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Review of CMOS LC Voltage Controlled Oscillators

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ABSTRACT

In this paper, we review CMOS LC Voltage Controlled Oscillators (VCO) for wireless multi-standard transceivers and wireless communications. The main parameters, such as power dissipation, Tuning range, phase noise, carrier frequency, supply voltage figure of merit (FOMt) were reviewed.

Keywords—CMOS, LC VCO, microelectronics, Nanoelectronics.

I INTRODUCTION

In recent years wireless communication market was still growing. Such situation increased the demand for low cost integrated transceivers. Because communication standards are becoming more complicated, requirements for such transceiver parameters as noise, linearity and power consumption are at the limits of technology. This forces RF IC designers to explore design trade-offs very deeply for each circuit, which makes design process much longer. This at the end has an impact on transceivers price. To help the designer, aiding tools should be created in order to make the design process easier and faster. Transceiver is the main part of the wireless system and its main function is to receive and transmit data. The basic transceiver consists of the following blocks: low noise amplifier (LNA), power amplifier (PA), down-conversion mixer, up-conversion mixer, filters and frequency synthesizer. In transceivers the phase locked loop (PLL) is mainly used as the frequency synthesizer.

A PLL is a closed-loop feedback system that sets fixed phase relationship between its output clock phase and the phase of a reference clock. A PLL is capable of tracking the phase changes that falls in this bandwidth of the PLL. A PLL also multiplies a low-frequency reference clock CK_{ref} to produce a high-frequency clock CK_{out} this is known as clock synthesis.

A PLL has a negative feedback control system circuit. The main objective of a PLL is to generate a signal in which the phase is the same as the phase of a reference signal. This is achieved after many iterations of comparison of the reference and feedback signals. In this lock mode the phase of the reference and feedback signal is zero. After this, the PLL continues to compare the two signals but since they are in lock mode, the PLL output is constant.

The basic block diagram of the PLL is shown in the Figure 1. In general a PLL consists of five main blocks:

- Phase Detector or Phase Frequency Detector (PD or PFD)
- Charge Pump (CP)
- Low Pass Filter (LPF)
- Voltage Controlled Oscillator (VCO)
- Divide by N Counter

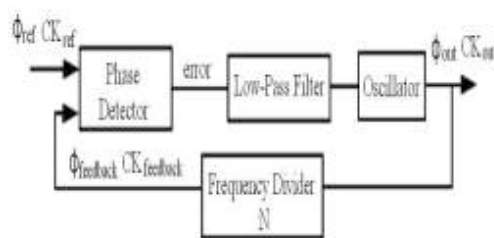


Fig. 1 Basic block diagram of a PLL

Commonly two types of VCOs: ring oscillators (Ring-VCOs) and LC oscillators (LC-VCOs) are used in high-frequency PLL. The Ring-VCOs take a small area on a chip and can provide very wide tuning range but their phase noise performance is very poor when compared to LC-VCOs. LC-VCOs can operate in high frequency, but their tuning range is relatively small and on-chip inductors occupy a lot of chip area.

The schematic of basic LC-VCO is shown in Fig. 2. The LC-VCO consists of the following parts: high-quality inductor (L), varactors block, switched capacitors block, cross-coupled transistors (M1, M2) and current control block. The inductor with varactors and the switched capacitors block form a LC tank. The negative resistance of the LC-VCO is given by the transconductance of the cross coupled M1 and M2 NMOS or PMOS transistors. They generate the negative resistance to cancel the loss in the LC tank so that the circuit can enable sustained oscillation.

(a) Switched Capacitor Block- First, confirm that you have the correct template for your Frequency calibration is consisted by two steps of fine tuning and coarse tuning to widen the operating frequency range. The coarse tuning is obtained using the switched capacitor block. A switched capacitor block is used in classic design. The block consists of capacitors arrays connected in parallel, which can be turned on or off depending on the required capacity. When the blocks are switched on, the capacity is reduced, when the blocks are switched off, the capacity increases. Switches in the LC-VCOs is realized using NMOS or PMOS transistors or capacitors.

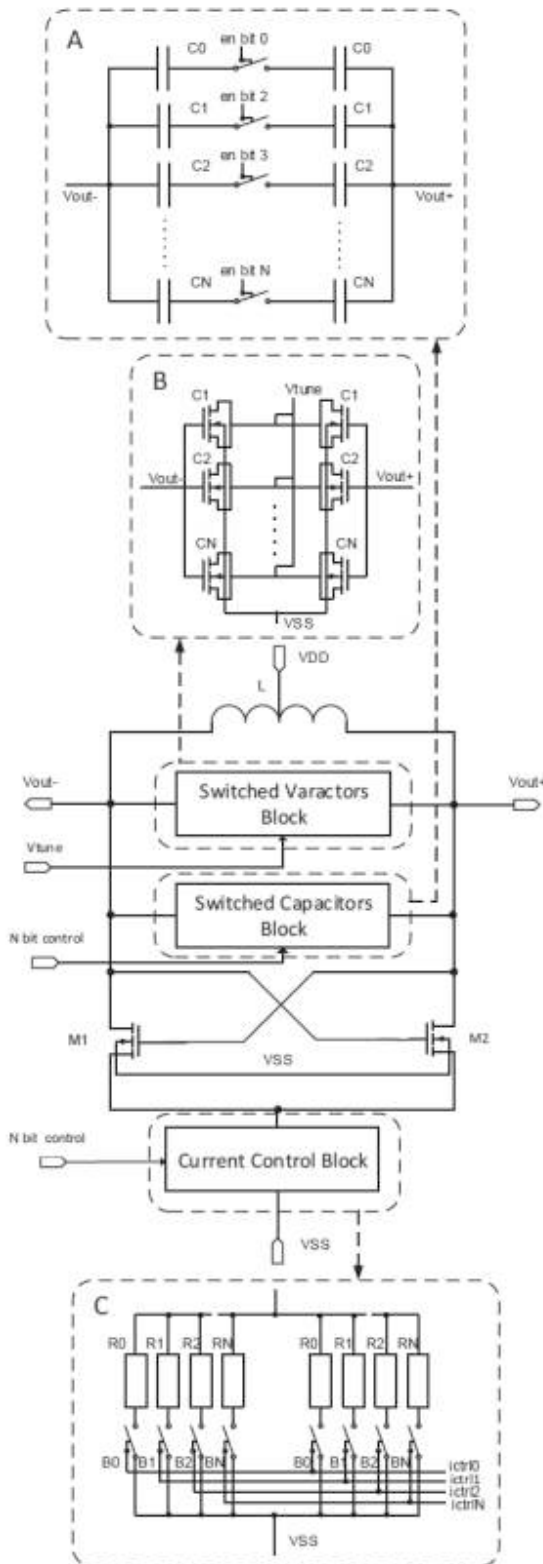


Fig. 2. Schematic of basic LC-VCO.

(b) Varactor Block- The fine tuning is obtained using the varactors block in order to get precise operation frequency. This block consists of parallel connected multi-fingered varactors. These varactors maximize the tunability of the LC-VCOs. The external voltage V_{tune} is used for varying linearly the equivalent capacitance of varactors. Basically V_{tune} control voltage can range from 0 V to ~ 5 V.

(c) Current Control Block- The last component of the LC-VCO is the current control block. In this block bias current is controlled by several bits. As can be seen in Fig. 2, ictrl is a binary array of several independent control signals for corresponding bias current switches. Therefore, by choosing ictrl signals, the LC-VCO can get various bias current values, which means that LC-VCO can adjust its power consumption to the optimum. Compared with bandgaps reference current biasing this structure has the advantage of simplicity and power consumption selection flexibility [2-4].

The paper is organized as follows: section II describes the analysis of the LC-VCOs overview; conclusions are summarized in section III.

IILC VCOS OVERVIEW

This paper provides an overview of thirty five different VCOs. All information has been compiled from IEEE Xplore digital library. The results comparison of VCOs are given in Table I and Table II . The main parameters of the VCO are: IC technology *Tch.* (nm), carrier frequency *Fc* (GHz), frequency tuning range *F* (%), phase noise *PN* (dBc/Hz), power dissipation *P* (mW), figure of merit *FOMt* (dBc/Hz).

Table 1
Performance Comparison of VCOS (Micro)

Nr.	Tch., nm	Fc, GHz	F, %	PN, dBc/Hz	PN@df, MHz	P, mW	FOMt, dBc/Hz
[5]	350	5.88	3.91	-112	1	19.2	-166.4
[6]	250	7.45	30.76	-100	1	0.54	-189.9
[7]	250	4.89	13.05	-124	1	22	-186.7
[8]	250	3.61	6.38	-130.7	1	22.6	-184.4
[9]	180	4	47.7	-115.6	1	2.99	-196.5
[10]	180	12.77	15.75	-110.2	1	1.08	-195.9
[11]	180	1.85	9.21	-126	1	1.35	-189.3
[12]	180	13	25.62	-101.4	1	2.4	-188.1
[13]	180	18.9	1.06	-129.3	1	10	-185.3
[14]	180	1.82	10.99	-127	1	6.3	-185
[15]	180	5.32	7.52	-122	1	13.5	-182.7
[16]	180	5.36	13.81	-127	3	18	-182.3
[17]	180	12.31	28.11	-108	0.1	50	-180.9
[18]	180	3.3	21.21	-91	1	5.04	-181.8
[19]	180	5.56	13.3	-105.8	1	3.6	-176.9
[20]	180	7.65	6.54	-108.3	1	4.9	-175.4
[21]	180	26.82	1.38	-104.1	1	2.3	-172.7
[22]	180	5.25	0.76	-117.6	1	1.05	-169.5
[23]	180	2.05	53.08	-83.82	1	11.2	-155.5
[24]	130	5.71	37.69	-132.7	1	2.21	-215.9
[25]	130	3.88	37.42	-138	3	13.6	-200.4
[26]	130	13.93	13.29	-100.6	1	0.6	-188.2
[27]	130	4.9	2.5	-135.7	3	3	-183.2
[28]	130	8.58	15.51	-106.2	1	4	-182.7
[29]	130	13.75	10.91	-104.6	1	5	-181.1
[30]	130	19.48	4.88	-103	1	5	-175.6
[31]	130	6	5.33	-115	1	12.5	-174.1

Table 2
Performance Comparison of VCOS (Nano)

Nr.	Tch., nm	Fc, GHz	F, %	PN, dBc/Hz	PN@ f , MHz	P, mW	FOMt, dBc/Hz
[32]	90	34.34	62.12	-100.80	1	20.00	-194.37
[33]	90	5.63	45.12	-108.00	1	14.00	-184.64
[34]	90	15.06	5.84	-94.86	1	13.69	-162.39
			83.4				
[35]	65	1.17	4	-124.30	1	2.40	-200.28
[36]	65	3.54	34.46	-142.10	10	13.70	-192.46
[37]	65	4.50	77.78	-110.00	1	9.36	-191.17
[38]	65	6.85	27.74	-118.30	1	20.20	-190.82
[39]	65	6.85	27.74	-118.30	1	20.20	-190.82

The main parameters was separated into **micro** (Table I) and **nano** (Table II) sections in order to view the information more obviously. VCOs designed in 350–130 nm IC technology belongs in **micro** section, and VCOs designed by 90–65 nm belongs in **nano** section.

To evaluate the overall performance of the VCO, a figure-of-merit including the tuning range (FOM_T) is used.

$$FOM_T = PN(\Delta f) - 20 \log(F_c \Delta F) + 20 \log(\Delta f / 10) + 10 \log(P / 1mW) \quad \dots \dots (1)$$

where $PN(\Delta f)$ is the phase noise at an offset frequency f , F_c is the carrier frequency, P is the power consumption in mW and F is a percentage of the frequency tuning range. In this paper all VCOs FOM_T values was recalculated by formula (1) and shown in Table I and Table II.

