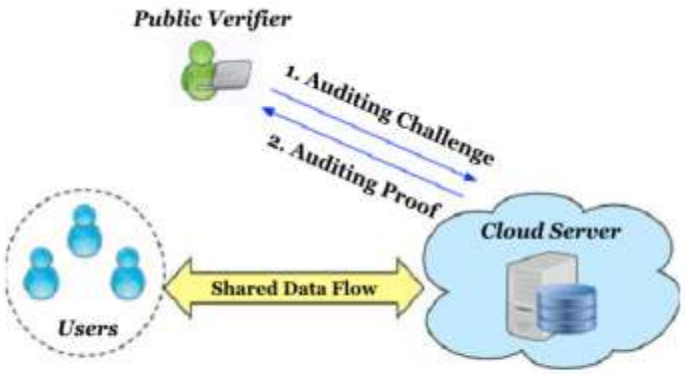


Fig. 2. Our system model includes the cloud server, a group of users and a public verifier.

cloud server responds to the public verifier with an auditing proof of the possession of shared data. Then, this public verifier checks the correctness of the entire data by verifying the correctness of the auditing proof. Essentially, the process of public auditing is a challengeand-response protocol between a public verifier and the cloudserver .

### 2.2 Threat Model

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**Integrity Threats**

Two kinds of threats related to the integrity of shared data are possible. First, an adversary may try to corrupt the integrity of shared data.Second,the cloud service provider may in Advertently corrupt(or even remove) data in its storagedue to hardware failures and human errors. Making matters worse, the cloud service provider is economically motivated, which means it may be reluctant to inform users about such corruption of data in order to save its reputation and avoilosing profit so fits services.

**Privacy Threats.**

The identity of the signer on each block in shared data is private and confidential to thegroup. During the process of auditing, a public verifier,who is only allowed to verify the correctness of shared data integrity, may try to reveal the identity of the signer on each block in shared data based on verification metadata.

Once the public verifier reveals the identity of the signer on each block, it can easily distinguishahigh-valuetarget(a particular user in the group or a special block in shared data) fromothers.

**2.3 Design Objectives**

Our mechanism, Oruta, should be designed to achieve following properties: (1) Public Auditing: A publicverifierisable to publicly verify the integrity of shared data without retrieving the entire data fromthecloud.(2)Correctness:A public verifier is able to correctly verify shared data integrity. (3) Unforgeability: Only a user in the group can generate valid verification metadata (i.e., signatures)on shared data.

(4)Identity Privacy: A public verifier cannot distinguish the identity of the signer on each block in shared data during the process of auditing.

## III. METHODOLOGIES

**3.1 Public Auditing Mechanisums**

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Data shareing among multiple users is perhaps one of the most engaging features that motivates cloud storage. Therefore, it is also necessary to ensure the integrity of shared data in the cloud is correct. Existing B. Wang is with the State Key Laboratory of Integrated Service See public auditing mechanisms can actually be extended to verify shared data integrity .However,a new significant privacy issue introduced in the case of shared data with the use of existing mechanisms is the leakage of identity privacy to public verifiers. For instance, Alice and Bob work together as a groupand share a file in the cloud . The shared file is divided into a number of small blocks, where each block is independently signed by one of the two users with existing public auditing solutions Once a block in this shared file is modified by a user, this user needs to sign the new block using his/her private key. Eventually, different blocks are signed by different users due to the modification introduced by these two different users. Then, in order to correctly audit the integrity of the entire data, a public verifier needs to choose the appropriate public key for each block (e.g., a block signed by Alice can only be correctly verified by Alice'spublic key). As a result, this public verifier will inevitably learn the identity of the signer on each block due to the unique binding between an identity and a public key via digital certificates under public key infrastructure (PKI). Failing to preserve identity privacy on shared data during public auditing will reveal significant confidential information.

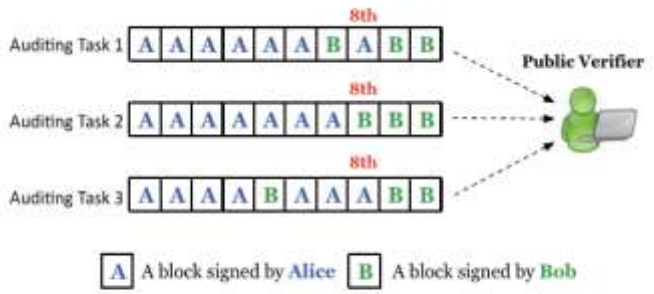


Fig. 1. Alice and Bob share a data file in the cloud, and a public verifier audits shared data integrity with existing mechanisms.

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(e.g., which particular user in the group or special block in shared data is a more valuable target) to public verifiers. Specifically, as shown in Fig. 1, after performing several auditing tasks, this public verifier can first learn that Alice may be a more important role in the group because most of the blocks in the shared file are always signed by Alice; on the other hand, this public verifier can also easily deduce that the eighth block may contain data of a higher value (e.g., a final bid in an auction), because this block is frequently modified by the two different users. In order to protect these confidential information, it is essential and critical to preserve identity privacy from public verifiers during public auditing. In this paper, to solve the above privacy issue on shared data, we propose Oruta,1 a novel privacy-preserving public auditing mechanism. More specifically, we utilize ring signatures to construct homomorphic authenticators in Oruta, so that a public verifier is able to verify the integrity of shared data without retrieving the entire data—while the identity of the signer on each block in shared data is kept private from the public verifier. In addition, we further extend our mechanism to support batch auditing, which can perform multiple Auditing tasks simultaneously and improve the efficiency of verification for multiple auditing tasks.

TABLE 1
Comparison among Different Mechanisms

| | PDP [9] | WWRL [5] | Oruta |
|---|---|---|---|
| Public Auditing | √ | √ | √ |
| Data Privacy | × | √ | √ |
| Identity Privacy | × | × | √ |

masking , which has been utilized in WWRL and can preserve data privacy from public verifiers. Moreover, we also leverage index hash tables from a previous public auditing solution to support dynamicdata. A high-level comparison among Oruta and existing mechanisms is presented in The remainder of this paper is organized as follows. In Section, we present the system model, threat model and design objectives. In Section, we introduce cryptographic primitives used in Oruta. The detailed design and security analysis of Oruta are presented .

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### 3.2PossibleAlternativeApproaches

To preserve the identity of the signer on each block during public auditing, one possible alternative approach isto ask all the users of the group to share

Aglobal private key Then, every user is able to sign blocks with this global private key. However,once one user of the group is compromised or leaving the group,a new global private key must be generated and securely sharedamong the rest of the group, which clearly introduces huge overhead to users in terms of key management and key distribution. While in our solution,each user in the rest of the group can still utilizeits own privatekey for computing verification metadata without generating or sharing any new secret keys.Another possible approach to achieve identity privacy,is to add a trusted proxy between a group of users and the cloud in the system model. More concretely,each member's data is collected, signed,and uploaded to the cloud by this trusted proxy,then apublicverifiercanonly verify and learn that it is the proxy signs the data,but cannot learn the identities of group members.Yet,the security of this method is threatened by the singlepoint failure of the proxy. Besides, sometimes,not all the group members would like to trust the same proxy forgenerating signatures and uploading data on their behalf. Utilizing group signaturesis also an alternative option to preserve identity privacy.Unfortunately,as shown in our recent work, how to design an efficient public auditing mechanism based on group signaturesremainsopen.2 Trusted Computing offers another possible alternativeapproach to achieve the design objectives of our mechanism. Specifically, by utilizing direct anonymous attestation [26], which is adopted by the Trusted Computing Group as the anonymous method for remote authentication in trusted platform module, users are able to preserve their identity privacy on shared data from a public verifier. The main problem with this approach is that it requires all the users using designed hardware,and needs the cloud provider to move all the existingcloud services to the trusted computing environment,which would be costly & impractical.

### 3.3 Homomorphic Encryption

Homo morphic Encryption systems are used to perform operations on encrypted data without knowing the privatekey (without decryption), the client is the only holder of the secret key.When we

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decrypt the result of any operation, it is the same as if we had carried out the calculation on the rawdata.

**Definition**: An encryption is homomorphic, if: from Enc(a) and Enc(b) it is possible to compute Enc(f (a,b)), where f can be: +, ×, ⊕ and without using theprivatekey. Among the Homomorphic encryption wedistinguish,according to the operations that allows to assess on raw data, the additive Homomorphic encryption (only additions of the raw data) is the Pailler and Goldwasser-Micalli cryptosystems, and the multiplicative Homomorphicencryption (only products on raw data)is the RSA and Gamal cryptosystems.

A. History of the Homomorphic encryption In 1978 Ronald Rivest, Leonard Adleman and MichaelDertouzos suggested for the first time the concept of Homomorphic encryption .
Since then, little progress has been made for 30 years. The encryptionsystemo f Shafi Goldwasser and Silvio Micali was proposed in 1982 was a provable security encryption scheme which reached a remarkable level of safety, it was an additive Homomorphic encryption, but it can encrypt only a singlebit.In the same concept in 1999 Pascal Paillier was also proposed a provable security encryption system that was also an additive

Example: Paillier Cryptosystem (1999):

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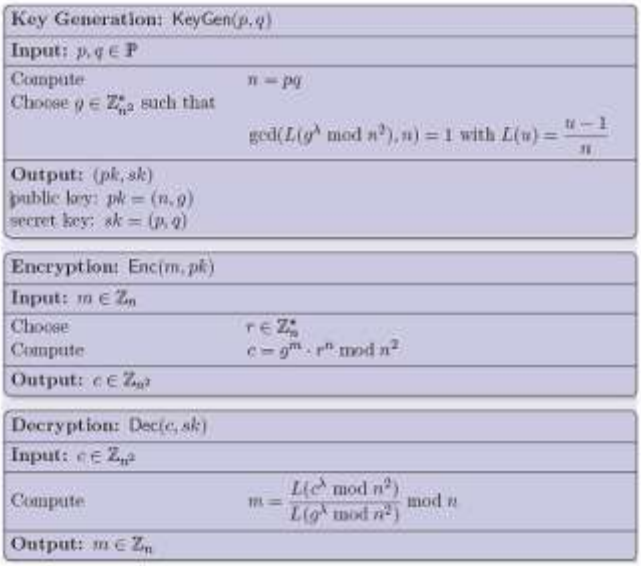


Fig: Paillier Algorithm

### B. Additive Homomorphic Encryption

A Homomorphicencryption is additive, if Enc (x⊕y) = Enc(x) ⊗ Enc(y) lEnc (Σ mi) = Π Enc (mi)
i=1 i=1

Suppose we have two ciphers C1 et C2 such that:

C1 = gm1. r1n mod n2

C2 = gm2. r2n mod n2

C1.C 2 = gm1. r1n . gm2. r2n mod n2 = gm1+ m2 (r1r2)n mod n2

So, Pailler cryptosystem realizes the property of additive Homomorphic encryption

An application of an additive Homomorphic encr ption is electronic voting: Each vote is encrypted but only the "sum" is decrypted.

## IV. PROPOSED SCHEMES

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### 4.1 Ring Signatures

The concept of ring signatures was first proposed by Rivest in 2001. With ring signatures, a verifier is convinced that a signature is computed using one of group members' private keys, but the verifier is not able to determine which one. More concretely, given a ring signature and a group of d users, a verifier cannot distinguish the signer's identity with a probability more than 1=d. This property can be used to preserve the identity of the signer from a verifier. The ring signature scheme introduced by (referred to as BGLS in this paper) is constructed on bilinear maps. We will extend this ring signature scheme to construct our public auditing mechanism.

#### 4.1.1 New Ring Signature Scheme (Overview)

As we introduced in previous sections, we intend to utilize Ring signatures to hide the identity of the signer on each block, so that private and sensitive information of the group is not disclosed to public verifiers. However, traditional ring signatures cannot be directly used into public auditing mechanisms, because these ring signature schemes do not support blockless verifiability. Without blockless verifiability, a public verifier has to download the whole data file to verify the correctness of shared data, which consumes Excessive bandwidth and takes very long verification times. Therefore, we design a new homomorphic authenticable ring signature (HARS) scheme, which is extended from a classic ring signature scheme. The ring signatures generated by HARS are not only able to preserve identity privacy but also able to support blockless verifiability. We will show how to build the privacy-preserving public auditing mechanism for shared data in the cloud based on this new ring signature scheme.

### 4.2 Ring Signature - Present

In 2001, A ring signature scheme was proposed by Rivest, Shamir, Tauman.

The signature scheme convinces a verifier that a document has been signed by one of n independent signers.

- A signer can connect the head and tail of the series of values by using own secret key.

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- A verifier computes series of values from the message and members' public keys, and checks that a signature has a ring structure.
- Anyone cannot distinguish a part of the signature which is used secret key.

**Ring Signature: Old**

Once upon a time, there was a signature scheme like a ring signature scheme in Japan.

**Background**

In 1756 (in the middle of Edo period), a signature was generated as a proof of solidarity when farmers in a certain village resisted their ruler.

A purpose of the shape of this signature is to hide their leader.

**4.3 Homeomorphisms**

RSA With Homomorphic Encryption Homomorphic Encryption systems are used to perform operations on encrypted data without knowing the private key (without decryption), the client is the only holder of the secret key. Homomorphic verifiable response is the key technique of CPDP because it not only reduces the communication bandwidth. In this technique we are using RSA.

**4.4 RSA Algorithm**

**Step 1:** RSA is a block cipher in which the plain text and cipher text are integers between 0and n-1 for some n. encryption and decryption are of the following form period for some plain text block M and cipher block c.

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**Step2:** C= mod n

M= mod n= ( )d mod n= mod n. both sender and receiver knows the values of d. This is public key encryption algorithm with a public key of KU={e,n} and private key of KR={d,n}.

**Step 3**: It is possible to find values of e,d,n such that M ed mod n=M for all M<n. It is relatively easy to calculate and for all values of M<n. it is infeasible to determine d given e and n.

| **Key Generation:** KeyGen$(p,q)$ | |
|---|---|
| **Input:** $p,q \in \mathbb{P}$ | |
| Compute | $n = p \cdot q$<br>$\varphi(n) = (p-1)(q-1)$ |
| Choose $e$ such that | $\gcd(e, \varphi(n)) = 1$ |
| Determine $d$ such that | $e \cdot d \equiv 1 \bmod \varphi(n)$ |
| **Output:** $(pk, sk)$<br>public key: $pk = (e, n)$<br>secret key: $sk = (d)$ | |

| **Encryption:** Enc$(m, pk)$ | |
|---|---|
| **Input:** $m \in \mathbb{Z}_n$ | |
| Compute | $c = m^e \bmod n$ |
| **Output:** $c \in \mathbb{Z}_n$ | |

| **Decryption:** Dec$(c, sk)$ | |
|---|---|
| **Input:** $c \in \mathbb{Z}_n$ | |
| Compute | $m = c^d \bmod n$ |
| **Output:** $m \in \mathbb{Z}_n$ | |

**Step 5:** Suppose we have two ciphers C1 and C2 such that

C1 = m1e mod n

C2 = m2e mod n

RSA cryptosystem realize the properties of the multiplicative Homomorphic encryption, but it still has a lack of security, because if we assume that two ciphers C1, C2 corresponding respectively to the messages m1, m2, so

C1 = m1e mod n

C2 = m2e mod n

**Step 6:** The client sends the pair (C1, C2) to the Cloud server, the server will perform the calculations requested by the client and sends the encrypted result (C1 × C2) to the client.

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## V. CONCLUSION

In this propose oruta, a privacy-preserving public auditing mechanism for shared data in the cloud. We utilize ring signatures to construct homomorphic authenticators, so that a public verifier is able to audit shared data integrity without retrieving the entire data, yet it cannot distinguish who is the signer on each block. To the best of our knowledge, designing an efficient public auditing mechanism with the capabilities of preserving identity privacy and supporting traceability is still open. Another problem for our future work is how to prove data freshness (prove the cloud possesses the latest version of shared data) while still preserving identity privacy.

## VI. FUTURE SCOPE OF THE STUDY

To improve the efficiency of verifying multiple auditing tasks, we further extend our mechanism to support batch auditing. There are two interesting problems we will continue to study for our future work. One of them is traceability, which means the ability for the group manager (i.e., the original user) to reveal the identity of the signer based on verification metadata in some special situations. Since Oruta is based on ring signatures, where the identity of the signer is unconditionally protected, the current design of ours does not support traceability.

## REFFERENCES

B. Wang, B. Li, and H. Li, "Oruta: Privacy Preserving Public Auditing for Shared Data in the Cloud," Proc. IEEE Fifth Int'l Conf. Cloud Computing, pp. 295-302, 2012.

M. Armbrust, A. Fox, R. Griffith, A.D. Joseph, R.H. Katz, A. Konwinski, G. Lee,D.A. Patterson,A. Rabkin, I. Stoica, and M. Zaharia, "A View of Cloud Computing,"Comm. ACM,vol.53,no.4,pp.50-58,Apr.2010.

K. Ren, C. Wang, and Q. Wang, "Security Challenges for the Public Cloud," IEEE Internet Computing, vol. 16, no. 1, pp. 69-73, 2012.

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R. Rivest, A. Shamir, and L. Adleman, "A Method for Obtaining Digital Signatures and Public Key Cryptosystems," Comm. ACM, vol. 21, no. 2, pp. 120-126, 1978.

Cloud Computing: Concepts, Technology & Architecture by Thomas Erl. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (**By Tim Mather-** Kaiping Xue; Peilin Hong "A Dynamic Secure Group Sharing Framework in Public Cloud Computing", *Cloud Computing, IEEE Transactions on*, On page(s): 459 - 470 Volume: 2, Issue: 4, Oct.-Dec. 1 2014.

He Huang; Xiang-Yang Li; Yu-e Sun; Hongli Xu; Liusheng Huang "PPS: Privacy-Preserving Strategy proof Social-Efficient Spectrum Auction Mechanisms", *Parallel and Distributed Systems, IEEE Transactions on*, On page(s): 1393 - 1404 Volume: 26, Issue: 5, May 1 2015.

Raja, A.S.; Abd Razak, S. "Analysis of Security and Privacy in Public Cloud Environment", Cloud Computing (ICCC), 2015 International Conference on, On page(s): 1 – 6.

Morioka, E.; Sharbaf, M.S. "Cloud Computing: Digital Forensic Solutions", Information Technology - New Generations (ITNG), 2015 12th International Conference on, On page(s): 589 – 594.

Raja, A.S.; Abd Razak, S. "Analysis of Security and Privacy in Public Cloud Environment", Cloud Computing (ICCC), 2015 .

Malina, L.; Hajny, J. "Efficient security solution for privacy-preserving cloud services", Telecommunications and Signal Processing (TSP), 2013 36th International Conference on, On page(s): 23 – 27.

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**International Journal Of Core Engineering & Management (IJCEM)**
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# SOLAR POWER ENERGY PROSPECTS OF DEVELOPMENT IN INDIA

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***ABSTRACT***

***Energy is required for all development works like Construction, Agriculture, Industries, Lightening, and Cleanliness etc. Energy is available in two forms 1) Conventional Energy (Non-Renewable Energy) Thermal, Nuclear, Oil 2) Non-Conventional Energy (Renewable Energy) Solar, Wind, Biomass, tidal etc. India's installed capacity of power generator is about 1, 23,463 Megawatts (MW) of which Thermal power generator accounts for (66%) Hydro power generator (26%) and Nuclear Power generator (5%). These Energy sources are non-renewable and usually get exhausted in account 200 years. There is huge cost involved in thermal power and environment hazard by releasing carbon and green house gases. Alternatively renewable energy sources are being gives more importance as sunshine, wind, biomass etc. and available in plenty and these are environment friendly. Solar power through solar photo voltaic cells are being used successfully in Rajasthan, west Bengal, Uttarakhand, and Chhattisgarh. Solar power is being used for domestic, agriculture and industrial purposes. The daily average solar energy incidence over India varies from 4.7kwh/square depending upon location. There is potential form solar power to the tune of 20 megawatts per sq.km. As against this 1.74Mw/sq is being utilized. The manufactures of solar photovoltaic cells are being taken up to reduced costs. Government is financing solar energy units up to 50% subsidy is given by 1REDA. More research programs are on the way for economical units for solar power energy. China is in forefront in utilizing solar energy. Through 1, 50,000 sqm of collected area for Solar Energy.***

***KEY WORDS: Solar energy, photo voltaic cell, Renewable Energy and Non-Renewable Energy, Cost analysis.***

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## I. INTRODUCTION

Energy is essential for our living. During the day, the sun gives out light and heat energy. At night street lamps use electrical energy to light. The food we ate contains energy, we use that energy to work and play. Solar energy can be converted directly into other forms of energy such as heat and electricity. Solar energy is used for heating water for domestic use, space heating of buildings, for agriculture products and industrial production. The strength of the solar energy available at any point on the earth depends on the day of the year, the time of day and the latitude of the collection point. The technology is now developing which will use solar energy to produce steam at high temperature and pressure to drive steam turbines for electric generators.

## II. PHOTO VOLTAIC CELL

Solar photovoltaic (SPV), solar thermal technologies, stand-alone wind energy and hybrid systems are being utilized for a host of industrial and commercial applications. The country has the largest assemblage of solar photovoltaic comprising approximately 5,00,000 PV systems total into 39MW and encompassing over 30 various applications. India receives about 300 sunny days in a year. This is equal to over 5000 trillion KWH per year, and is far more than total energy consumption of this country in a year. The daily average solar energy incidence over India varies from 4-7KWH/$M^2$ depending upon location.SPV system are found applications in households, agriculture, telecommunications, defense and rail ways, others. To promote increased usage of SPV usage in rural areas, cost-effective technology has been developed. The cost of PV has gone down considerably making easily affordability for rural applications. This includes 5,10,000 solar lanterns, 2,56,000 home lighting system, 48,000 street lighting system, 3,600 remote villages and hamlets and 5,000 water pumping system.

Lighting systems stand-alone power plants and other specialized systems are implemented central agencies while water pumping systems for agriculture and related users are implemented through IREDA (India renewable energy development agency).

**Specifications of SPV systems**

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Indian standards for PV modules and other related aspects have been developed. Most standards are in line with the relevant International Electro-technical commission (IEC) standards. MNES (Ministry of Non-Conventional Energy Sources) has drawn specifications for the purchase of solar lanterns, solar home systems, street lighting and solar water pumping systems, under its capital and interest subsidy schemes.

**Testing Centers and Certification**

The solar Energy Center (SEC) in Gurgaon, Haryana, is the lead SPV training and test center set up by Ministry of Non-Conventional Energy Sources (MNES). There are three test centers that have been authorized to test solar lighting systems like the solar home systems, solar street lighting systems and solar lanterns. It is mandatory for manufactures/ suppliers to obtain a test certificate from an authorized test center for the testing and certification of solar home systems, street lighting systems, and solar lanterns for supply, under the MNES program. The standards for solar generations and PIPV are however being evolved.

**Solar Lighting Systems**

Non-grid applications in solar PV includes solar lanterns, home community and street lighting systems, water pumping for agricultural and related uses, stand-alone power plants, solar generators, solar powered refrigerators for remote health centers or clinical uses. These technologies make the benefits of electricity availability in remote, inaccessible areas. Some of these are covered under the subsidy program of the ministry.

**Solar Water Pumping Systems**

MNES has been implementing through IREDA and SNAs, a program on deployment of SPV water pumping systems for agricultural and related uses, with the objective of development of marketing infrastructure and obtaining direct feedback on their performance and utilization, for meeting specific needs of the users in different agro-climatic conditions. MNES provides an interest subsidy on the loan component given by IREDA.

**SPV Power Program**

During the tenth five year plan, the ministry proposes to establish a SPV power capacity of 5MW for niche applications, viz., voltage stabilization at the tail ends of rural grids, centralized system for

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peak shaving or demand side management in urban centers and diesel saving in island/remote locations. A total of 31 grid-interactive SPV power projects aggregating to 2.5MW have so far been installed and 14 other projects of 800 Kw capacities are under installation.

The manufacturers of solar cells and modules can implement the projects by entering into a suitable power purchase agreement (PPA) with the SEBs. MNES also encourage the industry and private sector to set up grid interactive SPV power projects.

Further, the government is implementing biogas, improved Chulhas and integrated rural energy programs for energizing the rural sectors. A cumulative total of 3.4 million biogas plants have been set up till March 2002 against the potential of 12 million biogas plants.

The government offers special incentives for "turnkey entrepreneurs" in rural areas. Training centers for biogas development in nine states are in operation.

Besides solar, wind and biomass, there are other environment friendly renewable sources like Fuel Cells, Hydrogen Energy, Battery Operated Vehicles, Geothermal Energy, Ocean and Tidal Energy.

## III. RENEWABLE ENERGY

It is any source of energy that does not consume the finite resources of the earth and can be replenished. This exists in many forms including solar energy, photo voltaic, wind, hydro, tidal-wave and bio energy (including bio mass, bio gas and bio fuels). Our weather is an immense renewable energy resource driven by energy from the sun. it has been estimated that the energy output from 1cyclone is in order of 1000 billion KWH each day it exists. This is more energy output than a standard power station produces in 15 years.

## IV. NON RENEWABLE ENERGY

Non renewable energy fossil fuels (crude oil, natural gas, coal, oil shales and tar sands). It is a energy produced by burning fossil fuels such as coal. They are non renewable because they are finite resources of fossil fuels on the planet. If they are continuously used, one day they will run out.

It is estimated that the total amount of energy gained from fossil fuels since the start of civilization in equivalent to the same amount of energy we receive every 30days from the sun.

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## V. ADVANTAGES

- Solar energy is free although there is a cost in the building of collector and other equipments required to convert solar energy into electricity.
- Solar energy does not cause pollution.
- Solar energy can be used in remote area where it is too expensive to extend the electricity power grid.
- Many electric gadgets such as calculators and other low power consuming devices can be powered by solar energy effectively.
- It is estimated that the world's oil reserve will lost for 30-40 years. On the other hand solar energy is infinite forever.

## VI. DIS ADVANTAGES

- Solar energy can also be harnessed when it is day time and sunny.
- Solar collectors, panels and cells are relatively expensive to manufacture although prices are falling rapidly.
- Solar power station can be built but they don't match the power output of similar size conventional power stations.
- They are also very expensive.
- Large areas of lands are required to capture the sun energy collectors are usually arrange together especially when electricity is to be produced and used in same location.
- Solar power is used to charge batteries. So, that the solar powered devices can be used at night. However, the batteries are large and heavy and need storage space. They also replacing from time to time.

## VII. COST ANALYSIS

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In general, a family of house 5 members requires 1, 00,000 Rupees towards solar energy system insulation for lighting, pumping of water from bore well, A/C etc., (Domestic Purpose). The government will give 25 to 30% subsidy; balance amount has to be barrowed by the owner of the houses and maintance cost is negligible.

## VIII. CONCLUSION

If the above targeted potential is fully exploited, renewable energy sources will play a major role in coming years in supplying power to many of the rural areas and accelerate the economic progress of the county.

## REFERENCES

Azmal Hussain "Renewable Energy Global Perspectives," 1st Edition, 2008.

C. J. Wang and Y. B. Xue, "Solar Building Design," Beijing: China Architecture & Building Press, 1st Edition, 2007.

S. N. Wang, "The Development of Solar Building Technology in Domestic and Foreign," Journal of New Building Materials, No. 10, 2008.

T. S. Xin and C. M. Yang, "Application of Solar Energy Technology to Congregated House," Journal of Architecture, No. 8, 2006.

Y. H. Wang, "Design of solar Residential Building Integration," Journal of Building Energy Efficiency, Vol. 38, No. 1, 2010.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# FABRICATION OF PAPER BRICK WITH PARTIAL REPLACEMENT OF CEMENT

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***ABSTRACT***

***Generally bricks are key construction materials for buildings. Particularly in low cost housing construction materials are replaced with economic and eco materials. So, in that case paper bricks are useful and they play a key role in the construction. Building materials of the future have to be lighter weight, energy efficient and lower cost. The objectives of the study are to develop light weight paper bricks from waste paper with minimum cost. Waste paper is used as raw material. The paper is hydrated and spun to obtain paper pulp slurry. This slurry is mixed with cement and cast to shape. By adding different mixes compressive strength and water absorption tests are conducted. The results showed that experimental bricks had higher compressive strength and less water absorption when compared to conventional bricks. It is concluded that paper bricks from waste paper posses attractive properties of good strength, sustainability and low cost. The result shows that the combination of paper waste and cement provides better results for producing economical new bricks with considerable economy by saving cement.***

***KEY WORDS: Paper bricks, Compressive strength, Water absorption, Efflorescence,*** **Waste paper, and Cement.**

## I.INTRODUCTION

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
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Since a large demand has been placed on building material industry especially in the last decade, due to the increasing population causes a chronic storage of building materials, the civil engineer has been challenged to convert industrial waste to useful building and construction materials.

Recycling of waste water as building materials will be better solution for environmental problems. The increase in usage of eco friendly, lower cost and light weight construction materials in building industry shows the need for recycling and reusing the materials. There are different types of bricks, depending upon the raw materials used for making bricks. Paper sludge mainly consists of cellulose fibre and inorganic materials.

The moisture content normally present in paper sludge may vary from 60-75%. However, this value can be reduced to as low as 35% by dewatering processes. The inorganic components are mainly kaolinite and calcium carbonate which reflects surface coating agents during the original paper making. In addition, paper sludge also contains heavy metals from inking activities such as writing and painting.

## II. MATERIALS

Cement which is used was an ordinary Portland cement throughout. It acts as a good binder with paper sludge to produce paper brick. It hardens quickly when mixed with paper sludge and water, waste news paper was used

## III. EXPERIMENTAL PROCEDURE

- Step-1:The waste paper was soaked in water for 24 hours,
- Step-2:Make the paper pulp,
- Step-3:Pore the cement into the paper pulp and mix it thoroughly,
- Step-4:Now add the water and mix it at uniform colour,
- Step-5:Pour the mixed proportion into the mould,
- Step-6:Vibrate the mix to remove the air with the help of Vibrator machine,
- Step-7:Remove the forms (moulds),
- Step-8:Let the Bricks dry for at least one week,

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**International Journal Of Core Engineering & Management (IJCEM)**
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- Step-9: After precede the tests.

Step-1

Step-2

Step-3

Step-4

Step-5

Step-6

Step-7

## IV. TESTS ON BRICKS

There are three tests which are conducted on paper bricks. Name wise

- Compressive strength of bricks
- Water absorption of bricks
- Efflorescence on bricks

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**International Journal Of Core Engineering & Management (IJCEM)**
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**Compressive strength test on bricks: (As per IS 3495-1992)**

This is a property of bricks which can be determined accurately. The compressive strength of bricks is found by crushing 12 of them individually until they fail or crumble. The pressure required to crush them is noted and the average compressive strength of the brick is stated as Newton's per $mm^2$ of surface area required to ultimately crush the brick. The crushing resistance varies from about $3.5N/mm^2$ for soft facing bricks up to $140N/mm^2$ for engineering bricks.

**Procedure for testing:**

- Unevenness observed in the bed faces of bricks is removed to provide two smooth and parallel faces by grinding. It is immersed in water at room temperature of 24 hours.
- The specimen is then removed and any surplus moisture is drained out room temperature. The frog and all voids in bed face are filled with cement. It is stored under the damp jute bags for 24hours followed by immersion in clean water for 3 days.
- This specimen is placed at flat faces horizontal, and mortar filled face facing upwards between two plywood sheets each of 3mm thickness and carefully centred between places of testing machine.
- 4) Load is applied uniformly rate of 14 Mpa/min till failure occur. The load at failure is consider the maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine

**Calculation: Load Failure/Area of brick.**

Specification: The average Compressive strength of bricks (as per IS 3495-1992) is 4.5 Mpa.

**Water absorption test on bricks: (As per IS 3495-1992)**

Water absorption depends on porosity, which is due to presence of attains voids in various sizes. Some of Pores may be through pores which permit air to escape in absorption tests and allow free passage of water in absorption tests, but other are completely seated and inaccessible to water under ordinary conditions. For this reason it is seldom possible to fill more than about three quarters

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**International Journal Of Core Engineering & Management (IJCEM)**
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of pores by simple immersion in cold water. For measuring total absorption the boiling method is adopted.

**Procedure for testing:**

- The specimen is dried in a ventilated oven at a temperature of 105˚c to 115˚c, till it sustainability constant mass. The specimen is cooled to room temperature and its weigh is recorded (M1).
- The dried specimen is immersed completely in clean water at room temperature of 27± 20˚c for 24 hours.
- The specimen is then removed and traces of water are wiped out with a damp cloth and the specimen is weighed. The weighing is completed 3min. After the specimen has removed from water (M2).

**Calculation:** (M2-M1/M1) *100

Specification:When tested as above, the average water absorption shall not be more than 20% by weight.

**Efflorescence test on bricks:**

Usually sulphate of magnesium, calcium, sulphate and carbonate bricks with magnesium (and sometimes chloride and nitrates) of sodium and potassium are found in efflorescence used in construction, the foundation soil, ground water, over in contact with brick work. Sodium sulphate content higher than 0.05 percent should not be used in construction. Soluble salt content in sand should not exceed 0.1%.

Soils used in manufacture of bricks should be free from salts of sulphates and potassium; if such salts are present in bricks then they will get dissolve. When bricks containing such type of salts are used as exposed surface then serious disfigurement shall occur when such bricks are given covering treatment then the disruption of surface layer shall takes place. This phenomenon is known as Efflorescence.

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**Procedure for testing:**

- Distilled water to be filled in a dish of sustainable size, the dish should be made of glass, porcelain or glazed stone were. Place the end of the bricks in the dish, the depth of immersion in water being 25mm, place the whole arrangements in a warm (for example 20 to 30˚c ) well ventilated room un till all the water in the dish is absorbed by the specimen and the surface water evaporate. Cover the dish with suitable cover, so that excessive evaporation from the dish may not occur.
- When the water has been absorbed and brick appear to be dry, place a similar quantity of water in the dish and allow it to evaporate as before .Examine the brick for efflorescence after the second evaporation.

**Calculation:**

- For 85% of Paper pulp, 15% of cement: Not more than 10% of area of the brick covered with a thin deposit a thin deposit of salt. So, it has Slight Efflorescence.
- For 80% Paper pulp, 20% cement: Not more than 10% of area of the brick covered with a thin deposit a thin deposit of salt. So, it has Slight Efflorescence.
- For 75% Paper pulp, 25% cement: Not more than 10% of area of the brick covered with a thin deposit a thin deposit of salt. So, it has Slight Efflorescence.

## V. RESULTS AND DISCUSSIONS

**Compressive strength results:**

| Specimen | % Of Cement Add | Compressive Strength (Mpa) |
|---|---|---|
| B1 | 15% | 2.5 |
| B2 | 20% | 3.5 |
| B3 | 25% | 4.1 |

**Water absorption results:**

| Specimen | % Of Cement Add | Water Absorption (%) |
|---|---|---|
| B1 | 15% | 35.8 |

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| | | |
|---|---|---|
| B2 | 20% | 32.8 |
| B3 | 25% | 28.8 |

**Efflorescence results:**

| Specimen | % Of Cement Add | Efflorescence |
|---|---|---|
| B1 | 15% | SLIGHT |
| B2 | 20% | SLIGHT |
| B3 | 25% | SLIGHT |

## VI. ADVANTAGES

We can easily recycle paper waste, these bricks are environmentally friendly, these bricks are Light in weight but good strength, Easy to use and expenses are low.

## VII. CONCLUSIONS

Based on the experimental investigations, the following results have been found. The optimum (%) of cement replacement in paper brick and compressive strength of the bricks are studied. It has been gained to 4.1% strength and is more compared with cement bricks. Paper bricks are more economical and the time required to prepare bricks is less compared to ordinary bricks. Paper bricks are recycled and help in using waste paper.

## REFERENCES

Building construction by Dr B.C Punmia, Ashok kumar Jain, Arun kumar Jain, Laxmi publications (P) Ltd., tenth edition, 2010.

Building materials by S.kDuggal, New age international publishers, fourth edition, 2012.

Properties of concrete by A.M.Neville, Indian edition published by Dorling Kindersley India Pvt. Ltd., Fourth impression, 2013.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
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Building Construction by Rangwala, Charotar publishing Pvt. Ltd., thirty second edition, 2014.

Concrete technology by M.L Gambhir, Mc Graw Hill Education Pvt.Ltd., fifth edition, 2013.

Concrete technology by M.S. Shetty, S.Chand & Company Pvt.Ltd. seventh revised edition, 2013.

Fabrication of paper bricks from paper waste and cement by Gobinath R, Saranyadevi D., Jeevanantham E, Dinesh J, Karthick S, Karthickeyan S, recent trends in civil engineering & technology, volume 4, no 2 (2014).

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# A NON-LINEAR DYNAMIC ANALYSIS OF RCC SHEAR WALL FOR SYMMETRIC REGULAR MUTISTOREY (G+19) BUILDING USING NEWMARK'S LINEAR ACCELERATION METHOD

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***ABSTRACT***

***This paper presents the non linear dynamic analysis of G + 19 multi storied building using RCC shear wall as resisting system. The building considered is symmetric in plan and is analyzed using Newmark's linear acceleration method using time stepping method considering EL Centro ground acceleration values with time interval of 0.02seconds. This work is carried out for enhancing the use of non linear analysis procedures and use of real ground acceleration values for analysis of buildings which increases the safety of the building analysis and helps in effective understanding the effect of real acceleration values on the structures. Results presented in this paper detail the peak values of lateral force, displacement of the considered building made analyzed using ElCentro ground acceleration values.***

***KEYWORDS: Dynamic analysis, shear wall, Newmark's linear acceleration method***

## I. INTRODUCTION

As we know that the earthquake and seismic forces are the major problems being faced in structural engineering field. As the earthquake is a natural phenomena, so one can't stop it but can resist it's effects by constructing different structural models by using different design and analytical methods, in

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that case we are going to a special case that is construction of a shear walls and analyzing them for a non-linear response.

Shear walls are the walls which are constructed mainly for high-rise RC frame buildings to resist seismic forces and wind forces coming on to the structures. These are the tall walls which are constructed from the foundation up to the top of the roof like as column. The shear wall has major advantages in structural field i.e., one can't afford to build concrete buildings meant to resist sever earthquakes without shear walls. Shear walls are easy to construct, because reinforcement detailing of walls is relatively straight-forward and therefore easily implemented at site. Shear walls are efficient, both in terms of construction cost and effectiveness in minimizing earthquake damage in structural and non-structural elements (like glass windows and building contents). Shear walls are generally planar but often constructed in L, T, U shapes also for suit of plan and increase the flexural stiffness of tall structures.

## II. LITERATURE REVIEW

**[1]M.S.Medhekar ,Gehad Ez-El-Din Rashad and Sudhir K.jain,[1992]** suggests the required specifications in addition to IS: 4326-1976 Provisions regarding shear design of flexural members. Step by step procedure for calculation of plastic moment capacity is given. Ductile structure may yield during earthquake, increases its time period and reduces the earthquake forces. Shear failure is avoided because it is brittle failure. Members are designed for the factored moments and shears obtained from analysis for a given load combination. The design shear force will be larger of

1). Shear obtained from analysis for given load combinations

2). The actual shear that is likely to develop in a member after flexural failure has taken place.

The design shear force will be calculated on the basis of ultimate moment capacity of plastic hinges at the ends of members.

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IS: 4326-1976 provisions for web reinforcement, spacing of stirrups shall be given. Partial safety factors for steel and concrete should be taken as 1.0, and stress in tension reinforcement of 1.25fy is assumed for calculation of plastic moment Capacity. Alternative parameters from ACI specifications are given for calculation of plastic moment capacity.

The author suggests that proposed method is quite accurate for under–reinforced section but considerably underestimates the plastic moment capacity of over reinforced section. But over reinforced sections are not be used in seismic design of structure due to poor ductility.

**[2]Sudhir K.Jain., et.al,[2002],** describes the context of the push-over analysis and illustrates its utility with the results of analysis on a hypothetical example building. Author observed that, a large number of buildings in our country need seismic retrofitting. These buildings are to be provided with additional strength, stiffness and ductility to ensure acceptable performance in a future earthquake. This paper discusses the concept of "push over analysis", that is becoming a popular tool in the profession for,

i) Design of new buildings.

ii) Seismic evaluation of existing buildings, and

Developing appropriate strategy for seismic retrofitting of buildings.

**[3]Sudhir K.Jain [2003]** reviewed the code of IS 1893 (Part-1): 2002, contains a discussion on clauses that are confusing and need classifications. The topographical and editorial errors are pointed out. Suggestions are also included for next revision of the code

The following observations are made from this paper

1. The seismic zone map now contains only four zones as compared to the five zones earlier, and relative values of zone factors are different.
2. The design spectrum shape depends on the type of soil and foundation soil factor has been dripped.

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3. The minimum design force based in empirical fundamental period of the building even if the dynamic analysis gives a very high value of natural period and thus low seismic force.
4. Most India buildings are soft storey buildings as per codal definitions simply because the ground storey height is usually different from that in the upper storey.
5. In the load combination the load factor 0.90 for gravity load, 1.5 for earthquake loads is used the in RC structures.

Comments and suggestions on earthquake intensity, risk level, service life of structure, response spectrums etc are given. The author suggests that there is need to simplify provisions on torsion in buildings, treatment of soft storey buildings, treatment of building, treatment of building with masonry infill walls etc.

## III. OBJECTIVE AND SCOPE

The main objective of this project is to show the importance of the earthquake resistant structures which will with stand the lateral forces. As the population of the world will goes on increasing so to provide the shelter, transportation, etc., for present and future population we have to construct more number of tall building structures which will satisfy the more people in economy space provided. But tall building structures are more sensitive regarding the lateral forces comparative to low and mid-rise buildings.

So, to resist that type of loadings, earthquake structural resisting systems to be used which will be a part of the structure. Different types of earthquake resisting systems are available for high-rise building but in which Shear walls are the most undertaking earthquake structural resisting systems which are simple to design and simple to execute. These shear walls are just like normal partition walls, they easily mix up with the structure. They will not destroy the appearance of the structure.

So, the present study is giving more importance to the analysis of shear wall for high-rise buildings.

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As the current project is analyzing the shear wall under dynamic method that is non-linear analysis for ground acceleration values of EL Centro which were recorded in 1940 at California, at that time these are the peak ground acceleration values in addition to that some more ground acceleration values which are recorded at different positions in different time but most of the scientists taken these values as a reference for the earthquake resistant design of structure and also the present softwares which are working for structural engineering filed also using these EL Centro values as a reference medium.

So, basing on these typical values and procedures the present project will give a peak and accurate result which will have a very good scope for future analysis

## IV. METHOD OF ANALYSIS

**Time history analysis:**

Nonlinear dynamic analysis utilizes the combination of ground motion records with a detailed structural model, therefore is capable of producing results with relatively low uncertainty. In nonlinear dynamic analyses, the detailed structural model subjected to a ground-motion record produces estimates of component deformations for each degree of freedom in the model and the modal responses are combined using schemes such as the square-root-sum-of-squares.

Time history analysis provides for linear or Non-linear evaluation dynamic structural response under loading, which may vary according to the specified time function.

Time history and response spectrum methods are the two basic methods that are commonly used for the seismic dynamic analysis. The time history method is relatively more time consuming, lengthy and costly. The response spectrum method, on the other hand it is relatively more time consuming more rapid concise and economical. Now days it's more convenient for using time history method than before for advancing of computer's hardware and software.

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Several methods exist to input seismic excitation when making the seismic time history analysis for design.

- To input displacement time history at the base, this is called displacement method.