In micro technology, the lowest FOM_T is in 24th VCO ($FOM_T = -215.88$ dBc/Hz). This VCO is designed in 0.13 μ m IC technology.

In nano technology, The lowest FOM_T is in 35th VCO ($FOM_T = -200.28$ dBc/Hz). This VCO is designed in 65nm IC technology.

III CONCLUSION

This paper provides an overview and analysis of forty (in Table I and Table II [5]–[44]) different VCOs. Overview was separated into **micro** and **nano** sections in order to view the information more obviously. VCOs designed in 0.35 – 0.13 μ m IC technology belongs **micro** section, and VCOs designed in 90 – 65 nm belongs **nano** section. The following parameters were taken into account during this analysis: IC technology **Tch.** (nm), carrier frequency **Fc** (GHz), frequency tuning range **F** (%), phase noise **PN** (dBc/Hz), power dissipation **P** (mW) and figure of merit **FOMt** (dBc/Hz).

The lowest FOM_T in **micro** section is in 24th VCO ($FOM_T = -215.88$ dBc/Hz). This result was affected by following parameters: very low phase noise at 1 MHz offset from carrier frequency ($PN = -132.68$ dBc/Hz), low power consumption ($P = 2.21$ mW) and wide frequency tuning range ($\Delta F = 37.69$ %). This VCO was designed in 0.13 μ m IC technology. The lowest FOM_T in **nano** section is in 35th VCO ($FOM_T = -200.28$ dBc/Hz). This result was affected by following parameters: low phase noise at 1 MHz offset from carrier frequency ($PN = -124.30$ dBc/Hz), low power consumption ($P = 2.4$ mW). This VCO was designed in 65 nm IC technology.

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Enriched Compost Production Technique from Water Hyacinth

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ABSTRACT

Water hyacinth is an aquatic weed and is known for causing a series of problems for aquatic life. If targeted properly, it can act as an extremely important alternative source of organic material for production of nutrient enriched organic manures by composting process. Water hyacinth has remarkable nutritive properties which not only result in healthy aquatic system but also add manure in the soil for sustainable productivity. Composting refers to the conversion of organic waste into organic manure. Composting is the biological decomposition and stabilization of organisms under condition that allows development of the thermophilic temperature as a result of biologically produced heat, with a final product sufficiently stable for storage and application to field without any adverse environmental effect. Keeping the above in mind the an experiment was conducted at the farm of Indian Institute of Soil Science, Bhopal (geographical location 23° 18' N latitude, 77° 24' E longitude, altitude 485 m amsl). Water hyacinth collected from Kaliasot river passing by Danish Kunj Bhopal and Cow dung as a raw material from Lamba Kheda village near IISS, Bhopal. Rock phosphate, lime and urea amendment, arranged from Soil Biology Division, IISS, and Bhopal for production of different types of enriched composts prepared from water hyacinth. Result of the study revealed that water hyacinth has remarkable nutritive properties that can be used for the production of nutrient enriched compost which not only result in healthy aquatic system but control act as soil amendments. Different enriched composts from water hyacinth viz; phospho compost, phospho compost with lime, phospho nitro compost, phospho sulpho nitro compost, vermicompost and microbial enriched composts. Among these composts, the highest percentage of N was evaluated in phospho nitro compost and phospho compost. The highest percentage of P and K were also recorded in phospho sulpho nitro compost (P 0.89 and K 1.04) and the lowest percentage of P and K being recorded in control (P 0.56 and K 1.02).

Keywords: Water hyacinth, compost, phospho compost, phospho nitro compost, vermicompost and microbial enriched compost

I INTRODUCTION

The water hyacinth (*Eichorina crassipes*) is a floating obligate plant. It belongs to family Pontederiaceae. This well known species grows in all types of fresh water. Water hyacinth differs in size from a few inches to over three feet tall. It has showy lavender flowers and its leaves are rounded and leathery, attached to spongy and sometime inflated stalks. Water hyacinth is one of the most productive plants

on earth and considered as one of the world's worst invasive aquatic plants (Gopal, 1984; Malik, 2006). Water hyacinth is one of the worst weed in the world aquatic or terrestrial environment (Holm *et al.*, 1977).



Fig. 1. Water hyacinth

The water hyacinth (*Eichhornia crassipes*) is a free floating aquatic weed originated in the 23.15% wetland area of north east region of India, where it was kept under control by natural predators (Abbasi *et al.*, 1996). Due to its fast growth and the robustness of its seeds, the water hyacinth has since then caused major problems in the whole area. At an average annual productivity of 50 dry (ash-free) tonnes per hectare per year, water hyacinth is one of the most productive plants in the world attributing the weed to cover water surfaces faster than most other plants (Abbasi *et al.*, 1986).

Compost is typically not a fertilizer, although when used at normal rates it can reduce the amount of required fertilizer. Compost can increase the water holding capacity of sandy textured soils, and can improve structure and water movement through heavier textured soils that are high in silt and clay content. By increasing the organic content of the soil, biological activity can be enhanced. Water and nutrient holding capacity can be improved in some soils. Some compost has the ability to suppress fungal diseases; research in this area is ongoing. Composts prepared from different organic wastes differ in their quality and stability. This mainly depends upon the composition of the raw material used for the composting process (Gour and Singh, 1995) (Ranalli *et al.*, 2001).

Composting is a biooxidative process in which the microorganism transform the more easily biodegradable organic matter into carbon dioxide, water, vapours, and other minerals (mineralisation process) or, with time, into more stable organic matter (humification process) called humic substances which are physically very similar to those present in soil (Kalamdhad *et al.*, 2011). Composting refers to the conversion of green waste into organic fertilizer with compost as end product. Composting is the biological decomposition and stabilization of organic substance under condition that allows development of the thermophilic temperature as a result of biologically produced heat, with a final product sufficiently stable for storage and application to land without any adverse environmental effect (Haug, 1980).

Much work has been carried out in different parts of the world to develop environmentally sound and appropriate methods for the management and control of water hyacinth. It recapitulated that the utilization of water hyacinth for composting has proved economically viable across the world (Gajalakshmi *et al.*, 2001). Researchers have recently substituted bean straw with water hyacinth as animal feed (raw material) (Tag El-Din *et al.*, 1992) for solid-phase fermentation for making pulp, paper and paper board and the vermicomposting of water hyacinth (Gupta *et al.*, 2007). However, a novel technology with ecologically sound and economically viable approach is needed to solve the problem of aquatic weed disposal and management. With an aim to solve the problems associated with water hyacinth the project has been proposed to prepare compost by using water hyacinth to improve nutritional contents by incorporation of different amendments. The project will be beneficial for those cities where the problems of aquatic weeds are much that can be over come through removal of such weeds. The compost preparation by exploitation of water hyacinth will help to treat this aquatic weed in a way which will further enhance the productivity of soil thereby keeping various ponds and lakes of the city in healthy state. This compost will provide an alternate method in contrary to conventional composts with an added advantage over chemical fertilizers. Therefore, water hyacinth biomass (harvested from water hyacinth in fasted natural water bodies), can be used as an effective source for bio-compost production through different types of composting.

II MATERIALS AND METHODS

This experiment was conducted at the form of Indian Institute of Soil Science Bhopal (geographical location 23° 18' N latitude, 77° 24' E longitude, altitude 485 m amsl). Water hyacinth as a source of waste material collected from Kaliasot river passing by Danish Kunj Bhopal and Cow dung as a raw material collected from Lamba Kheda village near ICAR, IISS Bhopal. Rock phosphate, lime, urea, microbial enriched compound and epigeic earth worm are the amendments arranged from Soil Biology Division ICAR, IISS Bhopal, Water hyacinth was used.

The details of experiment set up is given below:

(a) **Experimental setup:** There were seven pits for composting, dimension of each compost pits were length 6 to 7 feet. Width 3 feet and depth 2.5 feet. Fresh water hyacinth was

chopped in small pieces and filled in each of those pits along with cow dung in the ratio of 2:1 as shown in fig 2

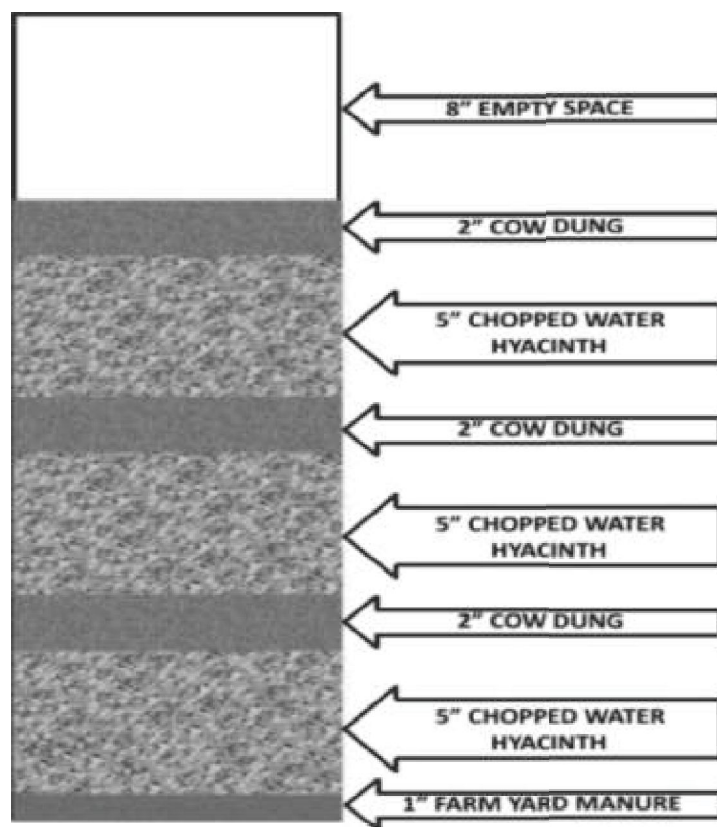


Fig. 2: Order of different layers of materials constituted for carrying out composting in pit

- (i) The bottom most layer of mature compost was about 1 inch thick containing about 10 kilograms of farm yard manure.
- (ii) The second layer above the manure compost's layer was of chopped fresh water hyacinth which was about 5 inch thick needed containing about 15.7 kgs of water hyacinth.
- (iii) The third layer above second layer was of fresh cow dung which was about 2 inch thick containing approx 13.33 kilograms of cow dung.
- (iv) The fourth layer above the cow dung layer was of chopped fresh water hyacinth (~15.7 kilograms) of 5 inch thickness.
- (v) The fifth layer above fourth layer was of fresh cow dung (~13.33 kilograms) of 2 inch thickness.
- (vi) The sixth layer above the fifth layer was of chopped fresh water hyacinth (~15.7 kilograms) of 5 inch thickness.
- (vii) The seventh layer above sixth layer was of fresh cow dung (~13.33 kilograms) of 2 inch thick Each pit remained empty by about 8 inch for turning and watering operation.

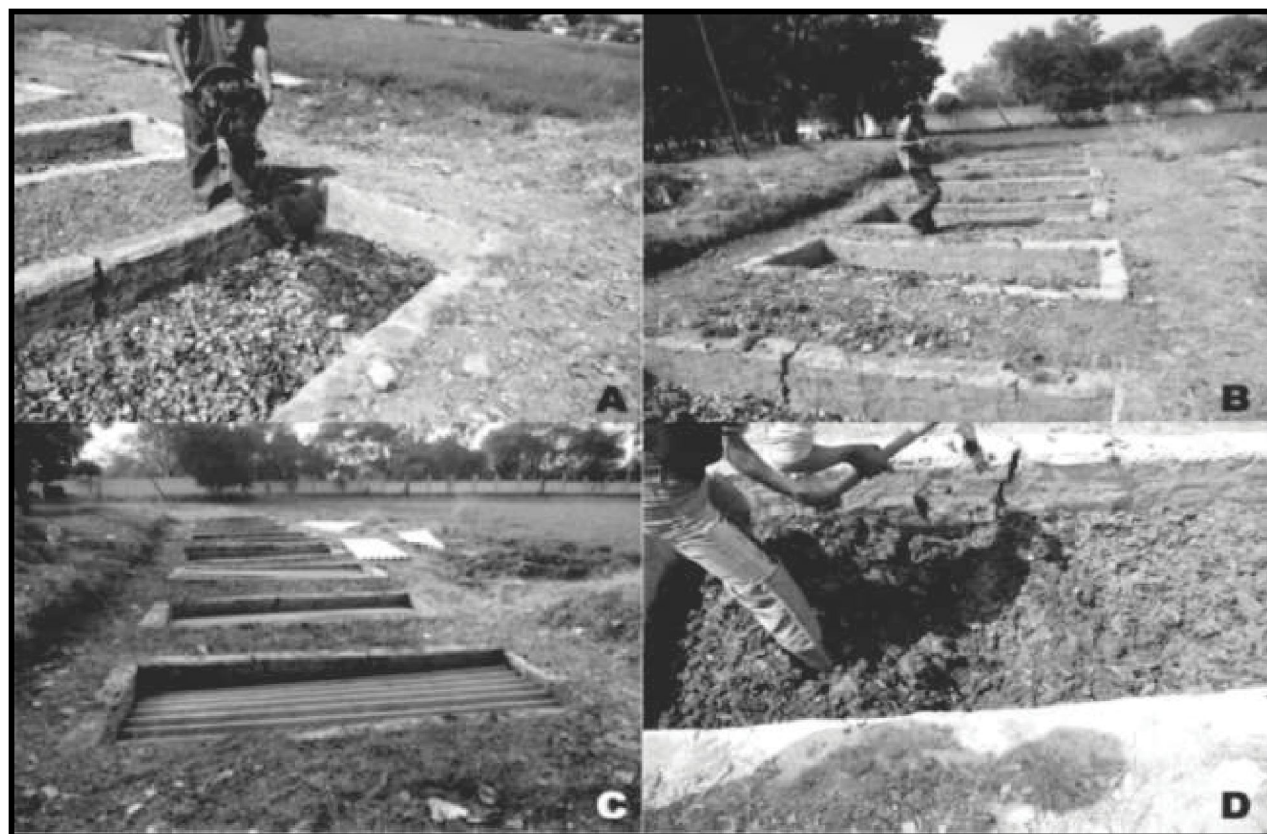


Fig 3: A&B. Filling of pits for composting, C. Pits were covered to facilitate composting, D. Turning for aeration

In each pit, different materials were used for composting fresh water hyacinth with cow dung. It was observed that after 21 days material in each pit was partially decomposed, and then in each pit

various treatments were imposed as mentioned in table 1 Earthworms and microbial culture were inoculated after 32 days. Following treatments were applied in each of those prepared pits:

Table 1
Composition of different materials used for composting from water hyacinth

S.No.	Material	Quantity in Kg	Material %
1	Water hyacinth + Cow dung	77+40	15.7+13.3
2	Rock phosphate	2.925	2.5
3	lime	2.34	2
4	Urea	0.06	0.5
5	Gypsum	11.7	10
6	Earth worm	2	-
7	Microbial culture	0.0585	-

As per the shown table above mentioned materials were applied in each pit. Prepration of microbial culture and their sub cultures of fungai (*A. awamori*, *A. hetromorphous* and *R. pusillus*) were prepared by

using potato dextrose agar media. Seven different types of composts were developed by incorporating the materials in varied ratio as shown in table 2 and3.

Table 2
Different types of compost

S. No.	Constituents/ Treatments	Compost type	Pit
1.	Water hyacinth and cow dung (T1)	III CONTROL	1
2.	Water hyacinth, cow dung and rock phosphate (T2)	IV PHOSPHO COMPOST	2
3.	Water hyacinth, cow dung and rock phosphate, lime (T3)	V PHOSPHOSULPHO COMPOST	3
4.	Water hyacinth, cow dung and rock phosphate, lime, urea (T4)	VI PHOSPHO NITRO COMPOST	4
5.	Water hyacinth, cow dung and rock phosphate, gypsum, urea (T5)	VII PHOSPHOSULPHO NITRO COMPOST	5
6.	Water hyacinth and cow dung, epigic earthworm (T6)	VIII VERMI COMPOST	6
7.	Water hyacinth and cow dung, microbial culture (T7)	IX MICROBIAL ENRICHED COMPOST	7

Table 3
Ratio of components (Different formulations of composts) Different types of compost were prepared with defined ratio of contents as mentioned below:

S. No.	Compost Type	Quantities of materials							
		WH* (in Kg)	CD* (in Kg)	RP* (in Kg)	L* (in Kg)	U* (in gm)	Gyp* (in Kg)	MC* (in gm)	EW* (in No.)
1.	Control (T1)	77	40	-	-	-	-	-	-
2.	Phospho compost (T2)	77	40	2.925	-	-	-	-	-
3.	Phospho sulpho compost (T3)	77	40	2.925	2.34	-	-	-	-
4.	Phospho nitro compost (T4)	77	40	2.925	2.34	600	-	-	-
5.	Phospho sulpho nitro compost (T5)	77	40	2.925	2.34	600	11.7	-	-
6.	Vermi Compost (T6)	77	40	-	-	-	-	-	2500 Adult
7.	Microbial enriched compost (T7)	77	40	-	-	-	-	58.5	-

* Water hyacinth (WH), Cow dung (CD), Rock phosphate (RP), Lime (L), Urea (U), Gypsum (Gyp), Microbial culture (MC), Earthworms (EW)

(b) **Analytical Techniques:** Different parameters were analyzed for the characterization of both substrates (water hyacinth and cow dung) and products (water hyacinth compost) by dry ashing and wet oxidation method (Issac and Johnson, 1975). Moisture was measured by gravimetric method (AOAC,1990). pH in substrates and composts (Jackson,1973) were determined by hydroxyl ion activity of the soil water system. EC (Jackson, 1973) in substrates and composts. TOC

(kjeldahl,1883) was determined by titration method. Ash%(Issac and Johnson 1975) by using dry ashing method. Total Nitrogen (N) in substrates and composts were determined by (Kjeldahl, 1883). A suitable sample is digested with a strong acid so that it releases nitrogen which can be determined by a suitable titration technique. Substrates and composts samples for N determination were digested in sulphuric acid at a temperature between 360°C and 410°C. Total

phosphorus(P) in substrates and composts(Jackson, 1967). Total Potassium (K) in substrates and composts (Jackson, 1967), the most common method for K determination is through flame photometer. The substrates and composts sample for K estimation can be digested in di-acid or in tri-acid. In addition digest obtained from dry ash is also taken for K determination. C: N ration (Sanchez, 2001) TOC and TN of compost ratio is C: N ratio. Cation exchange capacity in different

substrates and composts (Knudsen et al.,1982) were determined by centrifugation method.

III RESULTS AND DISCUSSION

Composting of water hyacinth biomass was completed in 7 -8 weeks. The mature composts were black in colour, granular and fibrous with pleasant earthy



Fig.4a Matured composts : (Control, Phospho compost, Phospho compost with lime)

smell compared with control mixture which was light brown in colour, coarse in appearance with a foul smell. The appearance of black colour is indicative of

its maturity.(Pandharipande *et al.* 2004) reported that the mature compost must be dark brown or black granular spongy in feel and smell normally



Fig.4b: Matured composts (Phospho Nitro compost, Phospho Sulpho Nitro compost, Vermi Compost, Microbial enriched compost)

Water hyacinth and cow dung constituted the main ingredients in this study for the preparation of composts. Varied compositions of chemicals, earthworms and microbes have important role in the decomposition of substrates. The macronutrients

substrates and composts (T1, T2, T3, T4, T5, T6 and T7) were determined. Initial studies performed with S1 and S2 showed significantly higher levels of nitrogen and Potassium in S1 in comparison to S2

Table 4
Evaluation of physiochemical parameters of water hyacinth and cow dung

S. No.	Parameter	Water Hyacinth (S1)	Cow dung (S2)
1	Moisture (%)	78	53
2	Dry matter (%)	12	47
3	pH	8.1	6.2
4	EC	0.48	0.40
5	Ash (%)	28	25
6	TOC (%)	40	25
7	TN (%)	2.06	1.08
8	TP ₂ O ₅ (%)	0.48	0.41
9	TK (%)	1.85	0.41
10	C: N	19:1	23:1

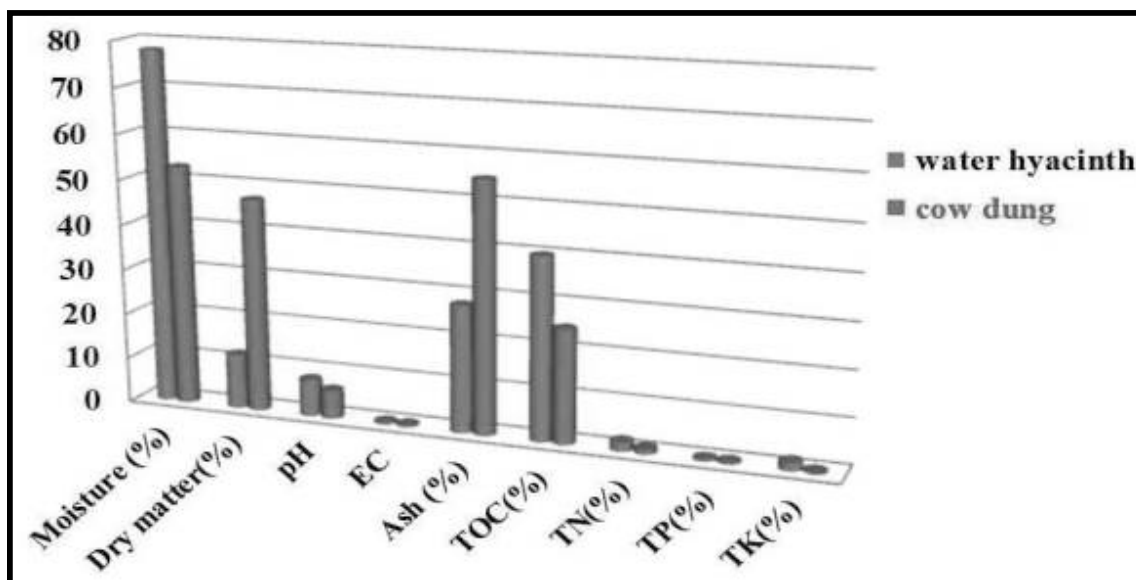


Fig.5: Graphical representation of physiochemical parameters of water hyacinth and cow dung

Table 5
Analysis of parameters of water hyacinth prior to composting

S. No.	Parameters (Water hyacinth)	Results obtained	References					
			1*	2*	3*	4*	5*	6*
1.	Moisture (%)	78	-	80.4	-	-	92.8	-
2.	Dry matter (%)	12	-	10.2	-	-	-	-
3.	pH	8.1	-	-	-	7	8.1	5.35
4.	EC	0.48	-	-	-	-	0.46	-
5.	Ash (%)	28	19.2	27.2	-	-	41.7	-
6.	TOC (%)	40	34.9	-	33	33	33.8	21.5
7.	TN (%)	2.06	1.61	-	1.94	1.94	1.95	1.23
8.	TP (%)	0.48	0.31	0.79	-	-	0.54	0.39
9.	TK (%)	1.86	3.81	4.6	-	-	0.97	2.09
10.	Na (%)	0.52	0.56	0.37	-	-	-	-
11.	C: N	19.4:1	21:1	-	17:1	17:1	36:1	17:1

1*: Parra *et al.*, (1971); 2*: Aderibigbe and Brown (1993); 3*: Khan & Sarwar (2002); 4*: Malik (2007); 5*: Parveen and Padmaja, (2010); 6*: Basu *et al.*, (2011).