- To input the inertia loading, calculated from the time history of support motion acceleration, this is called acceleration method.

The time history analysis (THA) technique represents the most sophisticated method of dynamic analysis for buildings. in this method, the mathematical model of the buildings is subjected to accelerations from earthquakes records that represent the building is subjected at the base of the structure. the method consists of a step by step direct integration over a time interval the equations of motion are solved with the displacements, the equation of motion can be represented as:

$$\mathbf{Kx(t)+Cx^{*}(t)+Mx^{**}(t)=P(t)}$$

Where

K is the stiffness matrix, C is the damping matrix;

M is the diagonal mass matrix. p(t) is the applied load and

x, $x^{*}$,$x^{**}$ are the displacements, velocities and accelerations of the structure

## V. SHEAR WALLS

Shear walls are specially designed structural walls incorporated in building to resist lateral forces that are produced in the plane of the wall due to wind, earthquake and other forces. These walls behave more like flexural members. They are usually provided in tall buildings and have been found to be of immense use to avoid total collapse of building under seismic forces. It is always advisable to incorporate them in buildings in regions likely to experience earthquake of large intensity or high

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winds. Shear walls for wind are designed as simple concrete walls. The design of these walls for seismic forces requires special considerations as they should be safe under repeated loads

## VI. DIFFERENT GEOMETRIES OF SHEAR WALLS

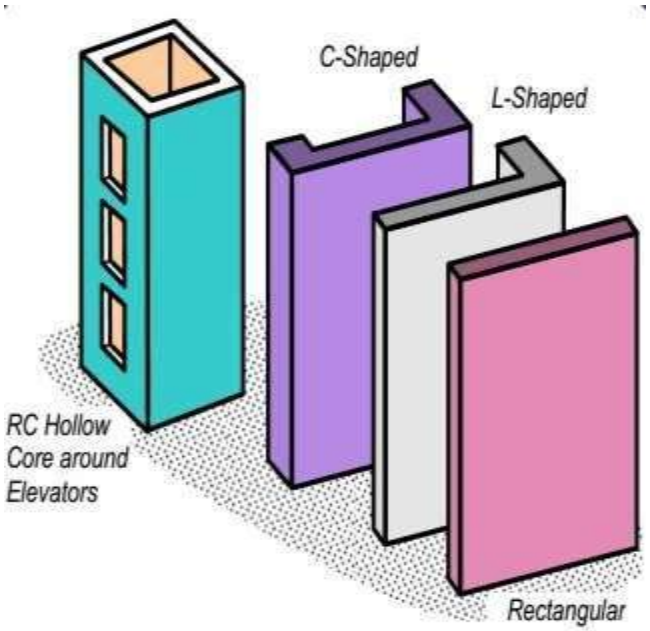


Fig-1: Different geometries of shear wall

## VII. EXPERIMENTAL DATA

No of stories = G + 19

Columns size = ( 0.4 x 0.4 ) m

Girders : (0.3 x 0.6) m.

Dead Load + Live Load = 10 kN/$m^2$.

**Member properties:**

Inertia of a single wall about its strong axis

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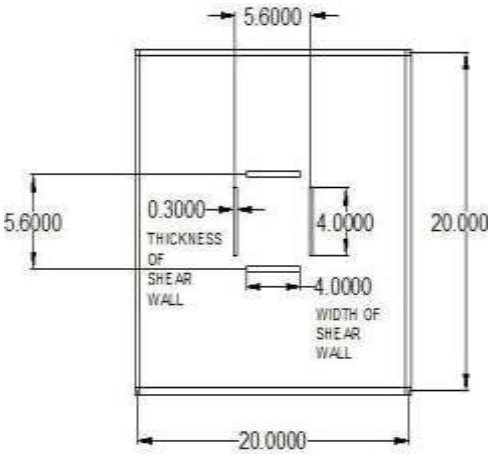
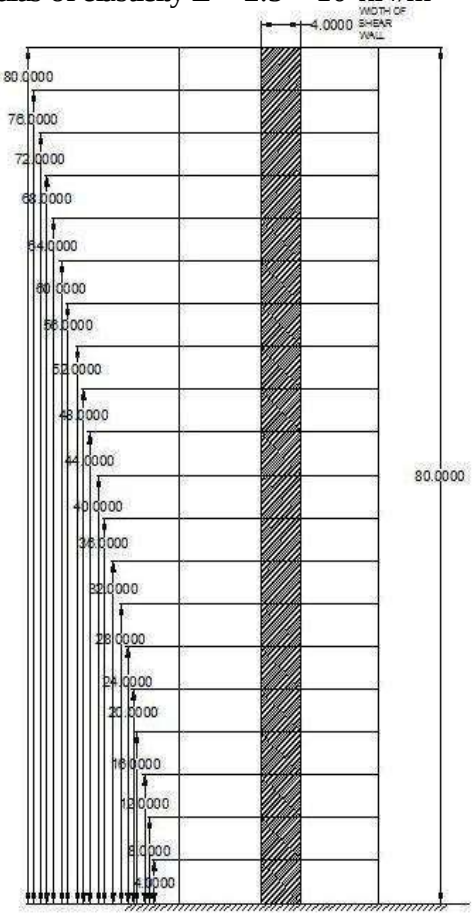
= $(0.3 * 4^3)/12 = 1.6m^4$ Inertia of a single column

= $(0.4 * 0.4^3)/12$

= $0.002m^4$

Inertia of a girder = $(0.3 * 0.6^3)/12 = 0.005m^4$ Modulus of elasticity $E = 2.5 * 10^7 kN/m^2$




## VIII. ANALYTICAL PARAMETERS

Dividing the floor plan at a typical level into25parts, 4m X 4m region, each carrying 160kN g ravity load,

$\Sigma p = 25 * 160 = 4000kN$

Shape value=

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Stiffness = $\frac{1-\cos\left(3.14*\frac{x}{160}\right)}{12*\frac{80000000}{x^3}}$

Where x = height of the each storey from the base.

Mass of each storey = (4000/9.81) = 407.7472

Using shape function concept the following generalized parameters calculated are

Mass = 2054.90377 kN-sec$^2$/ m.

Stiffness = 1137.1785 kN/m.

Damping = 11.4 kN-sec/m.

By using these values, the calculated constant values used in the iteration process are:

Taking, $\gamma = \frac{1}{2}$ & $\beta = \frac{1}{6}$ ; and acceleration due to gravity, g = 9.81 m/sec$^2$.

Effective stiffens = 30826403.73 kN/m.

Using newmark's time history linear acceleration values the analysis was carried out by a preparation of a spread sheet for considered EL Centro ground acceleration values the analysis procedure was carried

## IX. ANALYSIS PHILOSOPHY

The maximum shear force in the entire considered loading history of seismic activity has been identified. For solving this non linear response of shear walls by linear acceleration method, the following parameters are required to be taken and are analyzed in a chronological order.

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The time interval selected for this problem is 0.02 sec. i.e., at each and every time step of 0.02 the shear force exerted on to the shear wall has been calculated and maximum shear force generated is identified and for maximum value of shear force, structural element (shear wall) is to be designed. For every time interval, acceleration, velocity, displacement (drift) of the shear wall is calculated. i.e., Initial stiffness of shear wall at first time step 0.02sec is to be calculated by using load deflection relationship.

A Damping coefficient is also calculated which break downs or shut down earthquake load after that the stiffness of the shear wall and incremental effective force is calculated. With the help of these values the incremental displacement, velocity are calculated for every time interval and therefore the shear force using load deflection relationship is calculated and acceleration is checked for each and every time interval.

The above procedure is repeated till maximum shear force in each time interval is achieve

***Table 1 :details of base shear distribution for each floor with respect to height.***

| FLOOR LEVEL | BASE SHEAR | % Distribution of base shear for each floor | % change with height | % difference of base shear with floor to floor |
|---|---|---|---|---|
| 4 | 0.013465363 | 0.000187847 | 0.018784721 | 6.247449045 |
| 8 | 0.214887658 | 0.002997769 | 6.266233766 | 13.60473398 |
| 12 | 1.08141516 | 0.015086175 | 19.87096774 | 11.95654766 |
| 16 | 3.397736664 | 0.047399789 | 31.8275154 | 9.496201188 |
| 20 | 8.222243652 | 0.114703597 | 41.32371659 | 7.435075302 |
| 24 | 16.86309962 | 0.235247003 | 48.75879189 | 5.986394972 |
| 28 | 30.80288988 | 0.429712668 | 54.74518686 | 4.756160846 |

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| | | | | |
|---|---|---|---|---|
| 32 | 51.76839024 | 0.722189806 | 59.50134771 | 4.026049551 |
| 36 | 81.48986496 | 1.136816299 | 63.52739726 | 3.38752683 |
| 40 | 121.7813008 | 1.698897988 | 66.91492409 | 2.889718888 |
| 44 | 174.4601728 | 2.433789381 | 69.80464298 | 2.513661096 |
| 48 | 241.2393031 | 3.365385032 | 72.31830407 | 2.20912345 |
| 52 | 323.6919764 | 4.515632893 | 74.52742752 | 1.94427572 |
| 56 | 423.2833358 | 5.904972299 | 76.47170324 | 1.758023523 |
| 60 | 541.0773542 | 7.548246099 | 78.22972677 | 1.581943501 |
| 64 | 677.9426522 | 9.457571899 | 79.81167027 | 1.439923699 |
| 68 | 834.3745878 | 11.63986014 | 81.25159397 | 1.322113137 |
| 72 | 1010.460372 | 14.09632745 | 82.5737071 | 1.215705681 |
| 76 | 1205.952325 | 16.8235186 | 83.78941279 | 1.128715036 |
| 80 | 1420.135319 | 19.81145726 | 84.91812782 | |
| | **7168.405258** | | | |

## X. RESULTS AND DISCUSSION

The results are presented in table 1. By observing the results obtained using the EL Centro ground acceleration values a peak base shear is obtained for the consider shear wall for the considered structural plan after a huge successful iteration process, at last the peak base shear value would obtained is 7168.405258 kN at ground acceleration value of - 0.3556 and this peak base shear value can be used for the further process of designing of a shear wall for the considered structure.

The work was done in consideration of a 20 storey building contains shear wall of (0.3 x 4) m in dimension with considering E = 2.5 x $10^7$ kN/$m^2$. A service load of 10 kN/$m^2$ was considered for a total area of building of 20 x 20m i.e, 400 $m^2$, each floor area is divided into 25 equal parts of (4 x 4) m. Hence the split of 25 equal parts of area was made each part of the floor occupies a service

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load of 160 kN, Hence for each floor a load of 4000 kN was considered a total load of 8 x $10^4$ kN was calculated.

This total weight of the building was then calculated for generalized mass, generalized stiffness, generalized damping for all the floors using generalized coordinate method using mode shape values.

Shear wall from each floor to base was considered, as shear wall/ structural wall is a continuous system from the bottom of base level to each individual floor level. The effect of lateral force will be observed by shear wall at each floor and is dissipated. As structural wall/ shear wall is a continuous system, cumulative height was considered for each floor from base level and then stiffness of each floor was calculated.

The building with shear wall was analyzed by the use of non linear newmark's equation by considered time period of 0.02sec for EL Centro ground acceleration values.
The change of base shear was linear when observed with height and a significant effect of change of pattern of lateral force was started at 36m height of building where nearly 1.13% of total lateral force was concentrated at the height and 19% of total base shear was observed at 80m level of building.

When compared with height the change of base shear was 6% from 4m to 8m height of building, 13% from 8m to 13m of building, 11% from 12 to 16m of building, 9% from 16 to 20m, 7% from 20 to 24m, 6% from 24m to 28m, 5% from 28 to 32m, 4% from 32 to 36m, 3.5% from 36 to 40m, 2.5% to 2% from 40m to 52m of height of building, 2% to 1.2% from 52m to 80m height of the building, this mentioned change of base shear from storey to storey represents marginal percentage increase with respect to floor to floor levels of considered 20 storey building. A total of 7168.41kN of base shear was observed for the building with use of EL Centro values and with time interval of 0.02 seconds.

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## XI. CONCLUSIONS

In the present study, 1559 EL Centro ground acceleration values are considered and these values are used for finding peak base shear of shear wall at each floor, the procedure is repeated to find out the peak base shear of a shear wall, so that here we concluded that shear walls are the more prominent structures in earthquake resistant design for high-rise buildings. In this project we got a peak base shear of 7168 kN at a ground acceleration value of -0.3556 so it is shown that the shear wall would resist the base shear of great value which will a building cannot with stand for that lateral force. Here also the shear wall is responding in a short interval of time when the earthquake is produced, so this show that importance of shear wall in high-rise buildings which are analyzed under non-linear analysis for peak ground acceleration values.

## XII. FUTURE SCOPE

The present study has been used for future analysis also and it is said to be as follows:

- The peak base shear which is find out in this project can be used for the future design process so that we can easily work out the detailing of reinforcement and remaining parameters.
- The translational parameters are also useful for the building design simultaneously in the design of a shear wall.
- As in this project we analyzed the considered problem under non-linear analysis that is dynamic method for peak ground acceleration values which shows that the results obtained are at ultimate state values.
- As we know that earthquake is a natural disaster and losses from these phenomena giving more interest on the earthquake resist design especially for high rise buildings, for this type of discussions this study has a good future scope

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## REFERENCES

Limit state reinforced concrete design-by A.K.Jain

Comparative analysis of Multistoried building for building for vertical and seismic loading –by G.V.Rama Lingeswara Rao

Reinforced concrete volume volume I-by H.J.Shah

Advanced reinforced concrete design-by N.Krishna Raju

Earthquake resistant design of concrete structures-by Dr. S.K.GHOSH

Technical instructions seismic design for buildings-(from internet).

## CODE BOOKS

IS:456 –2000 Indian standard code of practice for plain and reinforced concrete

SP-16 Design aids for reinforced concrete to IS:456-2000.

IS-1893(part1):2002 Criteria for earthquake resistant design of structures .part1: General provisions and buildings (5th revision).

IS-4326:1993-earthquake resistant design and construction of buildings-code of practice (2nd revision)

SP-22-1982-Explanatory Hand Book on codes for earthquake engineering IS: 1893-1976 &IS: 4326-1976.

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IS: 13920:1993 Ductile detailing of reinforced concrete structures subjected to seismic forces-code of practice.

IS:875 (part 2)-1987 code of practice (other than earthquake) part 2 :Imposed loads (2nd revision)

IS:875 (part 3)-1987 code of practice for design loads (other than earthquakes) part 3: Wind loads (2nd revision)

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# A NOVEL APPROACH FOR TRAVEL SUGGESTIONS USING CROWD SOURCING

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***ABSTRACT***

***Now a day's large amount of digital data is being accumulated in various significant fields, including e-commerce, social network, tourism, finance, health care, education, and environment. However, the rapid growth of online travel information imposes an increasing challenge for tourists who have to choose from a large number of available travel packages for satisfying their personalized needs. The Present travel recommender system model is not upon user side at all. With many existing recommenders user cannot make own packages based upon ratings of previous tourist's. In this paper a recommender model is developed based on crowd sourcing, where it suggests the tourist's where-when-why to travel. Here, the previous travelers give their ratings upon the routes, accommodation, food etc and from the resulting reviews of old customers, the new customers make comfortable packages by including their own places by their own wish. Experimental results have shown significant benefits of the proposed model.***

***Keywords: Web mining, Recommender system, Data mining, Crowd sourcing.***

## I. INTRODUCTION

The ubiquity of Web can be characterized by the enormous volume and coverage of Web content, the phenomenal number of Web users and businesses, the vast number of computers and devices accessing Web, and the large number of Web-based applications [6]. Crowd sourcing is the

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process of getting work or funding, usually online, from a crowd of people. The word is a combination of the words 'crowd' and 'outsourcing'. The idea is to take work and outsource it to a crowd of workers. Famous Example: Wikipedia. Instead of Wikipedia creating an encyclopedia on their own, hiring writers and editors, they gave a crowd the ability to create the information on their own. The result is the most comprehensive encyclopedia this world has ever seen. The principle of crowd sourcing is that more heads are better than one. By canvassing a large crowd of people for ideas, skills, or participation, the quality of content and idea generation will be superior.

As an emerging trend, more and more travel companies provide online services [2, 3, 5]. However, the rapid growth of online travel information imposes an increasing challenge for tourists who have to choose from a large number of available travel packages for satisfying their personalized needs. Moreover, to increase the profit, the travel companies have to understand the preferences from different tourists and serve more attractive packages [4]. Therefore, the demand for intelligent travel services is expected to increase dramatically.Since recommender systems have been successfully applied to enhance the quality of service in a number of fields, it is natural choice to provide travel package recommendations.

Despite of the increasing interests in this field, the problem of leveraging unique features to distinguish personalized travel package recommendations [4] from traditional recommender systems remains pretty open. Indeed, there are many technical and domain challenges inherent in designing and implementing an effective recommender system for personalized travel package recommendation. First, travel data are much fewer and sparser than traditional items, such as movies for recommendation, because the costs for a travel are much more expensive than for watching a movie. Second, every travel package consists of many landscapes (places of interest and attractions), and Also, different travel packages are usually developed for different travel seasons [1, 3]. Third, traditional recommender systems usually rely on user explicit ratings. However, for travel data, the user ratings are usually not conveniently available. Finally, the traditional items for recommendation usually have a long period of stable value, while the values of travel packages can easily depreciate over time and a package usually only lasts for a certain period of time. The travel companies need to actively create new tour packages to replace the old ones based on the interests of the tourists.

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In this paper a model is developed based on a recommendation approach that can be use crowd source method which is based upon rating of users. These ratings are aggregated and analyzed to suggest and for creating of user's own travel packages using crowd source method. The model has two phases where in the phase the model has search and review methods by the existing users who can give ratings on specification of travelers in review method. Then in the second phase has the search method in which travelers can make their own package based upon reviews of existing users by crowd source method. Experiments shown significant quality in suggesting the travel packages to the user.

## II. RELATED WORK

Web mining refers to the discovery of knowledge from Web data that include Web pages, media objects on the Web, Web links, Web log data, and other data generated by the usage of Web data. Kosala and Blockeel classified Web mining into: (a) *Web content mining*, (b) *Web structure mining* and (c) *Web usage mining* [3]. Web content mining refers to mining knowledge from Web pages and other Web objects. Web structure mining refers to mining knowledge about link structure connecting Web pages and other Web objects. Web usage mining refers to the mining of usage patterns of Web pages found among users accessing a Website. Among the three, Web content mining is perhaps studied most extensively due to the prior work in text mining. The term "collaborative filtering" was introduced in the context of the first commercial recommender system, called Tapestry, which was designed to recommend documents drawn from newsgroups to a collection of users. The motivation was to leverage social collaboration in order to prevent users from getting inundated by a large volume of streaming documents. Collaborative filtering, which analyzes usage data across users to find well matched user-item pairs, has since been juxtaposed against the older methodology of content filtering which had its original roots in information retrieval. In content filtering, recommendations are not "collaborative" in the sense that suggestions made to a user do not explicitly utilize information across the entire user-base [5]. Some early successes of collaborative filtering on related domains included the GroupLens system.

## III. PROPOSED MODEL

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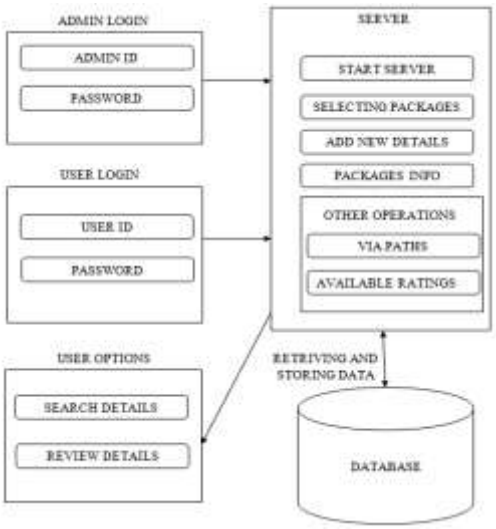
The proposed system is designed in two phases as shown in figure 1 where in the first phase the user's data is accumulated and managed through crowd sourcing.

### A. User Review Phase

Initially admin need to login by entering the admin id and a correct password. Once the admin logs in admin enters into the server. In this module, Users are having authentication and security to access the information from the system and as well they can enter their reviews elaborately as per the database design as shown in figure 2. Before accessing or searching the details user should have the account in that otherwise they should register first and provide the detailed information about the unique characteristics of travel package data. Thus, the users or the tourists and the items are the existing packages they experienced, and this exploits a real-world travel data.

### B. Package recommendation phase

The server collects some unique characteristics of the travel data based up on the reviews of users on information (e.g., price, transportation, and accommodations) of old travelers. Based upon the user's history of interest in satisfaction server will recommend travel packages. User can login in to system, can go through the ratings and can make their own package.




***B. Figure 1: System Architecture of Travel Package designer using crowd sourcing.***

### C. Database

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Data base mainly contains four table's registration table, tour review table, rating table, plan page table. In registration table, it contain name, user id(PK), password, email, age, loc, sex, time, review as attributes where user id act as primary key in this table. In tour review table, it contain tour id(PK),source,destination,via1,via2,via3,via4 as attributes where tour id act as primary key in this table for accessing other tables data. In rating table, it contain tour id(FK), place name, cost, travel, hotel, with family, with friends, total rating as attributes where tour id acts as foreign key which references tour review table for accessing other tables data. In plan page table, it contain tour id(PK),user id, start place, end place, interested, dot, days, no of persons, status as attributes where tour id acts as primary key which for accessing review page table data.

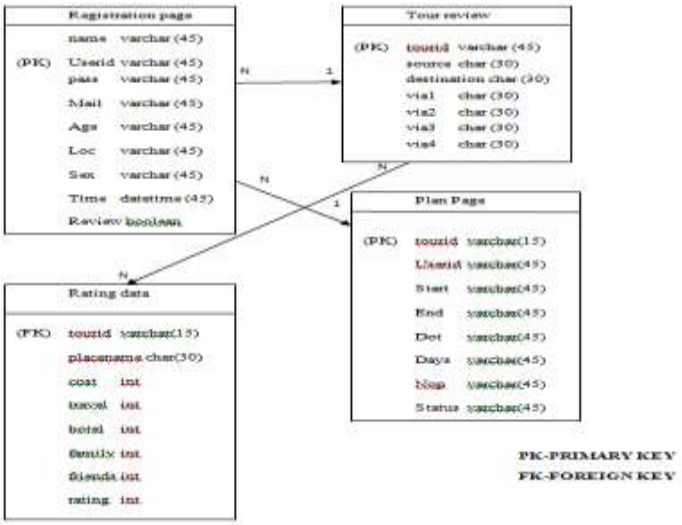


Figure 2: Snapshot of the database with cardinality relations

## IV. RESULTS

The experiments are made by the feedback of the user in terms of the satisfaction towards travel suggestions. It shows the average satisfaction of the user is significantly than the traditional travel package recommender which only considers overall rating. Table 1 shows the three test cases varying the number of users participating in crowd souring. Satisfaction of the user is calculated by taking inputs in the range of 1 to 5 and final aggregated values are transformed into the range of [0, 1].

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Table 1: Experiment result values for three test cases.

| *Technique* | *satisfaction* | | |
|---|---|---|---|
| | No of Users:20 | No of Users:40 | No of Users:100 |
| *With overall rating* | 0.552 | 0.653 | *0.781* |
| *With detailed ratings* | 0.965 | 0.958 | *0.974* |

## V. CONCLUSION

This paper presents the study on personalized travel package recommendation. Specifically, the proposed model first analyzed the unique characteristics of travel packages by crowd sourcing method (ratings) by old travelers. Then based upon this analysis new customers can make their own tour packages by observing the results (ratings) of pervious travelers. Finally, an empirical study was conducted on real-world travel data. Experimental results demonstrate that the review model can capture the unique characteristics of the travel packages, the novel approach can lead to better performances of travel package recommendation, and this recommender system model can be used as an effective assessment for travel group information.

## REFERENCES

Qi Liu, Enhong Chen, Hui Xiong, Yong Ge, Zhongmou Li, and Xiang Wu ,"A Cocktail Approach for Travel Package Recommendation", IEEE TRANSACTIONS, VOL. 26, NO. 2, FEBRUARY 2014.

C. Wang and D. Blei, "Collaborative Topic Modeling for Recommending Scientific Articles," Proc. ACM 17th ACM SIGKDD Int'l Conf. Knowledge Discovery and Data Mining, pp. 448-456, 2011.

Kosala, R., and Blockeel, H., "Web Mining Research: A Survey," *SIGKDD Explorations*, 2(1), June 2000.

U. Gretzel, "Intelligent Systems in Tourism: A Social Science Perspective," Annals of Tourism Research, vol. 38, no. 3, pp. 757-779, 2011.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
G. Adomavicius and A. Tuzhilin, "Toward the Next Generation of Recommender Systems: A Survey of the State-of-the-Art and Possible Extensions," IEEE Trans. Knowledge and Data Eng., vol. 17, no. 6, pp. 734-749, June 2005.

Q. Liu, E. Chen, H. Xiong, C. Ding, and J. Chen, "Enhancing Collaborative Filtering by User Interests Expansion via Personalized Ranking," IEEE Trans. Systems, Man, and Cybernetics, Part B: Cybernetics, vol. 42, no. 1, pp. 218-233, Feb. 2012.

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# A SIMPLE CIRCUIT FOR THE GENERATION OF HIGH VOLTAGE DC FROM AC BY USING LADDER NETWORK

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**Khairun Bee, Sujith Kumar**

GPREC, Kurnool

***ABSTRACT***

***This Paper presents a design to develop a high voltage DC from a supply source AC using the capacitors and diodes in a ladder network based on voltage multiplier concept. The method for stepping up the voltage is commonly done by a step-up transformer. The output of the secondary of the step up transformer increases the voltage and decreases the current. The other method for stepping up the voltage is a voltage multiplier but from AC to DC. Voltage multipliers are primarily used to develop high voltages where low current is required. This project describes the concept to develop high voltage DC from a single phase AC. For safety reasons our project restricts the multiplication factor such that the output would be generated. This concept of generation is used in electronic appliances like the CRT's, TV Picture tubes, oscilloscope and also used in industrial applications. The design of the circuit involves voltage multiplier, whose principle is to go on doubling the voltage for each stage. Thus, the output from voltage multiplier can generated. As this is not possible to be measured by a standard multimeter, a potential divider of 10:1 is used get the generated output. Due to low input impedance of the multimeter, the reading would actually be approximately 7 times the input AC voltage.***

## I. INTRODUCTION

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Alternating current (AC) is the most efficient way to deliver electrical power. However, most electronic devices need direct current (DC) to function. For this reason, AC to DC converters are either a part of devices themselves or as part of their power cords. If you've built a device you wish to power from an AC outlet, you must add an AC to DC converter.

A diode bridge is a device that changes Alternating Current (AC) to Direct Current (DC). The difference between these two kinds are that, AC is pulsed electricity switching polarities 50-60 times per second.

Find the voltage and amperage needed to power the components of your electronic device. Check the manufacturer's instructions, if necessary. Too much of either amperage or voltage will destroy the components, while too little will not allow the device to work correctly. Most have a safe range; aim for the centre so your input power can vary somewhat.

Use a transformer to step down the output from high-voltage AC to low-voltage AC. Electrical current enters the primary coil of the transformer and induces a current in the secondary coil, which has fewer coils, resulting in a lower voltage. Little power is lost in this process because the amperage increases in relation to the decrease in voltage.

Run the low-voltage AC through a rectifier. A rectifier usually consists of 4 diodes arranged in a diamond shape -- a type called a bridge rectifier. A diode only allows current to pass in 1 direction; the diamond configuration allow 2 diodes to pass the positive half of the current and the other 2 diodes to pass the negative half. The output of both sets is a current that climbs from 0 volts to the maximum positive voltage.

Add a large electrolytic capacitor to smooth out the voltage. A capacitor stores an electrical charge for a short time and then releases it slowly. The input from the rectifier resembles a string of humps; the output of the "smoothing capacitor" is a somewhat steady voltage with ripples. For devices that only need a low current, you can create a regulator with a resistor and a zener diode, which is designed to break down when a certain voltage is reached, allowing current to pass through it. The resistor limits the current. Pass the output of the smoother through a regulator. This smooth's out the

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ripples and creates a very steady current that will operate your electronic device without damaging it. Regulators are integrated circuits and can either have fixed or variable output voltages.

## II. VOLTAGE MULTIPLIER

A voltage multiplier is an electrical system that converts alternating current (a.c.) electrical power from a lower voltage to a higher direct current (d.c.) voltage by means of capacitors and diodes combined into a network. It is a known fact that when voltages are stepped up by means of transformers, the output current decreases. This is also true of voltage multipliers. Although the measured open-circuit output voltage of a voltage multiplier may be several times greater than the input voltage, once a load is connected the value of the output voltage decreases.

Voltage multipliers may be classified as voltage doublers, triplers, qudruplers, etc. The classification depends on the ratio of the output voltage to the input voltage. For example, a voltage multiplier whose open-circuit output voltage is two times the peak of the a.c. input voltage, $V_p$ is called a voltage doubler. Voltage multipliers 'amplify' the input voltage through the use of series-aiding voltage sources. This can be compared to the connection of dry cells (batteries) in series.

## III. LADDER NETWORK

String resistor ladder network (analog to digital conversion, or ADC) A string of many, often equally dimensioned, resistors connected between two reference voltages is a resistor string ladder network. The resistors act as voltage dividers between the referenced voltages.

A resistor ladder is an electrical circuit made from repeating units of resistors. Two configurations are discussed below, a string resistor ladder and an R–2R ladder. An R–2R Ladder is a simple and inexpensive way to perform digital-to-analog conversion, using repetitive arrangements of precise resistor networks in a ladder-like configuration. A string resistor ladder implements the non-repetitive reference network.

## IV. CIRCUIT OPERATION

The operation of circuit diagram is described below.

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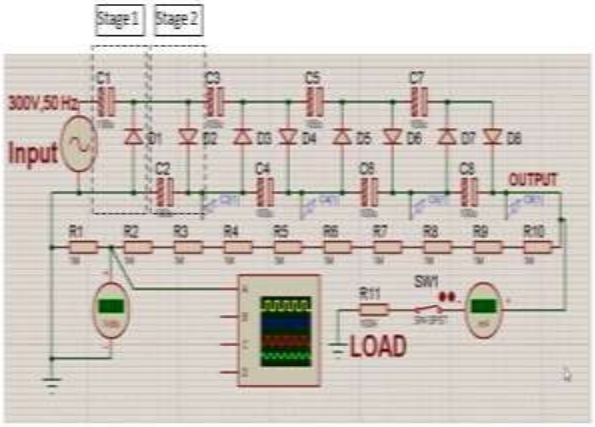


Fig.1. 8-Stage Voltage Multiplier

During negative half cycle, the diode D1 is forward bias and the capacitor starts charging and reaches the source. Initially assume the source voltage is V volts ,So the capacitor is charged with V volts. The voltage across the capacitor is V volts .For the next positive half cycle, the voltage get added i.e, 2V volts(source voltage + voltage across capacitor C1) between the two points of diode D1. For the positive half cycle, the diode D1 is reverse biased. So,the capacitor C1 is supplies the voltage then the diode D2 gets forward biased. The capacitor starts charged with 2V volts. For the next half cycle, the voltage get added with 3V volts(source voltage + voltage across the capacitor C2).So, the voltage between points of diode D2 is 3V volts. And so on this process is continued up to 8 stages, we get 8V volts.

The design of the circuit involves voltage multiplier, whose principle is to go on doubling the voltage for each stage. As this is not possible to be measured by a standard multi meter, a potential divider of 10:1 is used at the output.

## V. SIMULATION OF 8–STAGE VOLTAGE MULTIPLIER WITH LOAD

The simulation of 8 – stage voltage multiplier circuit diagram is shown in Fig.2. The results for this circuit are as shown in Fig.3. The first trace shows the Input voltage waveform of 65 V.The second trace shows the Output voltage waveform of 80 V.The third trace shows the Output current of 0.24 A.

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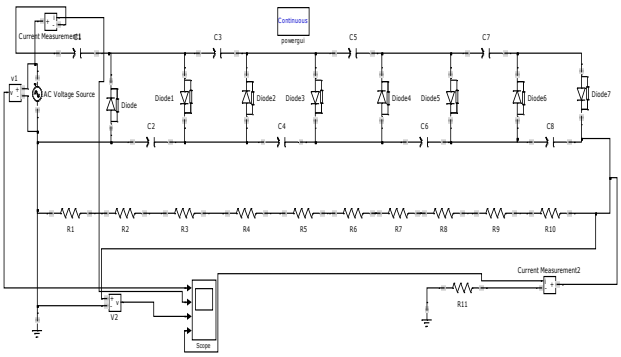


Fig.2. Matlab Simulink Diagram of 8-Stage Voltage Multiplier with load (Ladder Network)

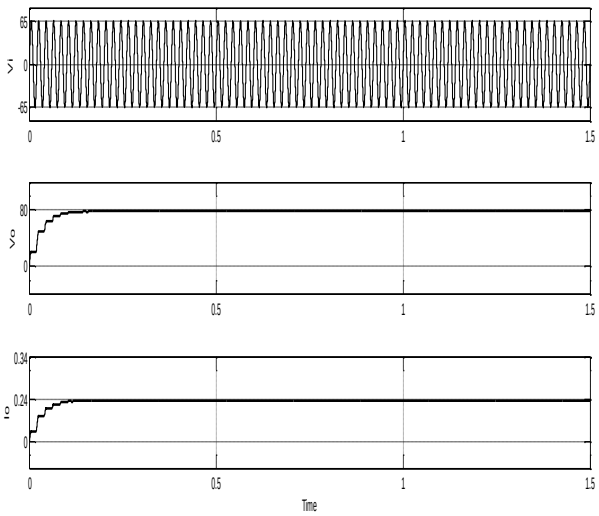


Fig.3. Waveforms of Input Voltage($V_i$), Output Voltage($V_o$),Output Current($I_o$)

## VI. HARDWARE IMPLEMENTATION WITH LOAD

A prototype ladder network is tested experimentally and is as shoen in Fig.4, which shows the top view.

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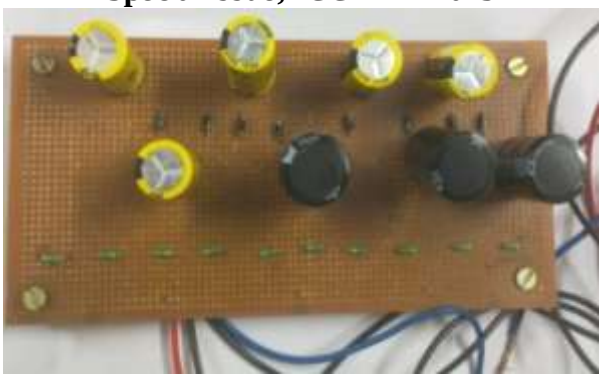

Fig.4. Top view of Ladder Network

The Overall circuit setup is as shown in Fig.5. with resistive load.

Fig.5. Experimental set-up of With Load

## VII. SIMULATION OF 8 – STAGE VOLTAGE MULTIPLIER WITHOUT LOAD

Different stages are considered and are explained in detail as given below. First a two stage is considered

**Stage-2:**

The simulation circuit diagram of 2 – stage voltage multiplier without load as shown below.

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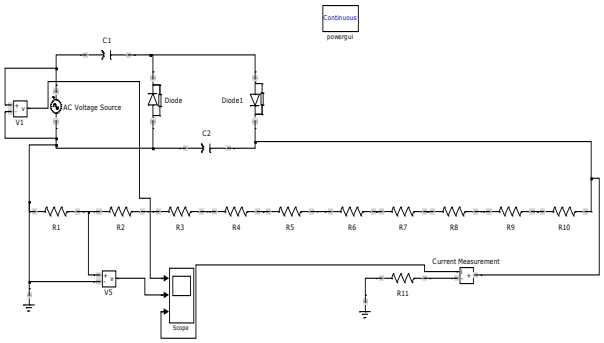


Fig.6. Matlab Simulink Diagram of 2-Stage Voltage Multiplier without load (Ladder Network)

The simulation results for two stage is as shown in Fig.7. The first trace shows the Input voltage waveform. The second trace shows the Output voltage waveform. The third trace shows the Output current.

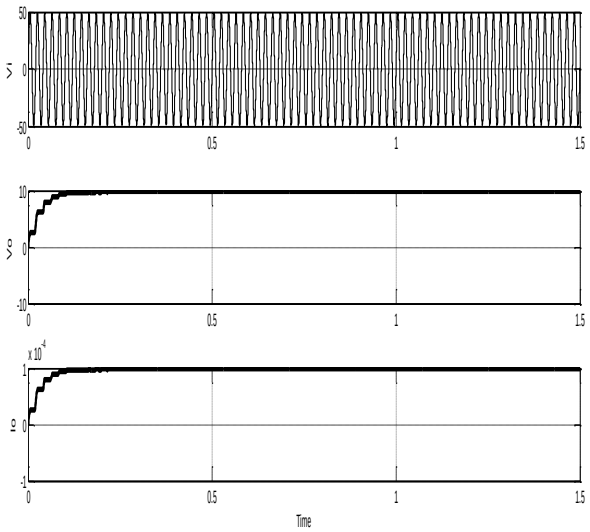


Fig.7. Waveforms of Input Voltage($V_i$), Output Voltage($V_o$),Output Current($I_o$) with out load

**Stage-4:**

The simulation circuit diagram of 4 – stage voltage multiplier without load is as shown in Fig.8.

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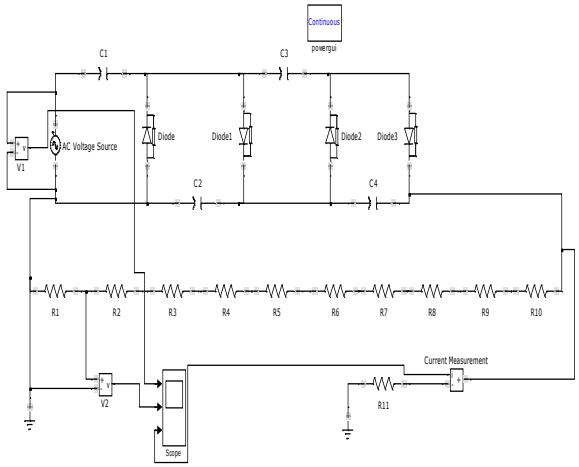


Fig.8. Matlab Simulink Diagram of 2-Stage Voltage Multiplier without load (Ladder Network)

The simulation results for two stage is as shown in Fig.7. The first trace shows the Input voltage waveform.The second trace shows the Output voltage waveform.The third trace shows the Output current.

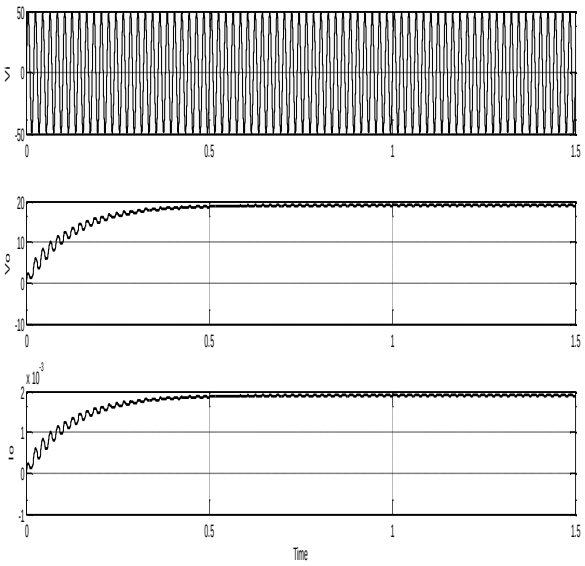


Fig.9. Waveforms of Input Voltage($V_i$), Output Voltage($V_o$),Output Current($I_o$) with out load

**Stage-8:**

The simulation circuit diagram of 8-stage voltage multiplier without load as shown in Fig.10.

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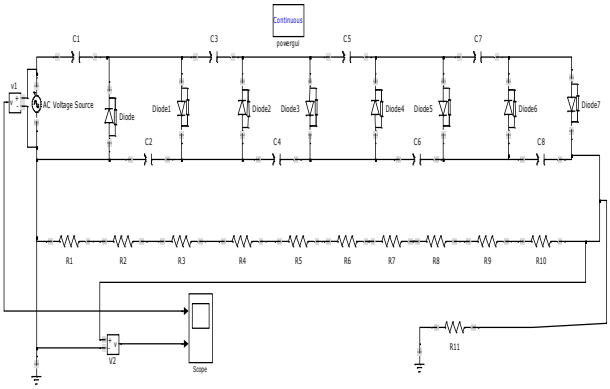


Fig.10. Matlab Simulink Diagram of 8-Stage Voltage Multiplier without load (Ladder Network)

The simulation results for two stage is as shown in Fig.7. The first trace shows the Input voltage waveform.The second trace shows the Output voltage waveform.

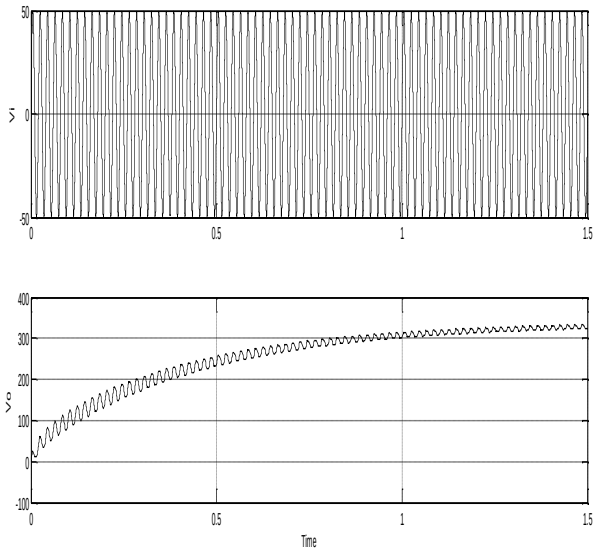


Fig.11. Waveforms of Input Voltage( $V_i$ ),Output Voltage($V_o$) With out Load

Table 1. Comparison of the simulation and experimental results with load

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| S. No. | I/p voltage(V) | | I/p current(A) | | O/p voltage(V) | | O/p current(A) | |
|---|---|---|---|---|---|---|---|---|
| | SIm | EXp | SIm | EXp | SIm | EXp | SIm | Exp |
| 1 | 30 | 30 | 0.5 | 0.44 | 35 | 38 | 0.095 | 0.09 |
| 2 | 50 | 50 | 0.82 | 0.76 | 60 | 62 | 0.17 | 0.16 |
| 3 | 65 | 65 | 1 | 1 | 80 | 80 | 0.24 | 0.24 |

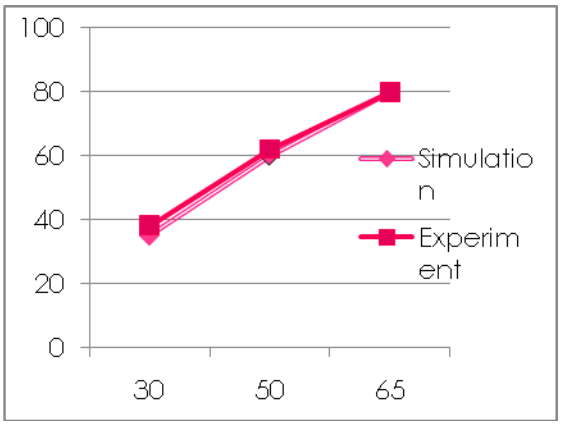


Fig.14. Graphical representation of simulation and experimental results of 8 – Stage Voltage Multiplier With Load

The simulation and experimental values are shown graphically as shown in Fig.14 with load and as in Fig.15.