The evaluated values of water hyacinth mentioned in table 4 shows that the moisture content is 78% which is found to be similar with the work reported by (Aderibigbe and Brown, 1993) and (Parveen and Padmaja, 2010). The contents of other properties and macronutrients shown in table 4 such as pH, EC, ash, TOC, TN, TP, TK and Na% were 8.1, 0.48, 28%, 40%, 2.06%, 0.48, 1.86% and 0.52%, respectively. The findings of the study were further compared and

found to be similar with the studies conducted by (Parra *et al.*, 1971); (Aderibigbe and Brown 1993); (Khan & Sarwar 2002); (Malik 2007; Parveen and Padmaja, 2010; and Basu *et al.*, 2011). The Na contents present in the water hyacinth and manure may not pose any problem as most crops may not be affected. Most of the K and Na present in water hyacinth plant was water soluble. The water hyacinth is rich in N and K among macronutrients and iron and manganese among micronutrients. The results obtained for physico-chemical of substrates and amended water hyacinth composts are further discussed in detail.

Table 6
Analysis of physico-chemical parameters of seven different types of water hyacinth composts

S. No.	Parameters (Water Hyacinth)	Control	Phospho compost	Phospho compost (Lime)	Phospho Nitro compost	Phospho Sulpho Nitro compost	Vermi Compost	Microbial enriched compost
		T1	T2	T3	T4	T5	T6	T7
1	Moisture (%)	64	57	68	52	69	77	77.2
2	pH	7.53	7.47	7.91	7.77	7.07	7.76	7.72
3	EC	1.927	2.073	1.119	2.352	1.302	0.892	1.254
4	Ash (%)	58	63	43	36	57	51	56
5	TOC (%)	23.3	21	31.6	35.5	23.8	27.2	24.4
6	TN (%)	1.14	1.20	1.27	1.32	1.16	1.16	1.23
7	TP (%)	0.56	0.86	0.87	0.88	0.89	0.59	0.58
8	TK (%)	1.02	1.03	1.03	1.036	1.04	1.03	1.03
9	Na%	0.0274	0.0332	0.0360	0.02724	0.01876	0.029	0.026
10	C: N	20.44	17.5	24.88	26.89	20.52	23.45	19.84

Table 6 provides the data on analysis of water hyacinth compost made with incorporation of different organic, mineral and microbial cultures. The general properties of composts and the nutrient compositions of composts varied depending on the amendments applied to the organic matter. With the addition of P through rock phosphate the

phosphorous concentration increased in the compost. The carbon nitrogen ratio in all the compost is near to 20:1 indicating good maturity of compost. The N contents and K contents have also exceeded 1.00%.

Moisture (%): Moisture loss during the composting process can be viewed as an index of

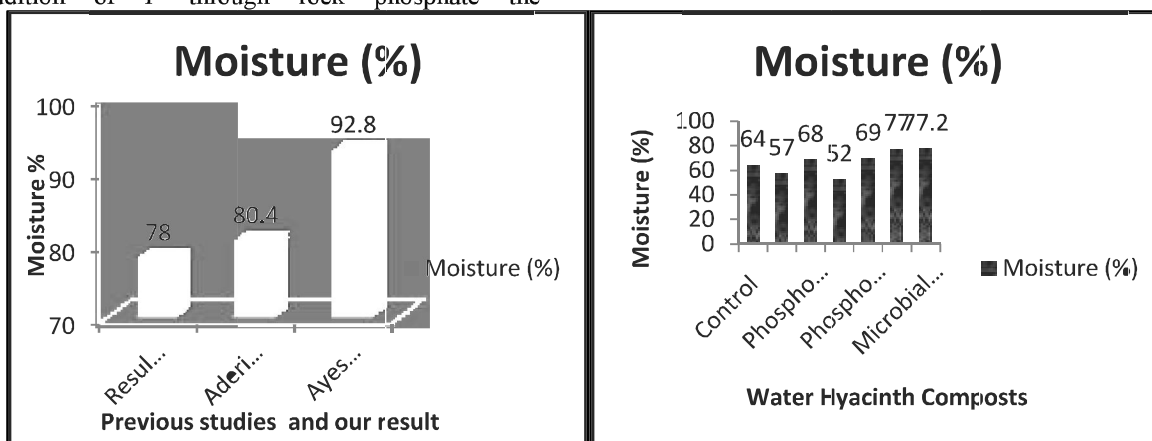


Fig.6 : Graphical comparison of moisture content in different studies

decomposition rate, since the heat generated during decomposition leads to vaporization. An optimum moisture is required for organisms to survive. The preliminary moisture content with water hyacinth and cow dung were 78% and 53%, respectively. The moisture content in prepared composts (T1 –T7) was found in the range of 52% to 77% while the control showed moisture content of 64%, which is much lower than the individual substrate moisture content. (Umsakul *et al.*, 2010) have reported 70% moisture content at the final week of composting of water hyacinth.

pH: pH of composts varied from slightly alkaline to neutral in range from 7.07 to 7.77. The difference in pH of different mixtures can be attributed to difference in physicochemical characteristics of contents used in the process. (Pramanik *et al.*, 2007) have postulated that decomposition of organic matter leads to the formation of ammonium (NH_4^+) and humic acids. The combined effect of these two oppositely charged groups actually regulates the pH of compost leading to a shift of pH towards neutrality or acidity.

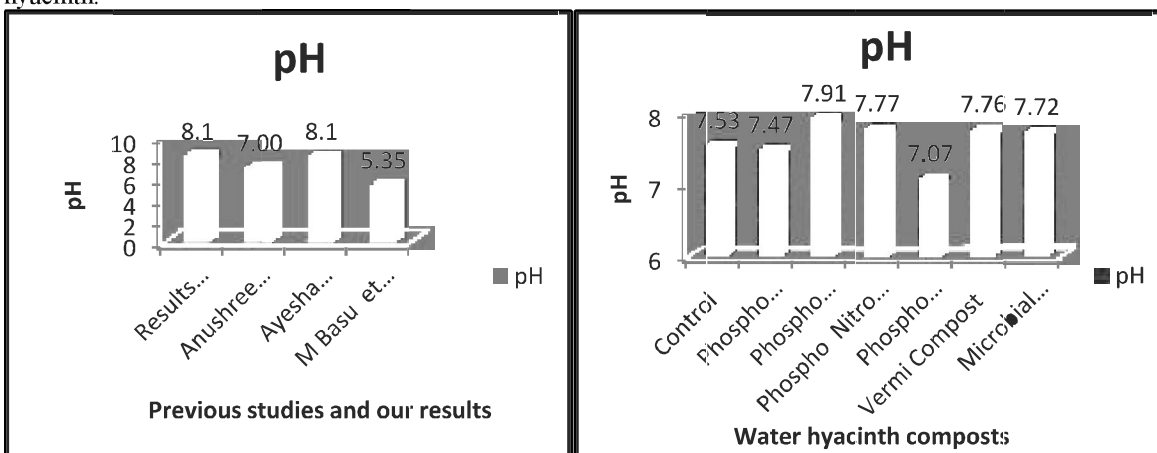


Fig.7 : Graphical comparison of pH in different studies

The variation in pH values may be due to N and P mineralization and decomposition of organic matter into intermediates of organic acids like ammonium and humic acids (Ndegwa and Thompson, 2000). These two groups actually regulate the pH of compost leading to a shift of pH towards neutrality. pH of composts produced from different treatments was neutral to slight alkaline, which is within the optimal range for plant growth(Goh and Haynes, 1977). The pH for all the composting units was not different significantly.

IV ELECTRICAL CONDUCTIVITY

Electrical conductivity (EC) of vermicomposts was higher than initial wastes. The EC reflects the salinity of any material and it is a good indicator of the applicability and utility of a compost or vermicompost for agricultural purposes. The EC was in the range of 0.892–2.352 dSm⁻¹ for different composts (Table6). This increase in EC might have been due to release of different mineral ions, such as phosphate, ammonium, potassium etc. (Kaviraj and Sharma, 2003).

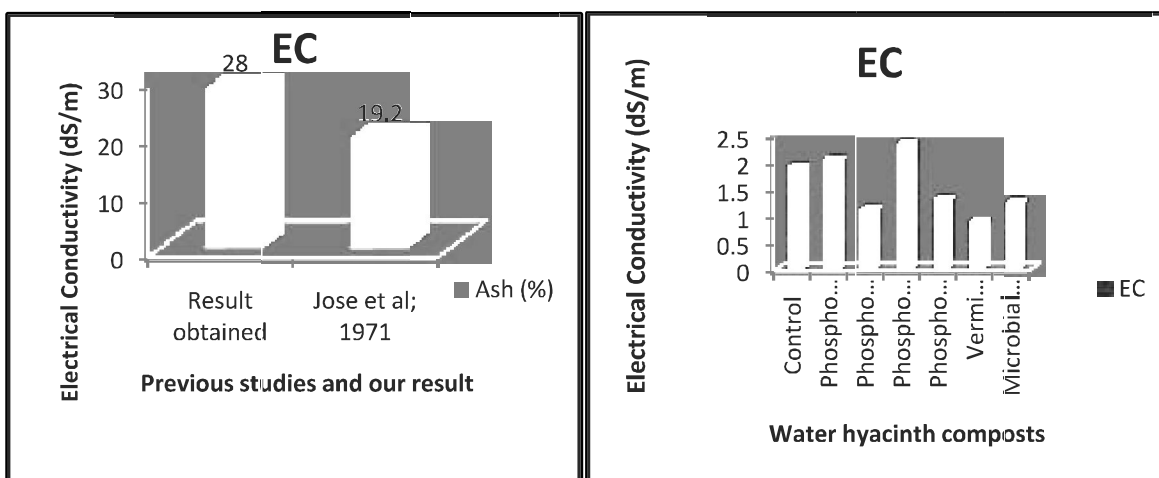


Fig.8 : Graphical comparison of electrical conductivity in different studies

Ash%: High Ash content indicates possible: (i) excess mineralization (old compost) (ii) contamination with dirt base material during turning (iii) poor quality feedstock or (iv) soil or mineral products added. Finding the source and reducing ash

is often the fastest means of increasing nutrient quality of compost. Ash values may be disturbed by lixiviation, inopportune blending of soil during turnover operations and even deliberate incorporation of insoluble minerals (Godden *et al*; 2004).