Table 1. Comparison of the simulation and experimental results with out load

| S.No. | I/p Voltage(V) | | O/p Voltage(V) | |
|---|---|---|---|---|
| | Simulation | Experimental | Simulation | Experimental |
| 1 | 10 | 10 | 65 | 110 |
| 2 | 20 | 20 | 130 | 223 |
| 3 | 30 | 30 | 200 | 328 |
| 4 | 40 | 40 | 270 | 445 |
| 5 | 50 | 50 | 335 | 555 |

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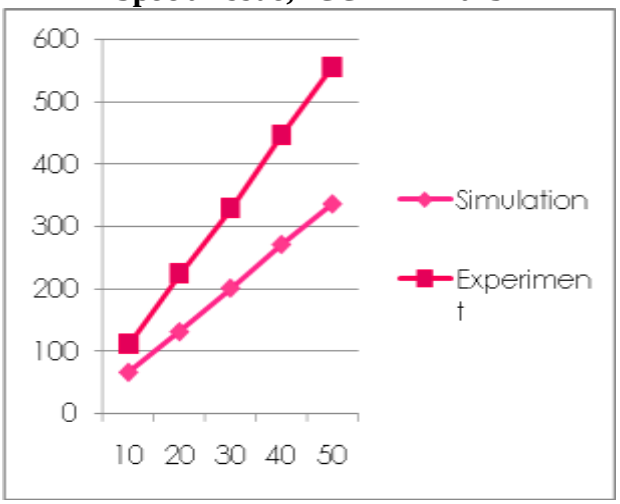


Fig.15. Graphical representation of simulation and experimental results of 8 – Stage Voltage Multiplier Without Load

This concept of generation is used in electronic appliances like the CRT's, TV Picture tubes, oscilloscope, electrolysis process and also used in industrial applications. In the future expansion this circuit is use in the medical instruments like x-ray, ct-scan, and renel scan machine. Also it can be use in the weapons technology, likewise stun gun, tesla coil gun, power lab rail gun, etc.

## VIII. CONCLUSION

The 8 – stage voltage multiplier is used to generate high output DC voltage using low input AC voltage. The circuit is simulated using MATLAB initially and a hardware model is developed. The experimental results correlate with the simulation results.

## REFERENCES

G.S. Senthil Raaj, G.T. Sundar Rajan," Simulation and Implementation of Single-Phase Single-Stage High Step-Up AC–DC Matrix Converter based of Cockcroft–Walton Voltage Multiplier", International Conference on Innovations In Intelligent Instrumentation, Optimization And Signal Processing "ICIIIOSP-2013"

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Cheeru G. suresh, Elizabedh Rajan,Chittesh V.C.,Chinnu G. suresh, "Transformless high step-up DC-DC Cockcroft-Wolton multiplier in hybrid system", IRF International Conference on 10th August 2014, Cochin, India, ISBN: 978-93-84209-43-8

C. M. Young and M. H. Chen, "A novel single-phase ac to high voltage dc converter based on Cockcroft–Walton cascade rectifier," in Proc. Int. Conf. Power Electron. Drive Syst., Nov. 2009, pp. 822–826.

C. M. Young, M. H. Chen, T. A. Chang, and C. C. Ko, "Transfomerless high step-up dc-dc converter with Cockcroft–Walton voltage multiplier," in Proc. IEEE Conf. Ind. Electron. Appl., Jun. 2011, pp. 1599–1604.

P. W. Wheeler, J. Rodriguez, J. C. Clare, L. Empringham, and A. Weinstein, "Matrix converters: A technology review," IEEE Trans. Ind. Electron., vol. 49, no. 2, pp. 276–288, Apr. 2002.

Y. P. Hsieh, J. F. Chen, T. J. Liang, and L. S. Yang, "A novel high step-up DC-DC converter for a microgrid system," IEEE Trans. Power Electron., vol. 26, no. 4, pp. 1127–1136, Apr. 2011.

S. M. Chen, T. J. Liang, L. S. Yang, and J. F. Chen, "A cascaded high stepup DC-DC converter with single switch for microsource applications," IEEE Trans. Power Electron., vol. 26, no. 4, pp. 1146–1153, Apr. 2011.

Z. Cao, M. Hu, N. Frohleke, and J. Bocker, "Modeling and control design for a very low-frequency high-voltage test system," IEEE Trans. Power Electron., vol. 25, no. 4, pp. 1068–1077, Apr. 2010.

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# COMPARATIVE ANALYSIS OF AREA EFFICIENT LOW POWER CMOS FULL ADDER DESIGN WITH TSMC 180nm TECHNOLOGY

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***ABSTRACT***

***An adder or summer is a digital circuit that performs addition of numbers. CMOS Full Adder is implemented in its conventional manner and area efficient, low power CMOS full adder with a sleep transistor is implemented in TSMC 180nm technology. Power analysis is carried with LTspice simulations.***

***Keywords— CMOS, Power Gating, Sleep Transistor, Full adder, LT-Spice.***

## I. INTRODUCTION

Any computational circuit is incomplete without the use of an adder. Addition is one of the primary operations in arithmetic circuits. Using CMOS technology different approaches for realizing adders are investigated. There is an exponential increase in leakage power with the technology scaling. Therefore, for low power applications, leakage power reduction is a key point. Different methods are being implemented to reduce the critical problem of leakage power [1,2]. Among various methods, Power Gating effectively reduces the standby-leakage power. Sleep transistors are used in this power gating technique to switch off the power supply to various parts of the design in standby mode. The major challenge is in the design of optimal sleep transistor. Actually it effects the performance of the design, overall power dissipation, routing techniques, area and integrity of signal/power.

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If a PMOS or NMOS high $V_{th}$ connects power supply to circuit power supply (virtual power supply) then it is termed as a sleep transistor. Sleep transistor is controlled by a power management unit to switch on and off power supply to the circuit. The PMOS sleep transistor is used to switch $V_{DD}$ supply and hence is named "header switch". The NMOS sleep transistor controls $V_{SS}$ supply and hence is called "footer switch".

Increasing $L_{gate}$ results in higher $V_{th}$ and hence lower leakage and higher $I_{on}/I_{off}$ efficiency, at price of significant increase of $R_{on}$ and decrease of Ion. Applying optimal reversed body bias is more efficient and effective alternative to produce a higher efficiency and Ion and lower Ron and $I_{off}$ sleep transistor than by increasing $L_{gate}$. Correct choices in sleep transistor implementations such as header or footer switch and ring or grid distributions are also important.

*A. Sleep Transistor Efficiency*

Sleep transistor efficiency is defined by a ratio of drain current in ON and OFF states, i.e. $I_{on}/I_{off}$. It is desirable to maximize the efficiency to achieve high drive in normal operation and low leakage in sleep mode. The sleep transistor efficiency can be analyzed by SPICE simulations where two high $V_{th}$ transistors are configured for ON and OFF state respectively to measure $I_{on}$ and $I_{off}$. A high temperature is set on ON sleep transistor to model high chip temperature in operating mode and a low temperature is set on OFF sleep transistor to reflect the cool situation when the design is in sleep mode. The sleep transistor efficiency varies with gate length, width and body bias.

*B. Sleep Transistor Design Considerations*

Sleep transistor implementation introduces extra cost in chip area, routing resource, IR-drop and design complexity. There are also extra power dissipations from sleep transistors, power-gating control logic and power-on/off introduced operations. It is essential to ensure that the leakage reduction from the power gating implementation overwhelms those introduced costs to be worth the effort. To that end, various design considerations and tradeoffs need to be analyzed and handled correctly in the sleep transistor design and implementations. A good sleep transistor design is achieved by optimizing gate length and width, finger size and body-bias based on overall considerations of power efficiency, leakage current, IR-drop, area efficiency and layout impact.

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## II. CMOS FULL ADDER

Addition is a basic arithmetic operation i.e., adding two binary digits. An adder or summer is a digital circuit that performs addition of numbers [3]. In many computers and other kinds of processors, adders are used not only in the arithmetic logic unit(s), but also in other parts of the processor, where they are used to calculate addresses, table indices, and similar operations.

Although adders can be constructed for many numerical representations, such as binary-coded decimal or excess-3, the most common adders operate on binary numbers. In cases where two's complement or ones' complement is being used to represent negative numbers, it is trivial to modify an adder into an adder–subtractor. Other signed number representations require a more complex adder.

### *A. Conventional Full Adder*

A Conventional Full adder (CFA) performs addition of three bits, where the third bit is derived from the previous addition. Hence a CFA can be represented as a combinational circuit performing the sum of bits A, B and $C_{in}$.

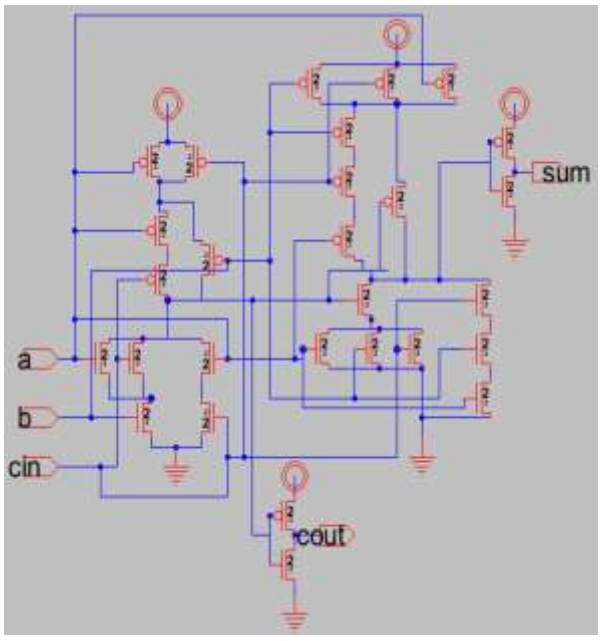


Fig.1. Conventional CMOS full adder Design

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CFA can be represented by three modules by extracting the information from logical expressions as given below

SUM = A.B.Cin + A.B.Cin + A.B.Cin + A.B.Cin

May be factored as follows:

SUM = Cin (A.B+A.B) + Cin (A.B+A.B)
= A (XOR) B (XOR) Cin

CARRY = A.B + A. Cin + B. Cin4.6)

CARRY = A.B + Cin (A+B)

CMOS technology of CFA implementation exhibits many advantages over pass-transistor logic [4]. Without any transistor sizing, CMOS CFA design is implemented as in Fig.1 in TSMC 180nm technology.

*a. Implementation of full adder with sizing of a transistor - Design1with sleep transistor*

For low power and efficient area, Full Adder Design 1 (FAD1) is shown as in Fig.2 as a solution compared to Fig.1. In addition, FAD1 help out for ground bounce noise minimization with the addition of sleep transistor. FAD1 is targeted towards reducing standby leakage power [5,6]. FAD1 schematic and layout is implemented with the specified transistor sizing. Fig.3 illustrates the layout of FAD1.

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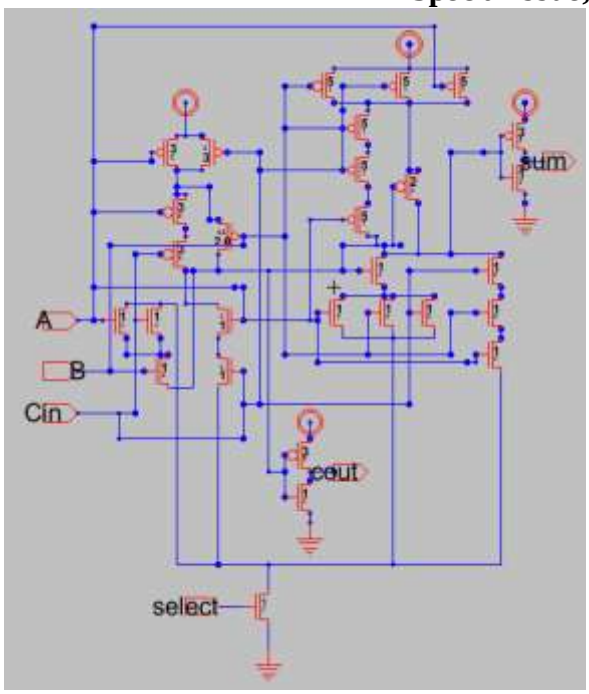


Fig.2. FAD1with sleep transistor

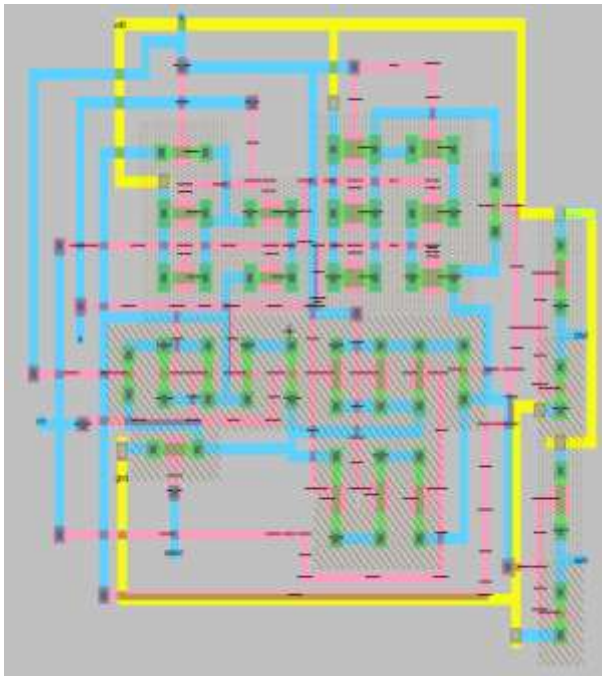

Fig.3. Layout of FAD1with sleep transistor

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## SIMULATION RESULTS

Implemented CFA and FAD1 were analyzed and average power calculations are carried out using LTspice tool. As the output power cannot be determined at each and every element, a resistor is placed at the supply to determine the Power = V(I). hence average power can be calculated as I ($R_{test}$) * $V_{dd}$.

Fig. 5 depicts the output waveforms of CFA and Fig. 6 represents the FAD1 output waveforms.

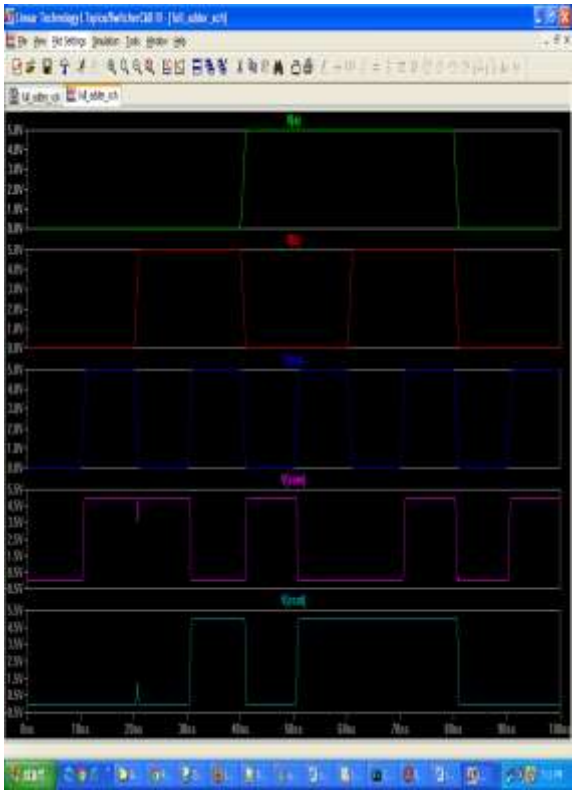

Fig. 5. CFA Output Waveforms

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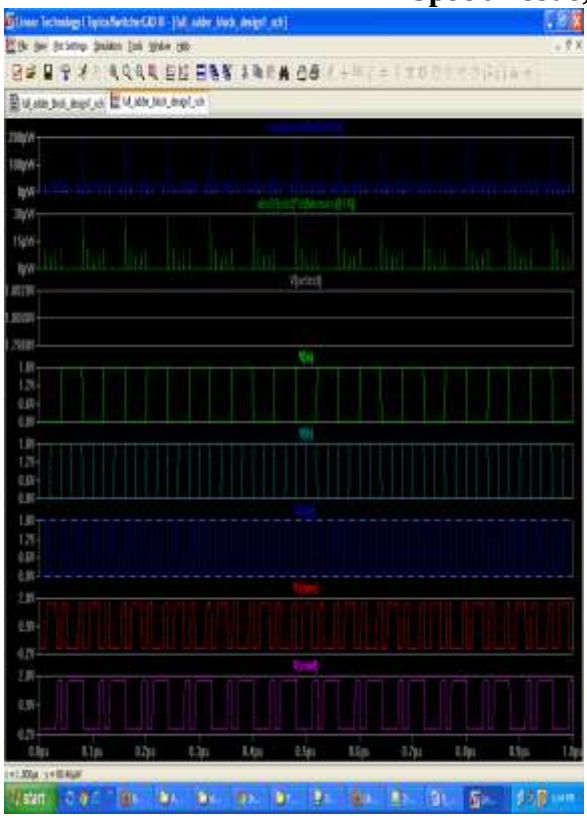

Fig. 6. FAD 1 Output Waveforms

Fig.7 illustrates waveforms when select = logic 0 for FAD1.

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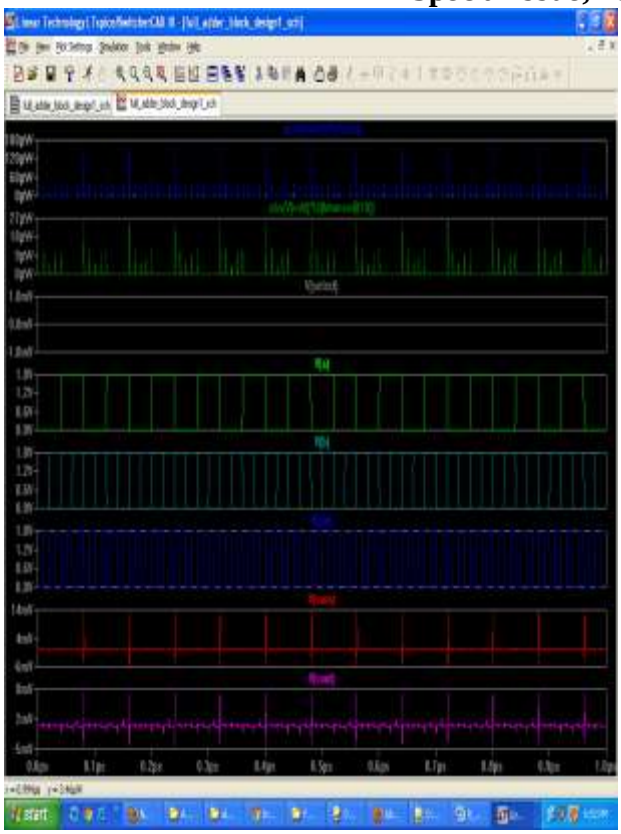

Fig .8. FAD1 schematic output waveforms when select = logic 0.

CFA and FDA1 power calculations are carried out with LTspice and are tabulated as shown in Table.I.

TABLE I

POWER ANALYSIS COMPARISION

| **Power** | **CFA** | **FAD1** |
|---|---|---|
| Average Power | 480 mW | 3.58 µw |
| Leakage Power | 614 mw | 5.09 µw |

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## III.CONCLUSION

CMOS Full Adder is implemented with and without sleep transistor with transistor sizing in TSMC 180nm technology. Power analysis is carried with LTspice simulations where results conclude that with the transistor sizing FDA1 decreases the leakage power considerably. Further transistor sizing and implementation of the designs in 130nm technology is under investigation and is aimed for further decrease in leakage power.

## REFERENCES

T.S.Rappaport, Wireless Communication Principles and Practice, New Jersey: Prentice Hall, 1996.

Rabaey J. M., A. Chandrakasan, B. Nikolic, Digital Integrated Circuits, A Design Perspective, 2nd Prentice Hall, Englewood Cliffs, NJ, 2002

K.Navi, O. Kavehei, M. Rouholamini, A. Sahafi, S. Mehrabi, N. Dadkhai, "Low-Power and High-Performance I-bit CMOS Full Adder Cell," Journal of Computers, Academy Press, vol. 3, no. 2, Feb. 2008.

Pren R. Zimmermann, W. Fichtner, "Low-power logic styles: CMOS versus pass-transistor logic," IEEE J. Solid- State Circuits, vol. 32, pp. 1079- 1090, July 1997.

S.G.Narendra and A. Chandrakasan, Leakage in Nanometer CMOS Technologies. New York: Springer-verlag, 2006.

Ku He, Rong Luo, Yu Wang, "A Power Gating Scheme for Ground Bounce Reduction During Mode Transition, " in ICCD07, pp. 388-394, 2007.

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# A CASE STUDY ON POWER CONSUMPTION BASED ON ILLUMINATION TECHNIQUES

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***ABSTRACT***

***The main theme of the Paper is to have a brief idea about the present day illumination techniques and to apply them to a practical local area. We have chosen our GPREC campus for this case study. The main aim of the project is to determine the installation charges when old tube lights are replaced by a new model called T5. And we have to find the charges for the installation of new LED street lights. They started a new era in field of electricity. They created a renascence in electricity. Total power consumption in both the cases are determined and finally savings should be calculated based on the tariff rates of the college campus. By this case study we can choose a better alternative light loads as our main intention is to minimize the power consumption. This can infer a better alternative and full conversion will 'save' many generating stations in the world.***

## I. INTRODUCTION

India has over 17 percent of the world's population and consumes maximum energy in residential, commercial and agricultural purposes. It is found that the share of energy consumption in India has also been on the raise due to sharp urbanization, population explosion, sustainable development of the country.

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From 1991 to 2007 a number of reforms have been introduced by the government to improve the power system in India. It in turn revolutionized the growth in power capacity, reliability in supply, growth in the revenue collection.

The conservation of energy is an important means to reduce peak and average demand of energy. It is possible to save energy with the implementation of energy conservation technology which increases generation of energy with available source. In domestic, commercial and industrial sector, lighting system consumes significant amount of energy. It consumes 50% of total energy consumption in commercial buildings and 10% in industries. In all the sectors both indoor and outdoor lighting efficiency can be improved with higher efficient lighting sources which will help to reduce the gap between demand and supply.

## II. HISTORY AND EVALUATION OF LIGHT BULBS

Thomas Alva Edison invented the light bulb, and everyone would probably know it and he was the patent holder for the electric light and he did advances in the technology considerably, but the story of the light bulb actually goes back much further and starts with Humphry Davy. He was believed to have invented the electric light in 1802, a device called the Electric Arc Lamp. This was the beginning of a long road of experiments, successes and failures with electric lighting that would span the next two centuries and still continues today.

Over the next 70 years, more and more inventors created light devices and light bulbs with varying degrees of success. In 1874, Henry Woodward, a medical electrician, and his colleague, Mathew Evans, filed for a Canadian patent for electric lamps. They were never able to make their lamps a commercial success.

Thomas Edison had begun serious research into developing a practical incandescent lamp with the metal filament material, however, and he kept trying different materials to improve on the filament from his original design and found that a carbonized bamboo filament was capable of lasting more than 1,200

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hours. This opened to door to the commercial production of light bulbs that could actually be used in practical applications. Later further advancements came up and bulbs became brighter, low wattage, more life expectancy. Now there are several choices of light bulbs available, from incandescent to fluorescent to LED.

## III. SECTOR WISE ENERGY DEMAND AND EFFICIENCY OF LIGHTING SOURCES

From the time of independence, India has raised the power generation capacity from 1362 MW to many folds at present. But the gap between generation and the demand is increasing day by day. Energy consumption pattern of different sectors in India in the year 2007 are given in the table 1.

In all sectors there are some commonly used light fittings such as incandescent light, fluorescent light, sodium vapour, mercury vapour, metal halide etc. for particular application. Among these a number of areas found with incandescent light as a source of lighting which very inefficient from the point of view of energy efficiency.

It is evident that higher efficiency of lighting source will definitely reduce the energy consumption. Luminous efficiency of different light sources is listed in table 2.

Table 1: Sector wise energy consumption

| *AREA* | *CONSUMPTION* |
|---|---|
| Domestic | 21% |
| Commercial | 18% |
| Industrial | 32% |
| Transportation | 29% |

Table 2:luminous efficiency of different light sources

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| ***Light source*** | ***Luminous efficiency (lumen/watt)*** |
|---|---|
| Incandescent light | 18-20 |
| Fluorescent light | 60-70 |
| Sodium Vapour | 40-120 |
| Mercury Vapour | 50-60 |
| Metal Halide | 80-125 |
| CFLs | 50-80 |
| LEDs | 20-60 |

In olden age, incandescence and fluorescence lamps were the main focus in illumination technology. But the current technology of CFL has improved the efficiency and it has really proved standards. However, a new kind of lighting became available. Now the LEDs are available with different color improving RI and giving a better look and cool light emission, appears white to the human eye.

## IV. A CASE STUDY OF REPLACING EXISTING LIGHTING SYSTEM (INCANDESCENT) BY T5 CFL LIGHT IN OUR INSTITUTIONAL AREA

In the present energy scenario, in developing countries like India, an efficient lighting with proper techniques is used, major energy saving is possible. The cost parameter has also to be kept in mind.

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Lighting system is categorized as Direct Lighting, Indirect Lighting and Direct/Indirect Lighting. Various domestic lamps used are shown in figure.1

**Incandescent lamps:** It is the oldest and very common lamp used in homes, indoors and outdoors especially in rural areas. Of the common lamps, it is the most inefficient. This bulb is often used, especially in a fixture that actually controls the light output rather than scattering it everywhere.

INCANDESCENT CFL LED

1879 1976 1927

Fig.1. Various domestic lamps

**Fluorescent lamps:** These lamps are almost four to five times more efficient than incandescent lights. They are nowadays most widely used for indoor applications. Energy saving is achieved because they are lower wattage lamps and provide more lumens. . The objective is to provide maximum light output with minimum energy consumption. Fluorescent lamps are different types such as Compact Fluorescent Lamps (CFLs), tube lights or tube lamps which are further classified into T 5, T 8 and T 12. T 12- oldest and most energy inefficient. They have the largest tube diameter also and are heavy. T 8 - comparatively new and even have less tube diameter. They are more efficient than the older one. T 5 - most efficient and most compact and have less tube diameter.

**LED Lamp:** An LED lamp is a LED unit that is fitted into a lamp for lighting purpose. LED lamps have greater lifespan and much more efficiency than other lamps. LEDs are very expensive which is the biggest disadvantage, but the payback period of installation is very less.

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## V. METHODOLOGY

The scope of this work includes evaluation of the lighting system in the Library, Admin Building, and all Branch department. A survey was conducted in our GPRE College and found 1690 conventional tube lights, which were ON for the purpose of vigilance. Each block details are given in table 3.

The tube lights use to ON from 9 AM to 5 PM (Timing use to vary subject to season change). The tube lights were of standard make. After testing on choke it was observed that chokes are consuming 13 watts of power (average). It has been identified that the most commonly used light bulbs are; Philips Incandescent light 40W Fitting E27 feet. Some of light bulbs are shown in Figure 2. The Philips linear Fluorescent tubes consume 28 W for the 4 feet long linear tube. They have approximately 15000 hours life time and produce 2670 lumens.

Table 3: Block Details

| S.No | Name of the block | No. of Tube lights |
|---|---|---|
| 1 | EEE Block-1 | 70 |
| 2 | EEE Block-2 | 52 |
| 3 | EXAMINATION CELL | 24 |
| 4 | ADMINISTRATIVE | 128 |
| 5 | JUNIOR | 24 |

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| | | |
|---|---|---|
| | MECHANICAL | |
| 6 | DRAWING HALLS 1,2 | 39 |
| 7 | DRAWING HALLS 3,4 | 45 |
| 8 | LIBRARY | 79 |
| 9 | CSE -1 | 192 |
| 10 | CSE -2 | 105 |
| 11 | TNP | 19 |
| 12 | MEC BLOCK -1 | 107 |
| 13 | MEC BLOCK -2 | 152 |
| 14 | MEC BLOCK -3 | 150 |
| 15 | ECE -1 | 90 |
| 16 | ECE -2 | 112 |
| 17 | ECE -3 | 58 |
| 18 | CIVIL -1 | 100 |
| 19 | CIVIL -2 | 43 |
| 20 | PG BLOCK | 40 |
| 21 | GIM | 06 |

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| | | |
|---|---|---|
| 22 | GIRL'S LOUNGE | 43 |
| | TOTAL | 1690 |

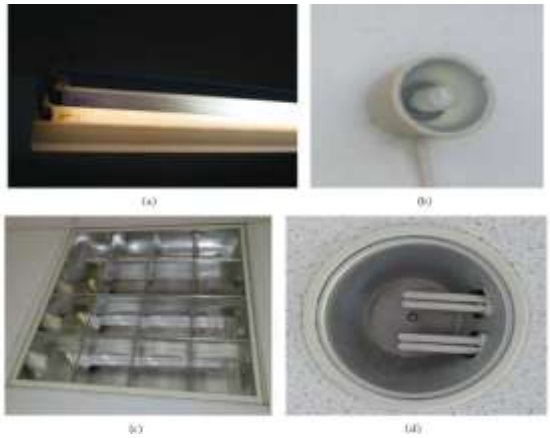

Fig.2. (a) Philips Fluorescent tube 36 W 4 feet, (b) Philips compact Fluorescent light (CFL) bulb 14W Fitting E27, (c) Philips 36 W/4Pin Fitting 2G11, and (d) Philips PL-C 13W 2Pin Fitting G24

The 18 W Philips Fluorescent tube has lifetime of 15000 hours and produces 1350 lumens. The Philips CFL 14 W bulb comes with E27 fitting. This bulb produces approximately 800 lumens and has life time of 8000 hours.

## VI. IDEAL LIGHTING TECHNOLOGY

The Fluorescent tube and CFL are the main lighting systems in the campus. Substituting a 36W T8 fluorescent tube by a 28W T5 CFL tube . The wattage and cost of these tubes to replace 36 W T8s varies according to manufacturers.T5 tubes have a significantly extensive life span of almost five times more dependent on the quality. The types of light chosen to replace the current lighting system are shown in Figure 3 and the details are given in table 4**.**

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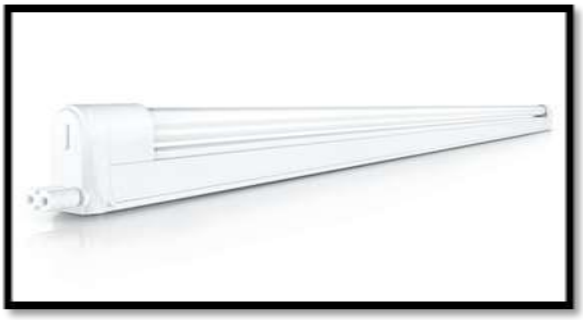
Fig.3. Tube lights

Table 4: Tube Light Details

| Model | Diameter | Wattage | Lumens | LPW |
|---|---|---|---|---|
| T5 | 0.625 | 28 | 2600 | 110 |
| T8 | 1 Inch | 40 | 2600 | 75 |
| T12 | 1.5 Inch | 60 | 2600 | 55 |

**T 5 Description**

T5 tube has an easy installing method by just removing the current tube including the ballast and simple rewiring which is suggested to be done by qualified electrician. The new model of T5 is shown in Fig.4



- MODEL: T5
- WATTAGE: 28

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- BALLAST: In built with the set
- THICKNESS: 0.625 inch
- LUMENS: 110 LPW
- LIFE SPAN: 35,000 hrs
- SHAPE: Linear fluorescent tube

Different companies manufacturing T5 are listed below in table 5.

Table 5: Different companies manufacturing T5 with cost

| S.NO | NAME OF THE COMPANY | COST IN INR |
|---|---|---|
| 1 | PHILIPS | Rs.460 |
| 2 | HAVELLS | Rs.480 |
| 3 | CROMPTON | Rs.400 |
| 4 | GM | Rs.440 |

Still there are many other companies which are not mentioned.

INSTALLATION CHARGES:

Total no. of tube lights in campus: 1690(including gym and langue).If all tube lights are replaced with T5 model, then the installation charges with respect to different companies are in table 6.

Table 6. Installation charges with respect to different companies

| *S.NO* | *NAME OF THE* | *INSTALLATION* |
|---|---|---|

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| | *COMPANY* | *CHARGES* |
|---|---|---|
| 1 | PHILIPS | Rs.7,77,400 |
| 2 | HAVELLS | Rs.8,11,200 |
| 3 | CROMPTON | Rs.6,76,000 |
| 4 | GM | Rs.7,43,600 |

## VII. POWER CONSUMPTION ANALYSIS

Taking burning hours of one light source as reference (which is maximum), number of bulbs required for all other light sources and their cost are calculated. Taking the tariff rates into consideration that the college belongs to HT IV with unit charge of Rs7.25/- and Rs. 8.3 during peak hours. Number of bulbs and cost for light sources taking burning hours of one light source as reference can be calculated as given in table 7.

### A. PRACTICAL ANALYSIS

Considering 8 working hours a day and considering 250 working days in an year and the details are given in table 8.

Table 7. Ideal Power Consumption Analysis

| TYPE | NEW(T5) | OLD(T8,T12) |
|---|---|---|
| WATTAGE | 28 | (40+3),(40+17) |
| NO.OF LAMPS | 1690 | 1690 |
| POWER CONSUMPTION | 47.32 Kwhr | 80.93 kwhr |

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| | | |
|---|---|---|
| FOR HOUR | | |
| FOR DAY | 1135.68 kwhr | 1942.32 kwhr |
| FOR MONTH | 34070.4 kwhr | 58269.6 kwhr |
| FOR 365 DAYS | 408.84 kwhr | 708.9 kwhr |

Table 8. Practical power Consumption Analysis

| TYPE | NEW(T5) | OLD(T8,T12) |
|---|---|---|
| CONSUMPTION IN A DAY | 378.56 Kwhr | 647.44 kwhr |
| FOR250 DAYS (Year) | 94.65 Mwhr | 161.86 Mwhr |
| TOTAL COST | Rs.6,86,140 | Rs.11,73,485 |

## B. CONSIDERING FOR 5 HOURS

(As Peak Hours in a Day)

Table 9.considering for 5 hours

| TYPE | NEW(T5) | OLD(T8,T12) |
|---|---|---|
| CONSUMPTION IN A DAY | 236.6 Kwhr | 404.63 kwhr |
| FOR250 DAYS (Year) | 59.15 Mwhr | 101.157 Mwhr |

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| | | |
|---|---|---|
| TOTAL COST | Rs.4,28,837 | Rs.7,33,391 |

## VIII. RESULTS & DISCUSSIONS

Finally the study shows that the life cycle cost is much more for the incandescent lamps while it is far lesser for the other lamps. The life cycle cost is very less for T5 lamps. For an efficient light source, it should have high luminous efficacy, minimum power consumption and minimum life cycle cost.

According to their performance evaluation is tabulated in Star rating indicates the performance of lamps according to their ability of minimum power consumption, maximum luminous efficacy and minimum life cycle cost. More the star rating, more good is the quality or performance according to these factors.

**Table 10:** Lamp performances according to factors.

| ***Lamp*** | ***Star rating*** | ***Performance*** |
|---|---|---|
| Incandescent | * | Poor |
| CFL | ** | Satisfactory |
| T 12 | *** | Good |
| T 8 | **** | Very good |
| T 5 | ***** | Excellent |

## IX. LED STREET LIGHTS

LEDs will consume less electricity than conventional lighting including CFLs and can produce less of the parasitic by product heat. The efficiency of light source is measured in lumens/watt. The efficiency of LED is compatible with the present light source but the efficiency of LED lighting is very high. The advantages of LED's are

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- Long Life
- Energy Efficiency
- Zero UV Emissions
- Operational in Extremely Cold or Hot Temperatures
- Instant Lighting & Frequent Switching
- Low wattage

## X. A CASE STUDY OF REPLACING CONVENTIONAL STREET LIGHTING SYSTEM (FLUORESCENT) BY LEDs IN OUR INSTITUTIONAL AREA

A survey was conducted in our Engineering College and found that 53 street lights are present in the entire campus for vigilance purpose. It is observed that all the lights remain in operation for around 12 hours (6 p.m. to 6 am) in a day. The duration of operation may slightly vary depending on the seasonal change of day length. It is also observed that the lights remain in operation throughout the year irrespective of holidays and vacation as it operates for vigilance purpose of the campus. The light output of the fluorescent light fixtures is around 2400 lumen.

For this purpose high efficient LED street light fixture of **STAR COMPANY** model no **ACL-SL-01**. It consumes 24 watt with luminous efficacy of around 110-117 lm/w. . Taking 12 hours of operation in a day, total energy consumption of a single existing light i.e. sodium vapour lamp in a day is given by:

1. 150*12 watts-hour = 1800watt-hour.
2. So, annual energy consumption of a single existing light is given by:
   1800*365 watt-hour = 657units.
3. Hence annual energy consumption of total existing light i.e.53 fluorescent light is given by:
   53*657unit = 34,821units.
4. Annual energy cost for campus lighting with existing light fixture is given by:
   (23,214*7.25)+(11,607*8.3)= Rs.2,64,640/-

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(Considering unit cost as Rs. 8.3/- for peak load hours & Rs.7.25/- for normal hours)

If all existing light fittings are replaced by proposed 24 watt &50 W LED Street light which gives output of around 7000 lumen which is very close to the light output of existing fluorescent light fixture. Taking same hours of operation i.e. 12 hours day, energy consumption in a day of a LED Street light fixture is given in table 11.

Table 11. Street Light Details

| ***MODEL*** | ***HIGH PRESSURE SODIUM VAPOUR LAMP*** | ***LED (24W)*** | ***LED (50W)*** |
|---|---|---|---|
| **WATTAGE** | *150 W* | *24 W* | *50 W* |
| **CONSUMPTION FOR 12 HRS** | *1800 Whr* | *288 Whr* | *600 Whr* |
| **ANNUAL ENERGY CONSUMPTION** | *657 Units* | *105.52 Units* | *219 Units* |

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| | | | |
|---|---|---|---|
| **FOR 53 LIGHTS** | *34821 Units* | *5571.76 Units* | *11607 Units* |
| **ENERGY COST/ ANNUM** | *Rs.2,64,640/-* | *Rs.42,337/-* | *Rs.88,213/-* |

Minimum life span of a LED is 50000 hours whereas the life span of sodium vapour light is around 12000 hours. Taking 12 hours of operation LED light fixture will last for 2 years and 7 months. For the same hours of operation per day, LED light fixture will last around 11 years. So the onetime investment in LED light is bound for around 11 years whereas the investment of sodium vapour light fitting is bound only around 2 years 7 months. Hence for the period of 11 years the existing fittings needs to replace five times.

Table 12. Details of Savings

| MODEL | LED(24W) | LED(50) |
|---|---|---|
| Annual Energy Saving | 29250 Units | 23214 units |
| Annual Cost Savings | Rs.2,22,303 | Rs.1,76,427 |
| Effeciency% | 84 | 66.6 |
| Payback Period | 7 months | 13 months |

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## XI .CONCLUSION

A detailed information regarding CFLS and LEDs has been discussed in this project. The installation charges were estimated when all the old model tube lights and street lights were replaced by new model lights called T5and LED street lights respectively. Based on the information collected from GPREC, as a case study ,power consumption and cost analysis were made and so it is better if the old tube lights are replaced with new one.

## REFERENCES

Government of India, 'Load Generation Balance Report 2011-12', A report by Central ElectricityAuthority(CEA),MinistryofPower,availableathttp://www.cea.nic.in/reports/yearly/lgbr_report.pdf

V. S. Verma, 'Energy Efficient Technologies use in India – An Overview 2004', Bureau of Energy Efficiency (BEE), 20 August 2004.

T.M.I.Mahlia, H.A.Razak, and M.A.Nursahida, "Life cycle cost analysis and payback period of lighting retroit at the University of Malasiya," Renewable and Sustainable Energy Reviews, vol. 15, no. 2, pp. 1125–1132, 2011.

Prashant Kumar Soori and Safaa Alzubaidi, Study on improving the energy efficiency of office building's lighting system design, IEEE GCC conference and exhibition (GCC) 2011, Dubai, United Arab Emirates, pages 585-588.

LEDs in Real Lighting Applications: from Niche Markets to General Lighting; Matthias Wendt - Philips Research Aachen, Germany & Jan-Willem Andriesse - Philips Lighting, Eindhoven, The Netherlands.

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# A COMPARATIVE APPROACH BETWEEN CONVENTIONAL MOSFET AND TUNNEL FIELD EFFECT TRANSISTORS (TFETS)

**CH. Pavankumar, Dr.K.Sivani**

KITS, Warangal

***ABSTRACT***

As the down scaling of conventional CMOS technology results in, rapidly approaching fundamental limits. Alternative device structures are constantly proposed to substitute the traditional CMOS type devices. That type of device is a gated reverse-biased p-i-n structure, commonly referred to as Tunnel Field-Effect Transistor (TFET). This device is particularly promising for ultra-low-power applications. The most prominent feature of TFETs is their capacity for producing an inverse sub-threshold swing (SS) smaller than the 60 mV/decade thermal limit (at 300 K) of conventional inversion mode MOSFETs. Sub-thermal SS is achievable because, the drain current in TFETs is produced by carrier injection from source to channel which is predominantly governed by quantum mechanical band-to-band tunnelling (BTBT), rather than by diffusion as in MOSFETs. In, this paper we will show the silvaco TCAD simulation results for both conventional MOSFET and Tunnel field effect transistor.

***Keywords: band-to-band tunnelling, inversion mode, subthreshold swing.***

## I. INTRODUCTION

As the down scaling of conventional CMOS technology results in, rapidly approaching fundamental limits [1, 2]. Alternative device structures are constantly proposed to substitute the traditional CMOS type devices. That type of device is a gated reverse-biased p-i-n structure, commonly referred to as Tunnel Field-Effect Transistor (TFET). This device is particularly promising for ultra-low-power applications [3]. The most prominent feature of TFETs is their capacity for producing an inverse sub-

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threshold swing (SS) smaller than the 60 mV/decade thermal limit (at 300 K) of conventional inversion mode MOSFETs [1, 2, & 4]. Sub-thermal SS is achievable because, the drain current in TFETs is produced by carrier injection from source to channel which is predominantly governed by quantum mechanical band-to-band tunnelling (BTBT) [5], rather than by diffusion as in MOSFETs. The trans conductance (gm) to drain current (Id) ratio (TCR, gm/Id) in the sub-threshold region, is known as device efficiency, is the corresponding important for analogy applications, as it portrays the available gain per unit of power dissipation of a FET. Because of their smaller SS, TFETs are capable of TCR values in the sub-threshold region higher than the maximum possible value achievable in conventional inversion mode MOSFETs. Thus, a TFET has the potential for delivering higher gain than a MOSFET for the same power dissipation [6]. Although a variety of TFET models have been proposed [7–13] and continue to be developed, fundamental parameters, such as SS and threshold voltage (VT), are still not properly defined for TFETs as they are for conventional inversion mode MOSFETs. For example, the value of SS in TFETs does not remain constant throughout the sub-threshold region but increases with applied gate voltage. Therefore SS is usually quoted as an average or overall number evaluated over several decades of ID, from nominally off to nominally on values. In certain publications, reference is even made to a point-SS in order to reflect the lowest achievable SS value for the performed processing. Likewise, an unequivocal physical mechanism-based definition of threshold voltage does not exist for TFETs, and its extraction remains a challenging task. Therefore it is not uncommon to expediently quote the VT of a TFET as the value of gate voltage (VG) measured at some predefined value of ID. In Tunnel FETs, the definition of threshold voltage is completely different and threshold voltage is the voltage at which drain current changes from quasi exponential to linear. By these ambiguities, being able to determine VT still is a very important task for TFET device assessment and circuit**.**

## II. WORKING PRINCIPLE OF TFETS

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Tunnel FETs utilize a MOS gate to control the band-to-band tunnelling across a degenerate p-n junction. The schematic energy band diagrams and Cross-section of n- channel TFET in OFF and ON states are shown in Figure 1a and b. The device is generally off. When zero volts is applied to the gate, the conduction band minimum of the channel is above the valence band maximum of the source, then band-to-band tunnelling is suppressed. A tunnelling window, qVtw, opens up as the conduction band of channel is shifted below the valence band of source. Electrons in the valence band with energy in this tunnelling window tunnel into the empty states in channel and the transistor is ON. The principle of operation for the p-channel TFET with source, channel and drain conductivity types switched is same as n-channel TFET.In the general conventional mode of operation, the n-channel TFET tunnel current is suppressed when Vgs is low and the tunnel window at the source junction is opened when Vgs positive. However the TFET can turn on at the channel drain junction when the gate bias is sufficiently negative. As shown in

Figure 1c when the gate bias is negative, the valence band maximum of channel can be shifted above the conduction band minimum of the drain, leading to electron tunnelling from the channel into the drain. Therefore, the tunnelling window opens up again, with the tunnel junction is shifted from source-channel junction to the drain-channel junction. When this happens the channel conduction changes from one carrier type to another and the transfer characteristic is said to be ambipolar. This behaviour is generally universal across TFET geometries.

When the gate bias is still positive and the drain bias becomes negative, TFET behaves like an Esaki diode, with the signature negative differential resistance (NDR) behaviour appearing in the output characteristics.

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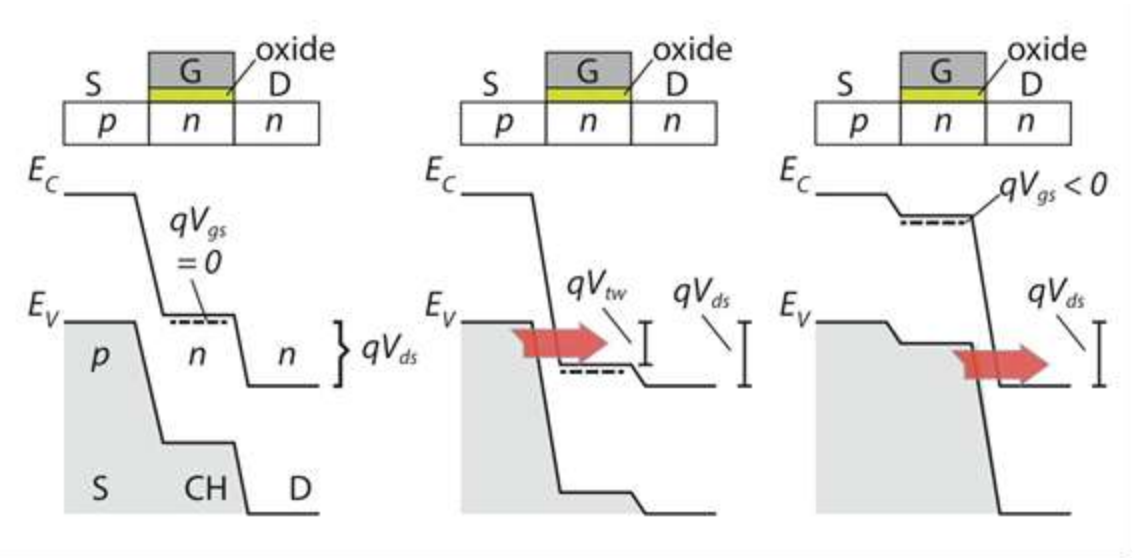


Figure 1. Schematic energy band diagram and Cross-section of an n-channel TFET when the device is biased in (a) OFF (b) ON and (c) ambipolar state where the symbols are defined as follows: EC, conduction band, EV, valence band, $V_{gs}$, gate-source voltage, $V_{ds}$, drain-source voltage, and $V_{tw}$, tunnelling window.

In the quest for transistors that can replace CMOS as the power horse of the semiconductor industry, steep slope devices such as tunnel field-effect transistors (TFETs) have emerged as the leading contender because of their capability to keep scaling the supply voltage and lowering the power consumption. TFETs utilize inter band tunneling as the current conduction mechanism, thus avoiding the Boltzmann-limited subthreshold swing of 60 mV/decade as shown in below figure. From the figure 3 we can point out the difference between MOSFETs and TFETs. And also the basic structure of TFETs is shown in figure 2. From the basic structure of the TFET we can state that it is like a P-I-N structure (p stands for p-type material, I stands for intrinsic semiconductor and N stands for n-type material).

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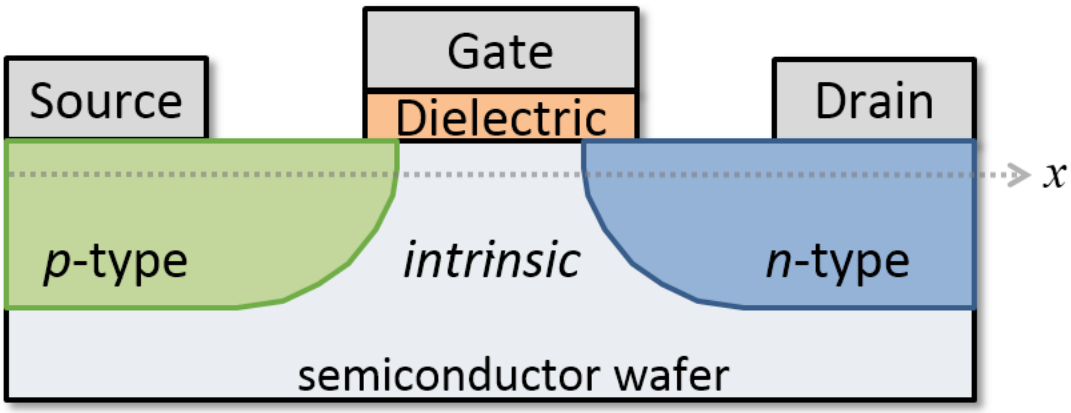


Figure 2: TFET lateral structure.

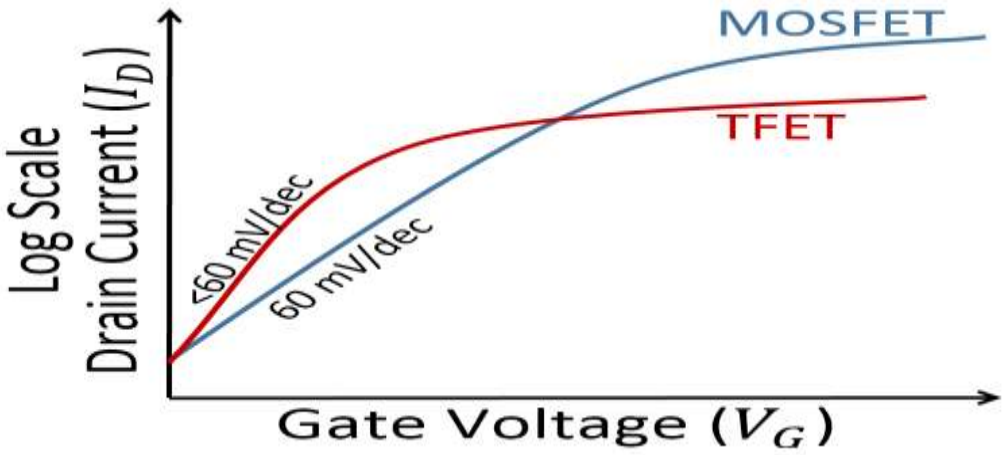


Figure 3: TFET transfer characteristics.

## III. SUBTHRESHOLD SWING

The subthreshold swing of a FET is defined as the amount of gate voltage necessary to increase or decrease the subthreshold drain current by a factor of 10, usually expressed in millivolts per decade (mV/dec). An expression is given by the formula below, found in many solid-state device textbooks:

$$SS=\frac{nkT}{q}\ln 10 \qquad \text{Equation 1}$$

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Here n is a factor which describes the efficiency of the gate voltage in changing the semiconductor surface potential.Ideally, the surface potential has a value given by avoltage divider consisting of the depletion capacitance ($C_D$) in series with the oxide capacitance ($C_{OX}$) equal to $1 + C_D/C_{OX}$ Due to the thermionic nature of the drain current in a MOSFET, SS is limited by temperature and its minimum possible value is equal to 60 mV/decade at room temperature.

## IV.BAND-TO-BAND TUNNELLING

Tunnelling is a quantum mechanical phenomenon, it occurs due to the wave-like properties of electrons on the atomic scale. When an electron is incident upon an energy barrier, it may be reflected from the barrier or transmitted through. The probability of transmission through, or tunnelling is decided by the height, width, and shape of the barrier. For the case of n-channel TFETs, tunnelling occurs in the source-channel p+n+ junction. At an appropriate gate bias, electrons in the p+ source below the source Fermi level may tunnel through the energy gap into empty states above the Fermi level in the conduction band of the channel.

## V. RESULTS

From the figure 4, the $I_d$ vs $V_{gs}$ graph of N channel MOSFET is shown. The simulation is done by using silvacoTcad, two mosfets models have been modelled and simulated.

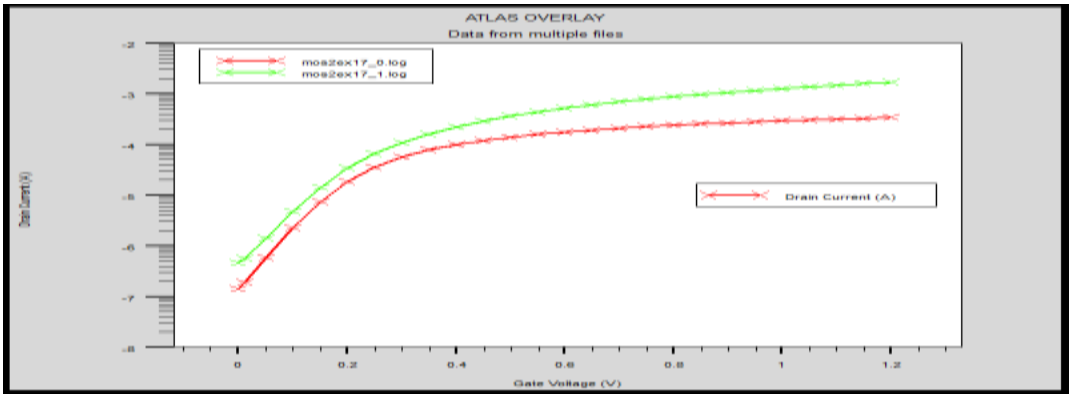


**Figure 4: $I_d$ vs $V_{gs}$ characteristics**

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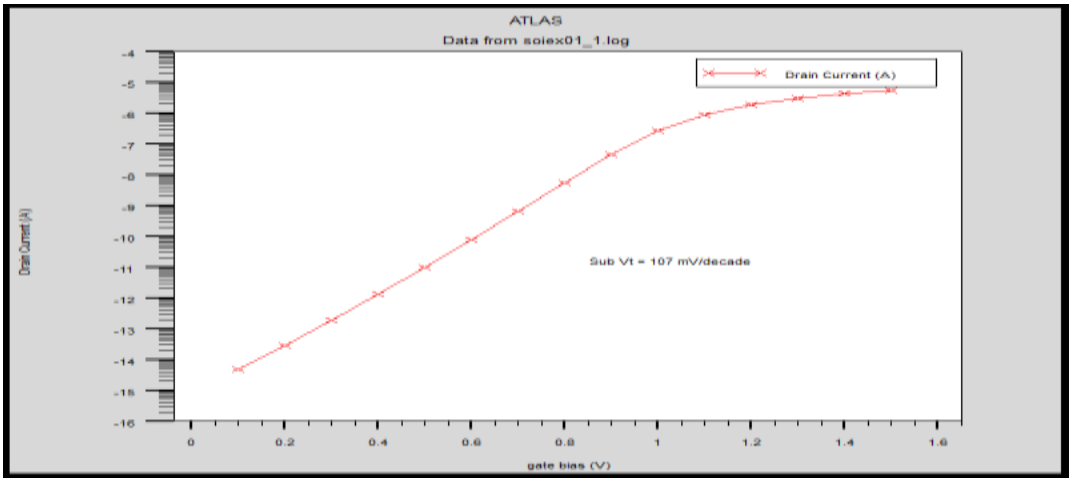


**Figure 5: Subthreshold slope for conventional NMOSFET**

From the figure4 and 5 it is evident that tunnel fets have Subthreshold Slope (SS) is less than MOSFET that is less than 60 mv/decade.

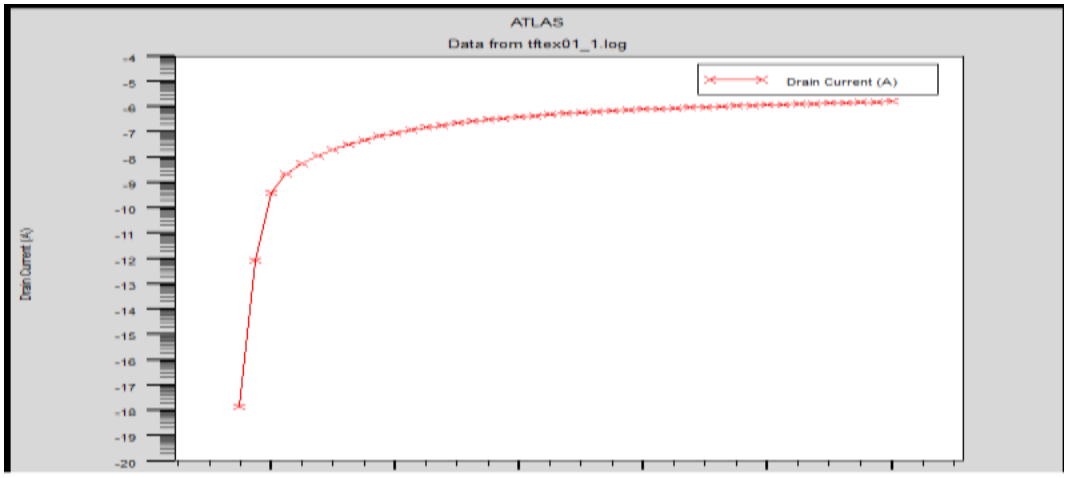


**Figure 6: Subthreshold slope for conventional Tunnel FET**

## VI. CONCLUSION

TFETs are the most promising steep-slope switch candidate, having the potential to use a supply voltage significantly below 0.5 V and then offering significant power dissipation savings. Because of their low off currents, they are ideally suited for both low-power and low-standby-power logic

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applications operating at moderate frequencies. Other promising applications of TFETs are ultra-low power specialized analog integrated circuits with improved temperature stability and low-power SRAM.

In this paper we have shown the subthreshold slope for both conventional mosfet and tunnel fet, it is clear that tunnel fet is having subthreshold slope less than 60 mv/decade. Hence tunnel FETs can be further scaled to meet the today's challenges.

## REFERENCES

Seabaugh AC, Zhang Q. Low-voltage tunnel transistors for beyond CMOS logic.Proc IEEE 2010; 98:2095–110. http://dx.doi.org/10.1109/JPROC.2010.207047.

Claeys C. Trends and challenges in micro- and nanoelectronics for the nextdecade. Proc 19th IntConf – Mixed Des IntegrCircSyst (MIXDES) 2012; 6226267:37–42.

Ionescu AM, Riel H. Tunnel field-effect transistors as energy-efficient electronic switches. Nature 2011; 479:329–37. http://dx.doi.org/10.1038/nature1067.

Agopian PGD, Martino MDV, Filho SGDS, Martino JA, Rooyackers R, LeonelliD,et al. Temperature impact on the tunnel FET off-state current components.Solid-State Electron 2012; 78:141–6. http://dx.doi.org/10.1016/j.sse.2012.05.05.

De Michielis L, Lattanzio L, Moselund KE, Riel H, Ionescu AM. Tunnelling andoccupancy probabilities: how do they affect Tunnel-FET behavior? IEEE Electron Dev Lett 2013; 34:726–8. http://dx.doi.org/10.1109/LED.2013.225766.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Narang R, Saxena M, Gupta RS, Gupta M. Drain current model for a gate allaround (GAA) p–n–p–n tunnel FET. Microelectron J 2013; 44:479–88. http://dx.doi.org/10.1016/j.mejo.2013.04.00.

García Bardon M, Neves HP, Puers R, Van Hoof C. Pseudo-two-dimensionalmodel for double-gate tunnel fets considering the junctions depletion regions.IEEE Trans Electron Dev 2010;57:827–34. http://dx.doi.org/10.1109/TED.2010.204066.

Verhulst AS, Leonelli D, Rooyackers R, Groeseneken G. Drain voltage dependentanalytical model of tunnel field-effect transistors. J ApplPhys 2011; 110. http://dx.doi.org/10.1063/1.360906. 024510–10.

Bhushan B, Nayak K, Rao VR. DC compact model for SOI tunnel field-effecttransistors. IEEE Trans Electron Dev 2012; 59(10):2635–42. http://dx.doi.org/10.1109/TED.2012.220918.

Pan A, Chui C-O. A quasi-analytical model for double-gate tunnelling fieldeffecttransistors. IEEE Electron Dev Lett 2012; 33:1468–70. http://dx.doi.org/10.1109/LED.2012.220893.

Wan J, Le Royer C, Zaslavsky A, Cristoloveanu S. A tunnelling field effecttransistor model combining interband tunnelling with channel transport. J.ApplPhys 2011; 110:104503–7. http://dx.doi.org/10.1063/1.365887.

Zhang L, He J, Chan M. A compact model for double-gate tunneling field effecttransistor and its implications on circuit behaviors. IEEE Int Electron DevMeeting (IEDM) 2012:6.8.1–4. http://dx.doi.org/10.1109/IEDM.2012.647899.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Zhang L, Lin X, He J, Chan M. An analytical charge model for double-gate tunnelFETs. IEEE Trans Electron Dev 2012; 59:3217–23. http://dx.doi.org/10.1109/TED.2012.221714.

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# STUDY ON STRENGTH OF COMPACTED MUD WALLS ARE COMPARED WITH FLY ASH CONCRETE BLOCKS

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## ABSTRACT

***All the building structures are composed of different types of materials. These materials are either called building materials or materials of construction. It is very essential for a builder, may be an architecture or engineer or contractor, to become conversant thoroughly with these building materials. Mud is one of humankind"s oldest and most universally used construction materials. Even at the dawn of humanity, people were building with mud, using it to form protective walls shielding the entrances to their caves.Mud mortar was commonly used for low rise masonry buildings in the past. When the soil used for the mortar contains clay, problems like volume instability due to its high affinity towards water. Workability and strength of 12 different combinations of stabilized mud mortars have been examined. Fly ash blocks / bricks is an established technology with established standards in large parts of world Use of Fly Ash in construction is increasingly being promoted in the areas where it is available in abundance. The quality of the bricks – blocks may vary with factors like Quality of Fly Ash and other raw material, Proportion of mix, mixing and curing.Recommended quality of raw material is a dry fly ash collected from 1st or 2nd fields of ESPs, sludge lime – a waste from acetylene industries, Gypsum of purity of more than 80% and OPC cement. As a result, concentrating on "methods of wall construction", it was found that, "mud", was used over many centuries in traditional architecture. Therefore, concentrating on "mud wall construction", the goal was set to be developed, a "mud block", which has more structural durability, less weight, low cost comparing with flyash concrete block masonary.the mud***

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***masonary is very cheapest.it saves economy comparing with flyash concrete block masonary. The flyash concrete block masonary gives more strength to structure.***

***Key words: Mud masonary,Flyash concrete block masonray,walls,compressive strength,split tensile strength.***

## I. INTRODUCTION

Mud Walls are naturally-occurring background walls found in the Jungle and occasionally Underground Jungle. They can be destroyed with a Hammer, but cannot be picked up nor crafted. Therefore, they can never be placed or utilized in any other way by the player.

Mud walls have been used for the buildings since ancient times. Mud wall buildings can be seen throughout the world and mud construction techniques are still in vogue in many parts of the world. Cob wall, adobe, rammed earth, and wattle and daub are some of the common techniques of building mud walls.

If Mud Walls are sprayed with Dark Blue Solution they will turn into "natural"Mushroom Walls that likewise don't drop anything when destroyed. If these Mushroom Walls are sprayed with Green Solution they will revert back into Mud Walls or natural Jungle Walls, this seemingly being determined by layer level.

Stabilized mud blocks have been used for masonry construction in Australia, France, India, Columbia, Chile, Algeria, Brazil, Thailand and many other countries Understanding the strength of stabilized mud block masonry is essential for a satisfactory use of the new building material. At present, there is hardly any organized information on the properties of masonry using stabilized mud blocks. It is to be noted here that the information available on the strength of brick masonry may not be useful for understanding stabilized mud block masonry. There is hence a clear need for systematic study of various parameters affecting the strength of stabilized mud block masonry.

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## II. MATERIALS AND METHODS

### 2.1 Stabilized mud Block

Stabilized mud blocks can be prepared by compacting a moist mixture of soil and cement in a machine. A number of studies are available on the properties and use of soil cement blocks for building construction9.A manually operated machine called AURAM 240 was used to make blocks for the present study. Locally available soil was used. The grain size distribution of the soil is shown in fig-1. The liquid limit and plastic limit of the soil are 30.6 and 16 respectively.

The block making process consists of mixing the cement and screened soil (<6mm) by hand and then mixing with water to get a near optimum moisture content.

A cement content of 5% by weight of dry soil was used. After pressing the blocks were cured for 28 days under wet burlap. The properties of the blocks are given in table.I as the means of 5 specimens.

Wet strength was determined after soaking in water for 48 hours. Blocks of 240mmx240mmx90mm were used to prepare masonry prisms for strength studies.

Table 2.1:

Properties of stabilized mud blocks

| | |
|---|---|
| Block size | 240mm x 240mm x 90mm |
| Dry strength N/mm2 | 8.2 |
| Wet strength N/mm2 | 3.1 |
| Water absorption in % | 12 |

### 2.2 Objectives and methodology

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The key objective of this research is to find out the possibility of inventing a new "mud block" which has required strength for load bearing walls while satisfying less weight and low cost together with simple manufacturing process, by varying the mixing proportions of mud, cement and straw with water. The following methodology was developed to achieve the objective of the research; The selected soil was tested using standardized test methods: "Sieve Analysis", "Bottle test" and "Atterberg limit test", to find out the properties of the selected soil. After sieving the selected soil using 13 mm riddle (Figure 1), Bottle test was carried out, to find out whether the clay, silt, sand and gravel content of the soil, satisfies the properties that have to be in the soil for developing the required block .

**Figure 1 : Sieved soil**

### 2.3 Preparation of mud mortar

Mud mortar is prepared by mixing soil with water until it is workable i.e., until the mortar is in the plastic state. Mud mortar sets quickly on drying hence it does not require an elaborate curing process. Mud mortars are still being used in many parts of the world. Different types of soils can be used to prepare the mortar. Depending upon the soil type, the properties of the mortar varies. Hence to use the locally available soil in mortar and attain optimum use of it, particular preparation techniques and construction practices including addition of stabilizers are followed. Mud mortars are used in the construction of arches, vaults, masonry walls, arches and domes etc. they are particularly advantageous as no shuttering is required during construction. They function as a waterproofing coat and also improve the appearance of a building. External renders are liable to wear away at a rate depending on the harshness of the

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exposure conditions. They require regular maintenance and periodic repair, although if well-protected they can last a very long time indeed.

**2.4 Materials**

1.1 Clay Generally, the presence of clay in moderate amounts in a soil is desirable. Since clay has cohesive nature, it imparts plasticity to the soil when under moist conditions. Plasticity is due to the thin film of absorbed water which adheres strongly to the clay layers thus linking the particles together. Thus, the clay minerals act as natural binding agents for the cohesionless granular fractions of a soil (gravel, sand, and silt). Although, due to certain drawbacks are of clay are the facts that it has a high affinity towards water. Clayey soils swell in presence of water and shrinks in the absence of it. If the clay mineral is montmorillonite, this kind of swelling and shrinking is more prominent. Such volume instability is not highly undesirable in mortars. Therefore, soils which have clay content below 30% can be stabilized using cement and soils which clay content above 30% can be stabilized using lime.

**2.4.1 Lime**

Lime has the capacity to stabilize clayey soils through pozzolanic reaction. This reaction produces stable calcium silicate hydrates and calcium aluminate hydrates as the calcium from the lime reacts with the aluminates and silicates solubilized from the clay. The modification occurs because hydrated lime supplies calcium cations that replace the cations present on the surface of the clay particles. As a result, lime treatment can produce high and long-lasting strength gains, improvements in shear strength and durability in severe environmental conditions.

**2.4.2 Brick Dust**

Brick dust is obtained from construction and demolition waste. Brick dust finely ground into a powder can bring about a pozzolanic reaction when combined with lime given that they are composed of a type of clay that has a sufficient amount of soluble silica and alumina.Soluble silica and alumina react with calcium hydroxide and water to form a variety of calcium silicate hydrates, or C-S-H gel, that are responsible for the increase in the strength of the mortar.

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### 2.4.3 Fly ash bricks

A Clay brick, which was the primary wall material, is now being replaced by **FLY ASH BRICKS**, which are hi-tech well-improved quality products. They are competitive in comparison to the conventional clay bricks and provide enormous indirect benefits. The country can gain a lot by gainful utilization of fly ash bricks resulting in conservation of natural resources as well as protection of environment.

### 2.4.4 Composition

The important compositions of fly ash bricks are as follows;

- FLY ASH
- CEMENT
- SAND
- WATER

### 2.4.5 Sources of fly ash

72% of India's power plants are coal based. These power stations generate nearly 40 million tones of fly ash annually. Fly ash contains $Co_2$ emitted from Thermal power plants, industries using coal as a fuel emits unwanted ash and smoke from which fly ash is produced. In all the power plants and industries, they separate the fly ash by using the cyclone converter. This fly ash is then used as a raw material for manufacture of bricks.

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### 2.4.6 Manufacture

The fly ash brick is nothing but a slow setting pozzalona cement mix. The process is same as making cement in cement factories whereas the clay and limestone are burnt with coal and gypsum. And it is mixed and ground to cement.

In fly ash mix also the fly ash, which is burnt clay particles (oxides of clay) obtained from burning coal, which contains clay from the mines. When hydrated lime powder, gypsum are mixed and ground in a pan, the mixture gives a slow setting pozzalona cement.

While the mix is pressed at low pressure at low moisture content in hydraulic machine, which is specially designed to give high pressure load at a slow rate, in the order of 350kg/square inch.

At this of rate of pressure and with holding the pressure for a desired time gives ultimate strength to fly ash bricks.

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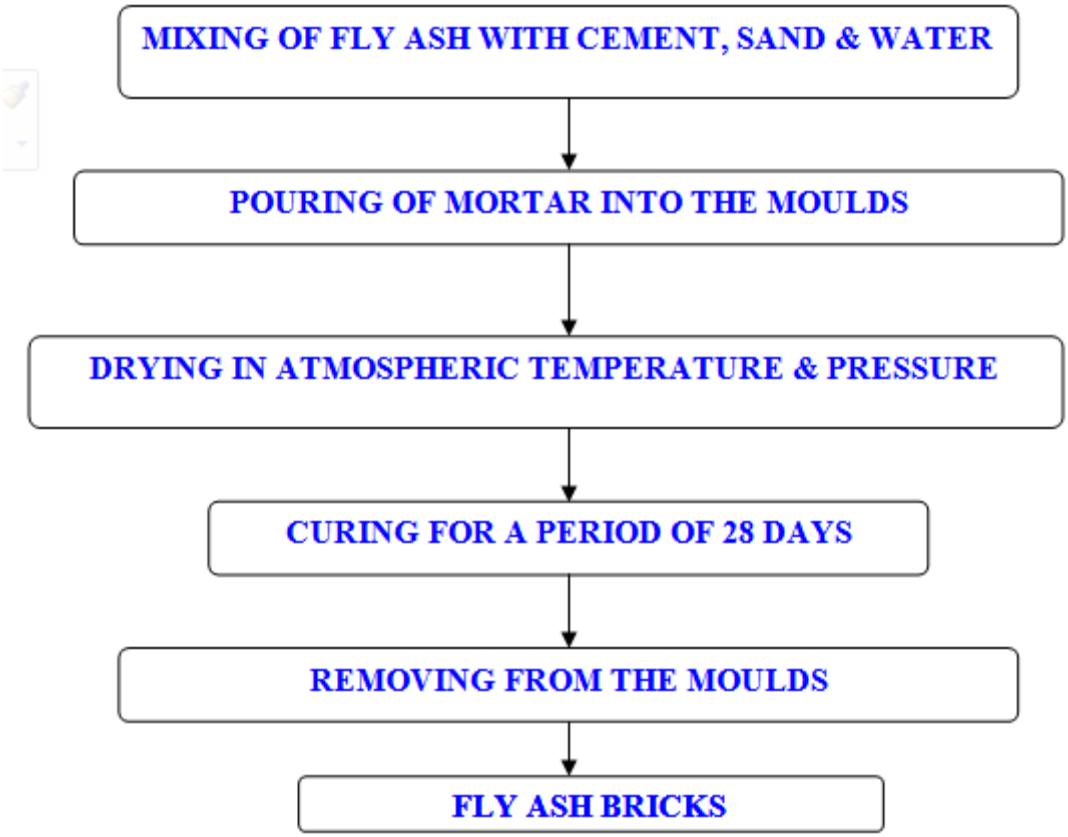


## 2.5 Experimental Investigations

### 2.5.1 Experimental Investigation on flyash concrete block

Testing of Materials Properties of constituent materials like brick, cement, sand and mortar etc. were tested in accordance to Bureau of Indian Standards (B.I.S.) specifications and test results so obtained were found to be within the prescribed limits. Preparation of prisms The test prisms were made in 1:6 cement-sand mortars with water cement ratio as 0.80. Thickness of mortar was kept uniform at D/6, where D is the thickness of brick. Testing of prisms in compression and shear Prisms in the compression were tested under compression testing machine and in shear; prisms were tested with help

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of Universal testing machine as shown in Fig. 2. Dial and Demac gauges were used to record compressive strain in prisms. 979 I.K. Khan (a) Testing of prism in compression (b) Testing of prism in shear Fig. 2: Testing of prisms in compression and shear 3. Mechanical Properties Compressive strength and crushing strain The ultimate load, compressive strength and crushing strain for different types of FAB masonry are given in Table 2. Table 2: Compressive strength, maximum vertical axial load per unit length and crushing strain Masonry type Compressive strength (MPa) Maximum vertical axial load per unit length (kN/m) Crushing strain A 1.22 279.30 1.32% B 0.84 167.5 0.53% C 1.41 247.19 0.78% Shear strength The shear strength of different types FAB masonry found from experiment conducted on masonry prisms are given in Table 3. Table 3: Shear strength of different types FAB masonry prisms S. No. Masonry type Shear strength, (MPa) Percentage decrease as compared to masonry Type A 1 A 0.46 00.00 2 B 0.21 54.35 3 C 0.35 23.91 Strength Characteristics of Low Cost Fly Ash Brick Masonry 980 Conclusions Based on the experimental and analytical studies of conventional and low cost and conventional FAB masonry,

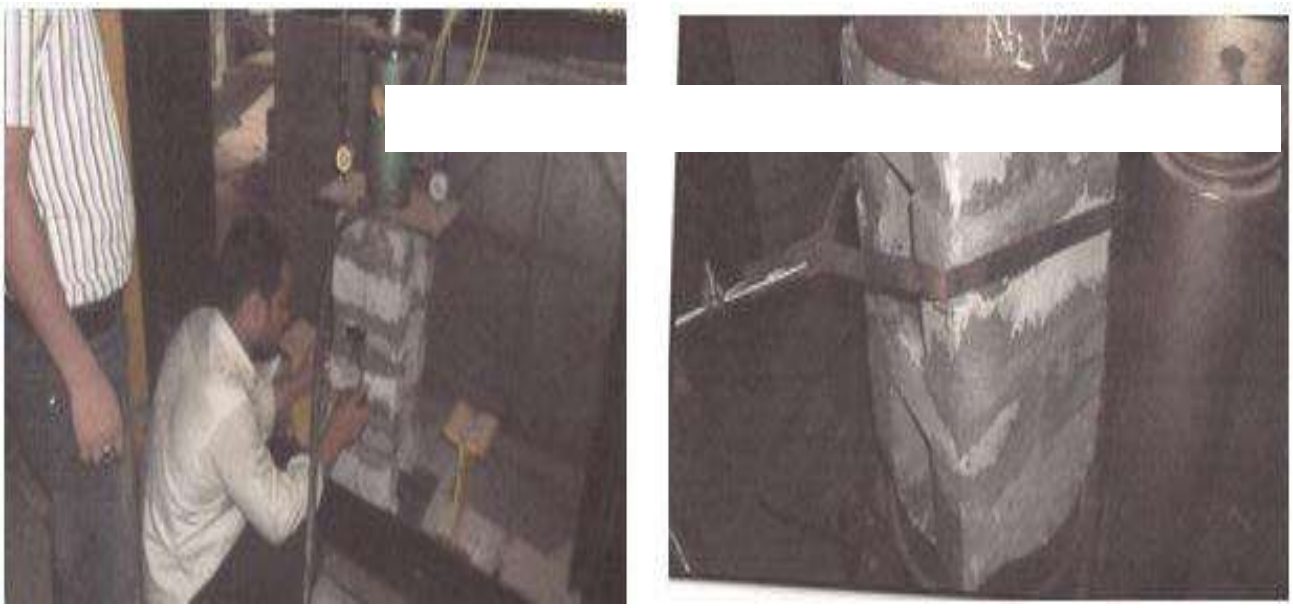

**Fig. 2: Testing of prisms in compression and shear**

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**Fig (a) Testing of prism in compression, Fig (b) Testing of prism in shear**

### 2.5.2 Experimental Investigation on mud mortar

The present work focuses on characterizing the properties of stabilized mud mortars. The characteristics like workability and compressive strength are determined for different proportions of mortars. Mix proportions are given in table 1. The mortar mix proportions in this study are based on weight.

Table -2.5.2 : Mix proportions

| Mortar designation | Mortar proportion | | | | |
|---|---|---|---|---|---|
| | Soil | Sand | Brick dust | Cement | Lime |
| M1 | 100% | - | - | 12% | - |
| M2 | 100% | - | - | 10% | 5% |
| M3 | 100% | - | - | 5% | 10% |
| M4 | 100% | - | - | - | 10% |
| M5 | 50% | 50% | - | 12% | - |
| M6 | 50% | 50% | - | 10% | 5% |
| M7 | 50% | 50% | - | 5% | 10% |
| M8 | 50% | 50% | - | - | 10% |
| M9 | 50% | 25% | 25% | 12% | - |
| M10 | 50% | 25% | 25% | 10% | 5% |
| M11 | 50% | 25% | 25% | 5% | 10% |

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| | | | | | |
|---|---|---|---|---|---|
| M12 | 50% | 25% | 25% | - | 10% |

## III. TESTING PROCEDURE

For the study, locally available red soil is used. This natural soil has 20% clay fraction and liquid limit 37.5%.The clay content is varied by diluting it with natural sand and brick dust. The brick dust is obtained by manually ramming construction and demolition waste. The cement used is of OPC 53 grade. The lime bought in the form of limestones, is slaked and used.

characters are measured by conducting flow table tests. Here, the flow is maintained at 100% and the water cement ratio is determined.

### 3.1 Compressive Strength of Mortar

The compressive strength of mortar was determined by testing 70mm size cube specimens. The specifications of I.S. 2250 code are followed. The mould greased and uniformly mixed mortar is then filled in 3 layers. Each layer is tamped 25 times using a standard tamping rod. The mortar cubes are demoulded after 24 hours and cured. After 28 days of curing, the specimens are tested in compression testing machine in saturated conditions.

## IV. RESULTS AND DISCUSSIONS

For 100% flow, the water content by weight mortar mix and 28 days compressive strength is as given in table 2. It is observed that when the water requirement of the mortar increases with the increase in clay fraction. The compressive strength of mortar mix with 10% clay fraction and 12% cement has the highest strength. The mortars with 20% clay fraction (M1 and M2) have compressive strength nearer to 3MPa. The mortar mixes with more clay and lime content are expected to gain strength over a period

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of time. They may be used as low strength mortar.

**Table -3.2:** Water content for 100% flow and 28 Compressive strength

| Mortar designation | Water content (%) | 28 days compressive strength (MPa) |
|---|---|---|
| M1 | 35.03 | 2.42 |
| M2 | 33.15 | 2.64 |
| M3 | 37.44 | 1.26 |
| M4 | 35 | 1.02 |
| M5 | 20.22 | 4.25 |
| M6 | 23.94 | 3.40 |
| M7 | 29.68 | 1.24 |
| M8 | 27.95 | 0.66 |
| M9 | 24.78 | 3.49 |
| M10 | 29.65 | 3.17 |
| M11 | 32.05 | 1.72 |
| M12 | 30.38 | 0.98 |

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**4.1 Determination of Workability through Flow Tests** Workability of the mortar should be such that it can be spread easily and adheres well with the masonry unit. Composition of the mix and water cement ratios are two major factors that affect workability. In the present study, the workability.

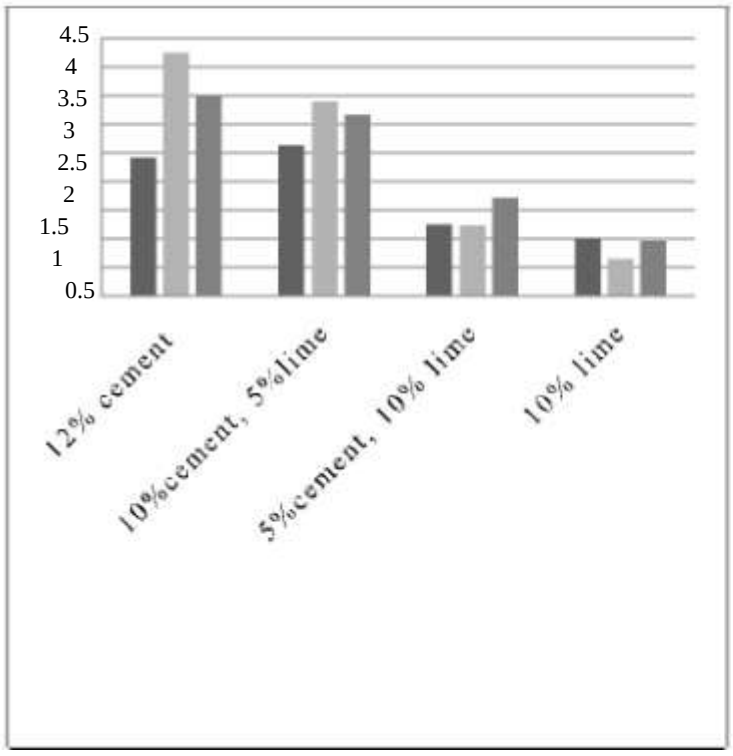


**Chart -1:** 28 days compressive strength

When lime is added, it is noticed that the strength with increase in clay fraction. The comparison of the compressive strengths of the mortar mixes is shown in chart 1.

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Table 4.1 Comparison Of Clay Bricks And Fly Ash Bricks

| Properties | Red blocks | Flyash blocks | Remarks |
|---|---|---|---|
| 1. Density | 1600-1750 kg/m$^3$ | 1700-1850 kg/m$^3$ | Higher load bearing |
| 1. Compressive strength | 30-35 kg/cm$^2$ | 90-100 kg/cm$^2$ | Higher load bearing |
| 1. Absorption | 15-25% | 10-14% | Less dampness |
| 1. Dimensional stability | Very low tolerance | High tolerance | Saving in mortar up to 25% |
| 1. Wastage during transit | Up to 10% | Less than 2% | Saving in cost up to 8% |
| 1. Plastering | Thickness vary on the both sides of wall | Even on both sides | Saving in plaster up to 15%. |

## V. CONCLUSIONS

As a result, concentrating on “methods of wall construction”, it was found that, “mud”, was used over many centuries in traditional architecture. the mud masonary is very cheapest.it saves economy

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comparing with flyash concrete block masonary. The flyash concrete block masonary gives more strength to structure. Mud mortar was commonly used for low rise masonry buildings in the past. When the soil used for the mortar contains clay, problems like volume instability due to its high affinity towards water.

It is evident from the studies that partial replacement of sand is viable as a maximum strength of 4.25 MPa is obtained which clearly exceeds the limit (3MPa) established by I.S. 2250 code The mortars containing lime may be used as low The mortars containing lime may be used as low strength mortars. Therefore, the construction can be made economical as well as ecofriendly.

Based on the experimental and analytical studies of conventional and low cost and conventional FAB masonry, following conclusions have been drawn:

i) All the FAB masonry prisms, tested in compression failed due to cracks developed along the vertical mortar joints.

ii) All the FAB masonry prisms tested in shear failed by sliding along the horizontal mortar bed which is the weakest plane in shear.

iii) Compressive strength of low cost FAB masonry Type C is higher than Type B , which is 15.57% higher than conventional FAB masonry Type A.

iv) Crushing strain of low cost FAB masonry Type C is also higher than Type B , which is 40.91% less than conventional FAB masonry Type A.

v) Shear strength of low cost FAB masonry Type C is higher than Type B , which is 23.91% less than conventional FAB masonry Type A.

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## REFERENCES

K.S. Jagadish, Building with Stabilized Mud, IK International Publishing House Pvt. Ltd, New Delhi, 2007.

Rogers, Sara B, Evaluation and Testing of Brick Dust as a Pozzolanic Additive to Lime Mortars for Architectural Conservation. (MastersThesis). University of Pennsylvania, Philadelphia, PA 2011.

Walker P and Stace, T., Properties of some cement stabilized compressed earth blocks and mortars, Mater.Struct.30, pp545-551, Nov 1997.

B. V. Venkatarama Reddy and Ajay Gupta, Characteristics of Cement-Soil Mortars, Materials and Structures, Vol.38, pp 639-650, July 2005.

B. V. Venkatarama Reddy and Ajay Gupta, Strength and Elastic Properties of Stabilized Mud Block Using Cement-Soil Mortars, Journal of Materials in Civil Engineering, Vol.18, No.3, pp 472-476, June 2006.

Laura Rampezzi and Roberto Bugini, St. Lorenzo basilica in Milan: integral approach to characterization of historical mortars, e-preservation science, Vol.3, pp 21-26, July 2006.

IS:2250, 'Indian standard code of practice for preparation and use of masonry mortars' bureau of Indian standards, New Delhi, India, 1981.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Gross, G.J., Dikhars, R.D. and Corogan, J.C. (1969). Recommended practice for engineered brick masonry. Structural Clay Product Institute, U.K.

Lenczner, D. (1972). Elements of load bearing brickwork. International Series of Monograms in Civil Engineering, Vol. 5, Pergamon Press, New York.

Pande, G.N., Kralj, B. and Middleton. J. (2001). Analysis of compressive strength ofNmasonry given by the equationsbm = K(sbdmf ds )a(sm)b ". Structural Engineering. Vol. 130(3): pp. 386-395.