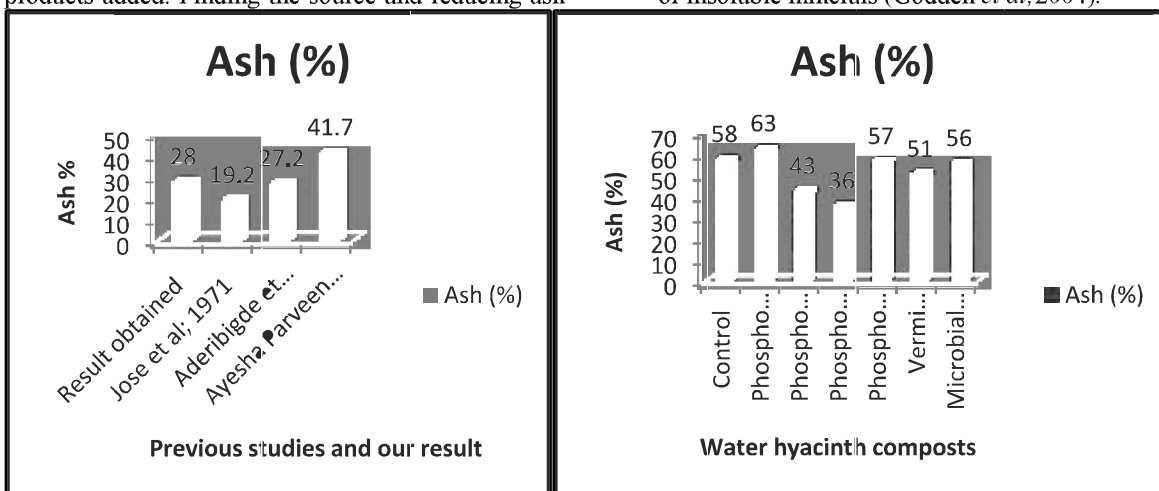


Fig.9 : Graphical comparison of ash content in different studies

An increase in ash% was seen after compost preparation in comparison to the substrates. Lime is generally recommended to correct soil acidity as evidence with pH value 7.91 and 7.77 for T3 and T4, respectively (table 6). Increased ash % in composts may be due to addition of mineral products to the substrates (T2).

V TOTAL ORGANIC CARBON

Reduction in organic matter and total C-content has direct correlation with rate of decomposition (Ros *et al.*, 2006) so, total organic content of composts were measured. Total organic C-content was observed 40% for water hyacinth which was decreased with composting. Highest percent reduction was observed 21% with T2 followed by T1 and T7 (23.3% and 24.4%) composts (Table 6).

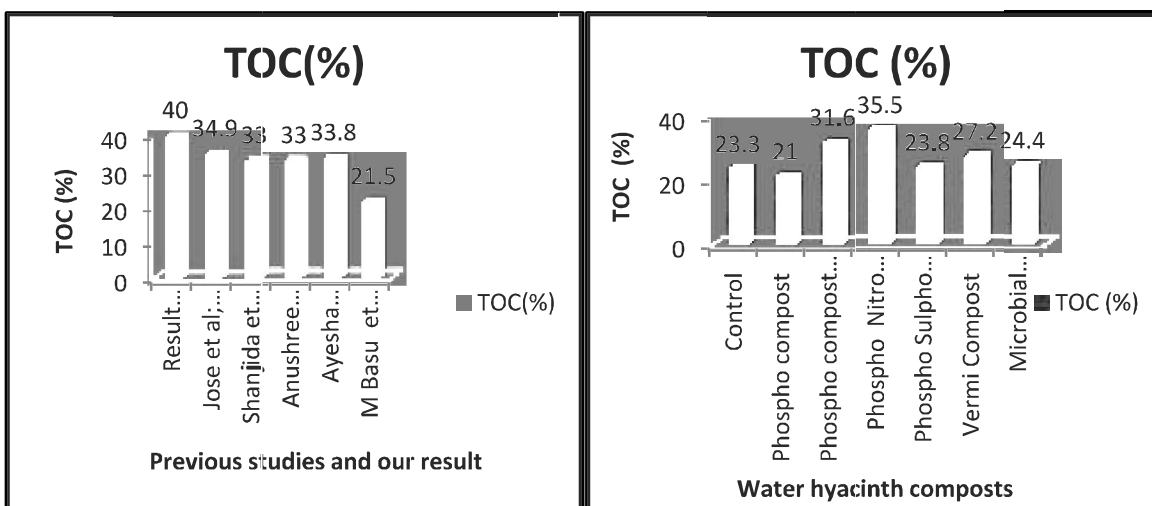


Fig.10 : Graphical comparison of total organic carbon content in different studies

Reduction in total organic C-content may be due to greater availability of easily biodegradable substances which were mineralized by microbes during respiration and thereby releasing CO₂ (Benito *et al.*, 2003). These results are in agreement with the previous studies on vermicomposting of agricultural and industrial wastes (Gupta *et al.*, 2007); (Suthar 2010; Raj and Antil, 2011); (Yadav and Garg, 2011).

Total N: Total N content of compost depends on the initial N content present in the feed

material and the degree of decomposition (Crawford, 1983). Presence of N rich weeds having lesser toxicity proved to be favorable for microbial mineralization of raw material. Decrease in pH, mineralization of protein us organic material and conversion of ammonium nitrogen into nitrate may be responsible for addition of N in compost (Yadav and Garg, 2011). Total nitrogen (TN) content in the prepared composts was approximately equal to

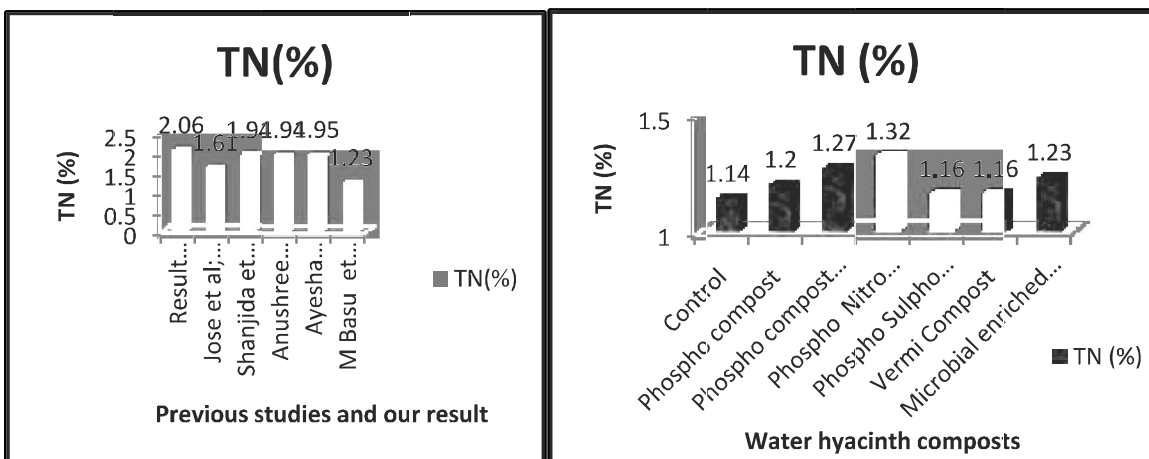


Fig.11 : Graphical comparison of total nitrogen content in different studies

initial substrate (S2). The initial TN content of the substrates was 2.06 and 1.08 g kg⁻¹ for S1 and S2, respectively. Whereas, TN content of treated composts was in the range of 1.16 to 1.23 g kg⁻¹ after composting. (Plaza *et al.* 2007) have reported that the nitrogen content of vermicomposts increase due

Total Phosphorous: Phosphorous is also an essential element for plant growth which also increased on composting. This may be due to transformation of unavailable forms of phosphorus to easily available forms by microbial enzymes like alkaline and acid phosphatases etc. On composting, phosphorous

to mineralization of C-rich materials and, possibly, due to the action of N-fixing bacteria. Decreases in pH may be another important factor in nitrogen retention by compost which otherwise may be lost as ammonia at higher pH values. The difference in TN content of composts was different from each other. content were enhanced in all composts. Maximal increase was found in compost (T5) approx 58.90% followed by T4 (57.1%) and T3 (55.4%) composts. Acid phosphatases and alkaline phosphatases may be responsible for this Transformation(Ghosh *et al.*, 1999).

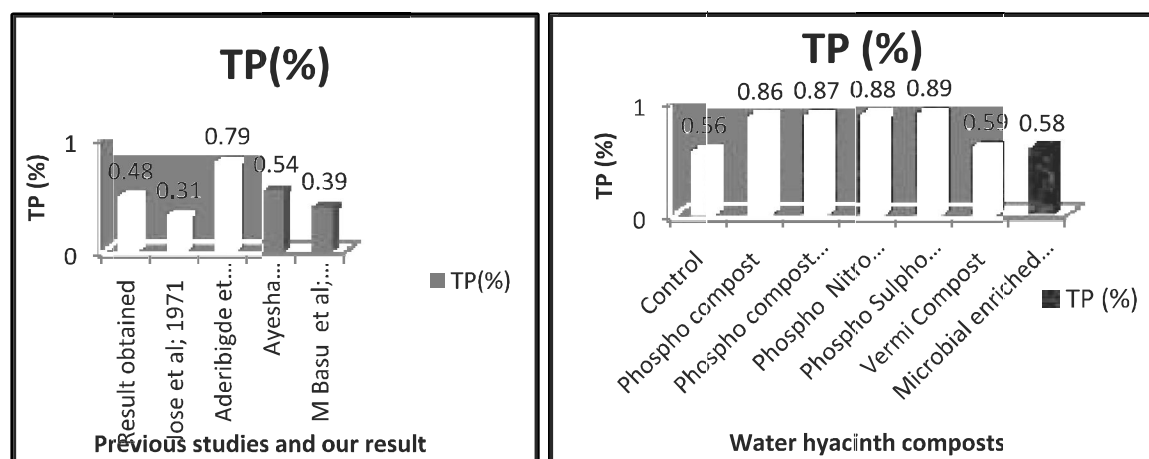


Fig.12 : Graphical comparison of total phosphorous content in different studies

After vermicomposting phosphorus content was highest in T4 and T5, and minimum in T1, CD + WH mixture (Table7). (Le Bayon and Binet 2006) have reported that some amount of phosphorus is converted to more available forms partly by earthworm gut enzymes, i.e., acid phosphatases and alkaline phosphatases. Actions of phosphorus-solubilizing microorganisms present in earthworm's casts may also be responsible for the release of

phosphorus in vermicomposting (Prakash and Karmegam, 2010).

Total Potassium: The potassium (K) content was greater in all the composts than initial waste (S2) (Table 5). The increase in potassium content was 1–2% in the composts as compared with K content in control. The differences in the results can be attributed to the differences in the chemical nature of

the initial raw materials.(Suthar 2008) has reported 104 - 160% increase in potassium content during vermicomposting. (Sangwan *et al.* 2010) have also

reported an increase in K in vermi composts after bioconversion of sugar industry waste.

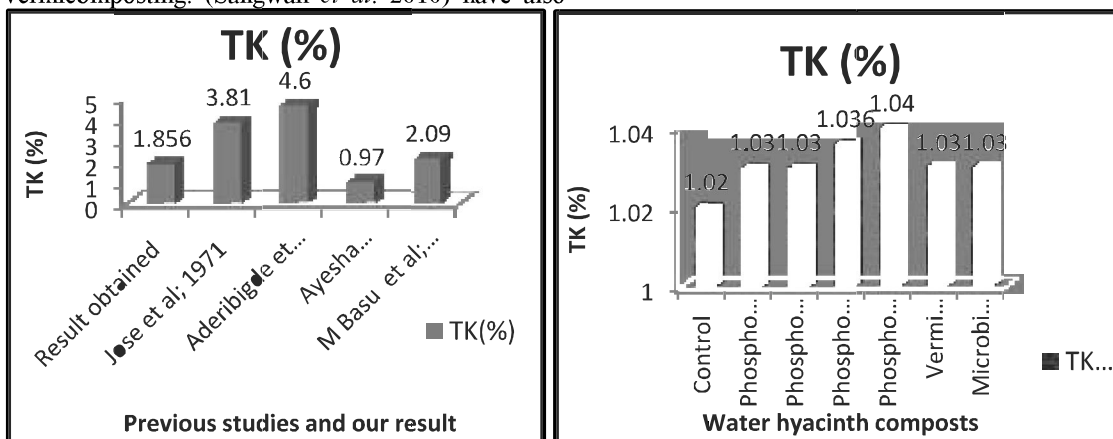


Fig.13: Graphical comparison of total potassium content in different studies

(Kaviraj and Sharma 2003) have reported that enhanced number of micro-flora present in the gut of earthworms might have played an important role in the process and increased potassium content during vermicomposting process.

Sodium%: There was slight difference in sodium content (Na) in all the composts as compared to

initial substrates combination (Table 5). Final Na content was in range of 0.018–0.036. The increase in Na content was 0.72–1.40 fold in the final composts as compared to Na content in control substrates combination.

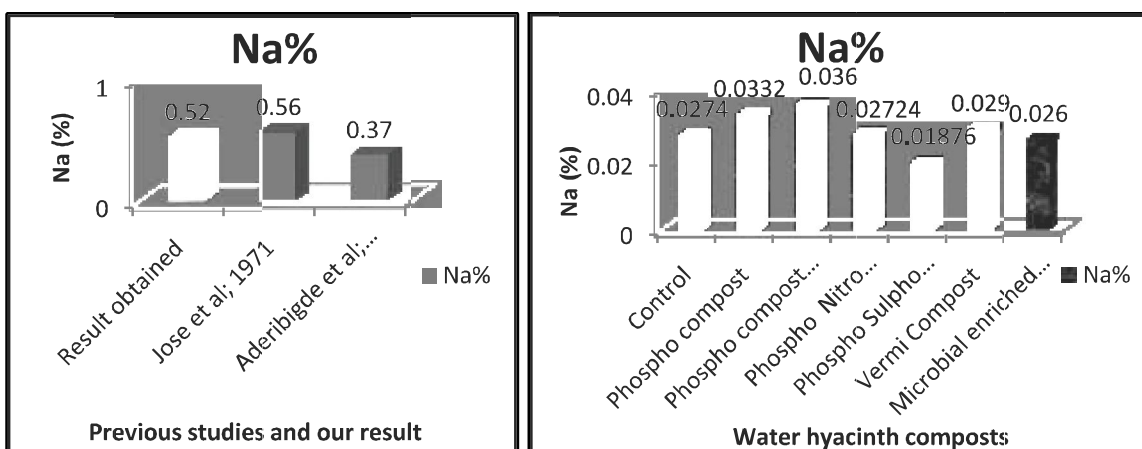


Fig.15 : Graphical comparison of total sodium in different studies

Variation in the Na content may be due to the difference in initial feed substrate characteristics in different composts (Yadav and Garg, 2011). The Na content was different in all the composts. The Na content was different in all the composts except in T4. An increase in Na % was observed with T2 (21.2%), T3 (31.4%) and T6 (5.8%) while with T5 (-31.5%) and (T7 -5.1%) Na % was reduced.

C: N ratio: Initial C: N ratio was in range of 19.42–23.15 (at 0 day), but after 45 days there was a significant change in the C: N ratio in all the composting units. The C: N ration decreased in compost T2 and T7 while an increase in C: N ratio was observed in compost T3, T4, T5 and T6. The increase in C: N ratio may be due to the N loss mainly through ammonia volatilization whereas the enhance C: N ratio resulted due to losses of carbon mainly as carbon dioxide, the carbon content of the compostable material decreased with time and N content per unit material increased.

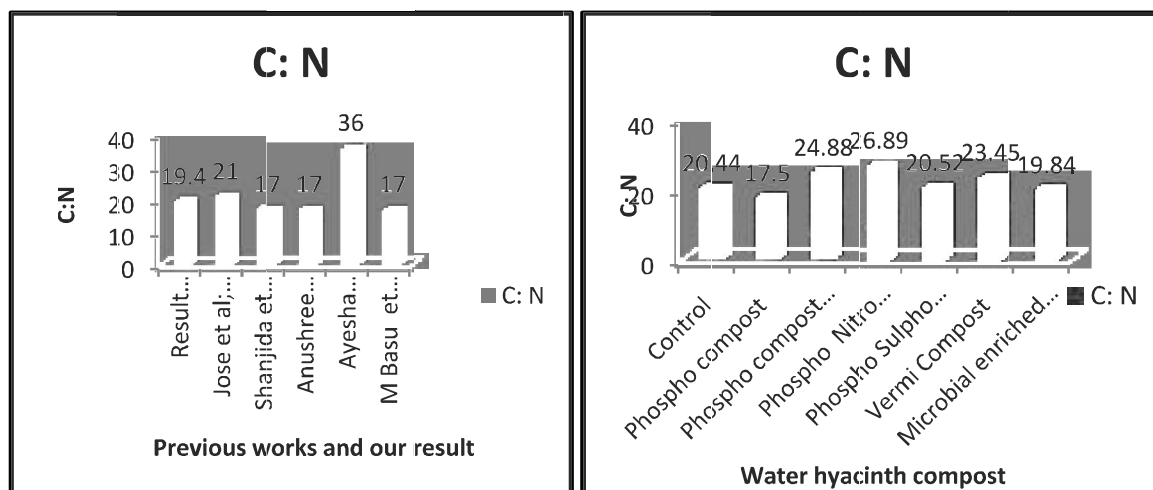


Fig.16 : Graphical comparison of C: N ratio in different studies

Final C: N ratio was in the range of 17.5–26.89. The lowest C: N ratio was in T2 unit containing water hyacinth, cow dung and rock phosphate (17.5) while highest in compost T4 unit containing water hyacinth, cow dung, rock phosphate, lime and urea had highest C: N ratio (26.89). The C/N ratio decreased and was <20 at the end of the process, suggesting the compost had reached an acceptable degree of maturation as suggested by (Golueke, 1981). [Electron transfer capacity as a rapid and simple maturity index for compost. (Yuan *et al.*, 2012)] However, (Hirari *et al.* 1983) have stated that the C:N ratio cannot be used as an absolute indicator of compost maturity, since the values for well-composted materials present a great maturity variability, due to characteristics of the waste used.

V CONCLUSION

The water hyacinth has remarkable nutritive properties that can be used for the production of nutrient enriched compost which not only result in healthy aquatic system but also add as an advantage on agricultural land. The result of the studies have shown that the water hyacinth composts prepared by combining different amendments such as rock phosphate, lime, urea, gypsum microbial cultures and earthworm, the highest percentage of N was evaluated in phospho nitro compost and in phospho compost with lime; their values are (1.32 and 1.27) respectively. Where the control compost gave the lowest value of N that is 1.14. The highest percentage of P and K were found in phospho sulpho nitro compost that are P 0.89, K 1.04 and the lowest percentage of P and K in control compost (P 0.56 and K 1.02). The phospho compost with lime gave highest value of sodium percent that is 0.36 where the phospho sulpho nitro compost gave the lowest

percent of sodium. The C: N ratio in all the composts is near to 20:1, indicating good maturity of the compost.

VI ACKNOWLEDGEMENTS

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Application of Mineral and Allumino Silicates in Te Electronic and Telephone Industries in India.

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ABSTRACT

The studies on the varieties of glasses have been carried out to understand the strength of various types of the glasses available in our country. The naturally occurring glass do not have a high hardness and good quality, generally it breaks, when the variety of compression force/ tensile force, or couple shear forces are active on these glasses. The varieties of glasses are available as per the utility of glasses, the manufacturer have as per their own requirement with different composition. In this paper variety of glasses has been discussed with composition and qualities.

I INTRODUCTION

The varieties of glasses can be manufactured with mineralogical composition, to attain good quality. There are two type of the glasses are-

- **Natural glass**
- **Synthesized/ Artificial glass.**

The silicate are the only source for the manufacturing of glass, which is commonly used by the manufacturers, but some the other minerals composed of silicates can also be used. Calcium, sodium, potassium, lithium and aluminum silicate can be utilized for the manufacturing of the new variety of glass. The glasses are produced when molten silica bearing mineral matter is quenched. Natural glasses have been formed from the melts that have originated as a consequence of the fusion of the country rocks adjacent to magma (These glasses are called Buchites. The collision of the meteorites and the earth result in (impact melt Tektites. The fusion of the rocks by frictional heat in response to faulting produces (Hyalomylonites). The striking of the sand or rock by lightning makes (Fulgurites and the heat produced by naturally initiated combustion of plant matter produce Ash Glass. By the chilling of the intrusive or extrusive magma Glassy igneous rocks O produced.

The compositions of the glass are determined by the geochemical analyses. The general composition of the glasses- frequently expressed as the basis of SiO₂ content, can be estimated from the glass index of refraction. Dispersion or specific gravity, particularly if its mode of occurrence on mineral and rocks are known.

The chemical composition of some important silicate minerals are as follows-

- Anorthite- Ca AlSi₃O₈
- Andesine - Ca AlSi₃O₈
- Labradorite- Ca NaAlSi₃O₈
- Bytownite - Ca NaAlSi₃O₈
- Oligoclase- NaCa AlSi₃O₈
- Albite- Na AlSi₃O₈

- Kyanite Al₂SiO₅
- Sillimenite Al₂O₃SiO₂
- Andalusite
- Bauxite- hydrated Aluminium oxide
- Chrysoberyl -BeAl₂O₄
- Corundom Al₂O₃, Quartz- SiO₂
- Obsidian- Volcanic glass,
- Pichtstone igneous glass.

The glass is used in the all domestic and industrial products, including mobile phones, TV, LED TV, automobile industry. For industries we need a special type of glass which must be very hard, and have good strength, scratch free and crack proof. The common varieties of glasses are

- (a) **Silica Glass-** This type of glass is manufactured with the ordinary silica or glassy sand particles; it can be used for the houses, windows, other transport and in housing industries.
- (b) **Natural Glass-** The natural glass is formed under the high temperature conditions in the Volcanic rocks, the melts are erupted through the volcanic pipe and by the rapid cooling, melt convert in to glass.

II SPECIAL PURPOSE GLASSES

In the standard laboratories various special types of glass can be manufactured/ prepared the details of these glasses are as follows-

- (a) **Sapphire Glass-** It is a very high quality glass and manufactures a very high temperature(about 4000 F) by melting the alumina silicate\Kyanite, sillimanite, Andalusite) at 4000 F Temp and rapidly cooling of the melt. This sapphire glass is used in the aero plane window, LED TV, Electronic products, Scratch proof watches cover etc. This glass in bit costly, so the common man / cannot use it.