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# PROJECT LOON

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***ABSTRACT***

***Project Loon is a google designed and sponsored project which enables the rural people to connect to the internet in an economical and efficient way. Currently all the urban people are provided with internets by internet service providers (ISP). Giving service to rural people through this ISP is a very expensive activity. So google designed a project named 'PROJECT LOON' with a balloon topped equipment with a internet router at the base . This equipment provides service to the people in its range within a radius of 32km(approx).Project Loon balloons float in the stratosphere, twice as high as airplanes and the weather. In the stratosphere, there are many layers of wind, and each layer of wind varies in direction and speed. Loon balloons go where they're needed by rising or descending into a layer of wind blowing in the desired direction of travel. By partnering with Telecommunications companies to share cellular spectrum we've enabled people to connect to the balloon network directly from their phones and other LTE-enabled devices. The signal is then passed across the balloon network and back down to the global Internet on Earth.***

***KEYWORDS: Internet Service Provider(ISP),Router, Google loon , Internet, Project loon, LTE-devices(long term evolution-devices)***

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## I. INTRODUCTION

Project loon works on the information given by of weather forecasting device. This device which is connected to weather will be fed with electricity through the solar panels provided at the bottom of the balloon. We find mobile phones and computers around everyone. Due to this smart change, internet helps in connecting people ,areas etc. this could be made easy through loon project.

## II. WORKING

NAVIGATING WITH THE WIND STRATOSPHERE Project Loon balloons travel approximately 20 km above the Earth's surface in the stratosphere. Winds in the stratosphere are stratified, and each layer of wind varies in speed and direction. Project Loon uses software algorithms to determine where its balloons need to go, then moves each one into a layer of wind blowing in the right direction. By moving with the wind, the balloons can be arranged to form one large communications network.

## III. DESIGN

The inflatable part of the balloon is called a balloon envelope. A well-made balloon envelope is critical for allowing a balloon to last around 100 days in the stratosphere. Loon's balloon envelopes are made from sheets of polyethylene plastic, and they measure fifteen meters wide by twelve meters tall when fully inflated. When a balloon is ready to be taken out of service, gas is released from the envelope to bring the balloon down to Earth in a controlled descent. In the unlikely event that a balloon drops too quickly, a parachute attached to the top of the envelope is deployed. Each balloon's electronics are powered by an array of solar panels. The solar array is a flexible plastic laminate supported by a light-weight aluminum frame. It uses high efficiency monocrystalline solar cells. The solar array is mounted at a steep angle to effectively capture sunlight on short winter days at higher latitudes. The array is divided into two sections facing in opposite directions, allowing us to capture energy in any orientation as the balloons spin slowly in the wind. The panels produce

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approximately 100 Watts of power in full sun, which is enough to keep Loon's electronics running while also charging a battery for use at night. By moving with the wind and charging in the sun, Project Loon is able to power itself using entirely renewable energy sources.

## IV. COMMUNICATION / CONNECTION:

Each balloon can provide connectivity to a ground area about 80 km in diameter using a wireless communications technology called LTE. To use LTE, Project Loon partners with telecommunications companies to share cellular spectrum so that people will be able to access the Internet everywhere directly from their phones and other LTE-enabled devices. Balloons relay wireless traffic from cell phones and other devices back to the global Internet using high-speed links.

## V. CONCLUSION

Thus, with this project named google loon also called project loon we can give access to most of the rural people very much efficiently, economically and easily. The network provided through this google loon can exceed the speed of 4G-LTE, which has not even come into existence even in urban and metropolitan cities in our country. Project Loon has generally been well received, although Square Kilometer Array (SKA) project developers and astronomers have raised concerns that the lower of the two ISM bands that Loon uses (2.4 GHz) will interfere with the mid-band frequency range (0.5 GHz-3 GHz) used in the SKA project .Google has not yet specified the costs of this project.

## REFERENCES

en.wikipedia.org/wiki/Project_Loon

google.com/loon/

gizmodo.com/googles-crazy-internet-balloons-will-flock-together-li-1232537205

https://www.google.co.in/#q=comments+of+people+on+project+loons

http://www.wired.com/business/2013/06/google_internet_balloons/all/google.com/loo

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http://www.youtube.com/watch?v=m96tYpEk1Ao

http://techcrunch.com/2013/06/14/google-x-announces-project-loon-balloon-powered-internet-for-rural-remoteand-underserved-areas/

techradar.com/news/world-of-tech/project-loon-explained-can-google-s-balloons-unite-the-world-online— 1182663

theinquirer.net/inquirer/news/2288071/bill-gates-slams-googles-project-loon-initiative.

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# E-RECEPTIONIST USING QT CREATOR

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***ABSTRACT***

***This paper concentrates on developing an E-Receptionist system for College Environment. The proposed system gives the details about various courses offered in the college and also stores the details of the students who have enquired into the database.First, the face detection algorithm runs on the camera's video input feed using Harr-Cascade algorithm. When this detects a face of a person from the input video feed, it orally greets the person with an audio message "Welcome" through the connected audio device. Then the user is asked to enter his details i.e. name, phone number and email id. These details are stored in a database. The visitor is then given an option to select the course for which he/she wants the details. The selected course details are displayed. OpenCV is used to run the camera. QtCreator IDE is used to develop the System. This application is implemented in Linux OS and CPP programming language is used.***

***Keywords: Qt Creator, Harr-Cascade, OpenCV***

## I. INTRODUCTION

This application deals with developing an E-receptionist system using Qt Creator. Harr cascade is used for face detection. The flowchart given below describes the sequence of the events occurring in this application

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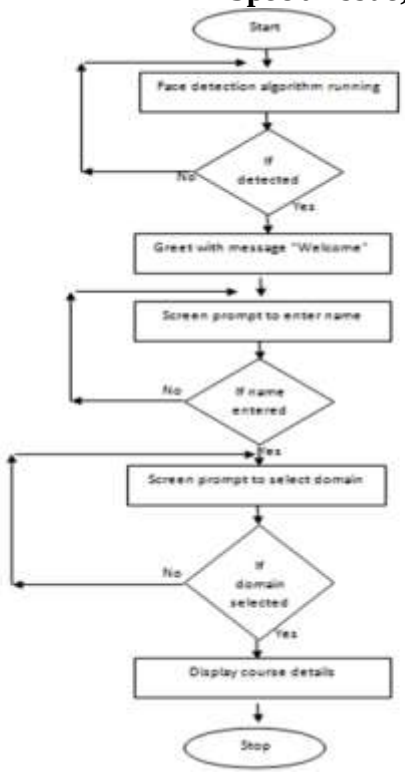


Fig1: Flowchart of application

If a person comes to the reception, the camera captures the picture of the person. While capturing , the surroundings of the human beings are also included. Harr Cascade algorithm is run to detect the human being.When the face of the person is detected, a welcome message is announced .Then the user needs to enter his/her details into the pop up or the space provided. The details are saved into the Qt Database. The user can get the details of the required course on the screen. This application can be developed either by using Windows OS or Linux. But it is better to use Linux OS , as it is open source, the chances of the kernel getting corrupted is also less as it is less prone to virus. This application is developed in QT Creator using CPP programming language. Various widgets required foe the application are developed in QTCreator. Details of the persons who enquire is stored in Qt Database, and can be retrieved whenever required.

## II. DESCRIPTION

This section provides in detail description of QtCreator and Harr-Cascade algorithm.

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All the applications which have camera module make use of OpenCV.Face detection is done using haar cascade algorithm.Haar cascade algorithm is basically used to detect the Human faces. The entire image is divided into background, positive images and negative images. The whole photo is converted to gray scale and positive images are detected. For example, eyes , nose, ears and mouth are considered. The background and negative images get eliminated. The haar cascade is given for different languages like C, C++, python etc. the whole algorithm is already predefined. First, a classifier (namely a cascade of boosted classifiers working with haar-like features) is trained with a few hundred sample views of a particular object (i.e., a face or a car), called positive examples, that are scaled to the same size (say, 20x20), and negative examples - arbitrary images of the same size.

After a classifier is trained, it can be applied to a region of interest (of the same size as used during the training) in an input image. The classifier outputs a "1" if the region is likely to show the object (i.e., face/car), and "0" otherwise. To search for the object in the whole image one can move the search window across the image and check every location using the classifier. The classifier is designed so that it can be easily "resized" in order to be able to find the objects of interest at different sizes, which is more efficient than resizing the image itself. So, to find an object of an unknown size in the image the scan procedure should be done several times at different scales.

The word "cascade" in the classifier name means that the resultant classifier consists of several simpler classifiers (stages) that are applied subsequently to a region of interest until at some stage the candidate is rejected or all the stages are passed. The word "boosted" means that the classifiers at every stage of the cascade are complex themselves and they are built out of basic classifiers using one of four different boosting techniques (weighted voting). Currently Discrete Adaboost, Real Adaboost, Gentle Adaboost and Logitboost are supported. The basic classifiers are decision-tree classifiers with at least 2 leaves. Haar-like features are the input to the basic classifiers, and are calculated as described below. The current algorithm uses the following Haar-like

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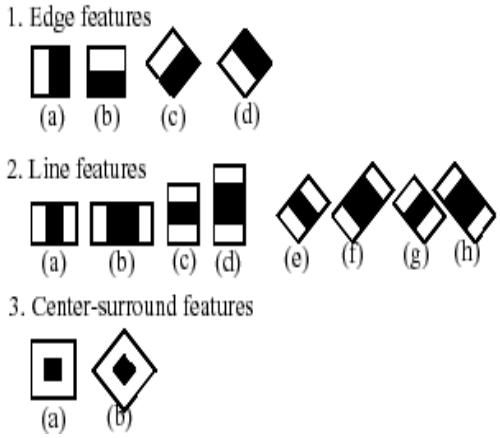


Fig 2:Haarfeatures

The feature used in a particular classifier is specified by its shape (1a, 2b etc.), position within the region of interestand the scale (this scale is not the same as the scale used at the detection stage, though these two scales are multiplied). For example, in the case of the third line feature (2c) the response is calculated as the difference between the sum of image pixels under the rectangle covering the whole feature (including the two white stripes and the black stripe in the middle) and the sum of the image pixels under the black stripe multiplied by 3 in order to compensate for the differences in the size of areas. The sums of pixel values over a rectangular regions are calculated rapidly using integral images.

Qt Creator is an integrated development environment (IDE) that provides tools to design and develop applications with the Qt application framework. Qt is designed for developing applications and user interfaces once and deploying them to several desktop and mobile operating systems. Qt Creator provides you with tools for accomplishing your tasks throughout the whole application development life-cycle, from creating a project to deploying the application to the target platforms.

## III. CROSS COMPILING QT FOR EMBEDDED LINUX APPLICATIONS

Cross-compiling is the process of compiling an application on one machine, producing executable code for a different machine or device. To cross-compile a Qt for Embedded Linux application, use the following approach:

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Note: The cross-compiling procedure has the configuration process in common with the installation procedure; i.e., you might not necessarily have to perform all the mentioned actions depending on your current configuration.

Step 1: Set the Cross-Compiler's Path:

export PATH=path/to/cross/compiler:$PATH

Step 2: Create a Target Specific qmake Specification:

The qmake tool requires a platform and compiler specific qmake.conf file describing the various default values, to generate the appropriate Makefiles. The standard Qt for

Embedded Linux distribution provides such files for several combinations of platforms and compilers. These files are located in the distribution's mkspecs/qws subdirectory.

Each platform has a default specification. Qt for Embedded Linux will use the default specification for the current platform unless told otherwise. To override this behavior, you can use the configure script's –platform option to change the specification for the host platform (where compilation will take place).

The configure script's –xplatform option is used to provide a specification for the target architecture (where the library will be deployed).

For example, to cross-compile an application to run on a device with an ARM architecture, using the GCC toolchain, run the configure script at the command line in the following way:

./configure –embedded arm –xplatform qws/linux-arm-g++ <other options>

If neither of the provided specifications fits your target device, you can create your own. To create a custom qmake.conf file, just copy and customize an already existing file. For example:

cp path/to/QtEmbedded/mkspecs/qws/linux-mips-g++/...

path/to/QtEmbedded/mkspecs/qws/linux-myarchitecture-g++/...

Note: When defining a mkspec for a Linux target, the directory must be prefixed with "linux-". We recommend that you copy the entire directory.

Note also that when providing you own qmake 8pecification, you must use the configure script's –xplatform option to make Qt for Embedded Linux aware of the custom qmake.conf file.

Step 3: Provide Architecture Specific Files:

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Starting with Qt 4, all of Qt's implicitly shared classes can safely be copied across threads like any other value classes, i.e., they are fully reentrant. This is accomplished by implementing reference counting operations using atomic hardware instructions on all the different platforms supported by Qt.

To support a new architecture, it is important to ensure that these platform-specific atomic operations are implemented in a corresponding header file (qatomic_ARCH.h), and that this file is located in Qt's src/corelib/arch directory. For example, the Intel 80386 implementation is located in src/corelib/arch/qatomic_i386.h.

Step 4: Provide Hardware Drivers:

Without the proper mouse and keyboard drivers, you will not be able to give any input to your application when it is installed on the target device. You must also ensure that the appropriate screen driver is present to make the server process able to put the application's widgets on screen.

Qt for Embedded Linux provides several ready-made mouse, keyboard and screen drivers, see the pointer handling, character input and display management documentation for details.

In addition, custom drivers can be added by deriving from the QWSMouseHandler, QWSKeyboardHandler and Qscreen classes respectively, and by creating corresponding plugins to make use of Qt's plugin mechanism (dynamically loading the drivers into the server application at runtime). Note that the plugins must be located in a location where Qt will look for plugins, e.g., the standard plugin directory.

See the How to Create Qt Plugins documentation and the Plug & Paint example for details.

Step 5: Build the Target Specific Executable:

Before building the executable, you must specify the target architecture as well as the target specific hardware drivers by running the configure script:

cd path/to/QtEmbedded

./configure –embedded <architecture> -qt-kbd-<keyboarddriver>

-qt-mouse-<mousedriver> -qt-gfx-<screendriver>

It is also important to make sure that all the third party libraries that the application and the Qt libraries require, are present in the tool chain. In particular, if the zlib and jpeg libraries are not

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available, they must be included by running the configure script with the –L and –I options. For example:

```
cd path/to/QtEmbedded
./configure  <other options>
-L /path/to/libjpeg/libraries –I /path/to/libjpeg/headers
```

The JPEG source can be downloaded from http://www.ijg.org/. The Qt for Embedded Linux distribution includes a version of the zlib source that can be compiled into the Qt for Embedded Linux library.Then build the executable:

```
cd path/to/myApplication
qmake –project
qmake
make
```

The target specific executable is ready for deployment.

## IV. RESULTS

The Mainwindow is shown in the fig below . It is developed in QtCreator using various widgets.


Fig3:Main Window

Harr cascade algorithm is run and human being is detected. When a person is recognized, it gives a red box.

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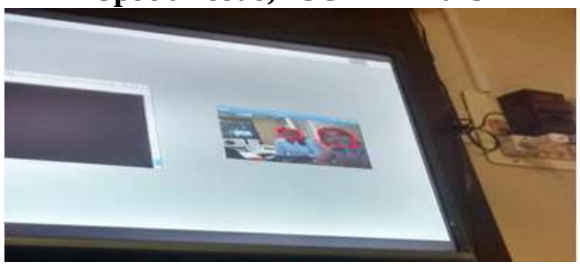

Fig4: Person recognition

The person needs to enter his/her details in the widgets provided below. These details get stored in Qt database.


Fig5: Dialog wherein person details are taken

The person needs to select the course regarding which he/she needs the information.

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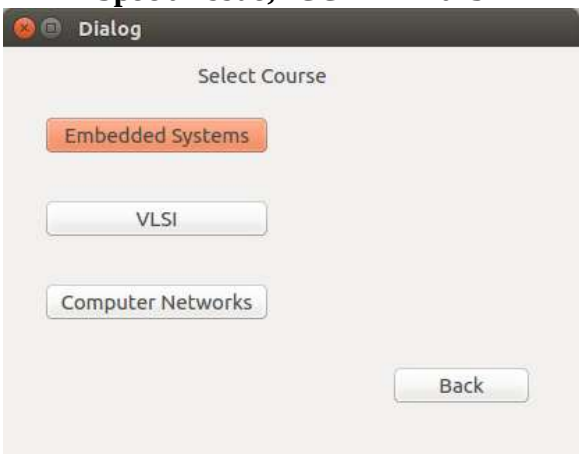


Fig6: Selection of Course for which the person requires the details

As the person wanted to know the details of Embedded Systems course, the content related to Embedded Systems is retrieved from the database.

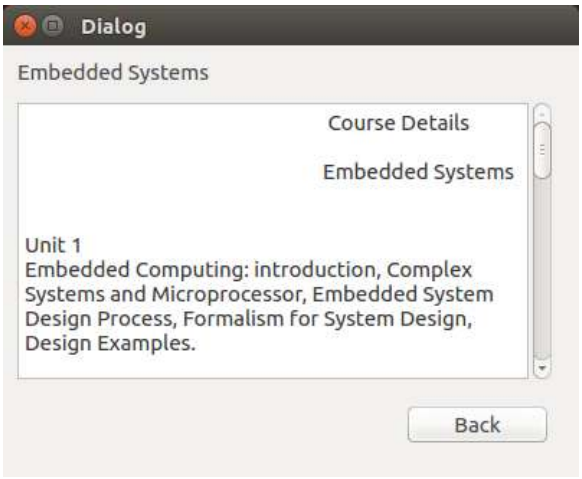


Fig7: Details of Embedded Systems Course

## V. CONCLUSION

The smart e-receptionist application is designed and implemented using Qt creator and Linux OS. Its very simple to use QTCreator for such applications. We can use Raspberry Pie or S3C2440 to port the application.

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## VI. FUTURE SCOPE

Face recognition can be added to the current work.. Face recognition can tell whether a person has already accessed the database or not. This will be useful to keep a track on how many people have enquired about various courses, so that a rough estimation of admissions can be made. Also, Text to speech and voice recognition can be added to increase interaction capabilities. By adding these, the visitor can ask questions and can have interactive conversation with the receptionist.

## REFERENCES

S. Sik, K. Jeong, and S. Hwa,"Developmentof information architecturefor user-centered hospital kiosk," in*Proc. IEEE 3rd Int. Conf. Data MiningIntelligent Information Technology Applications*, Oct. 2011,pp. 201–203.

J. Gauvain, J. Gangolf, and L.

Lamel. "Speech recognition for an informationkiosk" in *Proc. IEEE 4th Int.Conf. Spoken Language*, Oct. 1996, pp.849–852.

Microsoft. (2009, Mar. 3). Microsoftspeech SDK. [Online]. Available:http://www.microsoft.com/enus/download/details.aspx?id=10121

T. H. Cormen, C. E. Leiserson, R. L.Rivest, and C. Stein, *Introduction to Algorithms*.Cambridge, MA: MIT Press, 2009.

National Archives and RecordsAdministration. (2007, May). The Soundexsystem. [Online]. Available: http://www.archives.gov/research/census/soundex.html

D. E. Knuth, *The Art of ComputerProgramming: Sorting and Searching*,vol. 3. Reading, MA: Addison-Wesley, 1973.

A. Yilmaz, O. Javed, and M. Shah,"Object tracking: A survey," *ACM Comput.Surveys*, vol. 38, no. 4, pp. 1–45,Dec. 2006.

M. A. Zahid, N. I. Rao, and A. M.Siddiqui, "English to Urdu transliteration:An application of Soundex algorithm,"in *Proc. IEEE Infomraiton Emerging Technologies*,June 2010, pp. 1–5.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
S. White. (2004). How to strike amatch. [Online]. Available:

http://www.catalysoft.com/articles/StrikeAMatch.html

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**International Journal Of Core Engineering & Management (IJCEM)**
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# COMPARATIVE ANALYSIS OF LMT AND FT CLASSIFIERS FOR SMART HEART DISEASE PROPHECY

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***ABSTRACT***

***Healthcare industries collect voluminous clinical data which are not able to process manually. Advancements in Technology played a vital role in storing and processing such huge collection of clinical data. Medical decision support systems are intended to support doctors in their diagnosis. This provides effort to widen knowledge and understanding of frequent specialists and facilitates the diagnosis process, using patients' data from clinical databases. These systems help in predicting the most severe cardio vascular diseases like 'Heart Disease'. The term Heart disease encompasses the various diseases that affect the heart and causes to death. The exposure of heart disease from various factors or symptom is an issue which is not complimentary from fake presumptions often accompanied by unpredictable effects. Diagnosis of heart disease is a important and tedious task in medicine. It is indispensable to find the best fit classification algorithm that has superior accuracy on classification in heart disease prediction. This research work compares the efficiency of LMT and FT classifiers for prediction of heart diseases by various measures using open access machine learning tool.***

**Keywords—FT Classifier; Heart Disease Prediction; LMT Classifier; Performance Analysis**

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## I. INTRODUCTION

Medical data mining is an exploring field of data mining, where different data mining and classification techniques are used to predict the diseases based on the existing clinical data. Health care industries store huge amount of data of patients which can be used for this purpose. Even the serious diseases like 'Heart Attack' have some common symptoms which are used to predict the disease. Based on the past existing data if a classification model could be prepared, and then it is easy for the physician to predict the disease using basic clinical data and initiates the treatment without waiting for other medical modality results. Medical decision support systems use Medical data mining approach to support diagnosing process. Mainly classification algorithms play an important role for this purpose. The accuracy of the classification will be based on the accurate and enough training data available. Varieties of classification algorithms exist to predict the unknown data and Computer Science and Engineering Researchers have an opportunity to study the algorithms and suggest the best performing algorithm. This research work experiments and compares the performance of Memory based classifiers in predicting Heart Disease.

## II. LITERATURE REVIEW

neuro-fuzzy integrated approach of two levels is implemented in [1] to predict the Heart Disease. A combination of Maximal Frequent Item set Algorithm, C4.5, and K-means is used to extract and predict Heart Disease is presented in [2] and [11]. A combined approach of Artificial Neural Network and Feature Subset Selection with Principal component Analysis is applied to analyze Heart Disease in [3]. In [4], SPAM algorithm using Nearest Neighbor Classifier is proposed to diagnose Heart Diseases. Heart Disease prediction which applies Genetic Algorithm for assortment of attributes with Optimal reduced Set and then uses Naive Bayes and Decision Tree classifiers are presented in [5]. In [6], performance juxtaposition of C5.0 and the C4.5 decision tree algorithms is done and how the rules can be used in evidence based medicine is explained. [7] &[8] describes the heart attack prediction using Cluster based Association Rule Mining using sequence number. Literature survey on Heart Disease prediction is summarized in [9], [13], [27] and [16]. Differentiation among SMO, Logistic Function and

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Multilayer Perceptron on Heart Disease prediction is presented in [10]. Heart Disease evaluation using K- Nearest Neighbors is presented in [12]. The possibilities, advantages and uses of Data Mining in Health care to predict disease is elaborated in [14] and [22]. In [15], Adaptive Neuro-Fuzzy Inference system with combined Learning algorithm is described for Heart Disease prediction. Heart Disease classification and prediction using Artificial Neural Network Multilayer Perceptron using Back Propagation algorithm is described in [30] and [17]. In [18], Heart disease detection using (CART) Classification and Regression Tree Model is explained and the results are compared with existing research papers. In [19], Heart Disease prediction using Cascaded Neural Network Classifier is proposed and the same is compared with the performance of Support vector machine algorithm. [20] and [28] explains the prediction of Heart Diseases in advance using Data Mining Techniques like Naive Bayes, Neural Networks and Decision tree and the same using CART, ID3 and Decision Tree classifiers are summarized in [23]. In [21], Nine Voting Equal Frequency Discretization Gain Ratio Decision Tree is proposed for Heart disease prediction and compared with Bagging Algorithm and J48 Decision Tree classifier. In [24], a comparative analysis of Neural Network, Support Vector Machine and K-Means Clustering are elaborated. In [25], a web-based application named Decision Support in Heart Disease Prediction System using data mining technique is proposed. In [26], a comparative study of Naive Bayes, J48 and Decision Table algorithms for heart disease prediction is presented. Evaluation of Heart disease prediction using Decision Tree, Naive Bayes with Weighted Associative Classifier with Apriori Algorithm and K-Means is presented in [29]. In [31], efficiency of Naive Bayes classifier and Support Vector machine are compared. Prediction of Heart Disease using Naive Bayes and Jelinek-mercer smoothing is explained in [32]. Proficiency Comparison of Memory Based Classifiers for Heart Disease Prediction is done in [33]. Expertise Comparison of RIDOR, ZeroR and PART Classifiers for Intelligent Heart Disease Prediction is carried out in [34]. LMT Classifier and FT Classifier are used in many classification problems like Misfire Detection, Customer churn, Educational Mining, and other applications, which are described in [35 – 39]. This work investigates the performance comparison of LMT Classifier and Functional Tree classifier for prediction Heart Disease.

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## III. DATA SET USED

This work uses the Statlog Heart Disease database from UCI machine learning repository [40] with a total of 270 patient data with 13 medical attributes. This dataset contains 150 patients not having heart disease and 120 patients having heart disease. The diagnosis class value"1" is used to indicate the absence of heart disease and value "2" is used to indicate the presence of heart disease. The attributes are acronym as: age, sex, cp, trestbps, chol, fbs, restecg, thalach, exang, oldpeak, ca, slope, and thal, etc.

## IV. METHODOLOGY USED

This work compares the performance of LMT classifier and FT classifiers for heart disease prediction.

### *b. LMT Classifier*

Logistic Model Tree (LMT) classifier is a combination of Logistic Regression and Decision Tree algorithm, which makes a tree with binary and multiclass class variables. LMT constructs a single outcome in the form of tree containing binary splits on numeric attributes.

### *c. FT Classifier*

FT is a classifier algorithm for constructing 'Functional Trees'. It could have logistic regression functions defined at the inner nodes/leaves. The algorithm can deal with numeric, nominal attributes, missing values, binary and multi class variables.

## V. PERFORMANCE MEASURES USED

Various scales are used to gauge the performance of the LMT classifier and FT Classifier for heart disease prediction. They are as follows. Apart from these, the number of correctly classified instances and time taken to build the classification model are also considered.

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*a. Classification Accuracy*

Any classifier could have an error rate and may fail to categorize correctly. Classification accuracy is defined as correctly classified instances by Total number of instances multiplied by 100.

*b. Mean Absolute Error*

Mean absolute error is the average of the variance between projected and actual value in all test cases. It is a good measure to gauge the performance.

*c. Root Mean Square Error*

Root mean squared error is used to scale dissimilarities between values actually achieved and the values predicted by the model. It is determined by taking the square root of the mean square error.

## VI. RESULTS AND DISCUSSION

An open source machine learning tool is used to experiment the performance of LMT & FT Classifiers for heart disease prediction. The performance is tested out using the Training set as well as using various Cross Validation methods. The class is arrived by considering all 13 attributes of the dataset.

*a. Performance of LMT Classifier*

The overall assessment summary of LMT Classifier using training set and various cross validation methods is given in Table I. LMT Classifier gives 84.8148% accuracy for the training data set. Different cross validation methods are used to check its actual performance. There no much difference here. On an average, this gives around 83.6111% of accuracy for heart disease prediction using the different cross validation methods.

1. LMT CLASSIFIER OVERALL EVALUATION SUMMARY

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| Test Mode | Correctly Classified Instances | Incorrectly Classified Instances | Accuracy (%) | Mean Absolute Error | Root Mean Squared Error | Time Taken to Build Model (Sec) |
|---|---|---|---|---|---|---|
| Training Set | 229 | 41 | 84.8148 | 0.2149 | 0.3323 | 1.62 |
| 5 Fold CV | 227 | 43 | 84.0741 | 0.2316 | 0.3576 | 1.81 |
| 10 Fold CV | 225 | 45 | 83.3333 | 0.2302 | 0.3558 | 1.59 |
| 15 Fold CV | 226 | 44 | 83.7037 | 0.2363 | 0.3599 | 1.44 |
| 20 Fold CV | 225 | 45 | 83.3333 | 0.2355 | 0.357 | 1.45 |

*b. Performance of FT Classifier*

The overall assessment summary of FT Classifier using training set and various cross validation methods is given in Table II. FT Classifier gives 87.7778% accuracy for the training data set. Different cross validation methods are used to check its actual performance. It differ slightly from traing set performance. On an average, this gives around 82.223% of accuracy for heart disease prediction using the different cross validation methods.

2. FT CLASSIFIER OVERALL EVALUATION SUMMARY

| Test Mode | Correctly Classified Instances | Incorrectly Classified Instances | Accuracy | Mean Absolute Error | Root Mean Squared Error | Time Taken to Build Model (Sec) |
|---|---|---|---|---|---|---|

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| Test Mode | Correctly Classified Instances | Incorrectly Classified Instances | Accuracy | Mean Absolute Error | Root Mean Squared Error | Time Taken to Build Model (Sec) |
|---|---|---|---|---|---|---|
| Training Set | 237 | 33 | 87.7778 | 0.1869 | 0.3054 | 0.31 |
| 5 Fold CV | 226 | 44 | 83.7037 | 0.1979 | 0.3751 | 0.22 |
| 10 Fold CV | 224 | 46 | 82.963 | 0.2113 | 0.3829 | 0.16 |
| 15 Fold CV | 220 | 50 | 81.4815 | 0.2129 | 0.3743 | 0.16 |
| 20 Fold CV | 218 | 52 | 80.7407 | 0.2099 | 0.4013 | 0.19 |

*c. Comparison of LMT & FT Classifiers*

The comparison of performance between LMT and FT classifiersis depicted in Fig 1, and Fig 2 in terms of Classification Accuracy and Correctly Classified Instances. The complete ranking is done based on correctly classified instances, MAE and RMSE values, classification accuracy and other statistics found using Training Set result and Cross Validation Techniques. Consequently, it is perceived that LMT classifier outperforms FT Classifier.

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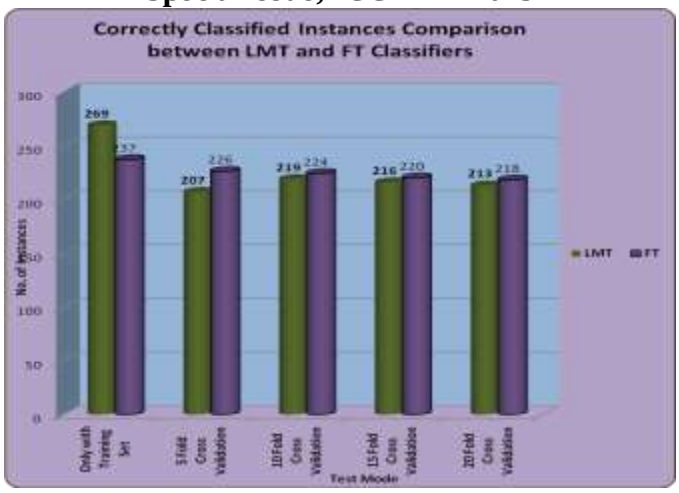


Figure 1. Classification Accuracy Comparison among Memory based Classifiers

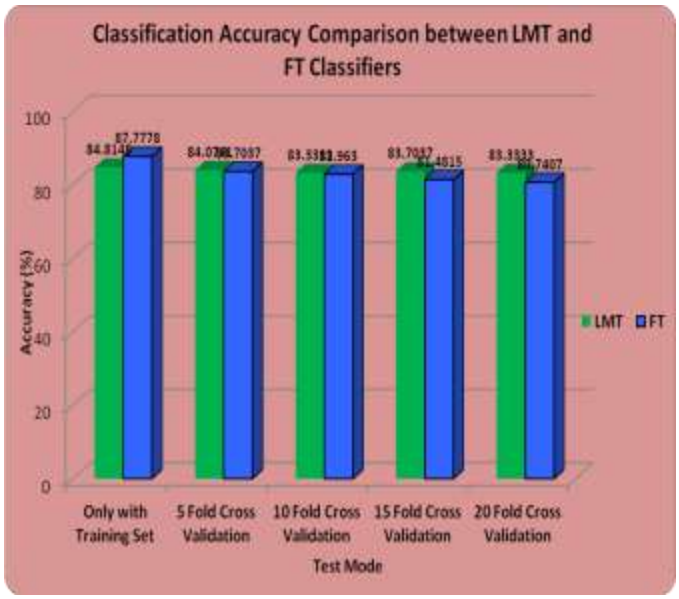


Figure 2. Correctly Classified Instances Comparison among Memory Based Classifiers

## VII. CONCLUSION

This work investigated the efficiency of LMT Classifier and FT Classifier for heart disease prediction. Experiment is done using an open source machine learning tool. Also, effectiveness comparison of the

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classifiers has been experimented in view of different scales of performance measure. At last, it is observed that LMT classifier outperforms more FT Classifier for heart disease prediction by taking various measures including Time taken to build the model and Classification accuracy.

## ACKNOWLEDGEMENT

The author expresses her deep gratitude to the Management of IBS Hyderabad, IFHE University for the support and motivation provided for this research work.

## REFRENCES

Ashish Kumar Sen, Shamsher Bahadur Patel, and D. P. Shukla, "Data Mining Technique for Prediction of Coronary Heart Disease Using Neuro-Fuzzy Integrated Approach Two Level,", Int. Journal of Engg. and Comp. Science, vol. 2 Issue 9, pp. 2663-2671, Sept 2013.

V. Manikantan and S. Latha, "Predicting the Analysis of Heart Disease Symptoms Using Medicinal Data Mining Methods," International Journal on Advanced Computer Theory and Engineering, vol. 2, no. 2, pp. 5-10, 2013.

M. Akhil Jabbar, B.L Deekshatulu, and Priti Chandra, "Classification of Heart Disease using Artificial Neural Network and Feature Subset Selection," Global Journal of Computer Science and Technology Neural & Artificial Intelligence, vol. 13, no. 3, 2013.

S. Sandhiya, P. Pavithra, A. Vidhya, S. Jegan and S. Saranya, "Novel Approach for Heart Disease verdict Using Data Mining Technique," International Journal of Modern Engineering Research, pp. 10-14.

Shruti Ratnakar, K. Rajeswari, and Rose Jacob, "Prediction of Heart Disease Using Genetic Algorithm For Selection of Optimal Reduced Set of Attributes," International Journal of Advanced Computational Engineering and Networking, vol. 1, no. 2, pp. 51 – 55, April-2013.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Mohammad Taha Khan, Shamimul Qamar and Laurent F. Massin, "A Prototype of Cancer/Heart Disease Prediction Model Using Data Mining," International Journal of Applied Engineering Research, vol.7 no. 11, 2012.

M.Akhil jabbar, Priti Chandra, and B.L Deekshatulu, "Heart Disease Prediction System using Associative Classification and Genetic Algorithm," International Conference on Emerging Trends in Electrical, Electronics and Communication Technologies, 2012.

MA. Jabbar, Priti Chandra, and B.L. Deekshatulu, "Cluster Based Association Rule Mining for Heart Attack Prediction," Journal of Theoretical and Applied Information Technology, vol. 32, no.2, pp. 196-201, October 2011.

S.Vijayarani and S.Sudha, "A Study of Heart Disease Prediction in Data Mining," International Journal of Computer Science and Information Technology & Security, vol. 2, no.5, pp. 1041-1045, October 2012.

S.Vijayarani and S.Sudha, "Comparative Analysis of Classification Function Techniques for Heart Disease Prediction," International Journal of Innovative Research in Computer and Communication Engineering, vol. 1, Issue 3, pp. 735-741, May 2013.

G.Karthiga, C.Preethi, R.Delshi, and Howsalya Devi, "Heart Disease Analysis System Using Data Mining Techniques," International Journal of Innovative Research in Science, Engineering and Technology, vol. 3, Special Issue 3, pp. 3101 – 3105, March 2014.

Mai Shouman, Tim Turner, and Rob Stocker, "Applying k-Nearest Neighbour in Diagnosing Heart Disease Patients." International Journal of Information and Education Technology, vol. 2, no. 3, pp. 220 – 223, June 2012.

K.Srinivas, G.Raghavendra Rao, and A.Govardhan, "Survey on Prediction of Heart Morbidity Using Data Mining Techniques," International Journal of Data Mining & Knowledge Management Process (IJDKP), vol.1, no.3, pp. 14-34, May 2011.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Boris Milovic and Milan Milovic, "Prediction and Decision Making in Health Care using Data Mining," International Journal of Public Health Science, vol. 1, no. 2, pp. 69 – 78, December 2012.

Negar Ziasabounchi and ImanAskerzade, "ANFIS Based Classification Model for Heart Disease Prediction," International Journal of Electrical & Computer Sciences, vol.14, no. 2, pp. 7-12, April 2014.

S.J Gnanasoundhari, G.Visalatchi, and.M.Balamurugan, "A Survey on Heart Disease Prediction System Using Data Mining Techniques," International Journal of Computer Science and Mobile Applications, vol. 2, Issue. 2, pp. 72-77, February 2014.

Chaitrali S. Dangare, and Sulabha S. Apte, "A Data Mining Approach for Prediction of Heart Disease using Neural Networks," International Journal of Computer Engineering and Technology, vol. 3, Issue 3, pp. 30-40, October - December 2012.

Mohammad Subhi Al-batah, "Testing the Probability of Heart Disease Using Classification and Regression Tree Model," Annual Research & Review in Biology, vol. 4, no. 11, pp. 1713-1725, 2014.

R. Chitra and V. Seenivasagam, "Heart Disease Prediction System Using Supervised Learning Classifier," Bonfring International Journal of Software Engineering and Soft Computing, vol. 3, no. 1, pp. 1-7, March 2013.

Vikas Chaurasia, et al, "Early Prediction of Heart Diseases Using Data Mining Techniques," Carib.j.SciTech, vol. 1, pp. 208-217, 2013.

Mai Shouman, Tim Turner, and Rob Stocker, "Using Decision Tree for Diagnosing Heart Disease Patients," Proceedings of the 9-th Australasian Data Mining Conference 2011 (AusDM'11), Ballarat, Australia, pp. 23 – 29, 2011.

Priti V. Wadal and S. R. Gupta, "Predictive Data Mining For Medical Diagnosis: An Overview Of Heart Disease Prediction," International Journal of Engineering Research and Applications, pp. 1 -4, April 2014.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Aditya Methaila, Prince Kansal, Himanshu Arya, and Pankaj Kumar, "Early Heart Disease Prediction using Data Mining Techniques," Sundarapandian et al. (Eds) : CCSEIT, DMDB, ICBB, MoWiN, AIAP - 2014, pp. 53-59.

Aqueel Ahmed and Shaikh Abdul Hannan, "Data Mining Techniques to Find Out Heart Diseases: An Overview," International Journal of Innovative Technology and Exploring Engineering, vol. 1, Issue 4, pp. 18-23, September 2012.

D. Raghu, T. Srikanth, and Ch. Raja Jacub, "Probability based Heart Disease Prediction using Data Mining Techniques," IJCST, vol. 2, Issue 4, pp. 66-68, October - December 2011.

Hari Ganesh S and Gajenthiran M, "Comparative study of Data Mining Approaches for prediction Heart Diseases," International organization of Scientific Research IOSR Journal of Engineering, vol. 04, Issue 07, pp. 36-39, July 2014.

Hariganesh S and Gajenthiran M, "A Survey: Data Mining Approaches for Prediction of Heart Disease," International Journal of Engineering Science Invention, vol. 3, Issue 4, pp. 44-46, April 2014.

K. Thenmozhi, P. Deepika, and M.Meiyappasamy, "Different Data Mining Techniques Involved in Heart Disease Prediction: A Survey," International Journal of Scientific Research, vol. 3, Issue 9, pp. 67-68, September 2014.

Aswathy Wilson, Jismi Simon, Liya Thomas, and Soniya Joseph, "Data Mining Techniques For Heart Disease Prediction," International Journal of Advances in Computer Science and Technology, vol. 3, no.2, pp. 113- 116, February 2014.

Manjusha B. Wadhonkar, P. A. Tijare, and S. N. Sawalkar, "Classification of Heart Disease Dataset using Multilayer Feed forward back propagation Algorithm," International Journal Application or Innovation in Engineering & Management, vol. 2, Issue 4, pp. 213-220, April 2013.

G. Parthiban and S.K.Srivatsa, "Applying Machine Learning Methods in Diagnosing Heart Disease for Diabetic Patients," International Journal of Applied Information Systems, vol. 3, no.7, pp. 25-30, August 2012.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Rupali R.Patil, "Heart Disease Prediction System using Naive Bayes and Jelinek-mercer smoothing," International Journal of Advanced Research in Computer and Communication Engineering, vol. 3, Issue 5, May 2014.

Lakshmi Devasena, C. 2015. Comparative Analysis of Memory Based Classifiers for Intelligent Heart Disease Prediction. International Journal of Applied Engineering Research (IJAER), Volume 10, Number 81, pp. 109-113.

Lakshmi Devasena, C. 2014. Proficiency Comparison of ZeroR, RIDOR and PART Classifiers for Intelligent Heart Disease Prediction. International Journal of Advances in Computer Science and Technology (IJACST), Vol.3, No.11 Special Issue, Pages: 12-18.

Huseyin Eristi and Yakup Demir. The Feature Selection based Power Quality Event Classification using Wavelet Transform and Logistic Model Tree. PRZEGLĄD ELEKTROTECHNICZNY (Electrical Review), R. 88 NR 7a/2012, pp. 43 – 48.

Abhishek Sharma, V. Sugumaran , S. Babu Devasenapati. Misfire detection in an IC engine using vibration signal and decision tree algorithms. Measurement (Elsevier) 50, 2014, pp. 370–380.

Syafiqah Nafis, Mokhairi Makhtar, Mohd Khalid Awang, M. Nordin A.Rahman and Mustafa Mat Deris. Feature Selections and Classification Model for Customer Churn. Journal of Theoretical and Applied Information Technology, Vol.75. No.3, 2015, pp. 356 – 365.

Prof. Dr. P. K. Srimani and Malini M. Patil. A Classification Model for Edu-Mining. Proc. of International Conference on Intelligent Computational Systems (ICICS'2012) Jan. 7-8, 2012 Dubai, pp. 35 – 40.

Maciej Piasecki and Adam Wardyński. Multiclassifier Approach to Tagging of Polish. Proceedings of the International Multiconference on Computer Science and Information Technology, 2006, pp. 169 – 178.