- (b) **HIE Glass**-This glass is composed of $Al_2O_3.SiO_2$ at high temperature. The melt of alumina silicate is cooled rapidly to form HIE glass. It is used in the Back plate glass, display, touch screen cover and optical component in the various industries. The HIE glass is very thin, hard, shock proof, scratch proof variety.
- (c) **Dragon Trail Glass**- The composition of this glass is made up of the Soda Lime glass, which is manufactured at the high Temperature by the melting of Albite ($NaAlSi_3O_8$) and Anorthite ($CaAl_2Si_2O_8$). This glass is very sophisticated glass used in the portable devises, smart phones, Tablet/ personal computer, cover glasses of various displays instruments/ equipments etc. The glass is also scratch and crack proof.
- (d) **Gorilla Glass**- This is very thin glass composed of Allumino silicate and a chemical layer on the glass. It is very much ecofriendly and use full in the i phones, smart phones and tablet used in the various industries. This gorilla glass is a scratch proof, high pressure resistance and with pristine surface.
- (e) **Shot Genetion Glass**- It is one of the very good high quality glass of Allumino silicate comprises of Kyanite, Silimenite, and Andalucite (Al_2SiO_5) this glass is flexible, hard, scratch proof, unbreakable. It is used in high level touch equipments in optical industries, communication and medical equipment industries.
- (f) **Soda Lime Glass**- It is very common type of the glass, composed of Soda Lime, silica and alumina rich. The mineral Albite and Anorthite are use for the manufacturing of this glass. These minerals are heated up to 1600-1700 C and melt is then cooled rapidly to form this glass. This glass is very thin, transparent, compact, hard and cheaper.
- (g) **Buchites**- This type of glass have been found in the contact zone between Basalt masses and their adjacent country rocks (shale) and also in xenoliths. They are apparently rather rare.
- (h) **Hyalomylonites**- It's a glassy rocks formed when the heat caused by friction associated with faulting is great enough to cause fusion of the rocks involved/ These glasses were recorded from the few fault zones that transect rocks such as granite and arkose. Deep seated zones where the rocks were already rather hot prior to faulting appear to be prerequisite to the formation of these glasses.
- (i) **Fulgarite**- This name is given to glass formation produced where lightning has caused melting and fusion of rocks material and the melt has then been quenched. There are two type of Fulgurite-1.Sand Fulgurite and 2. Rock crust Fulgurite. Sand fulgurite resulting from lightning striking unconsolidated sand are typically long, hollowlynders, the glass of which is bubble bearing and glass attached sand grains. The rock fulgurite are similarly constituted that coats rocks exposures that have been hit by lightning. Most sand and rock fulgurite are silica glass called-Lechatelierite.
- (j) **Asha Glass**- The name ash glass is applied to the scoriaceous and stag like glasses, typically greenish to dark grey in color that has been produced by the heat accompanying combustion of vegetal materials. Several glass stones, nearly 15kg in weight up have been recorded as having been formed as a result of haystack and straw(grain) fires. Although some gramineous species secrete free silica (e.g. epidermal cells of oats may yield opal), much of the silica of at least some of these glasses is apparently derived from subjacent mineral matter. Most of the ash glass that has been reported has been characterized by a relatively high alkali content and carbonaceous matter.

III CONCLUSION

This study made on composition, quality and application of various types of glasses will be helpful in product selection by the users as well as by the manufactures.

Eco Friendly & Less Polluting Water Fuelled Technology to Automobile Manufacturing Companies across India & the Global Market

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ABSTRACT

The proposed innovation is based on providing automatized water directly to Combustion Chamber. This will eliminate the drawback of Plug getting short. The system will use high voltage to get active hydrogen from H_2O and Khandkes Non-Return Valve for Perfect Combustion. Exhaust gases is just a water steam. So catalytic convertor is not required, as there is no pollution (Environment Friendly Cycle is maintained)

I INTRODUCTION

(a) Sustainability of Me You and Earth

- (i) Where are we going now? what our direction of progress, our luxuries as of now & what are its consequences? how our children, grand children will live on this earth? What's the good & bad part of it?
- (ii) One example is that of Airlines Now the biggest Airlines companies are also telling their esteemed clients that behind each and every seat you are travelling how much carbon FOOT PRINTS they are responsible for...?
- (iii) All multinational companies are asking their employees to come in one vehicle, sharing each ones private vehicleswhy?

- (iv) One of the leading Businessmen from India shares his private jet with employees who were supposed to be there for a meeting out from Mumbai ...why?

You know because each one is contributing in dealing with that BAD day which is coming nearer and nearer by using the consumption of fuels NOW. Each one of us is contributing these Carbon Foot prints. Now let's know the meaning of Carbon Foot Print, so its "the total sets of greenhouse gas emissions caused by an organization, event, product or person in 01 year"

II STATUS & FACTS OF THE INNOVATION

- (a) A working model (02 wheeler bike) has been made (fig. 1) which is practically running on Indian roads. But it took past 03 decades for us to reach to this level.

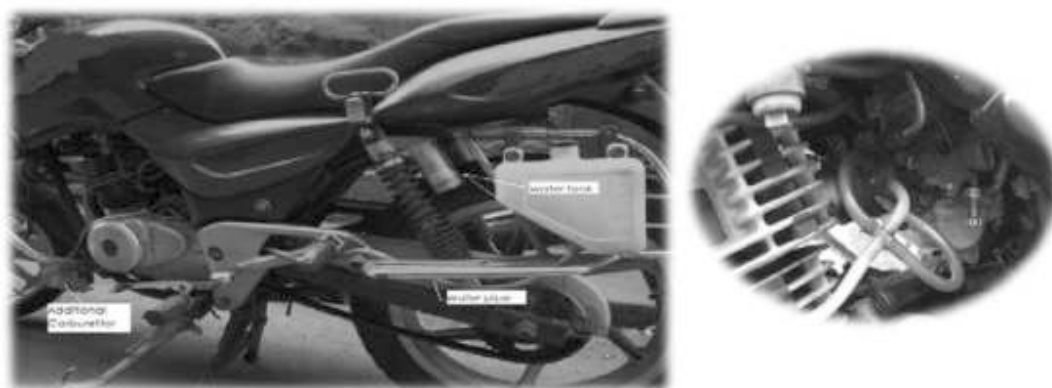


Fig.1 – Proto type Model

- (b) MPL (economy) of the fuel (Petrol) is being improved.
- (c) In present Prato type on road Average for one 150 CC bike is 35 -40 KMPL. Test reports are given at fig. 2



Fig.2 – Test Reports

- (d) Here, with our eco system, we are getting the average in between range of whooping 80-108 KMPL which is 200 % to 270 % more
- (e) We are reducing the emissions by 50%-60% as per reports.
- (f) Through this project we are trying best to minimise use of petrol which will benefit us & mother earth too in longer term. And we can survive & sustain if we deliberately use such hybrid technologies to run our engines wherever it may be fitted.
- (g) At present every common man is facing the rising price challenge every day. So to reduce the monthly expenses & to fight with the inflation our innovative technology can help in more than 50 % savings in monthly fuel expenditures which is just a DREAM of a common man today.
- (h) At present everyone is using available two wheelers which are mostly 04 stroke two wheelers which gives suppose 50 KMPL average. Then with our system it will give up to min. 75 KMPL. With an additional use of just water.
- (e) Use of artificially produced water is also fruitful here
- (f) We can accumulate carbon credits & reduce the crude oil import.
- (g) If we implement our system in the Indian Market then we can make Indian Rupee healthier & stronger.

IV ROAD MAP

- (a) If we implement this system in India then we can save up to 5,00,00,000 liters of petrol (Fuel) every day. (Ref. Wikipedia & Google)
- (b) It means we can save almost 300 Crores Rupees per day. (42 million US \$ per day)
- (c) Common man will get much more relief if we can manufacture and distribute this technology in India
- (d) Investor with our company can make annual turnover of Rs 6000 to 8000 Crores in which we are making considerable profits excluding all expenses.
- (e) At Present we have made the actual bike after making so many prototypes of the two wheelers, which is running on the road.

III TECHNOLOGY OVERVIEW

- (a) Our system works on simple water and petrol
- (b) Petrol consumption & expense will get reduced by 50%.
- (c) Overall 60% reduction in pollution control
- (d) No battery is required for fuel support

V CONCLUSION

This new innovation can benefit entire country. The inventor is looking for investor. One can contact him on following address Mr. Arvind J. Khandke (Innovator & Founder)
googolplex.technology.1@gmail.com, (+91) 942 38 60451.

Developing an Innovative Working Model of Hydro Electric Power Plant through 'Kabad Se Jugad'

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ABSTRACT

AISECT University is the first university in private sector in Madhya Pradesh which focused on research, practical exposure and skill development in higher education. One of the initiatives taken was the creation of a Centre for Renewable Energy (CRE) in the university which is developing various training facilities and also making efforts towards a greener campus. An Energy Park is a part of CRE which will have many working demonstration models of energy generation, management and conservation. What sets this Energy Park apart from similar other set-ups is the fact that this is being developed using university's own resources with lot of innovative ideas. A full working model of Hydro Electric Power Plant has been developed for the Energy Park using waste material/scrap (kabad). This model is the first of its kind which depicts full working of a Hydro Power Plant providing conceptual knowledge to actual working and motivating students for research & innovation.

I INTRODUCTION

Initially efforts were made to procure a model from the market. The manufacturers supply standard pump-motor or turbine only and not the complete 'Power Plant'. This is because plant has several other elements like penstock, generator, valves, draft tube. Overhead crane etc. One company was ready to take-up the total project but the price quoted was prohibitive.

The idea emerged that university should develop a model of Hydro Electric Power Plant in its own workshop. This required creation following main parts of Hydro Electric Power Plant:

- (a) Hydro turbine
- (b) Generator
- (c) Main inlet valve
- (d) Draft tube
- (e) EOT Crane
- (f) Goliath crane
- (g) Lift

II THE FIRST JUGAD- CONVERTING A CENTRIFUGAL PUMP IN TO A TURBINE

A Centrifugal pump is similar in construction to Francis turbine and hence can be converted in to Francis Turbine. The outline diagrams of Centrifugal Pump and Francis Turbine are shown in Fig. 1 and Fig. 2 respectively.

- The rotor of centrifugal pump and Francis turbine are called impeller and runner respectively.
- The water passages in a centrifugal pump/Francis Turbine are radial.
- They can have horizontal or vertical configuration.
- The directions of fluid flow in pump and turbine are reverse to each other.

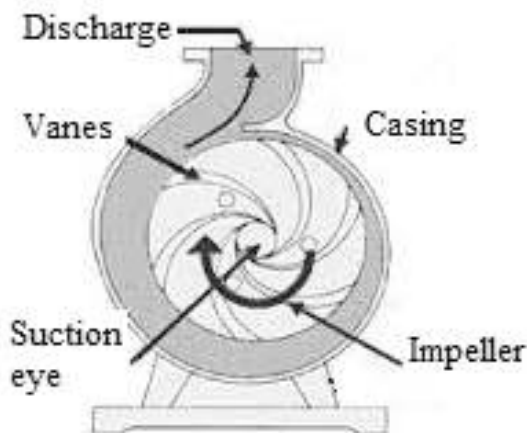


Fig. 1: Centrifugal pump

Table-1
Brief Comparison between Pump and Turbine

Centrifugal Pump	Francis Turbine
<ul style="list-style-type: none"> • Pump converts mechanical energy into Hydraulic energy. • The pump impeller is driven by elective motor, engine etc. • Pump is used to raise the water from lower level to higher level. This is achieved by creating a low pressure at inlet or suction end and high pressure at outlet or discharge or delivery end. • In pump, water enters axially from the center of the impeller, flows radially outwards and then rises vertically upwards. 	<ul style="list-style-type: none"> • Turbine converts the energy of water into torque. • Turbine is driven by the mechanical energy contained in water. • A coupled generator converts the mechanical energy into electrical energy. • Water from penstock enters spiral casing and passes radially inwards and rotates the runner. It comes out axially downwards through draft tube.

(a) Centrifugal pump

It was decided to procure suitable centrifugal pump for converting it into Francis turbine. Accordingly a hunt was launched to get an appropriate

centrifugal pump. An old 3.5 H.P. Centrifugal pump was purchased from 'Kabad Khaana', Bhopal. It is shown in Fig. 3.