UCI Machine Learning Data Repository – http://archive.ics.uci.edu/ml/datasets.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# EXPERIMENTAL INVESTIGATION OF ALUMINIUM 6061 TO BRASS (CuZn30) BY FRICTION STIR WELDING PROCESS ----AN OVERVIEW

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***ABSTRACT***

***The aim of the study is to show the practicability for joining of dissimilar Aluminium 6061 plate to brass (cuzn30) plate by Friction Stir Welding (FSW).Friction Stir Welding (FSW) is a solid state welding process. It is different from fusion welding process and also different from other old solid welding process. It is a way of joining materials without melting them. FSW of Aluminium and Aluminium alloys and Brass has captured important attention from manufacturing industries, such as Shipbuilding, Automotive, Railway and Aircraft production. A brass plate in Aircraft structures mainly as substitution on stringer reinforced plates has an important role. Brass materials are widely used as engineering materials in industry because of their high electrical and thermal conductivity, high strength, and high corrosion resistance. They are easily shaped and they possess nice appearance. However, it is difficult to fusion welding of brass. The main problem of these alloys in fusion welding is the evaporation of the zinc during the welding process. After welding the weld metal becomes porous. Moreover, the amount of zinc in the alloy is reduced due to evaporation. To overcome these problems Friction Stir Welding is developed. So, it needs experimental investigation in these areas .In this research Aluminium and Brass plates which are 4mm in thickness are***

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
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***used for welding procedures. It has been investigated microstructure properties, micro hardness, and tensile tests in order to evaluate the joint performance and the weld zone characteristics of dissimilar Aluminium/Brass (Al/CuZn30) joints.***

***Keywords: Welding; FSW; Dissimilar Al/CuZn30 joint, Microstructure, Mechanical properties.***

## I. INTRODUCTION

Friction Stir Welding (FSW) is a unique welding method and new invention for the welding technology world. FSW will not change the microstructure of the metal diverse unlike the conventional welding. It also can reduce the cost if compared to the conventional welding cost. It involves the joining of metals without fusion or filler materials. It is used already in routine, as well as critical applications, for the joining of structural components made of brass, aluminium and its alloys. Since FSW is essentially solid-state, i.e. without melting high quality weld can generally be fabricated with absence of solidification cracking, porosity, oxidation and other defects typical to traditional fusion welding. Friction stir welding was used to control properties in structural metals including aluminium and the other nonferrous alloys. The pin may have a diameter one-third of the cylindrical tool shoulder. The process is illustrated in fig.1 where a tapered shouldered tool plunges into the dissimilar plates and locally plasticizes the joint region during its movement along the joint line that causes a join between the work pieces. In this process, the heat is originally derived from the friction between the welding tool (including the shoulder and the probe) and the

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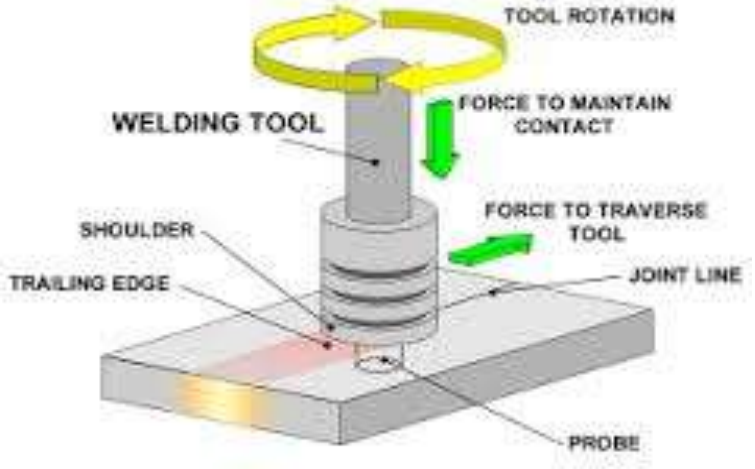


Fig.1 A FSW with tool rotational and transverse movements

Welded material, which causes the welded material to soften at temperature less than its melting point. The softened material underneath the shoulder is further subjected to extrusion by the tool rotational and transverse movements. It is expected that this process will inherently produce a weld with less residual stress and distortion as compared to the fusion welding methods, since no melting of the material occurs during the welding. Conventional milling machine is selected to innovate become as the FSW machines. The innovations of FSW machine are made by changing some setting on the conventional milling machine. Investigation on friction stir welding has so far mainly focused on developing tools and procedures for making welds in various alloys, characterize the properties of welding permitted to design and consider the possible mechanisms of flow in and around the weld bead.

## II. EXPERIMENTAL PROCEDURES AND STUDIES

### A. Materials and Experimental setup

Vertical milling machine of 7Kw is used to join the dissimilar plates of Aluminium 6061 and Brass (CuZn30) with dimensions (75mm x 75mm x 4mm) shown in fig2.

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Fig 2: H13 tool

Table 1: Specifications of vertical milling machine capacity of 10 tonnes

| Process Parameters | Minimum | Maximum |
|---|---|---|
| Spindle speed | 100 rpm | 1120 rpm |
| Transverse speed | 16 microns/sec | 1120mm/min |
| Plunge speed | 16 microns/sec | 1000mm/min |

Table 2: H13 tool dimensions

| Shoulder diameter(SD) | Pin diameter(PD) | Pin length (PL) |
|---|---|---|
| 25mm | 6mm | 3.6mm |

Table 3: Nominal chemical composition of 6061 Al alloy and Brass

| | |
|---|---|
| **6061 Al alloy** | Si 0.80 Fe 0.70 Cu 0.40 Mn 0.15 Mg1.2 Cr 0.35 Zn 0.25 Ti 0.15 Al balance |
| **Brass** | Zn 30 Cu rest |

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### B. Welding Parameters

Different parameters like tool rotation (rpm), welding speed (mm/min),tool plunge depth (mm),tool design etc, are involved in sufficient heat generation for the effective solid state joining of materials.

Table 4: Process parameters

| | Unit | Sample 1 | Sample 2 |
|---|---|---|---|
| Rotation Speed | rpm | 710-900 | 1120 |
| Transverse speed | mm/min | 10-60 | 10-110 |
| Offset | mm | 1 | 1 |
| Plunge depth | mm | 3 | 3 |

Tilt angle as 1 degree, offset were kept constant. Plunge depth is little bit varied but 3mm is sufficient for proper joint. Sample 2 has sufficient heat generation with more rpm so it has good strength of joint, whereas, sample 1 has insufficient heat generation with less rpm sample is not able to join properly.

## III. RESULTS AND DISCUSSIONS

### A. Tensile strength

Tensile specimens of required dimension are prepared by Electric Discharge Machine (Wire EDM).The tensile test has been carried out with the help of Universal Testing Machine (UTM).The % elongation is 0.64% , yield stress 55.118 N/mm$^2$.

Fig 3: Tensile Test specimen before and after test

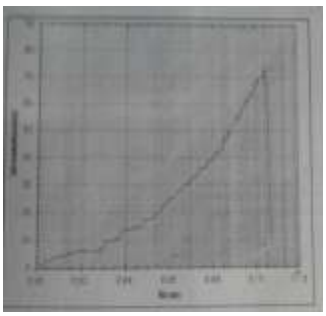

Fig 4: Graph for Tensile Test

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### B. Microstructure Distribution

The nature of test Microstructure has been conducted on MET SCOPE-1, SL.NO:CM01495.

The 100x magnification has been carried out at weld nugget and as well as at HAZ (Heat affected Zone). At weld nugget dendrites of brass solid solution with fine particles of grains are seen. Blow holes and cracks are observed and HAZ shows fine grain particles are seen in brass solution.

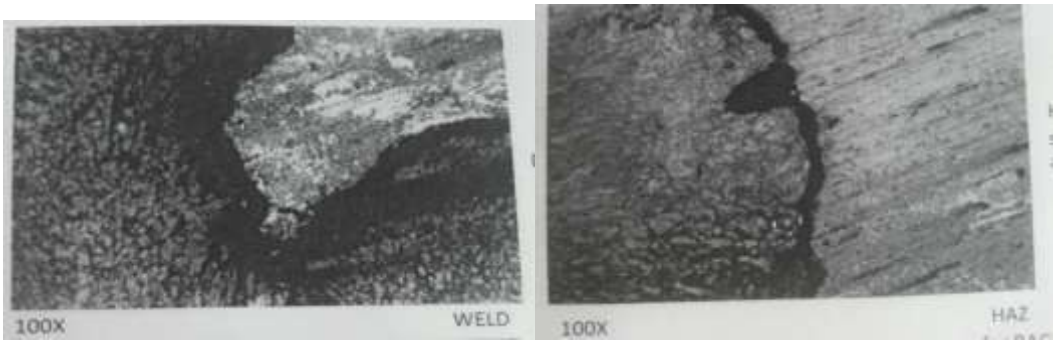


Fig 5: Microstructure Distribution at Weld area or Nugget and at HAZ

## V. CONCLUSIONS

Friction Stir Welding is performed to join 4mm thick plates of 6061 Al and brass (CuZn30) with varied parameters (like, tool rotation speed (rpm), welding speed (mm/min) and the joining conditions are characterized. The modification of conventional milling machine to manufacture welded joint process using FSW technique is another innovation to those who involve with new invention in welding technology. With low cost of money to invest they will experience in long term, saving labour cost and material waste during welding process. Also, brass has high strength rather than aluminium, sample 2 parameters has sufficient heat generation and good strength.

## REFERENCES

Lakshminarayanan, A.K., V.Balasubramanian, and K.Elangovan. "Effect of welding processes on tensile properties of 6061 aluminium alloy joint." The International journal of Advanced Manufacturing Technology 40,no.3(2009): 286-296.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**
Ahmed Khalid Hussain, Evaluation of Parameters of Friction Stir Welding,20 september 2012,2012h.

Universal milling machine manual books,1 November 2012,1500h.

W.M. Thomas, E.D. Nicholas, J.C. Needham, M.G. Murch, P. Templesmith, C.J. Dawes, G.B. Patent Application No. 9125978.8, December 1991.

S.T. Amancio-Filho, S. Sheikhi, J.F. dos Santos, C. Bolfarini, Preliminary study on the microstructure and mechanical properties of dissimilar friction stir welds in aircraft aluminium alloys 2024-T351 and 6056-T4, Journal of Materials Processing Technology 206 (2008) 132-142.

Elongovan K, Balasubramanian V. Effect of pin profile and rotational speed of the tool on the formation of friction stir processing zone in 6061 aluminium alloy. J Mater Manuf Processes, in press.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
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# EVALUATION OF THERMAL CONTACT RESISTANCE IN CONTINUOUS AND DISCONTINUOUS BRASS RODS

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***ABSTRACT***

***Conduction is the phenomena of heat transfer within a solid object or in between the objects in contact. Conduction phenomenon is used in many areas, where heat needs dissipation from a working body. Considering a continuous metallic rod, the amount of heat conducted from one end to other is linearly related to length of the metallic rod. In addition, when large amount of heat is to be dissipated, then the area of heat dissipation also should be large. Generally fins are used to cater these needs. Fins can be cast integrally with the body (as in the case of IC engines) or they have to be fitted externally to the body by press fitting them. The concept of 'Thermal Contact Resistance (TCR)' comes into light at the interface of press fitted extensions to enhance the rate of heat transfer. The metal rod with one or more extended contact surfaces rather integrally made, the amount of heat dissipated is lower per given length of rod. Present work aims at the evaluation of thermal contact resistance in non-ferrous metals using a customized fabricated test rig. The plot between length and temperature of the metal rod is continuous and linear all along the length except at the contact surfaces. At the contact surface region, the temperature graph exhibits an unusual drip, an additional resistance to heat conduction and less heat dissipation than that expected***

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***in continuous rod. It is reasoned the interface contact resistance arising from micro/ macro irregularities leaving air as conducting media in place of metal. TCR is evaluated from the obtained data, which in turn can be applied at industry level as per the requirement.***

## I. INTRODUCTION

Thermal contact conductance is the study of heat conduction between solid bodies which are in thermal contact. The thermal contact conductance coefficient, $\mathbf{h_c}$, is a property indicating the thermal conductivity, or ability to conduct heat between two bodies in contact. The inverse of this property is termed thermal contact resistance. When a junction is formed by pressing two similar or dissimilar metallic materials together, only a small fraction of the nominal surface area is actually in contact because of the non flatness and roughness of the contacting surfaces. If a heat flux is applied across the junction, the uniform flow of heat is generally restricted to conduction through the contact spotsas shown in Figure 1. The limited number and size of the contact spots results in an actual contact area, which is significantly smaller than the apparent contact area. This limited contact area causes a thermal resistance, the contact resistance or thermal contact resistance.

The temperature difference is used to define the contact resistance at the junction, such that:

$$1/S\alpha_c = (T_1 - T_2)/\dot{Q} = \Delta T/\dot{Q} \text{ or } 1/\alpha_c = (T_1 - T_2)/\dot{q} = \Delta T/\dot{q}$$

Where, $T_1$ and $T_2$ are the temperatures of the bounding contact surfaces; S is the area across which the heat is transferred, and $\alpha_c$ is the heat transfer coefficient for the junction, or the thermal contact conductance. This contact conductance or joint conductance is often reported in the literature and is defined as

$$\alpha_c = \dot{q}/\Delta T$$

In this work, analysis has been done by considering influence of work piece material factors, end temperatures both source and sink;isolating others such as surface roughness, contact pressure, on conductance. Generally, contact between two surfaces occurs only over microscopic contacts. The surface irregularities- the macroscopic contacts, in region, arise due to radius of curvature/ out-of-

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flatness of bodies; the micro contacts arise due to the microscopic irregularities or asperity characteristics of rough surfaces. The true or real area of contact, the total area of all micro-Generally contacts, is typically only a small fraction (a few percent or often much less) of the apparent contact area. This effect is usually observed through a relatively high temperature drop across the interface (changing up to 100 K or more over a few micrometers). Under these . Circumstances, the contact spots or the micro-contacts may be under high heat fluxes depending upon the heat flow, mechanical and thermal properties of the contact bodies.

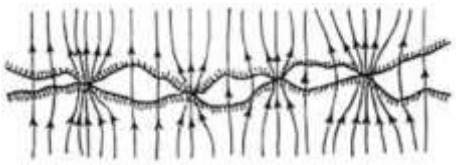

Figure 1 Microscopic view of contact between surface

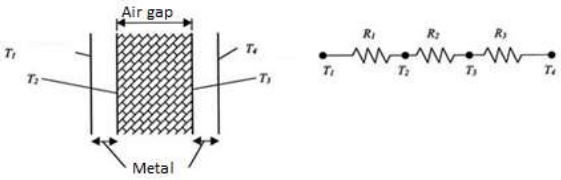


Figure 2 TCR model

## II. LITERATURE REVIEW

**[1] RolanCl.EeOtt** et al investigated some of the factors such as surface roughness and contact pressure. This phenomenon is called spreading resistance;' since the flow of heat or electrical current must spread out after they pass through the restricted areas that are actually in contact" Another type of thermal and electrical resistance, which is celled interface resistance", is caused by a film of foreign material such as an oxide, etc., on the surfaces of the contacting "hill, If the space between the hills of a contact is filled with air, there is a heat flow by convection currents. The literature indicates this quantity of heat flow is approximately one thousandth of the total heat flow through metal contacts. Since the only electrical current conduction mechanism acting between areas not in actual metal contact is that due to thermionic emission, the electrical resistance or these areas will be extremely high at room

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temperature or thermionic emission is negligible. The experimental apparatus to measure both the thermal and electrical contact resistances consists mainly of a bellows-actuated press which is operated remotely under vacuum bellow. A thin heat meter is used to indicate the quantity of heat flowing through the metal contacts. The temperature drop caused by the contacts is measured with thermocouples. The temperature difference and the quantity of heat flowing is used to calculate the thermal contact resistance. A strain gauge on the bellows-press stem measures the loading on the contact surfaces. Electrical probes are used to measure the electrical resistance across the contact surfaces. The thermocouples and electrical resistance probe.

**[2] William Edward Stewart**, et al has carried out experimental and analytical investigation to determine the thermal contact resistance of several metal specimen pairs using a relatively new pulse technique. Metal specimens were aluminium 2024-T3, aluminium 6061-T6, aluminium 7075-T6, copper 110, stainless steel 304, molybdenum, and Armco iron. Thermal contact resistance was also determined for dissimilar metal specimen pairs of aluminium 6061-T6 - copper 110 and aluminium 7075-T6 - copper 110. Aluminium 7075-T6, copper 110, and stainless steel 304 specimens were tested to determine the variance of contact resistance with time after loading. Specimens were circular cylindrical disks between .033 and .061 inches thick and .788 inches in diameter. Specimen contacting surfaces were nominally flat and polished to a surface rms roughness of approximately 2 micro-inches. Axial loads were applied from 20.7 to 124.2 psi in a 10 micron (10-5mm Hg) vacuum and -10°F environment. Results of the experiments showed that the thermal contact resistance decreased with increasing load, ii decreased with increasing time after initial loading and that directional effects are probably not a result of differential thermal expansion and the directional effect exists at relatively low interface pressures. Thermal contact resistance decreased approximately 40 percent for aluminum 2024-TJ and aluminium 6061-T6 specimens8 Aluminium 7075-T6 specimens decreased approximately 75 percent in thermal contact resistance over the interface pressure range of 20.7 to 124.2 psi. Molybdenum values of thermal contact resistance closely approximate those of aluminium 2024-TJ and

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aluminum 6061-T6 with a 62 percent decrease over the same pressure range. Copper 110 specimen data were approximately 50 percent less than the aluminium 2024-TJ and aluminium 6061-T6 data and decreased about 43 percent over the pressure range tested, while Armco iron and stainless steel data had approximately four and five times the values of thermal contact resistance as those obtained for aluminium 2024-TJ and aluminium 6061-T6 specimens. Data obtained from experiments to determine the decrease in thermal contact resistance after initial loading .indicated approximately 9 to 66 percent decreases in contact resistance. variances between thermal contact resistances for which affect the thermal and electrical resistance of metal contacts. Both of these contact resistances are primarily a function of the load on ·the contact and the condition of the surfaces. At low pressures only a small fraction other total gross area -of the contacts is in metal... to...metal contact. Increasing the load., flattens the hills and reduces both "the thermal and electrical contact resistance directional effects iii experiments were on the order of 20 percent.

**[3] Albin k j. Hasselström u. Eskil nilsson**, et al Determined thermal contact conductance in bolted joints when designing for space application. Interface temperature drops were used as reference in iterative finite volume analyses and developed methods to estimate the thermal contact conductance. Results were achieved for the relationship between interface pressure and thermal contact conductance in nickel-plated aluminum joints. Available theoretical models were found to vary strongly in estimation of thermal contact conductance. Experiments on bolted joints gave information about the total thermal contact conductance and its dependence on several important design parameters, including bolt torque, number of bolt, surface roughness and joint material.

## III. DESIGN SPECIFICATIONS

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A cylindrical brass rod has been considered and machined to required dimensions and cut into three sections as shown in the figures below and the dimensions of each part and the location of thermocouples are also shown in the figures below:

Specification of Work Pieces

- Raw material length: 750mm
- Raw material diameter: 52mm
- Overall Length of the rod: 700mm
- Overall Diameter of the rod: 50mm
- Dimension of thermocouple holes: M4 tap
- Total number of thermocouples: 08

**Part 1:**

- Length: 200mm
- No of thermocouple holes: 02

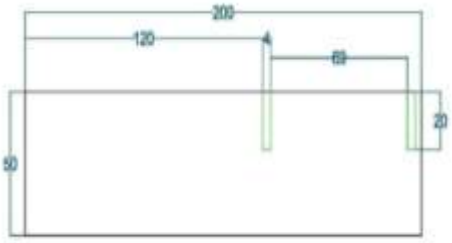


FIGURE 1 : PART 1

**Part 2:**

- Length: 300mm
- No of thermocouple holes: 04

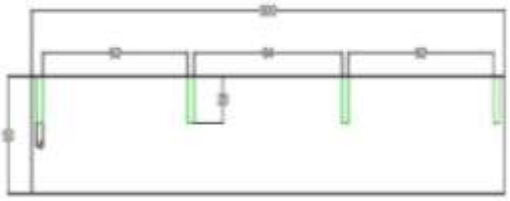

**Figure 2 : Part 2**

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**Part 3:**

- Length: 200mm
- No of thermocouple holes: 02
- Blind hole: 20mm Diameter, 150mm length.
- For water inlet and outlet: 1/4$^{th}$ inch BSP thread. (Hole)

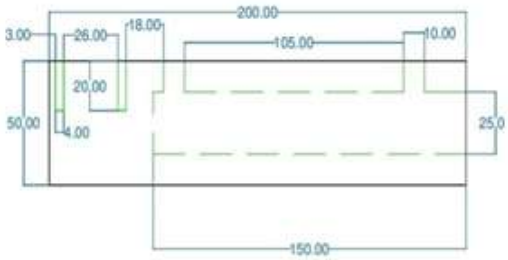


**Fig 3** Part 3

## IV. TEST RIG DETAILS

To set entire experiment in motion heat source is a vital element. A 500W collar type heater is used as a heat source. The power to the heater comes from the control box. It consists of an ammeter, a voltmeter, a variac, temperature controller and a 12 channel temperature indicator.

FIG 5 EXPERIMENTATION ON BRASS

The control box regulates desired amount of power to heater till a desired temperature is reached. The desired temperature is first set through the controller, and rate of heating is controlled by a calibrated variable resistor. The source temperature is maintained with in $\pm 2^0$ C through a thermocouple feedback

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sensor. Apart from controller circuit, thermo-couples that are capable of sensing temperatures as high as $200^0$ C are placed at points on the work piece where temperatures are to be measured to record the temperature.

The work piece is placed in a metallic frame and transparent enclosure of 1m height x 0.3m x 0.3m. The metallic frame is made up of mild-steel angle bars. An arrangement for loading through a graduated spring of 42mm diameter and 172mm in length, with 2 mild-steel end plates [273mm x 279mm] of 4mm thickness, and a square threaded bolt of length 300mm. A ceramic blanket is used to avoid lateral heat dissipation from the work piece by providing heat insulation. Ceramic blanket is an insulating material capable of providing insulation up to $2000^0$ C.

Brass, the widely used heat conducting media in engineering applications, is taken for the experiment, having metallurgical composition with 65 % copper and 35 % zinc, it to be ductile, malleable and strong. Rod parted into 3 parts and overall length adding to 700 mm and diameter 50mm after machining. The thermal conductivity of brass is evaluated in the laboratory as 109 w /m-K

| Current A | Voltage V | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ | $T_8$ | $T_9$ | $T_{10}$ | $T_{amb}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.1 | 100 | 50 | 45 | 32 | 30 | 29 | 28 | 27 | 27 | 27 | 27 | 27 |
| 1.1 | 100 | 80 | 73 | 46 | 41 | 35 | 33 | 27 | 27 | 26 | 27 | 27 |
| 1.5 | 150 | 110 | 97 | 60 | 52 | 43 | 39 | 29 | 28 | 28 | 27 | 27 |
| 1.5 | 150 | 140 | 126 | 72 | 60 | 47 | 42 | 29 | 29 | 28 | 27 | 27 |

## V. PROCEDURE

The temperatures at different locations are noted and the values of thermal conductivity (k) and convective heat transfer coefficient (h) for the air trapped in the junctions is to be calculated. Then the resistances at the junctions are to be calculated by using appropriate relations. The relations used for the calculations are:

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k = -Q/A (dt/dx)

R1 = 1 / k

Q = h A (ΔT)

h = Q/A (ΔT)

R2 = 1 / h A

Where,

Q,the heat supplied,

k , the thermal conductivity of the metal

A, the area of cross section of the work piece,

dt /dx, the temperature gradient in the rod,

h, convective heat transfer coefficient of the air gap

ΔT is the temperature difference across the junction.

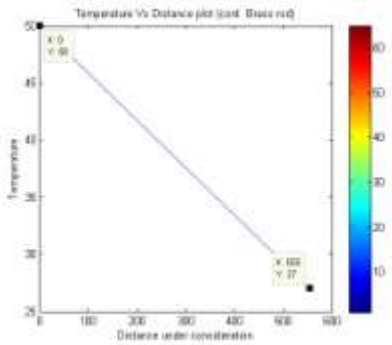
R1 and R2 are the corresponding resistances

$$R = R_1 + R_2 + R_3 = \frac{L_1}{k_1 A_1} + \frac{L_2}{k_2 A_2} + \frac{L_3}{k_3 A_3}.$$

## VI. RESULTS AND DISCUSSIONS

The results were tabulated after performing experiment on the brass rod. The temperature is measured in $^0$C, current is measured in amperes and voltage is measured in volts. Graphs were plotted for all the values and the results obtained are compared against a continuous rod of the same material. In a discontinuous rod, the temperature falls suddenly at the contact surface.

Temperature distribution in continuous metal rod



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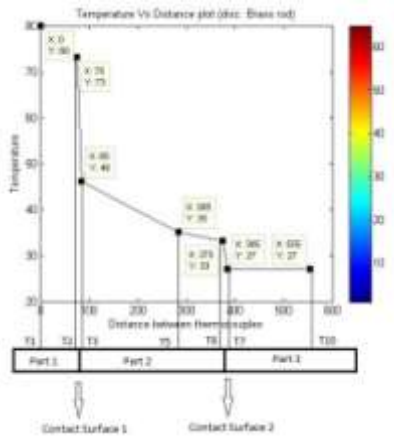
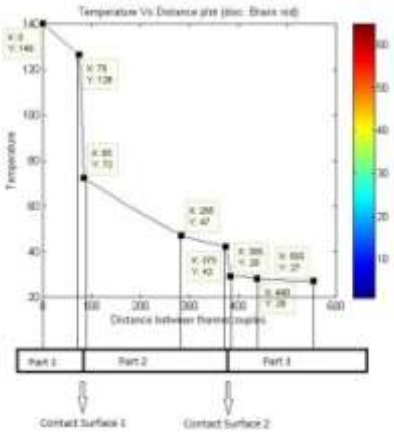
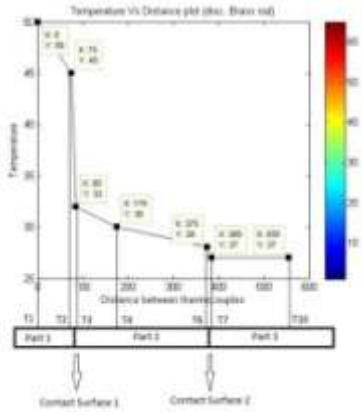
Temperature vs Distance graph of Brass at 50 $^0$C



Temperature vs Distance graph of Brass at 80 $^0$C



Temperature vs Distance graph at 110$^0$C



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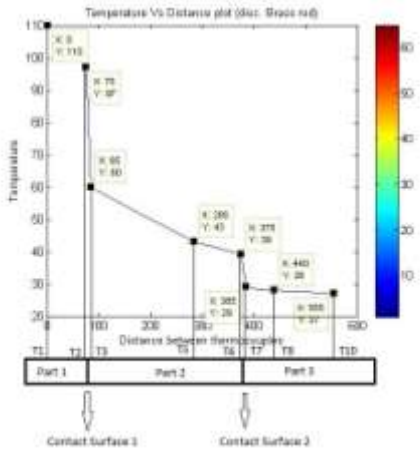
Temperature vs Distance graph at $140^0$C



## VII. CONCLUSION

It is evident that the thermal contact resistance at the interface in a discontinuous metal rod is comparatively high to that of resistance in a continuous rod. The rate of heat transfer across the interface is lower than that in the continuous rod due to junction behaviour. This must be avoided as it is detrimental to the rate of heat transfer and causes unwanted rise of temperature in materials. Extended investigations not presented here have suggested clear ways to reduce bulk rise in body temperature due to interface resistance.

## REFERENCES

Thermal and electrical resistance of metal contacts, Roland E. Ot

Determination of thermal contact resistance between metals using a pulse technique, William Edward Stewart Jr

THERMAL MANAGEMENT SOLUTIONS FOR LOW VOLUME COMPLEX ELECTRONIC SYSTEMS

Thermal Contact Conductance in Bolted Joints, ALBIN K J. HASSELSTRÖM U. ESKIL NILSSON

Prediction of Thermal contact resistance between polished surfaces,E.G.Wolf,D.Aschneider

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Measurements and Prediction of Thermal Contact Resistance across Coated Joints, C. Merrill S V. Garimella

Thermal contact resistance borivoje b. mikic warren m. rohsenow

Thermal Interface Materials for Power Electronics Applications Preprint S. Narumanchi, M. Mihalic, and K. Kelly National Renewable Energy Laboratory

Chapter 4Thermal contact resistance of CNT Interfaces

Thermal conductivity and contact resistance measurements for adhesives

Calculating interface resistance M. M. Yovanovich, J. R. Culham and P. Teertstra

Thermal contact resistance across a copper-silicon interface A.M. Khounsary, D. Chojno wski, and L. Assoufid

Review: Thermal Contact Resistance of Metallic Composite Pair, International Journal of Application or Innovation in Engineering & Management (IJAIEM)

NANO-BIO- ELECTRONIC, PHOTONIC AND MEMS PACKAGINGEDITED BY C.P. WONG, KYOUNG- SIK MOON, YI (GRACE) LI

Thermal Contact Resistance Across Nanoscale Silicon Dioxide and Silicon Interface Jie Chen,1 Gang Zhang,2, ∗ and Baowen Li1

A Novel Method to Reduce the Thermal Contact Resistance G.V Krishna Reddy, N.Chikkanna, B.Uma Maheswar Gowd

SILICON DEVICES AND PROCESS INTEGRATION: DEEP SUBMICRON AND NANO-SCALE ...

Investigation on interaction between indium based thermal interface material and copper and silicon substrates, Fac. of Microsyst. Electron. & Photonics, Wroclaw Univ. of Technol., Wrocław, Poland ; Matkowski, P. ; Platek, B. ; Zanden, C.

Advanced Materials For Thermal Management Of Electronic Packaging By Xingcun Colin Tong

Thermal contact resistance study Ph. Marion, L. Zhang, L. Vallet, M. Lesourd

Electrothermally bonded carbon nanotube interfaces Sriharsha V. Aradhya, Suresh V. Garimella, Timothy S. Fisher*

Fabrication and charachterization of mems thermal interface materials by amer mohammed hamdan

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Nano-engineered carbon nanofiber-copper composite thermal interface material for efficient heat conduction Quoc Ngo1,2, Brett A. Cruden2 , Alan M. Cassell2 , Gerard Sims2 , Jun Li2*, M. Meyyappan2 , and Cary Y. Yang1

Materials for Thermal conduction, D.D.L.Chung

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**Special issue, ICCEMT-2015**

# MICRO WATERSHED DELINEATION FOR LOCAL LEVEL PLANNING AND MANAGEMENT USING GIS TECHNOLOGIES

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***ABSTRACT***

***Watershed is a hydrologic unit or an area of land from which water drains, running downhill, to a shared destination. Watershed management has gained the top most priority in water resources sector necessitating delineation of watersheds to a mini watershed level in order to take up watershed development and management programmes. A micro-watershed, as defined by Bali in 1978, ranges in between 1-10 sq km or 100-1000 hectares. Planning watershed management at micro level needs delineation of watershed boundary at micro level. The delineation is based on stream hierarchy and codification from upstream downward that allows to get a micro-watershed of 500 to 1000 ha size viable enough for implementation of soil and water conservation programmes.***

***The present study proposes a methodology for rapid catchment delineation and Calculation of Subbasin Parameters for a micro watershed (1.274085527 km² or127.408 ha) in IT parks of Nanakramguda village of Serilingampally mandal, Rangareddy district. The Geographical Information System (GIS) applications are widely used for thematic mapping of natural resources for planning, development, management, monitoring and also in***

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***environmental studies for effective management of land and water resources. Preparation of maps such as Drainage map, Contour map, TIN map, Digital Elevation Model (DEM), Slope map, Study area Base map, boundary map have been prepared in ArcGIS environment for simultaneous processing of data representing study area. The ArcSWAT ArcGIS extension is a graphical user interface for the SWAT (Soil and Water Assessment Tool) model (Arnold et al., 1998). The SWAT model can be applied to support various watershed and water quality modeling studies. In present study SWAT model is used to generate detailed catchment delineation, subdivision of watersheds based on an automatic procedure using Digital Elevation Model (DEM), stream network data. A detailed report (Topographic Report) with several layers Basin, Watershed, Reach, Outlet, and Monitoring Point containing the parameters of the watershed(s) are generated.***

***Keywords: Geographical Information System, SWAT, Digital Elevation Model, Watershed Delineation.***

## I. INTRODUCTION

Watershed is an area of land where all of water i.e., under it the drains off of it goes in to the same place. So, aim of this is to throw a light on the importance of watershed management using Geospatial techniques. Micro-watershed study helps in identifying the areas causing problems and ultimately becomes a step towards planning to mitigate the problems. Here we analyze the slope, contour and terrain profile of study area and behaviour of stream segments, drainage direction, flow accumulation etc. In this study, it is aimed to ensure the existing water bodies in the area studied or considered as well as create the new hydrological features. The current study was undertaken on the application of the SWAT model which integrates the GIS information using the input DEM to Delineate the watershed, flow direction, flow accumulation, and stream network. Accurate delineation of a watershed plays an extremely important role in the management of the watershed. The delineated boundaries form the

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nucleus around which the management efforts such as land use, land change, soil types, geology and stream flows can be analyzed for appropriate conclusions.

## II. STUDY AREA DESCRIPTION

The study area considered was IT Parks of Nanakramguda village which includes Financial District and Nanakramguda of Serilingampally Mandal, Ranga Reddy District, Telangana State. Financial district and Nanakramguda lies within

Longitude: 78° 19’ 46’’ to 78° 20’ 56’’ E

Latitude: 17° 24’ 52’’ to 17° 25’ 41’’ N,

Combined Layout of Two IT parks (Fig1) Covering an area of 314.83 acres (1.274085527 km² or127.408 ha). Study area lies in Serilingampally mandal of Rangareddy district. The total annual Precipitation averages 803 mm (31.6 inches) which is equal to 803 Liters/m² (19.7 Gallons/ft²).The annual average temperature is 26.7 degrees Celsius (80.1 degrees Fahrenheit). On average there are 2877 hours of sunshine per year.

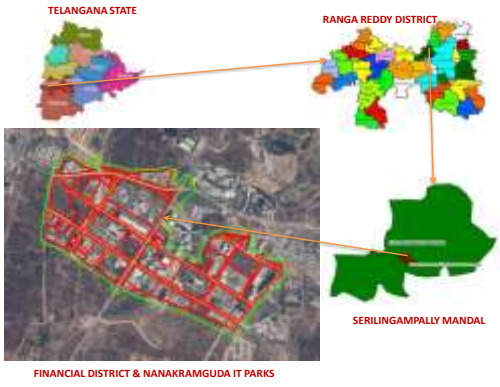


Fig1: Study Area Map

## III. PURPOSE OF PROJECT

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Both IT parks are characterized similar to most urban commercial developments. Location has clusters of buildings and roadways that have reached about 90% imperviousness. Outside of this area, the level of development drops off to a modest reached about 20% imperviousness. According to soil traditional nomenclature the study area consists of Red gravelly clay soils and rock lands. Soils of study area are moderately deep. combined thickness of weathered and fracture zones extending up to 20 m depth, which has been underlain with hard granitic rock. (Source: NGRI EXPLORATION, ASSESSMENT AND MANAGEMENT OF GROUNDWATER RESOURCES MANUAL). Impervious surfaces that do not allow the water to percolate in to the ground and also lead to huge quantity of storm water to flow and go to waste. If the runoff is not captured or it is discharged without first being treated, it can adversely affect water quality in the receiving water bodies. Stormwater runoff quantity can pose a threat to the surrounding area, as well as existing infrastructure in the study area. So the main purpose of the study is to develop a methodology of micro watershed delineation and characterization of study area for future watershed based land and water management activities and local level environmental planning and management.

## IV. OBJECTIVES

- Digitization of study area to produce required thematic maps with relevant attribute data using ArcGIS software.
- Delineation of watershed (catchment), sub-watershed (sub-catchment) boundaries and parameters of the watershed(s) using ArcSWAT software.

## V. METHODOLOGY

The methodology of the present study is based on a variety of spatial data which are utilized through GIS, SWAT analysis**.**

**GIS is applied in order to**

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- Select appropriate study sites,
- Perform various image processing operations such as Stacking, Rectification, Mosaic, Resolution merge etc.
- Digitize the layers like contours, roads, water bodies and settlements for the use of creating the base map.
- Extract the drainage information in the study area.
- Prepare TIN (Triangular Irregular Network) and DEM (Digital ElevationModel) from contour map
- Prepare slope map

**SWAT model is applied in order to**

Delineate and subdivide study area catchments, using automatic watershed delineation tool which includes the generation of digital stream , flow direction , flow accumulation, monitoring points, out lets , linking steam, longest path , watershed (catchment),sub-watershed(sub-catchment) parameters of the watershed(s) are generated.

**Data Used**

The following Data were used in the present study to obtain required results.

- Greater Hyderabad Guide Map from Survey of India having 1:20,000 scale
- IT Parks layout cad map
- ArcGIS, ArcSWAT software's
- Existing Water tanks, Industrial Statistics(Name ,Type, Acreage ,Water Budget)

**VI. RESULTS & DISCUSSION**

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**GIS work and Analysis:**

Georeferencing of IT Parks layout cad map and SOI toposheet was done, with reference to Google Earth using ArcGIS software. Toposheet was projected to Change the coordinate system of georeferenced images from geographic coordinate system (EPSG: 4326 - WGS 84) to projected coordinate system (EPSG: 32644 - WGS 84 / UTM zone 44N). The streams are digitized from georefrenced SOI toposheet by using ArcGIS 10.1 Editor Tool. Streams are spread all over the study area. The drainage pattern of the project area is dendrite to sub parallel. The contour interval is 5 m. The highest contour height is 625 m while the height of lowest contour is 540 m. These areas have high elevated and Slope values in study area ranges from 0 to 41. Fig (2 to 8) represents the generated thematic maps using ArcGIS software.

Fig 2: Layout map of study area

Fig 3: Georeferenced and Projected SOI Topo sheet

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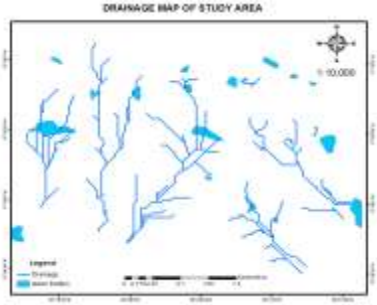

Fig 4: Drainage Map

Fig 5: Contour Map

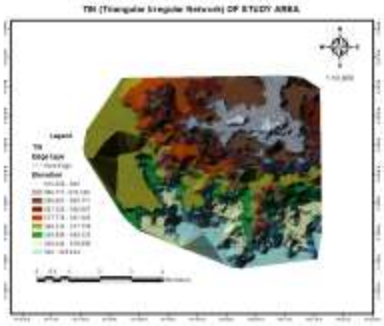

Fig 6: TIN map

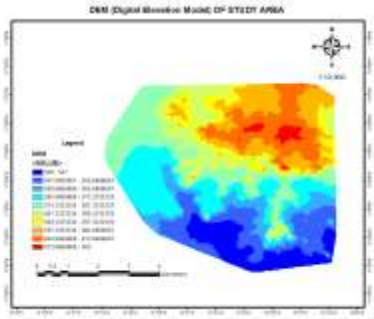

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Fig 7: DEM map

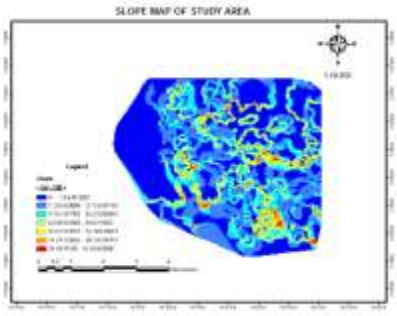


Fig 8: Slope map

**SWAT Modeling and Analysis:**

**Key Procedures include are**

- Setup a SWAT project and Load the DEM
- Define the working area (Mask)
- Burning in a stream network
- Specify the minimum sub-watershed area
- Define drainage inlets and sub-watershed outlets
- Watershed Outlet(s) Selection and Definition
- Run the calculation of the subbasin parameters

**Reporting of Watershed Delineation**

- When watershed delineation is completed and the Exit button is clicked on the Watershed Delineation form, the raster datasets generated by the ArcSWAT interface are exported from the SWAT project "Watershed\Grid" folder to the Project Raster Geodatabase.
- The working area, digital stream , flow direction , flow accumulation, monitoring points, out lets , linking steam, longest path , watershed (catchment) sub-watershed(sub-catchment) of study area were Delineated and shown in Fig (9 to

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14) below.

- A total of 38 watersheds are generated in the study area.
- Width, depth, slope, length, cross section length, shape length , shape area , elevation , elevation minimum , elevation maximum, latitude , longitude, of Watershed and reach are calculated.
- Calculated characteristics of Reach and Watershed are presented in Table 1 and 2

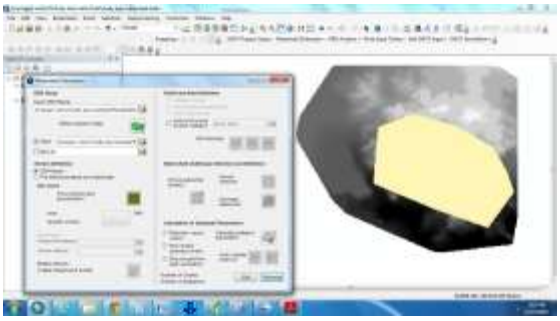

Fig 9: Image of masking grid (MASK) added to watershed view

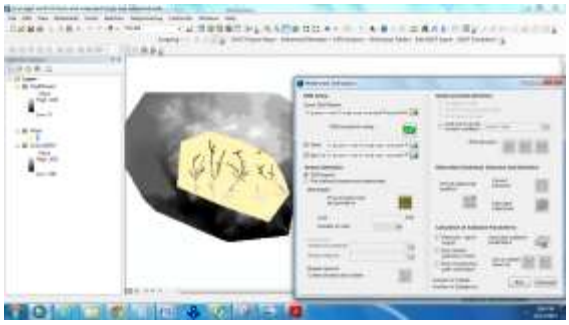

Fig 10: Image of Digit Stream added to watershed view

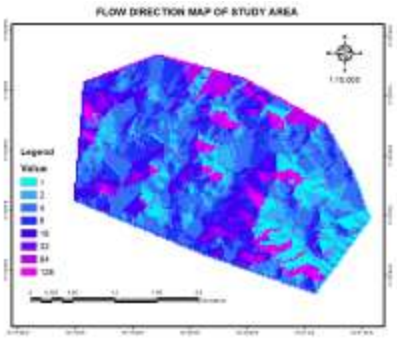

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Fig 11: Flow Direction Map

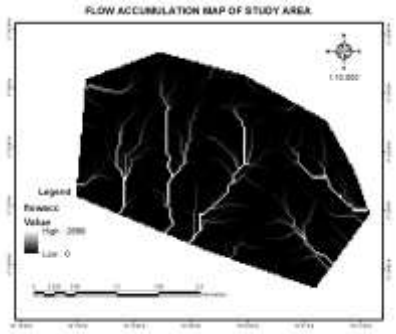


Fig 12: Flow Accumulation Map

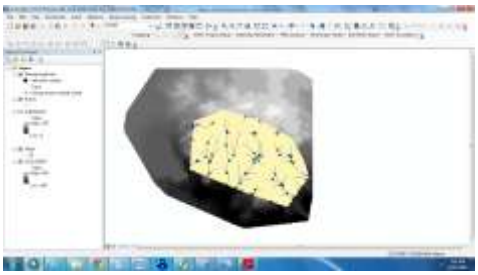

Fig 13: Image of Reach and Monitoring Point added to watershed view


Fig 14: Watershed and Basin layer map

The study area is reselected (Fig 15) according to the layout of Financial district and

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Nanakramguda IT parks.


Fig 15

## VII. CONCLUSION

The delineated micro watershed can be reselected to study area local level planning and derived subwatersheds parameters can then be exported to other modeling software for studies related to land, water management and for watershed management within the study area. Prioritization of watersheds is done for different watershed components so as to take any further relevant conservation measures. Detailed hydrogeological and geophysical investigations are recommended in the study area micro-watershed for more proper water management and selection of storm water harvesting methods.

The study has demonstrated how the integration of GIS and SWAT model can be a powerful tool in local level watershed management and planning. It also enables researchers to study long-term impacts of pollution loads resulting from different land-use processes and the Impact of storm runoff quality and quantity on downstream water bodies.

## REFERENCES

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Viswanathan K E, Manikandan M, Bharanitharan S "Watershed Delineation for Varahanadhi Basin Using Opensource Geospatial Technology" Volume II, Issue VI, June 2015. IJRSI, ISSN 2321 – 2705.

Mukeshkant, P R Singh, Ajay K Singh, Bilaspur Dilip Kumar "STUDY OF DIGHORA MICROWATERSHED, CHHATTISGARH THROUGH REMOTE SENSING & GIS "
Volume 4, Issue 1, Jan. 2015 IJRSG, ISSN No: 2319-3484.

Upendra R. Saharkar, D. D. Kulkarni, Amruta A. Pore "Micro & Macro Watershed Management Using Remote Sensing and GIS Software for Talegaon Dabhade "Volume 4, Issue 9, March 2015, IJEIT, ISSN: 2277-3754

S. Sudhakar*, Rajit Das and Dibya Chutia, "Micro Level Planning - RS & GIS Approach " Vol. XXXIII, 2013, Indian Cartographer.

Gaurav Savant Lei Wang Dr. Dennis Truax "REMOTE SENSING AND GEOSPATIAL APPLICATIONS FOR WATERSHED DELINEATION"

WINCHELL.M, SRINIVASAN.R, DI LUZIO.M, ARNOLD.J "ARCSWAT INTERFACE FOR SWAT 2012 USER'S GUIDE", 37-86P.

http://nptel.ac.in/courses/105102015/gis%20done/case%20study/Watershed%20Delineation%20by%20ArcSWAT.html

**Table 1: Reach attribute table**

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Table

Reach

| FID | Shape * | OBJECTID | ARCID | GRID_CODE | FROM_NODE | TO_NODE | Subbasin | SubbasinR | AreaC | Len2 | Slo2 | Wid2 | Dep2 | MinEl | MaxEl | Shape_Leng | HydrolD | OutletID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Polyline | 1 | 10 | 1 | 1 | 17 | 1 | 17 | 26.330199 | 567.635337 | 2.045346 | 0.579245 | 0.07623 | 590 | 601.618167 | 567.635337 | 200001 | 100001 |
| 1 | Polyline | 2 | 11 | 2 | 2 | 17 | 2 | 17 | 8.66457 | 346.588086 | 2.161716 | 0.297329 | 0.04887 | 590 | 597.492249 | 346.588086 | 200002 | 100002 |
| 2 | Polyline | 3 | 12 | 3 | 3 | 17 | 3 | 17 | 0.884122 | 29.0038 | 0.1 | 0.01843 | 0.007654 | 590 | 590 | 29.0038 | 200003 | 100004 |
| 3 | Polyline | 4 | 13 | 4 | 4 | 17 | 4 | 17 | 6.729763 | 102.543918 | 0.1 | 0.255499 | 0.044172 | 590 | 590 | 102.543918 | 200004 | 100005 |
| 4 | Polyline | 5 | 14 | 5 | 5 | 11 | 5 | 11 | 5.636177 | 90.530151 | 2.574691 | 0.22971 | 0.041147 | 582.669128 | 585 | 90.530151 | 200005 | 100006 |
| 5 | Polyline | 6 | 15 | 6 | 6 | 11 | 6 | 11 | 8.875718 | 183.548435 | 3.993971 | 0.285035 | 0.047513 | 582.669128 | 590 | 183.548435 | 200006 | 100007 |
| 6 | Polyline | 7 | 16 | 7 | 7 | 8 | 7 | 8 | 6.561519 | 130.5171 | 0.3671 | 0.251647 | 0.043727 | 600 | 600.400818 | 130.5171 | 200007 | 100008 |
| 7 | Polyline | 8 | 17 | 8 | 8 | 0 | 8 | 0 | 14.553113 | 102.543918 | 0.1 | 0.405848 | 0.060135 | 600 | 600 | 102.543918 | 200008 | 100003 |
| 8 | Polyline | 9 | 18 | 9 | 9 | 8 | 9 | 8 | 5.888543 | 61.526351 | 0.1 | 0.235827 | 0.041874 | 600 | 600 | 61.526351 | 200009 | 100011 |
| 9 | Polyline | 10 | 19 | 10 | 10 | 30 | 10 | 30 | 10.010523 | 224.566002 | 1.758111 | 0.324238 | 0.051776 | 581.05188 | 585 | 224.566002 | 200010 | 100009 |
| 10 | Polyline | 11 | 20 | 11 | 11 | 30 | 11 | 30 | 14.637238 | 58.0076 | 2.787993 | 0.407254 | 0.060274 | 581.05188 | 582.669128 | 58.0076 | 200011 | 100010 |
| 11 | Polyline | 12 | 22 | 12 | 12 | 15 | 12 | 15 | 5.215567 | 43.5057 | 0.805839 | 0.219266 | 0.03989 | 580.100769 | 580.451355 | 43.5057 | 200012 | 100012 |
| 12 | Polyline | 13 | 23 | 13 | 13 | 15 | 13 | 15 | 6.393275 | 266.614258 | 1.194929 | 0.247756 | 0.043275 | 580.100769 | 583.286621 | 266.614258 | 200013 | 100013 |
| 13 | Polyline | 14 | 24 | 14 | 14 | 39 | 14 | 39 | 5.383811 | 101.5133 | 4.819282 | 0.223483 | 0.0404 | 575 | 579.862212 | 101.5133 | 200014 | 100014 |
| 14 | Polyline | 15 | 25 | 15 | 15 | 39 | 15 | 39 | 14.973723 | 145.019 | 3.517311 | 0.412846 | 0.060824 | 575 | 580.100769 | 145.019 | 200015 | 100015 |
| 15 | Polyline | 16 | 26 | 16 | 16 | 43 | 16 | 43 | 5.467933 | 102.543918 | 0.1 | 0.225571 | 0.040651 | 580 | 580 | 102.543918 | 200016 | 100016 |
| 16 | Polyline | 17 | 27 | 17 | 17 | 43 | 17 | 43 | 45.257658 | 505.078367 | 1.979691 | 0.801687 | 0.094672 | 580 | 580 | 505.078367 | 200017 | 100017 |
| 17 | Polyline | 18 | 28 | 18 | 18 | 29 | 18 | 29 | 7.318618 | 200.538467 | 0.1 | 0.268687 | 0.045679 | 580 | 580 | 200.538467 | 200018 | 100018 |
| 18 | Polyline | 19 | 29 | 19 | 19 | 29 | 19 | 29 | 18.50685 | 660.65362 | 1.513652 | 0.468802 | 0.066203 | 580 | 580 | 660.65362 | 200019 | 100019 |
| 19 | Polyline | 20 | 30 | 20 | 20 | 27 | 20 | 27 | 7.570984 | 253.569802 | 4.073474 | 0.274209 | 0.046302 | 573.192017 | 583.521118 | 253.569802 | 200020 | 100020 |
| 20 | Polyline | 21 | 31 | 21 | 21 | 27 | 21 | 27 | 8.748692 | 253.569802 | 3.989228 | 0.299058 | 0.049059 | 573.192017 | 583.387466 | 253.569802 | 200021 | 100021 |
| 21 | Polyline | 22 | 32 | 22 | 22 | 40 | 22 | 40 | 5.552655 | 266.614188 | 1.672402 | 0.227647 | 0.0409 | 570.541138 | 575 | 266.614188 | 200022 | 100022 |
| 22 | Polyline | 23 | 33 | 23 | 23 | 40 | 23 | 40 | 6.982129 | 160.551518 | 1.561276 | 0.261206 | 0.044827 | 570.541138 | 573.047791 | 160.551518 | 200023 | 100025 |
| 23 | Polyline | 24 | 34 | 24 | 24 | 46 | 24 | 46 | 14.468991 | 640.748559 | 1.357796 | 0.404439 | 0.059995 | 571.299927 | 580 | 640.748559 | 200024 | 100023 |
| 24 | Polyline | 25 | 35 | 25 | 25 | 46 | 25 | 46 | 7.866251 | 113.527067 | 1.037996 | 0.263089 | 0.045042 | 571.299927 | 572.478333 | 113.527067 | 200025 | 100024 |
| 25 | Polyline | 26 | 36 | 26 | 26 | 57 | 26 | 57 | 8.875716 | 160.551518 | 1.138045 | 0.285035 | 0.047513 | 570 | 571.827148 | 160.551518 | 200026 | 100031 |
| 26 | Polyline | 27 | 37 | 27 | 27 | 57 | 27 | 57 | 18.506849 | 244.044167 | 1.387967 | 0.468802 | 0.066203 | 570 | 573.192017 | 244.044167 | 200027 | 100026 |
| 27 | Polyline | 28 | 38 | 28 | 28 | 56 | 28 | 56 | 15.478456 | 508.597118 | 1.966193 | 0.42114 | 0.061636 | 570 | 580 | 508.597118 | 200028 | 100027 |
| 28 | Polyline | 29 | 39 | 29 | 29 | 56 | 29 | 56 | 36.172478 | 425.104469 | 2.352363 | 0.709836 | 0.086555 | 570 | 580 | 425.104469 | 200029 | 100028 |
| 29 | Polyline | 30 | 40 | 30 | 30 | 47 | 30 | 47 | 44.979952 | 872.175237 | 1.267163 | 0.789104 | 0.093678 | 570 | 581.85188 | 872.175237 | 200030 | 100029 |
| 30 | Polyline | 31 | 41 | 31 | 31 | 47 | 31 | 47 | 34.658281 | 58.0076 | 0.1 | 0.683084 | 0.085088 | 570 | 570 | 58.0076 | 200031 | 100039 |
| 31 | Polyline | 32 | 42 | 32 | 32 | 31 | 32 | 31 | 18.675093 | 531.594035 | 0.984817 | 0.471354 | 0.066443 | 570 | 575.235229 | 531.594035 | 200032 | 100030 |
| 32 | Polyline | 33 | 43 | 33 | 33 | 31 | 33 | 31 | 14.468991 | 271.590453 | 0.902615 | 0.404439 | 0.059995 | 570 | 572.451416 | 271.590453 | 200033 | 100040 |
| 33 | Polyline | 34 | 44 | 34 | 34 | 57 | 34 | 57 | 4.710834 | 72.5095 | 0.1 | 0.206276 | 0.038299 | 570 | 570 | 72.5095 | 200034 | 100041 |
| 34 | Polyline | 35 | 45 | 35 | 35 | 57 | 35 | 57 | 0.504732 | 41.017567 | 0.1 | 0.054004 | 0.015674 | 570 | 570 | 41.017567 | 200035 | 100032 |
| 35 | Polyline | 36 | 46 | 36 | 36 | 44 | 36 | 44 | 6.896007 | 143.561556 | 0.1 | 0.259313 | 0.04461 | 570 | 570 | 143.561556 | 200036 | 100033 |
| 36 | Polyline | 37 | 47 | 37 | 37 | 44 | 37 | 44 | 8.916936 | 433.599486 | 1.994273 | 0.302496 | 0.049434 | 570 | 578.647156 | 433.599486 | 200037 | 100034 |
| 37 | Polyline | 38 | 48 | 38 | 38 | 46 | 38 | 46 | 9.421669 | 294.587369 | 0.1 | 0.312656 | 0.050535 | 570 | 570 | 294.587369 | 200038 | 100035 |
| 38 | Polyline | 39 | 49 | 39 | 39 | 46 | 39 | 46 | 31.293399 | 546.095935 | 0.91559 | 0.642483 | 0.081682 | 570 | 575 | 546.095935 | 200039 | 100036 |

1 (0 out of 107 Selected)

Reach

**Table 2: Watershed attribute table**

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Table

Watershed

| OBJECTID* | Shape* | GRIDCODE | Subbasin | Area | Slof | Len1 | Sll | Csl | Wid1 | Dep1 | Lat | Long_ | Elev | ElevMin | ElevMax | Bname | Shape_Length | Shape_Area | Hydrol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Polygon | 1 | 1 | 26.330199 | 3.392167 | 849.17835 | 91.435538 | 2.268471 | 0.579245 | 0.07623 | 17.43528 | 78.328658 | 601.089457 | 590 | 614 | <Null> | 2842.3724 | 263301.98972 | 3000 |
| 2 | Polygon | 2 | 2 | 8.66457 | 4.382278 | 723.210614 | 91.435538 | 3.456808 | 0.297329 | 0.04687 | 17.434307 | 78.331028 | 602.650485 | 590 | 615 | <Null> | 1972.2584 | 86645.702687 | 3000 |
| 3 | Polygon | 3 | 3 | 0.084122 | 0.001 | 29.0038 | 121.914051 | 0.1 | 0.01843 | 0.007654 | 17.430895 | 78.329557 | 590 | 590 | 590 | <Null> | 116.0152 | 841.220414 | 3000 |
| 4 | Polygon | 4 | 4 | 6.729763 | 5.133874 | 450.162638 | 60.957025 | 4.442839 | 0.255499 | 0.044172 | 17.432249 | 78.33113 | 596.5375 | 590 | 610 | <Null> | 1449.212496 | 68107.938136 | 3000 |
| 5 | Polygon | 5 | 5 | 5.636177 | 5.150626 | 420.128218 | 60.957025 | 3.642919 | 0.22971 | 0.041147 | 17.432735 | 78.338341 | 595.074627 | 583 | 600 | <Null> | 1276.1672 | 56361.767767 | 3000 |
| 6 | Polygon | 6 | 6 | 8.075716 | 7.082424 | 466.122053 | 60.957025 | 5.457772 | 0.285035 | 0.047513 | 17.431682 | 78.341623 | 599.604167 | 584 | 610 | <Null> | 1392.1826 | 79915.962575 | 3000 |
| 7 | Polygon | 7 | 7 | 6.561519 | 3.160989 | 384.086915 | 91.435538 | 2.603577 | 0.251647 | 0.043727 | 17.431415 | 78.345554 | 603.487179 | 600 | 610 | <Null> | 1392.1824 | 65615.192326 | 3000 |
| 8 | Polygon | 8 | 8 | 2.103051 | 0.589982 | 250.05106 | 121.914051 | 0.1 | 0.127145 | 0.027739 | 17.430521 | 78.347801 | 600.08 | 600 | 602 | <Null> | 812.1064 | 21030.510361 | 3000 |
| 9 | Polygon | 9 | 9 | 5.888543 | 6.591115 | 367.096882 | 60.957025 | 5.072545 | 0.235827 | 0.041674 | 17.429716 | 78.346059 | 604.471429 | 600 | 625 | <Null> | 1102.1444 | 58885.429011 | 3000 |
| 10 | Polygon | 10 | 10 | 10.010523 | 7.016932 | 473.158555 | 60.957025 | 4.84386 | 0.324238 | 0.051776 | 17.431109 | 78.337093 | 592.554622 | 583 | 605 | <Null> | 1624.2128 | 98422.788489 | 3000 |
| 11 | Polygon | 11 | 11 | 0.925342 | 4.719029 | 163.039657 | 91.435538 | 6.183079 | 0.077691 | 0.019974 | 17.430767 | 78.338519 | 584.818182 | 581 | 591 | <Null> | 782.955839 | 11708.656719 | 3000 |
| 12 | Polygon | 12 | 12 | 5.215567 | 1.128779 | 472.128937 | 121.914051 | 0.871142 | 0.219266 | 0.03989 | 17.430338 | 78.32332 | 583.612903 | 580 | 585 | <Null> | 1218.1596 | 52155.685695 | 3000 |
| 13 | Polygon | 13 | 13 | 6.383275 | 3.252639 | 658.16551 | 91.435538 | 2.774537 | 0.247756 | 0.043275 | 17.431289 | 78.325002 | 586.447368 | 580 | 600 | <Null> | 1798.2356 | 63932.751497 | 3000 |
| 14 | Polygon | 14 | 14 | 5.383811 | 1.470996 | 459.08455 | 121.914051 | 1.941159 | 0.223483 | 0.0404 | 17.42979 | 78.321912 | 583.09375 | 576 | 585 | <Null> | 1334.1748 | 53838.106524 | 3000 |
| 15 | Polygon | 15 | 15 | 3.364882 | 3.619091 | 462.176495 | 91.435538 | 2.19623 | 0.168567 | 0.033476 | 17.42854 | 78.323827 | 581.6 | 575 | 585 | <Null> | 1334.1748 | 33648.816578 | 3000 |
| 16 | Polygon | 16 | 16 | 5.467933 | 2.012378 | 559.14034 | 91.435538 | 1.508151 | 0.225571 | 0.040651 | 17.428077 | 78.328259 | 582.107692 | 580 | 588 | <Null> | 1392.1824 | 54679.326939 | 3000 |
| 17 | Polygon | 17 | 17 | 3.449004 | 2.211199 | 535.112804 | 91.435538 | 1.868765 | 0.171083 | 0.033808 | 17.42917 | 78.329083 | 584.902439 | 580 | 590 | <Null> | 1334.1748 | 34490.036992 | 3000 |
| 18 | Polygon | 18 | 18 | 7.318618 | 4.401642 | 774.180714 | 91.435538 | 2.583376 | 0.268687 | 0.045679 | 17.430065 | 78.332336 | 587.195402 | 580 | 600 | <Null> | 1914.2508 | 72344.955642 | 3000 |
| 19 | Polygon | 19 | 19 | 18.50685 | 5.332833 | 962.278525 | 60.957025 | 2.598 | 0.468602 | 0.066203 | 17.43025 | 78.334203 | 589.918182 | 580 | 606 | <Null> | 3074.403 | 185068.496978 | 3000 |
| 20 | Polygon | 20 | 20 | 7.570984 | 8.759235 | 603.678659 | 60.957025 | 6.647852 | 0.274209 | 0.046302 | 17.427613 | 78.347235 | 592.788889 | 574 | 615 | <Null> | 1508.1976 | 75709.8373 | 3000 |
| 21 | Polygon | 21 | 21 | 8.748892 | 6.5223 | 548.15719 | 60.957025 | 4.596295 | 0.299058 | 0.049059 | 17.427238 | 78.348971 | 590.125 | 574 | 600 | <Null> | 1566.2052 | 87486.923102 | 3000 |
| 22 | Polygon | 22 | 22 | 5.552055 | 1.973206 | 753.245034 | 121.914051 | 1.813427 | 0.227647 | 0.0409 | 17.426374 | 78.327113 | 578.030303 | 571 | 585 | <Null> | 2262.2964 | 55520.547353 | 3000 |
| 23 | Polygon | 23 | 23 | 6.982129 | 1.808201 | 555.194692 | 121.914051 | 1.559731 | 0.261206 | 0.044827 | 17.424624 | 78.327423 | 576.012048 | 571 | 580 | <Null> | 1624.2128 | 69821.294398 | 3000 |
| 24 | Polygon | 24 | 24 | 14.468991 | 6.028965 | 988.367297 | 60.957025 | 2.308863 | 0.404439 | 0.059895 | 17.426996 | 78.335758 | 583.790698 | 571 | 595 | <Null> | 1764.255535 | 139642.588797 | 3000 |
| 25 | Polygon | 25 | 25 | 7.066251 | 6.006183 | 641.175477 | 60.957025 | 4.110467 | 0.263089 | 0.045042 | 17.426671 | 78.338214 | 583 | 571 | 600 | <Null> | 1318.707203 | 65704.709038 | 3000 |
| 26 | Polygon | 26 | 26 | 8.075716 | 3.947745 | 710.166228 | 91.435538 | 6.171359 | 0.285035 | 0.047513 | 17.424811 | 78.346537 | 577.489583 | 570 | 613 | <Null> | 1798.2356 | 80757.159787 | 3000 |
| 27 | Polygon | 27 | 27 | 2.187173 | 3.654513 | 291.068628 | 91.435538 | 1.987285 | 0.130173 | 0.028177 | 17.424688 | 78.34834 | 572.269231 | 570 | 578 | <Null> | 870.114 | 21030.510136 | 3000 |
| 28 | Polygon | 28 | 28 | 15.478456 | 3.041895 | 983.214205 | 91.435538 | 2.435851 | 0.42114 | 0.061636 | 17.427418 | 78.331076 | 580.625 | 570 | 595 | <Null> | 2378.3116 | 154784.556257 | 3000 |
| 29 | Polygon | 29 | 29 | 10.347011 | 7.487714 | 460.115169 | 60.957025 | 3.037503 | 0.330734 | 0.052465 | 17.424083 | 78.333359 | 578.544715 | 570 | 590 | <Null> | 1682.2204 | 103470.110976 | 3000 |
| 30 | Polygon | 30 | 30 | 19.432192 | 8.954802 | 1158.267629 | 60.957025 | 2.140711 | 0.482728 | 0.067508 | 17.428665 | 78.340159 | 586.160173 | 570 | 610 | <Null> | 2600.333996 | 183078.103722 | 3000 |
| 31 | Polygon | 31 | 31 | 1.514197 | 0.997809 | 464.060816 | 121.914051 | 1.077445 | 0.1044 | 0.024323 | 17.424969 | 78.341119 | 571.944444 | 570 | 575 | <Null> | 1113.701635 | 23761.873952 | 3000 |
| 32 | Polygon | 32 | 32 | 18.675093 | 6.862229 | 1054.266193 | 60.957025 | 3.785048 | 0.471354 | 0.066443 | 17.427482 | 78.34288 | 586.675676 | 570 | 623 | <Null> | 2497.917389 | 183067.159051 | 3000 |
| 33 | Polygon | 33 | 33 | 14.468991 | 5.582062 | 908.21657 | 60.957025 | 5.505295 | 0.404439 | 0.059895 | 17.425282 | 78.344218 | 588.151163 | 570 | 622 | <Null> | 2033.792372 | 148404.379987 | 3000 |
| 34 | Polygon | 34 | 34 | 4.710834 | 3.424673 | 449.132019 | 91.435538 | 3.339775 | 0.206276 | 0.038299 | 17.422223 | 78.346654 | 576 | 570 | 585 | <Null> | 1276.1672 | 47108.343289 | 3000 |
| 35 | Polygon | 35 | 35 | 0.504732 | 1.705201 | 111.038938 | 121.914051 | 2.188855 | 0.054604 | 0.015674 | 17.423638 | 78.348354 | 570.166667 | 570 | 571 | <Null> | 406.0532 | 5047.322487 | 3000 |
| 36 | Polygon | 36 | 36 | 6.898007 | 7.67516 | 466.122053 | 60.957025 | 6.012222 | 0.259313 | 0.04461 | 17.425404 | 78.350837 | 576.036585 | 570 | 600 | <Null> | 1450.19 | 68980.073984 | 3000 |
| 37 | Polygon | 37 | 37 | 8.916936 | 7.284137 | 692.145577 | 60.957025 | 4.334348 | 0.302496 | 0.049434 | 17.427069 | 78.352024 | 588.132075 | 570 | 600 | <Null> | 1972.2584 | 89169.363831 | 3000 |
| 38 | Polygon | 38 | 38 | 9.421669 | 5.482552 | 670.179278 | 60.957025 | 4.476414 | 0.312656 | 0.050535 | 17.42526 | 78.320552 | 576.651786 | 570 | 600 | <Null> | 1798.2356 | 94216.686417 | 3000 |

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**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# E-LEARNING AMENITIES IN EDUCATIONAL SYSTEM RESTRICTED TO HIGH TECHNOLOGY

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***ABSTRACT***

***Educational technology is not restricted to high technology. Nonetheless, electronic educational technology, also called e-learning, has become an important part of society today, comprising an extensive array of digitization approaches, components and delivery methods. For example, m-learning emphasizes mobility, but is otherwise indistinguishable in principle from educational technology. The concept of E-learning in India has gained force with the launching of INDEST-Indian National E-learning in Engineering Science and Technology, UGC-INFONET, SDNP-Sustainable Development Networking Programme of UNDP. It has several differing interpretations, derived from different communities involved in E-learning research .The purpose of this study is to present the state of the E-learning education in Engineering Colleges of Telangana(in general) and Hyderabad (in Particular) . This paper presents the study on the use of digital resources by BTech and MTech students available in Computer Labs in their colleges. The primary data was collected and the findings suggest that most of the students are familiar with the usage of digital resources. Greater part of the students have expressed 'lack of interest' and 'lack of time' are the main problems in securing access to digital resources.***

***Key words: E-learning, Engineering Colleges, Computer Labs students, Telangana***

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International Journal Of Core Engineering & Management (IJCEM)
Special issue, ICCEMT-2015

## I. INTRODUCTION

Educational technology includes numerous types of media that deliver text, audio, images, animation, and streaming video, and includes technology applications and processes such as audio or video tape, satellite TV, CD-ROM, and computer-based learning, as well as local intranet/extranet and web-based learning. Information and communication systems, whether free-standing or based on either local networks or the Internet in networked learning, underlie many e-learning processes.

E-learning is a term and concept that serves as an umbrella for a great many of diverse activities. Virtual library, electronic library, library without walls and a few other terms have also been used to carry a similar connotation, but the term 'E-learning' seems to be here to stay. But what does this concept cover? A number of differing interpretations exist, as formulated by sharply different and divided communities that have something to do with digital libraries.

Theoretical perspectives and scientific testing influence instructional design. The application of theories of human behavior to educational technology derives input from instructional theory, learning theory, educational psychology, media psychology and human performance technology. Educational technology and e-learning can occur in or out of the classroom. It can be self-paced, asynchronous learning or may be instructor-led, synchronous learning. It is suited to distance learning and in conjunction with face-to-face teaching, which is termed blended learning. In this paper we are concerned with digital facilities and amenities available in engineering colleges and their effective usage by students.

## II. SCOPE OF ELEARNING

Educational technology refers to the use of both physical hardware and educational theoretics. It encompasses several domains, including learning theory, computer-based training, online learning, and, where mobile technologies are used, m-learning. Accordingly, there are several discrete aspects to describing the intellectual and technical development of educational technology:

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- educational technology as the theory and practice of educational approaches to learning
- educational technology as technological tools and media that assist in the communication of knowledge, and its development and exchange
- educational technology for learning management systems (LMS), such as tools for student and curriculum management, and education management information systems (EMIS)
- educational technology itself as an educational subject; such courses may be called "Computer Studies" or "Information and Communication Technology (ICT)"

## III. RELATED WORK

The technological innovation is constantly and pervasively altering the way in which work is done, which, in turn requires that workplace learning and training to occur on a just-in-time, just-what-needed and just-where-it-needed basis (Basssi, Cheney, & Van Buren, 1997). E-learning is becoming a norm for corporate training (Chute, Thompson & Hancock, 1999; Galagan, 2000). While there is a lot of learner-related information, limited studies have explored required trainers' roles and skills in an e-learning scenario (Abernathy, 1998). This section reviews and discusses trainers' roles and competencies.

E-learning facilities used in a library where information can be stored in electronic format containing texts, images, sound, video, maps, scientific and business data, as well as hypermedia combination of these elements. There will be vast population of user scattered around the globe, which are able to access, easily and conveniently. (Keshava,2008) the digital libraries may be defined as the new way of carrying out the functions of libraries, encompassing new type of information resources new approaches to acquisition; new methods of storage and preservations; new approaches to classification and cataloging; intensive use of electronic systems and networks; and dramatic shifts in intellectual, organizational and electronic practice. E-learning is system providing a community of users with coherent access to a large, organized repository of information and knowledge. (Arms, 1995) Digital libraries are organizations that provide the resources, including the specialized staff, to

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select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities.

The history of E-learning is short and explosive (Kar & seadle, 2004) It is well recognized that libraries all over the world are undergoing transformation, especially owing to the development in information and communication technologies. Traditional libraries are changing to digital libraries and new libraries that are being set up are increasingly of the digital kind. As a result, there is widespread interest and consequently, a lot of research and development activities are being carried out in this area world over. In India a number of institutions are also in the process of setting up digital libraries and many scholars and practitioners are conducting research on digital libraries. In recent years, quite a few conferences on digital libraries and their various facets have been organized in India. In addition to many national conferences, international conferences such as the International Conference of Asian Digital Libraries (ICADL) 2001, International Conferences on Digital Libraries (ICDL) 2004 and 2006 gave necessary impetus to E-learning awareness and developments in India. Both ICADL 2001 and ICDL 2004 were reported as widely attended (Mahesh, 2008).

Guild Annual Research Report, April 2006 was on the subject of future directions in e-learning. From their survey sample it was noticed that “designing and developing elearning content” activity will get more focus and attention in future. The second highest priority, according to this report is the “addressing learner requirements and preferences” [J. Pulichino, “Future directions in e-Learning research Report 2006”, The Learning Guild Research 2006]. For an organization, “Extend the global reach of the E-learning content” is the focusing priority area to get the content out beyond the geographical limit. In that report it was clearly written that “Blended learning” will grow significantly in the year ahead.

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Ardil introduced an e-learning collaborative circle for teachers and students to announce their research subjects/projects through a cyberspace where members can interact creatively and freely to consider relevant issues, sharing individual experiences and providing and gaining support from each other [C. Ardil, "E-learning Collaborative Circles" , International Journal of Humanities and social Services, Vol. 1, No. 4, 2007.] Designing and developing distance education programs requires specialized training and skills. This is more so in case of online learning [J. Dikshit, A. Gaba, S. Bhushan, S. Garg, and S. Panda, "learning Attitude, Motivation and Preferences of Online Learners" Indian journal of Open Learning 12(3), 149-167, 2003].

## IV. OBJECTIVES OF THE STUDY

The objectives of the present study are:

- To Study the accessibility and availability of E-learning facilities in engineering Colleges in Hyderabad and Telangana.
- To study the usage of E-learning amenities by BTech & MTech students in Engineering colleges.
- To find out the problems encountered by Students in accessing the E-learning facilities.
- To suggest appropriate actions to improve the digital resources by Engineering Colleges.

## V. METHODOLOGY

Keeping in view the objectives in mind, a questionnaire is prepared to collect data from the students of the engineering colleges studying in Telangana State. The survey has been conducted for the period of 10 days. Copies of questionnaire were distributed to 200 Students. Then the data was analyzed and interpreted as follows

## VI. DATA ANALYSIS

**Table 1**
**BTech/MTech Student's acquaintance with digital resources**

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| Use | No of responses | Percentage |
|---|---|---|
| Familiar | 186 | 93 |
| Not familiar | 14 | 7 |
| **Total** | **120** | **100.00** |

**Table 2**

**Distribution of students according to their frequency of using the computers**

| Frequency | No of responses | Percentage |
|---|---|---|
| Daily | 140 | 70 |
| 2 or 3 times a week | 26 | 13 |
| Once a week | 15 | 7.5 |
| Once in a month | 5 | 2.5 |
| Rarely | 4 | 2 |
| Never | 0 | 0 |
| **Total** | **200** | **100.00** |

**Table 3**

**Distribution of students according to their "Main" purpose of using the digital resources**

| Purpose | No of responses | Percentage |
|---|---|---|
| For communication(email) | 125 | 62.5 |
| For research | 8 | 4 |
| To collect subject information | 12 | 6 |
| Upgrade general knowledge | 10 | 5 |
| For Entertainment | 40 | 20 |
| For career development | 5 | 2.5 |
| **Total** | **200** | **100.00** |

**Table 4**

**Distribution of students according to the sufficiency of information in digital resources**

| Opinion | No of responses | Percentage |
|---|---|---|
| Always | 155 | 77.5 |
| Some time | 35 | 17.5 |
| Never | 10 | 5 |
| **Total** | **200** | **100.00** |

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**Table 5**

**Distribution of students according to the factors that prevent them in accessing the digital resources**

| Factors | No of responses | Percentage |
|---|---|---|
| Lack of Interest | 76 | 38 |
| Lack of Money | 17 | 8.5 |
| Lack of time | 67 | 33.5 |
| Distraction while on Net | 19 | 9.5 |
| Lack of IT knowledge | 6 | 3 |
| Limited accesses to computers | 15 | 7.5 |
| **Total** | **200** | **100** |

## VII. FINDINGS

- Most of the Engineering students are familiar with the usage of digital resources.
- Majority the students are using the computers on a regular basis.
- Most of the students are using internet for communication and entertainment purposes.
- Most of the students are mainly using search engines(Google and Wikipedia) compared to other research resources.
- Many of the students opined that they were acquiring skills to use digital resources through 'self-study' method.
- Majority of the students opined that the information available in the digital resources is always 'adequate'.
- Majority of the students have expressed 'lack of interest' and 'lack of time' are the main problems for using digital resources for academic Puposes.

## VIII. RECOMMENDATIONS:

The following suggestions are made to improve the use of digital resources in the college.

1.The Engineering Colleges management should update the digital resources in the library from time to time.

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2.The Engineering College should create more awareness levels towards continuous usage of online journals for enhancing the knowledge base of the students and Teaching staffs.

3.The College library must facilitate the conduct of evaluations and assessments at regular intervals by college staff and students for bringing changes in the digital resources.

4. Though subscribing for online Journal, Colleges should subscribe hard copy Journals, as students/staff are inclined to pickup and read a physical journal without any kind of incentive.

## IX. CONCLUSION

Today, the prevailing paradigm is computer-mediated communication (CMC), where the primary interaction is between learners and instructors, mediated by the computer. In addition, modern ICT provides education with tools for sustaining learning communities and associated knowledge management tasks. Students growing up in this digital age have extensive exposure to a variety of media. Major high-tech companies such as Google, Verizon, Microsoft are funding schools to provide them the ability to teach their students through technology, which may lead to improved student performance. The day is not far off to visualize all engineering libraries with huge digital collection and the latest technology to access the same. With more and more resources available in digital format, the collection development has to include these resources, thus making them easily accessible to students. The Internet has unlocked a world of opportunity for students. Information and ideas that were previously out of reach are a click away. Students of all ages can connect, share, and learn on a global scale. Using computers or other forms of technology can give students practice on core content and skills while the teacher can work with others, conduct assessments, or perform other tasks. Studies completed in "computer intensive" settings found increases in student-centric, cooperative and higher order learning, students writing skills, problem solving, and using technology. In addition, positive attitudes toward technology as a learning tool by parents, students and teachers are also improved.

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## REFERENCES

C. Blezu, and E. M. Popa, "E-Learning and its Prospects in Education"12th WSEAS International Conference on COMPUTERS, Heraklion, Greece, July 23-25, 2008.

S. Adkins, "The US Market for Self-paced eLearning Products and Services: 2010-2015 Forecast and Analysis" Ambient Insight, LLC, January 2011

I. E. Allen, J. Seaman, "Online Nation: Five Years of Growth in Online Learning". Needham, MA: Sloan Consortium, 2007.

C. Ardil, "E-learning Collaborative Circles" , International Journal of Humanities and social Services, Vol. 1, No. 4, 2007.

Namahn. "E-learning: A research Note" http://www.namahn.com/resources/documents/note-e-learning.pdf

J. Dikshit, A. Gaba, S. Bhushan, S. Garg, and S. Panda, "learning Attitude, Motivation and Preferences of Online Learners" Indian journal of Open Learning 12(3), 149-167, 2003.

K. R Ellis, "E-learning Standards Update" learning circuits, 2005.

P. Gledhill, "Latest e-Learning research in Europe Middle East and Africa" (page 1 of 3), 2004.

S. Kakoty, and S.K Sarma. "Expert System Applications in E-learning Environment: Analysis on Current Trends and Future Prospects" International Journal of Internet Computing (IJIC), Vol. 1, 90-93, 2011

Sein, M. K., & Robey, D. (1991). Learning style and the efficacy of computer training methods. Perceptual and Motor Skills 72 (1) 243.

Horn, Richard (2000) "The Network is the Teacher: Collaborative E-Learning." http://www.learningcircuits.org/jun2000/horn.html June, 2000.

Hall, Brandon (2000a) "Resources for enterprise-wide e-learning initiatives." ELearning Magazine, http://www.elearningmag.com/issues/may00/cover.htm.

Galagan, P. (2000). Getting started with e-learning. Training and Development 54 (4), p. 62-64.

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**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# DESIGN OF VGA AND COMPARATOR FOR LOW POWER FLASH ADC

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***ABSTRACT***

***Flash Analog to Digital Converter (ADC) being the fastest ADC is a major block in Ethernet Applications. In Flash ADC, as the number of components increases for every increase in bit, the design of various blocks like Variable Gain Amplifier, Comparator Array and Encoder with CMOS technology decreases the power consumption. Individual modules are designed targeting for the design of low power flash ADC. This paper presents the design of Variable Gain Amplifier and a comparator for a low power flash ADC in TSMC 130 nm CMOS Technology.***

***Keywords— Flash ADC, Variable Gain Amplifier, Comparator, CMOS.***

## I. INTRODUCTION

The Variable Gain Amplifier (VGA) is utilized in many applications for decades, which includes radar, ultrasound and wireless communication. The purpose of the VGA is to improve the dynamic performance. Broadly speaking, the VGA is used in two different situations. The first is to match the input signal level to full scale input level of a device like an ADC or a FM-discriminator. The second in which the fixed input voltage is scaled to compensate variable losses like transmission line voltage level adjustment [1].

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To keep the ADC amplitude in range, Variable Gain Amplifier is designed with high linearity. To improve the ADC performance, along with good linearity VGA should have low noise figure. Variable gain amplifier (VGA) conditions the signal received from the channel to utilize full dynamic range of the analog-to-digital converter (ADC).The VGA is a signal conditioning circuit with adjustable gain. Depending upon the nature of the gain control signal, the VGA is divided into two categories.

- Analog variable gain amplifier (AVGA)
- Digital variable gain amplifier (DVGA)

The gain control in the AVGA is controlled by the analog voltage and the gain is linear function of the analog control voltage signal. The gain levels are continuous. The gain control in the DVGA is controlled by the digital control word and the gain levels are stepped. The AVGA is compact in size as compared to the DVGA. But in DVGA different parameters of the gain control could be observed.

## II. VARIABLE GAIN AMPLIFIER

DVGA is implemented in this paper, which is used to adjust the level of the signal received from the channel. The on-chip micro Computer first calibrates the ADC upon ADC start-up, and then continuously compensates the non-linearities in VGA [2]. The ADC as in Fig.1 consists of a frontend Variable Gain Amplifier (G) which provides fine control of gain and maintains the analog input signal in full-scale voltage range of ADC. Each instance of G drives a Track and Hold (T&H) circuitry that is clocked by a 2.5-GHz clock. The comparator array of 63 comparators is fed by the sampled

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analog signal and reference signals which are generated by a resister ladder network with 400m V of full-scale voltage.

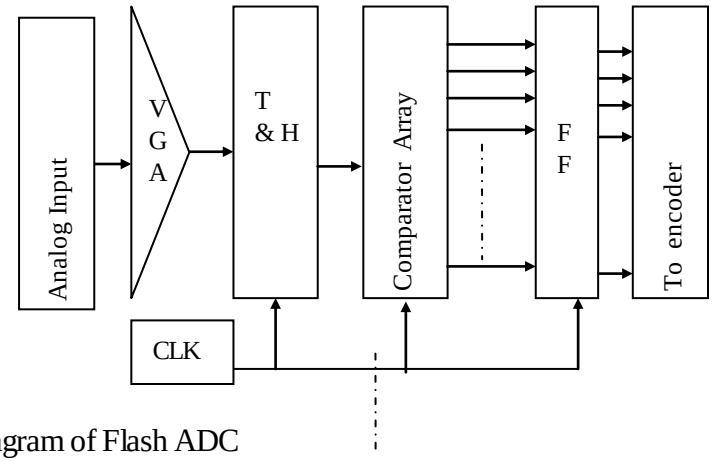


Fig.1**:** Block diagram of Flash ADC

The output of comparator array is 63 bit thermometer code. It is given to flipflops and here the metastability related error rate is decreased [3]. A multiplexer logic then converts the metastability hardened thermometer code into binary. Finally, the output is retimed to a single clock phase.

**Non Linearity**

As the signal amplitude increases, the non linearity comes into play. At the small signal amplitudes, the output is approximately exact replica of the input but as the signal amplitude increases from certain limit, the amplifier exhibit saturation, which results in the non linearity.

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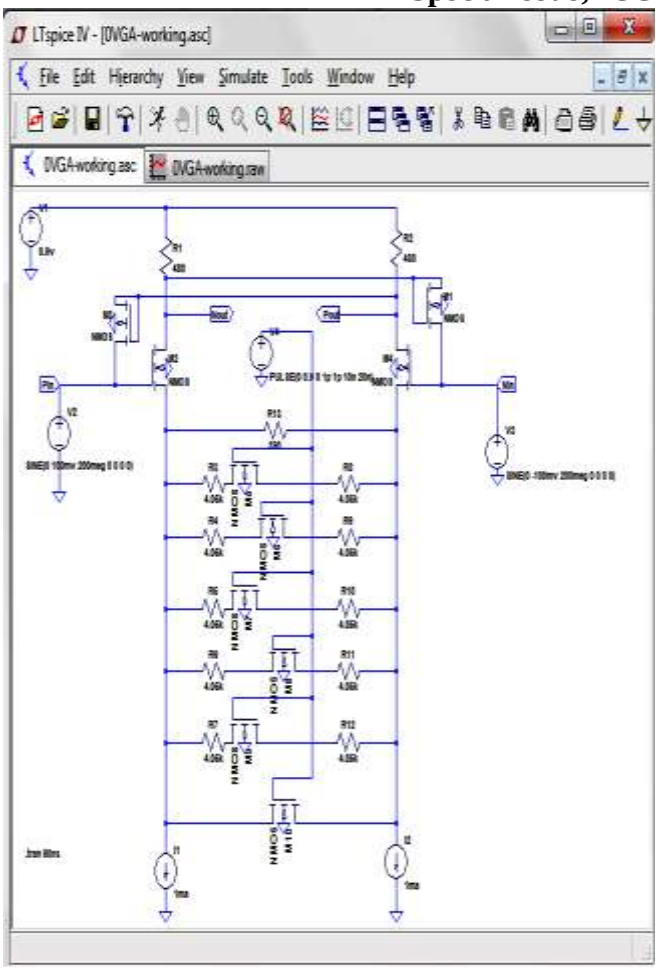


Fig.2: Schematic of variable gain amplifier

**Linearization Technique**

The principle of the linearization is to reduce the gain dependency of the amplifier on the input amplitude, by making the gain independent of the bias current. For high speed applications, the simplest method for the linearization is the source degeneration. The source degeneration utilizes a linear resistor at the source terminal as shown in Fig.2. This resistor reduces the swing at the gate to source, making the input/output characteristics more linear.

The overall trans-conductance of the amplifier shown in Fig.2 is $Gm = g_m / (1 + g_m * R_s)$, where the body effect is neglected. Note that the linearization depends upon $g_m R_s$ not on Rs alone. The design

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of the source-degenerated differential amplifier equipped with variable gain control. The purpose of source degeneration is to improve the linearity of the amplification. For the amplifier, source degeneration is implemented via a digitally programmable resistor array that allows the gain to be varied.

The M3and M4 helps in extending bandwidth during normal operation also disconnecting the input signal from the load during calibration. Charge feedback via gate-to-drain overlap capacitance of M1 and M2 can disturb circuit functionality. Cross-coupled devices M3 and M4 perform first-order cancellation of this effect.

## III. DYNAMIC COMPARATOR AND ENCODER

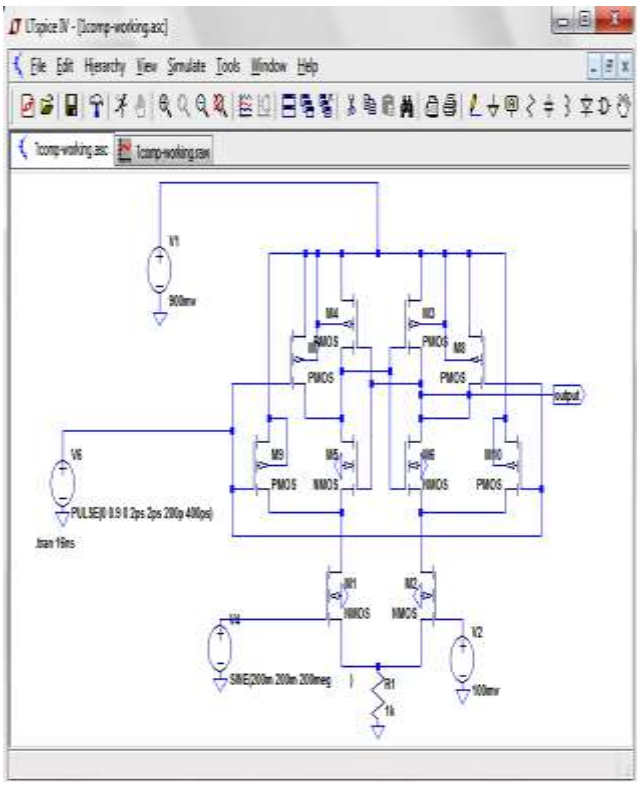


Fig.3: Schematic of Dynamic comparator

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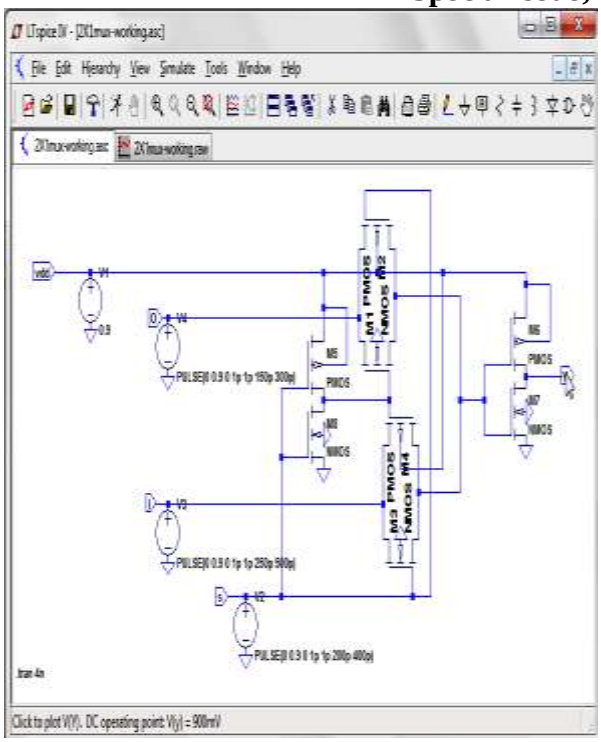


Fig. 4 Working of Inverted output 2 X 1 multiplexer

Flash ADC requires 63 comparators for the design of comparator array. For acquiring a low power design, the dynamic comparators designed in this flash ADC are operating without the pre-amplifiers as in Fig.3. A local clock buffer is used which provides the advantage of shutting down of power to individual comparators which in turn saves the clock tree power. The last module in the flash ADC-encoder design is implemented in multiplexer based architecture as in Fig. 4.

## IV. SIMULATION RESULTS

LTSpice analysis is carried out for the VGA module of Fig. 2 and the simulation waveforms are depicted in Fig.5 as shown below.

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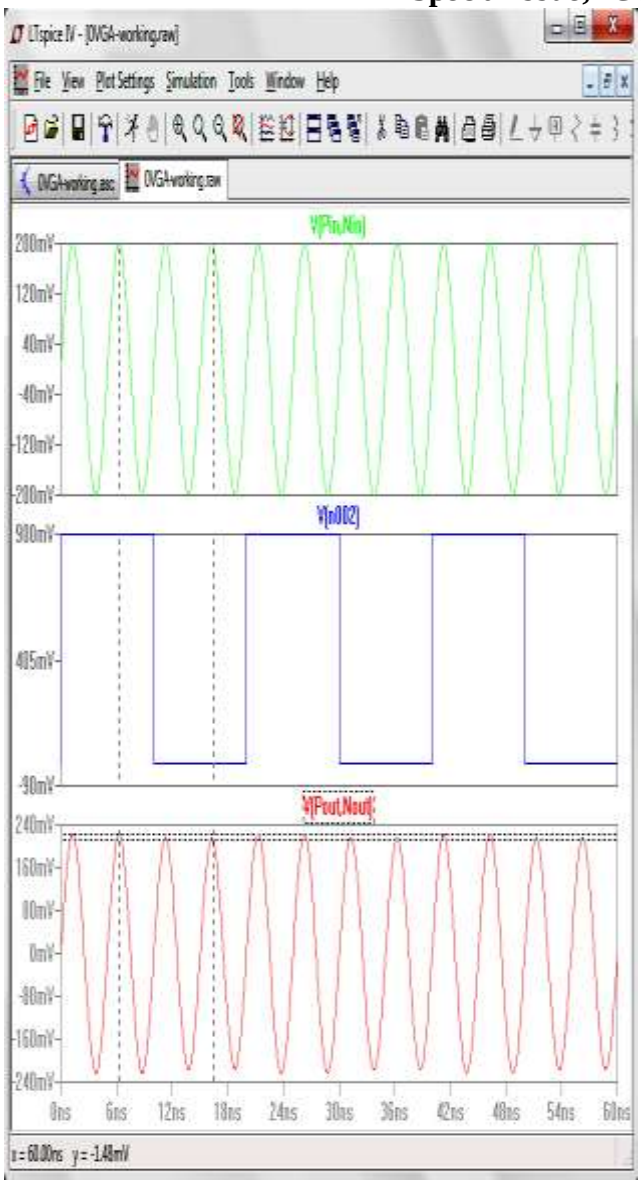


Fig.5 Simulation waveforms of VGA

Fig. 6 illustrates the functionality of the dynamic comparator designed as a module in flash ADC as shown in Fig. 3. The last module in the flash ADC- encoder design is implemented in multiplexer as in Fig.4 and Fig.8 illustrates the output waveforms [4].

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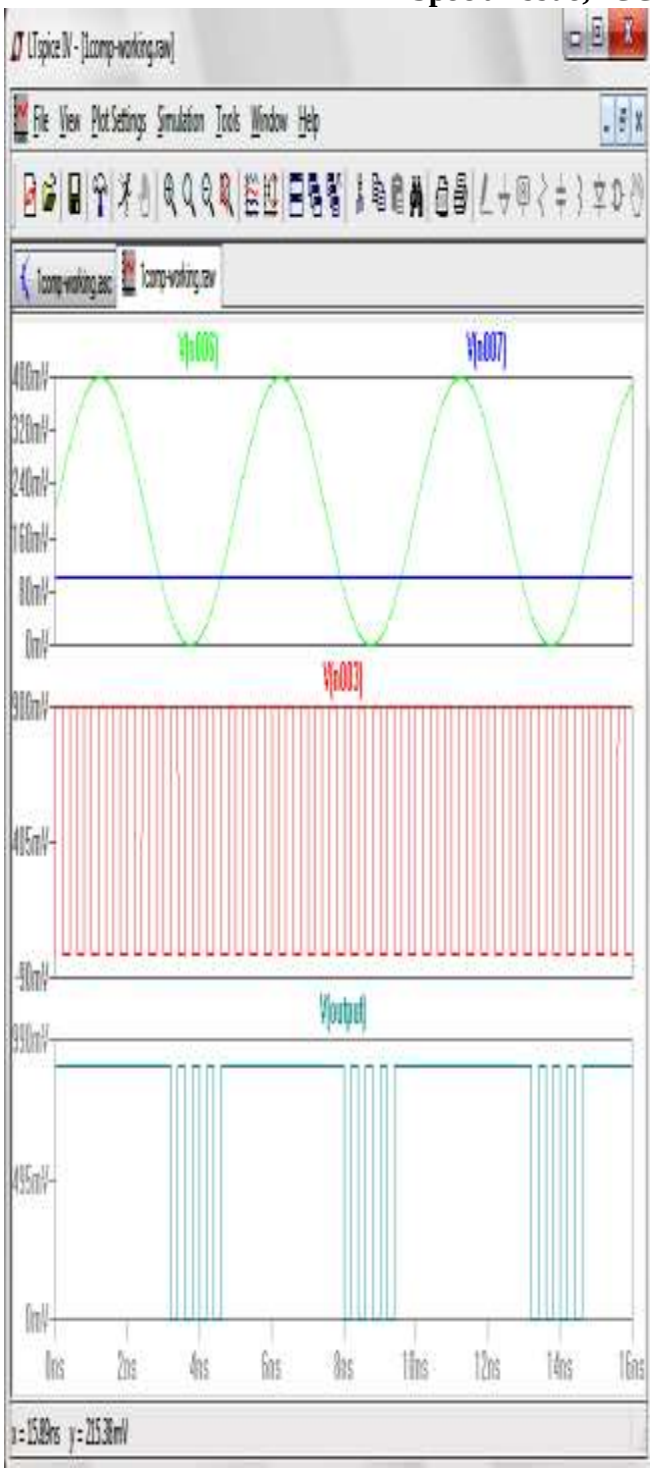


Fig.6 Dynamic comparator circuit – functionality:

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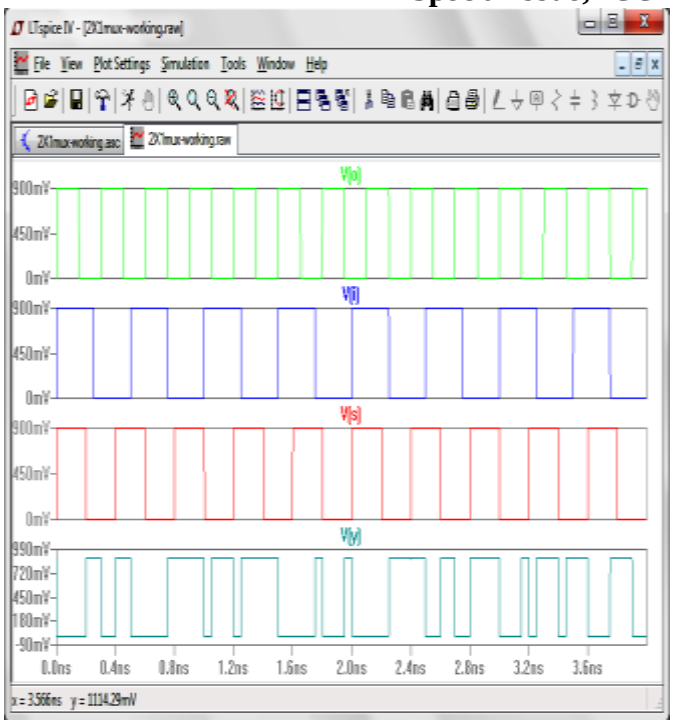


Fig.8 Output of 2 x1 Multiplexer

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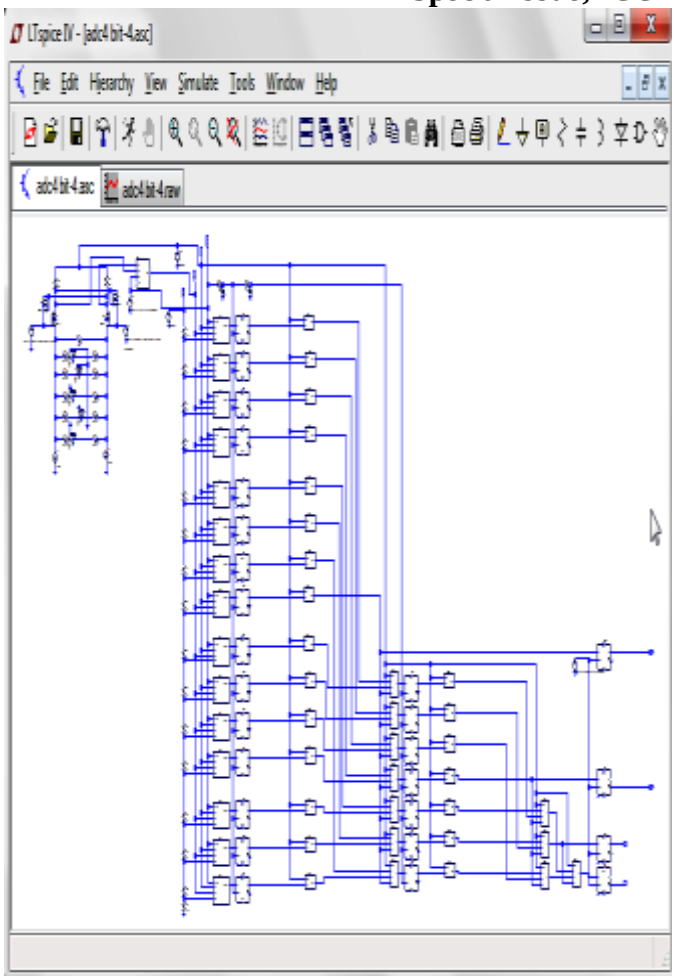


Fig. 9 Schematic of 4 bit Flash ADC

The design is targeted for a multibit flash ADC for 10G ethernet applications. The proposed design is initially verified with a 4 bit flash ADC architecture as shown in Fig. 9 and its corresponding module outputs in Fig. 10. Further the same approach for design of 2.5-GS/s, 15mW flash ADC is under investigation with appropriate changes which is suitable for 10GE DSP-based receiver.

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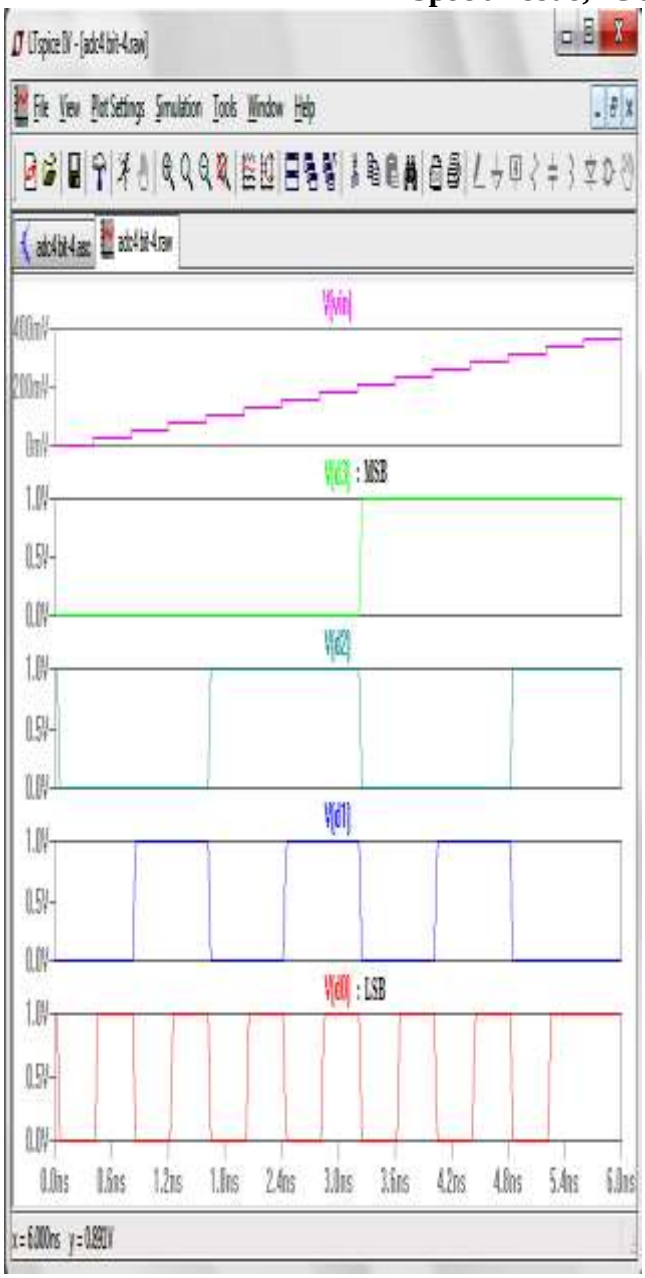


Fig. 9 Output at every module of 4 bit Flash ADC

4-bit Flash ADC presented in this work is also suitable for pipelined architecture targeted for various DSP based applictaions and wireless applications. The proposed design is implemented with efficient hardware and area compared to previous architectures[5,6]. Hence this design is suitable for low-power applications.

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## V. CONCLUSION

Design of Variable Gain Amplifier and a comparator for a low power flash ADC in TSMC 130 nm CMOS Technology is done. LTSpice simulations are carried out to check the functionality and the output of each and every module. Further the multiplexer based encoder architecture design is completed and the entire design is verified with 4-bit flash ADC and is further extended for high resolution. This design is suitable for 10GE DSP-based receiver.

## REFERENCES

N.West. K.Eshragian, Principles of CMOS VLSI Design: A systems Perspective, Addison-wesley, 1993.

K.Berstein et aI., "Design and CAD challenges in sub-90nm CMOS technologies," in Proc. int. conf computer. Aided Design., 2003, pp. 129- 136.

S.G.Narendra and A. Chandrakasan, Leakage in Nanometer CMOS Technologies. New York: Springer-verlag, 2006.

B. Hochet, and F. Kaess, "New Encoding Scheme For High-speed Flash ADC's",1997 IEEE International Symposium on Circuits and Systems, pp. 5-8, June 9-12,1997, Hong Kong .

Hamid Reza Mafi, and HosseinShamsi,"A 10-Bit 50-MS/s Charge Injection Pipelined ADC Using a Digital Calibration", IEEE, 9 th International Multi-Conference on systems, signals and Devices,2012.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
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Vladimir Stojanovic, Chih-Kong Ken Yang, "A Serial-Link Transceiver Based on 8-GSamples/s A/D and D/A Converters in 0.25-µm CMOS"IEEE Journal of Solid-State circuits, vol. 36, NO. 11, November 2001.

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# CROSS SITE REQUEST FORGERY – HOW TO, THREATS & MITIGATIONS

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***ABSTRACT***

***With the ever-evolving threat landscape, it's quite important for enterprises to secure themselves against security attacks. With growing costs while defending against threats increasing unpredictably, it's been a tough time for enterprises securing their respective technical infrastructures. Hostile Linking, which also goes by the names, cross-site request forgery, XSRF, Session Riding is one such critical web application vulnerability. CSRF is the attack in which the end user is forced to execute commands or is forced to authenticate requests without his/her knowledge. This attack has been known and is being exploited in wild since a long time, yet many popular sites were found to be vulnerable to this attack. Financial Institutions are put to huge losses due to these vulnerabilities. This paper not only provides comprehensive attack scenarios, which are used to exploit this vulnerability but also provides a systematic way of identifying this security issue in web applications. The financial risk a company takes by not mitigating these issues will also be discussed. This paper highlights a point black intact security methodology that is to be adapted to combat this eventual security menace. Some of the myths of developers pertaining to this security issue will be discussed and suitable remedies are stated. The prime focus of the paper is on the robust mitigations possible for this vulnerability throwing light on end user mitigations and real time case studies involving top-notch web applications.***

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***Index Terms— CSRF, Vulnerability, Web Application Security.***

## I. INTRODUCTION

CSRF is the acronym for cross site request forgery. A security researcher first introduced this vulnerability some time around late 2000's. According to the Department of Homeland Security of the United States government, the most dangerous CSRF vulnerability has been rated as 909th dangerous software vulnerability ever found [1]. This vulnerability is often called the sleeping giant. It's apt to say that because of the wide spread exploitation of this vulnerability in wild. One best example to show what can be done using this vulnerability is the loss of 18 million user accounts of a website associated with the eBay Inc. thereby causing a heavy loss to the company [2]. Unlike XSS, CSRF takes advantage of the website trust towards the user and compels the user to do actions without the knowledge of the user. For example changing the user credentials without the knowledge of the user. Over the years so many developers neglected this vulnerability. This paper emphasizes the severity of the issue and the need for patching this issue. This paper also covers the best possible mitigations for this issue, which are in fact very easy to implement and integrate.

The basic attack scenario is the victim tricks the user into doing actions without the knowledge of the user taking the help of inherent statelessness of the web to stimulate the user actions on the target website from the attackers website. This attack requires the victim to be logged in the website. This is how the attack happens:

1) The user sends a login request to the website
2) The website checks the user credentials and then it authenticates the user if the credentials are correct
3) The server assigns a session cookie and returns with a dashboard UI to it
4) The user receives a CSRF trap attack vector. This attack vector can be an email or an inline embedded image etc
5) The CSRFed site sends a forged request to the website impersonating the user.

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6) The website responds to the request and processes it as there is no mitigation against forged requests.

7) Since that happens from the victim's browser it self, the browser sends the session cookie too.

## II. VULNERABLE CODE– HOW TO FIND?


This section focuses on how to find this particular vulnerability in a website.

Lets consider this simple web form that is used to transfer money from one account to another

This is a hypothetical web application of a bank, which can be used to transfer money from one account to other account. Thepost request, which is sent, is

```
GET http://fakebankfortesting/transfer_funds.cgi?fromaccount=123&toaccount
=345&amount=100&date=11112014
HTTP/1.1
Host: fakebankfortesting
User-Agent: Mozilla/5.0 (Macintosh; U; PPC MacOSX Mach-O; en-US;)
Firefox/13.1
Cookie : SESSIONID= 1234567890ABCDS0DF
```

Here the account number of the account from which the money is being sent is 123 and the one, which is receiving, is 345.

Here the form accepts both GET as well as POST requests, So If we change the request to a GET request

And the simple URL would be

http://fakebankfortesting/transfer_funds.cgi?fromaccount=123&toaccount=345&amount=100&date=11112014

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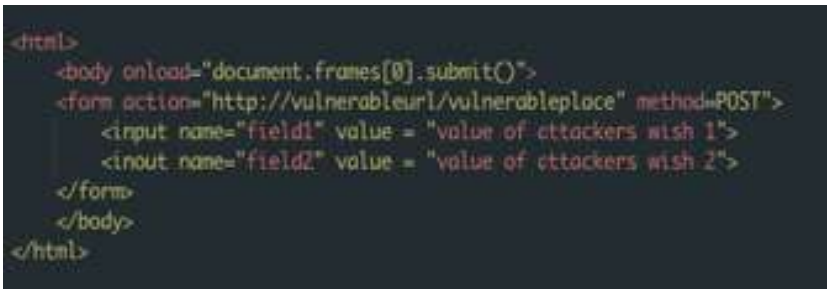
Here if the request is observed carefully, then it is well evident that the request doesn't contain any token or header validation or anything that can stop from the attack being forged. This is the main problem with the website which authenticates the user only by cookie.

Penetration test check-list:

1) First check whether the form is a GET request or POST request.

2) If it is a POST request then check for any token in the request and if there is any, then check for proper validation of token. However in most cases the token is not validated or even try converting it to a GET request as shown before.

If the site is vulnerable then script a html file as follows and send it to the victim: http://hacker/csrf.html




3) If it is a GET request then check whether then check for any token and if there no token try attacking using the following attack vector:

<Imgsrc="attack url">

Save that as a html file and then run that file, if the request is successful then the website is vulnerable to CSRF.

**ATTACK VECTORS**

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In the case of this vulnerability, there are different types of attack vectors. But the most common type of attack vector is a simple html file. For example the attacker sends an html file. An attacker finds a CSRF vulnerability in a website and then creates a html script for the attack. Figure 5 is a classic example of a html file scripted for an attack against a vulnerable website. The following are some of the different possible attack vectors:

1) Phishing: The easiest way to exploit CSRF is phishing. The attacker hosts the html file in his website and then phishes the user to go to that file.
2) Inline embedded images

   Ex:

   <imgsrc="http://fakebankfortesting/transfer_funds.cgi?fromaccount=123&toaccount=345&amount=100&date=11112014">
3) Persistent script Injection: If the website is vulnerable to persistent script injection then the attacker can just embed the html attack script into the website and the whole bunch of users who visit that page which is vulnerable to script injection can be hacked or compromised.

The paper discussed only few popular and important ways of exploiting CSRF. Apart from them there are some ways. However, they are not popularly used as attack vectors.

## III. MITIGATIONS

There are several mitigations that are proven ineffective in tackling the CSRF attack. This section focuses on different robust defenses that are to be implemented in order to protect against these attacks.

1) Token based protection:

The POST or GET based request consists of a random token that can't be guessed by the attacker that should be validated by the server and if the post token value is equal to the session token value then request can be processed otherwise the request should be aborted.

2) Nonce token based protection:

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The request contains a nonce token, which is unique per session and can't be guessed by the hacker. Nonce is the acronym for cryptographic number used once. In some places nonce is a 128 bit cryptographic random data, which is very hard for the attacker to predict. This is a proven method to protect forms against CSRF attacks.

3) Using a token combined with an action specific secret:

This is the best protection one can apply against csrf. Using a random token which contains a random secret + action specific secret and validating the same on the other side. This causes less computational overload.

4) Using a captcha:

Captchas were first introduced to protect forms against spam but they can even be used to protect forms against csrf. This is the simplest yet quite powerful protection against the csrf attacks. The captcha generated random images that users need to enter or it creates some challenges that user needs to complete in order to process the request.

5) Re-authentication:

If the web form asks for re authentication for sensitive requests then the attacker won't be able to perform the attack, as the attackerdoesn't know the password. Also things like Multi Factor authentication would pretty much help to fight against this issue.

6) Short timed sessions:

Although, this alone isn't a completed mitigation, this certainly improves the chances of the victim not becoming a prey for the malicious attacker. Developers should use short timed sessions to end the users session in order to end inactive users sessions so that the users wont be a pray to these attacks when they are not active on the website.

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## VI. CONCLUSIONS

CSRF attacks are increasing day by day and it's a high time that developers start protecting their website against csrf. This paper presents a perfect checklist framework, which can be useful for finding csrf vulnerabilities. This paper explains the threats by this particular attacks and also some of the robust defenses that can help the developer to mitigate against these attacks. This paper highly recommends the developers to use the captcha based, as it is very easy to integrate. This paper advices end users to follow the precautions stated in Section 5 to avoid being a victim of this attack.

## REFERENCES

http://www.kb.cert.org/CERT_WEB%5Cservices%5Cvul-notes.nsf/bymetric?open&start=908

http://www.darkreading.com/attacks-breaches/hacker-steals-data-on-18m-auction-customers-in-south-korea/d/d-id/1129325?

Whitepaper on CSRF attacks and defenses- Jeremiah Blatz, 2007.

CSRF – A common web application security weakness – Jesse Burns, 2007

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**International Journal Of Core Engineering & Management (IJCEM)**
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# ROLE OF BUSINESS COMMUNICATION IN PRESENT SCENARIO

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***ABSTRACT***

***Success of a business depends on its communication competence. Predominantly, from effectively communicating with personnel to reaching out to clients and customers, communication is a huge factor in business operations. The obstacles in the Business paved way to importance of Business Communication in the modern world. Proficient communication skills are crucial for the success of any organization.. This paper tries to analyze the characteristic features of Business Communication and its emerging trends in Business World, its evolution and existence from 12$^{th}$ century to present scenario. It also tries to analyze from an individual's point of view expertise in writing and speaking skills helps the individual to acquire a job, perform well, and earn promotions. If one decides to go into business, they need to be technosavy, develop proficiency in writing and speaking skills which will help him promote his product, manage his employees among other things. The same skills also help him achieve his personal and social goals. Thus the objective of effective business communication is to achieve desired result by all means.***

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***Keywords: Business Communication, Clarity, Honesty, Listening, Outsourcing, Teleconference***

## I. INTRODUCTION

Business communication involves exchange of ideas between two parties for a specific purpose It may be a commercial enterprise, whether it's two persons on a shop floor making a product or two companies entering a merger. Technological innovations have presented solutions and obstacles in the communications process. Business communication has evolved in response to overcoming the impediment, especially as each solution presents the potential for a new set of challenges.

## II. OBJECTIVES OF THE STUDY

To analyze the role of business communication in today's world.

To understand the paradigm shift since its evolution.

To analyze the characteristic features of business communication and its emerging trends in Business world.

## III. RESEARCH METHODOLOGY OF THE STUDY

This paper has been developed from descriptive secondary data gathered by reviewing literature and Articles published in Journals, books, Magazines and Websites.

## IV. EVOLUTION OF BUSINESS COMMUNICATION

### English as a Common Business Language

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England began to develop overseas colonies as early as the 12th century in Ireland, and soon expanded to the New World in the Americas, creating English-speaking colonies in what would eventually become the United States and Canada. Other key colonies in the British Empire included various parts of India, the African continent, such as South Africa, the Middle East, Australia and Hong Kong. English was the unifying language in many of these areas, and soon became the language of trade, travel and commerce.

The English language is the universal language of international communication and with increasing globalization, it is important to have a refined understanding of the nature and structure of English and how we communicate with each other. An understanding of the various dimensions of language and communication will help us to acquire the ability to communicate more effectively in this business world.

**Essential Areas**

The following are the key areas which must be conquered by the individual not only for academic pursuit, but also to enable the individual to balance versatile situations that will almost certainly arise at work.

- Presentations and Introductions.
- Description of a company or role within a company.
- Description of one's professional skills, role, experience and qualification.
- Description of future prospects proposals and projects.
- Opinions and personal proxemics.
- Participation in discussions, agreeing or disagreeing with other people's opinions.
- Suggestions and offers.
- Criticism and advice.
- Numbers, quantities, prices and dimensions.

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- Forecasts and estimates.
- Comparisons.
- Sequencing.
- Telephone calls, understanding messages, asking and giving information.
- Gleaning information from press articles.
- Writing letters, memos and reports

## V. CHARACTERISTICS OF EFFECTIVE BUSINESS COMMUNICATION

Communication is a necessity in nearly all areas of the business world

Effective business communication first requires taking time to listen to the other person's perspective. Start the conversation by asking questions--and listening thoroughly and attentively--to the responses. As Stephen Covey, author of "The 7 Habits of Highly Effective People," has famously said: "Seek first to understand."

### *A. Efficiency*

Although email may seem like the quickest way to get the message across at work, taking a few minutes to pick up the phone or walk to someone's office may be more effective. Facial expressions and body language make setting the right tone infinitely comfortable, and speaking in person allows for back-and-forth dialogue to ensure that both of them understand each other. As psychologist and management consultant Ken Siegel tells Candice Novak of "U.S. News and World Report" in an article titled "7 Ways Your E-mail Can Get You Fired," "You could have a phone conversation that would take three

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minutes to resolve an issue, but on email it would take five or eight emails over a course of a couple days."

*B. Clarity*

Majority of the people have received emails or had correspondence at work that left them surprised exactly what was just said. Confusing jargon, contradictory statements or a lack of focus can remove the meaning from business communication. According to Bill Gates in his 1999 book "Business at the Speed of Thought," "Like a human being, a company has to have an internal communication mechanism, a 'nervous system,' to coordinate its actions." Keeping emails, memos and discussions clear and precise, and proofreading any messages before hitting send can help keep that system running smoothly.

*C. Honesty*

Everyone in an organization needs to be kept informed to perform effectively, especially during hard times. Sometimes managers at various levels may be tempted to withhold unpleasant corporate updates from employees for fear of reduced productivity. However, honesty is always crucial. In fact, employees will feel more a part of a company that trusts them with difficult news, and will do their best to get the company back on its feet. After all, everyone in the business has something at stake. As "Harvard Business Review" columnist and business leadership guru John Baldoni puts it, "Tell people what they need to know and they will reward you with solid performance."

## VI. Emerging trends in Business Communication

### Social media

Businesses are literary taking work to where the play is. There are over 1 billion Facebook user and nearly half a billion twitter and there is no way you can ignore such numbers. Many successful businesses have established customer care teams that interact and answer customer questions using

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social media platforms. You can barely go thirty minutes on Facebook without coming across a business advert. Social media is both fun and cheap to use making it a preferred marketing tool.

**Outsourcing**

It is a cost cutting move that businesses are applying to improve customer service and feedback collection. With progression in technology, customer desks can be located thousands of miles away from your business establishment. A business can have a 24hrs customer's desk without paying a single cent as payment.

**Teleconferencing**

Teleconferencing has highly developed with many businesses holding their AGMs tenuously using telecommunication amenities, although it has been there for a while.

## VII. CONCLUSION

Communication is the link of day to day living as well as business. Any Successful organization creates a proper communication structure to enable smooth execution. New employees are instructed on the various aspects of managerial communication. Business communication is always planned towards create reliability and goodwill and also make possibility towards a superior position in this competitive business environment.

## REFERENCES

http://managementstudyguide.com/emerging-trends-in-information-technology.html
http://www.unevoc.unesco.org/fileadmin/up/emergingtrendsinictforeducationandtraining.pdf
http://www.bbsp.harvard.edu/products/hbr/index.html
http://www.ehow.com/about_6710260_importance-english-business-communication.html

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ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

# GREEN TECHNOLOGY TO MANAGE BUSINESS & SAVE THE PLANET

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***ABSTRACT***

***As the name implies green technology is one that has a "green" purpose. an invention that will have an impact on the environment and business , is what we are talking about. Green inventions are environmentally friendly inventions that often involve: energy efficiency, recycling, safety and health concerns, renewable resources, and more. Green Technology is one of the development in business management that is economically feasible and reduces the risk to human health and the environment. In order for a business to be truly sustainable, it must sustain not only the necessary environmental resources, but also its social resources, including employees, customers (the community), and its reputation.***

***Key-words: Technology, Green Technology & Green Business Innovation, Sustainable development, Recycling & Reuse. Posterity, Instigation, Paradigm, Benign***

## I. INTRODUCTION

**1.1. Introduction of Green Technology(GT)-**The term "technology" refers to the application of knowledge for practical purposes. The field of "green technology" encompasses a continuously evolving group of methods and materials, from techniques for generating energy to non-toxic cleaning products. The application of one or more of environmental science, green chemistry, environmental monitoring and electronic devices to monitor, model and conserve the natural environment and resources, and to curb

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Special issue, ICCEMT-2015

the negative impacts of human involvement. The term is also used to describe sustainable energy generation technologies such as photovoltaics, wind turbines, bioreactors, etc. **Sustainable** development is the core of *environmental technologies*. The term *environmental technologies* is also used to describe a class of electronic devices that can promote sustainable management of resources.

**1.2. Introduction of Green Business (GB)-**Green Technology in business also referred to as Environmental Technology, Sustainable Technology or Clean technology going green is top priority for most organizations today. Having realized that green technology brings with it, improved business productivity and a significant reduction in energy costs, companies are beginning to include concepts such as green data centers, virtualization, power management, re-cycling and e-waste management as part of their corporate agenda. The present expectation is that this field will bring innovation and changes in daily life of similar magnitude to the "information technology" explosion which are existing over the last two decades. In these early stages, it is impossible to predict what "green technology" may eventually encompass.

## II . GREEN OBJECTIVES

### 2.1. Principles of GT-There are mainly Twelve Principles of GT

1. **Inherent Rather Than Circumstantial**-Designers need to strive to ensure that all materials and energy inputs and outputs are as inherently nonhazardous as possible.

2. **Prevention Instead of Treatment**-It is better to prevent waste than to treat or clean up waste after it is formed.

3. **Design for Separation**-Separation and purification operations should be designed to minimize energy consumption and materials use.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

4. **Maximize Efficiency**-Products, processes, and systems should be designed to maximize mass, energy, space, and time efficiency.

5. **Output-Pulled Versus Input-Pushed**-Products, processes, and systems should be "output pulled" rather than "input pushed" through the use of energy and materials.

6. **Conserve Complexity**-Embedded entropy and complexity must be viewed as an investment when making design choices on recycle, reuse, or beneficial disposition.

7. **Durability Rather Than Immortality**-Targeted durability, not immortality, should be a design goal.

8. **Meet Need, Minimize Excess**-Design for unnecessary capacity or capability (e.g., "one size fits all") solutions should be considered a design flaw.

9. **Minimize Material Diversity**-Material diversity in multicomponent products should be minimized to promote disassembly and value retention.

10. **Integrate Material and Energy Flows**-Design of products, processes, and systems must include integration and interconnectivity with available energy and materials flows.

11. **Design for Commercial "Afterlife"**-Products, processes, and systems should be designed for performance in a commercial "afterlife."

12. **Renewable Rather Than Depleting**-Material and energy inputs should be renewable rather than depleting.

**2.2 Green Strategies**-Businesses use a number of strategies to meet their green objectives. Some of the green strategies parallely with broad aspects of technology are listed below-

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**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

**1. Sustainability**- Meeting present needs without compromising the ability of future generations to meet their own needs,without further destruction to the environment (e.g. pollution) or depleting nature's resources beyond its natural rate of regeneration.

**2.Cradle to cradle"** design- An alternative to traditional pollute and then clean-up industrial practice in developing "Cradle to cradle" design ending the "cradle to grave" cycle of manufactured products, by creating products that can be fully reclaimed or re-used. Green technology represents a fundamental shift from this model toward a pollution prevention paradigm and product presents no risk.

**3. Energy Innovation - Being the most urgent issue for green technology** ,the development of alternative fuels, new means of generating energy and energy efficiency this area looks into the development of alternative, renewable, cleaner and sustainable sources of energy (e.g. solar energy, biomass energy, wind power energy, etc) to replace non-renewable energies (e.g. petroleum and coal) in meeting the world's energy needs.

**4.Green building** -This area of GT looks into the design and construction of eco friendly buildings and urban cities, so as to minimize the impact that these man-made structures have on the natural environment.It encompasses the choice of building materials plus its location.

**5.Recycling** - This area looks into carrying out the actual recycling process for the various recyclable materials found in post-consumer or post-industrial waste, as well as constantly finding ways to improve recycling rates and efficiency at the various stages of the recycling process, etc. Besides the downstream recycling process, some in this area also work upstream in designing products that are recyclable, finding demands for recycled materials, or finding ways to recycle materials that are conventionally not recycled.

## III. IMPORTANCE OF GT & GB

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The knowledge of green technology in business managment is important, with the aim of conserving the environment and reducing man's impact on it are widespread (though some may argue that it is still not enough) in our lives and society today. The applications can range from simple appliances (like the energy saving lightings that you install in your house) to highly complex and specialized systems (e.g. recycling facilities and systems, climate monitoring systems, air filtering devices and systems etc).

**To overcome the hindrances-** The world has a fixed amount of natural resources, some of which are already depleted or ruined. For example: household batteries and electronics often contain dangerous chemicals that can pollute the groundwater after disposal, contaminating our soil and water with chemicals that cannot be removed from the drinking water supply and the food crops grown on contaminated soil. The risks to human health are immense.

**Go Green - If Not for Love Then Profit-**Inventors should know that green inventions and clean technologies are good business. These are fast growing markets with growing profits.Consumers should know that buying green inventions can reduce your energy bill and that green inventions are often safer and healthier products.

## IV.APPLICATIONS OF GT IN GB MANAGEMENT

Environmentally friendly actions don't have to be large to have an impact. Whether you run a home-based business or a brick and mortar retail business, there are simple easy things you can do to go green, Consistently reducing the amount of energy, water, and paper our businesses use can make a huge difference, both to the environment and to our pocketbooks. Here are just ten easy-to-implement ideas for running a green business from the Department of Foreign Affairs and International Trade's Greening Operations guides that you can put into practice right now to make your business a more environmentally friendly place.

**Ten Ways Your Business Can Go Green:**

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1. Turning off equipment when it's not being used. This can reduce the energy used by 25 percent; turning off the computers at the end of the day can save an additional 50 percent.

2. Encouraging communications by email and reading email messages on screen to determine whether it's necessary to print them. If it's not, don't!

3. Reducing fax-related paper waste by using a fax-modem and by using a fax cover sheet only when necessary. Fax-modems allow documents to be sent directly from a computer, without requiring a printed hard copy.

4**.** Producing double-sided document**s** whenever possible.

5. Not leaving taps dripping always close them tightly after use. (One drop wasted per second wastes 10,000 litres per year.) Start Earning from First Month! Low Investment High Return.

**6.** Recycling & Reus**e** of water through effluent treatment plant, Installing displacement toilet dams in toilet reservoirs.

7. Finding a supply of paper with maximum available recycled content**.**

8. Choosing suppliers who take back packaging for reuse.

9.Instigating an ongoing search for "greener" products and services in the local community. The further your supplies or service providers have to travel, the more energy will be used to get them to you.

10.Before deciding whether you need to purchase new office furniture, see if your existing office furniture can be refurnished. It's less expensive than buying new and better for the environment.

**Examples-**Solar cell is One of the best known example of green technology.Generating electricity from solar energy means less consumption of fossil fuels, reducing pollution and greenhouse gas emissions.

ISSN: 2348 9510
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Reusable water bottle is Another simple invention can be considered Green.You can refill yourself its health-promoting and eco-friendly.

## V.CONCLUSION

So we can conclude that GT is appropriate to the environmental, cultural and economic situation. Technology that works from the bottom up it is not just an overlay to the situation; it is a genuine grass root solution to economic needs. As sensible human beings it is, but logical to use appropriate technologies to our advantage. GT aims at sustainable development. It is a way of fulfilling our duty as human, to take care of what we have and pass on what is the best to our posterity. Nature has bestowed us with intelligence but with this power comes responsibility. we need to ensure pro-active protection of the environment and careful management of its diversity.

My message to the society is to take whatever we have inherited from our past and analyse that, wrong practices carried by anyone will affect everyone in the long run. The climate change and its effect is the proof. Business firms should take a wide range of green initiatives and encourage education in their communities by training their employees

It can be concluded that GT holds multiple benefits for us, our business and call for the spirit of enquiry, innovation and invention. One thing is for certain that we will be risking the fate of the mankind if we do not adopt them in the present. Thus I Emphasize that the Green Technology is the crucial need of the planet.

## REFERENCES

Stephen J. Decanio & William E. Watkins, 1998. "Investment In Energy Efficiency: Do The Characteristics Of Firms Matter?," The Review of Economics and Statistics, MIT Press, vol. 80(1), pages 95-107, February.

ISSN: 2348 9510
**International Journal Of Core Engineering & Management (IJCEM)**
**Special issue, ICCEMT-2015**

Anna Alberini & Kathleen Segerson, 2002. "Assessing Voluntary Programs to Improve Environmental Quality," Environmental & Resource Economics, European Association of Environmental and Resource Economists, vol. 22(1), pages 157-184, June.

Matthew Potoski & Aseem Prakash, 2005. "Covenants with weak swords: ISO 14001 and facilities' environmental performance," Journal of Policy Analysis and Management, John Wiley & Sons, Ltd., vol. 24(4), pages 745-769.

Galende, Jesus & de la Fuente, Juan Manuel, 2003. "Internal factors determining a firm's innovative behaviour," Research Policy, Elsevier, vol. 32(5), pages 715-736, May.

Nakamura, Masao & Takahashi, Takuya & Vertinsky, Ilan, 2001. "Why Japanese Firms Choose to Certify: A Study of Managerial Responses to Environmental Issues," Journal of Environmental Economics and Management, Elsevier, vol. 42(1), pages 23-52, July.

Khanna, Madhu & Damon, Lisa A., 1999. "EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms," Journal of Environmental Economics and Management, Elsevier, vol. 37(1), pages 1-25, January..

Green Technologies and Business Practices,An ITApproach,Patricia Ordonez de Pablos,University of Oviedo,Spain.

- Handbook of Research On Green ICT,Technology,Businessand Social Perspectives, Bhuwan Unhelkar,Univ.of Western Sydeny&Methods Science,Australia.

http://green-technology.org/green _tech.htm

http://www.all-recycling-facts.com/green-technology.html

http://www.industrialgreenchem.com/pdf-docs/industrial-green-chemistry-initiatives-in-india.pdf

ISSN: 2348 9510
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