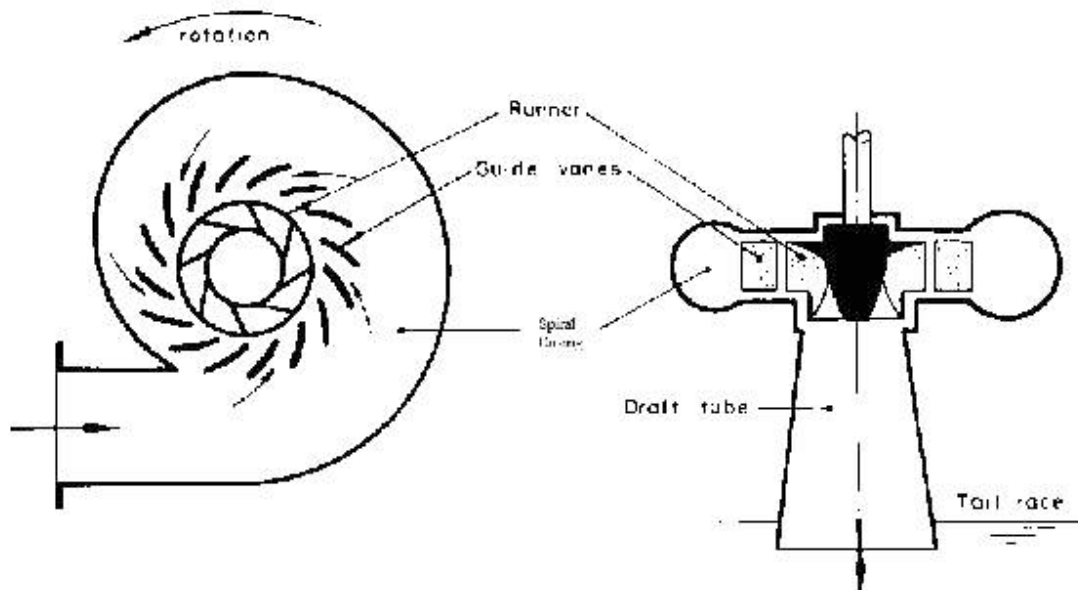


Fig. 2: Francis turbine

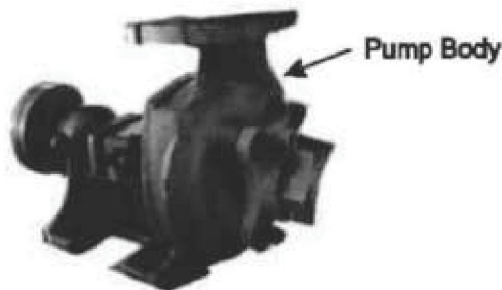


Fig. 3: Centrifugal pump

Impeller can be seen in Fig. 4 where body of the pump has been opened out.

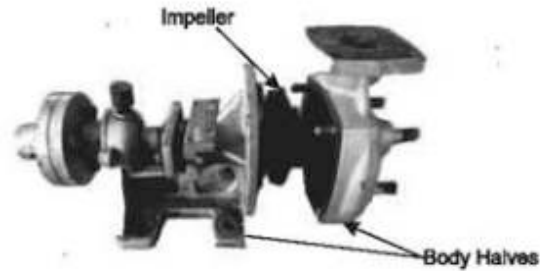


Fig. 4: Impeller in a centrifugal pump

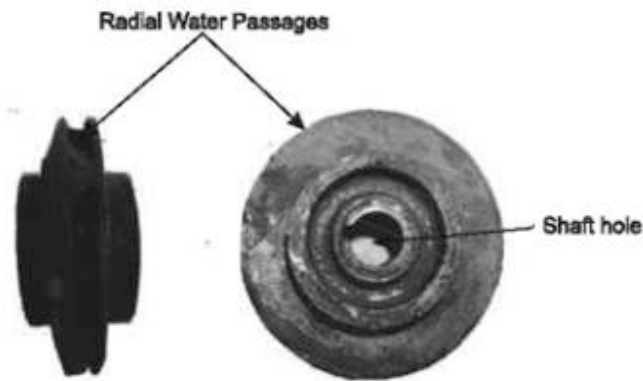


Fig. 5: Two views of impeller

(b) Modifications

(i) Trial of a pump as a pump

Centrifugal pump was operating due to heavy rust, misalignment; bend in the shaft, jamming and leakages due to damaged seals.

Creative measures

- Scrapped and de-rusted the body and parts thoroughly.
- Straightening of shaft using hydraulic press.
- Assembly of the new seals.
- Assembled the parts again.
- Applied oil and grease properly prior to further operation as a pump.

(ii) Operation of a pump as a turbine

- Rotation of turbine was slow
- There was no control on inlet water flow for which it was felt necessary to provide a valve called Main Inlet Valve (MIV).

(c) Development of MIV and Draft Tube

Using in-house knowledge, MIV and draft tube were developed with innovations, assumptions and application of plumbing, casting and sheet metal work.

MIV, draft tube and their assembly on turbine are shown in Fig. 6, Fig. 7 and Fig. 8 respectively.

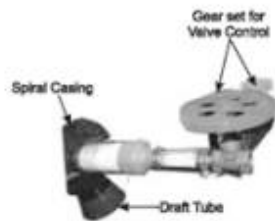


Fig. 6: Inlet valve and gear

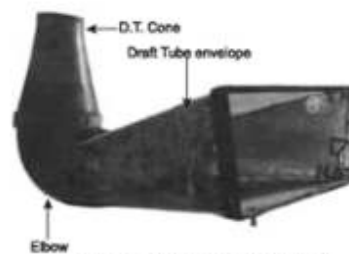


Fig. 7: Draft tube assembly

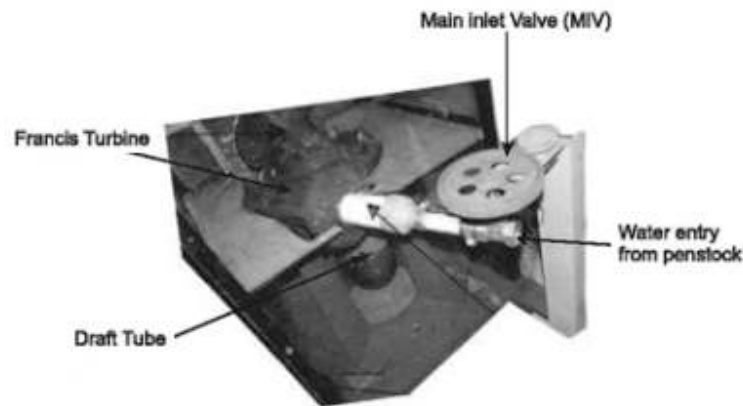


Fig. 8: Main Inlet Valve and Draft Tube

III TRIALS, TESTING & MODIFICATIONS

(a) Trial After Assembly of Inlet Pipe and Draft Tube

OBSERVATIONS:

- Flow of water controlled to certain extent at either end of the turbine.
- Rotation increased but still higher speed was required.



Fig. 9 : Divergent Nozzle

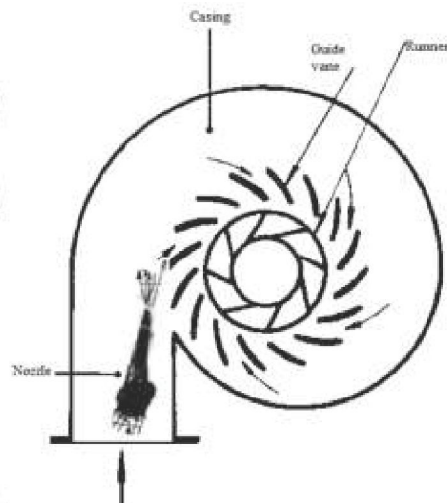


Fig. 10: Modified arrangement of Francis Turbine

- In order to obtain higher speed of rotation, some innovative solution was to be found out.
- Similar to an impulse turbine, a nozzle was used which helped to obtain higher speed of rotation.

(b) Further Improvement

A nozzle was developed such that jet of water hit directly on runner. Fig. 9 shows nozzle whereas Fig. 10 shows the nozzle assembled at the entry of spiral casing.

IV JUGAD TO DEVELOP OTHER COMPONENTS

(a) Generator-

The basic idea was to demonstrate working of 'Hydro Electric Power Plant'. Instead of complicated 3-phase synchronous or induction generator, it was decided to use a D.C. dynamo with a gear wheel to increase the rotational speed as shown in Fig. 11. When turbine runner rotates, dynamo produces electricity which is indicated by glow of LED.



Fig. 11: Dynamo

- (b) Gear Mechanism - In order to increase the speed of rotation of dynamo, a large gear wheel was used as shown in Fig. 12.



Fig. 12: Large Gear Wheel

- (c) **Casing** - Generator casing encloses mainly slipring assembly, toothed wheel of speed signal generator and dome light. The casing is shown in Fig. 13.



Fig. 13: Generator Casing

- (d) **Power Plant Crane** - EOT Overhead Crane for handling of materials/equipments is shown in Fig. 14. It provides up-down, longitudinal and lateral motions to the make access throughout the power house. The motion of the EOT Crane is controlled by wireless remote operation.



Fig. 14: Power plant overhead crane

- (e) **Goliath Crane** moves on rails. It is provided to operate Draft tube gate as shown in Fig. 15. It is operated by wireless remote control.



Fig. 15: Goliath Crane

- (f) **Lift** - A lift has been provided for access of the employees to different floors of the power plant including control room. It is shown in Fig. 16.

V FINAL ASSEMBLY

Structure to provide rigid support to turbine-generator is fabricated using steel channels/angles.

At various stages of modifications, sub-assemblies were tested for operation. The functional model demonstrates working of a hydro power plant.

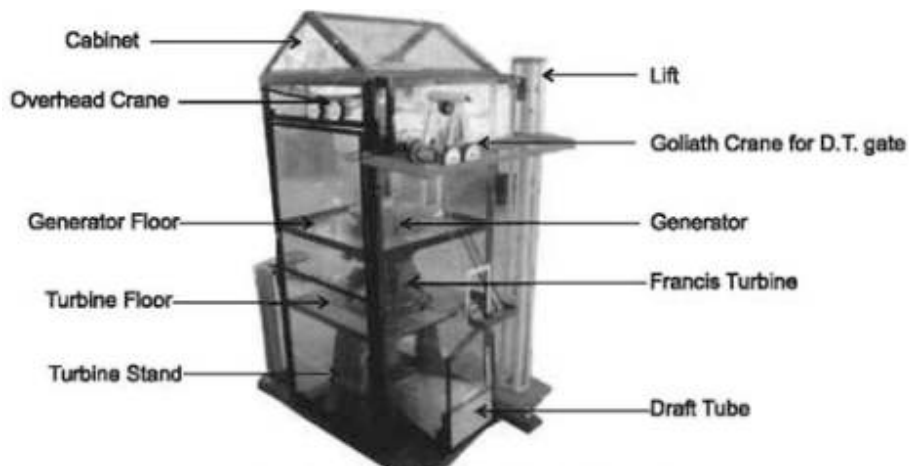


Fig 16: Completed Model of Hydro Electric Power Plant

VI CONCLUSION

Successful development of working model of the Hydro Electric Power Plant has been encouraging. This will be connected with the penstock after construction of dam and reservoir in Energy Park. The model tested with water displayed working of an actual Hydro Power Plant. It can motivate a student not only to understand but use this model for further research and innovation.

VII ACKNOWLEDGMENT

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Interconnected Hybrid Clouds Using Scheduling Techniques

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ABSTRACT

Technology is changing to embrace the cloud. Cloud Computing is simply sharing computing resources that are available through a service provider. Those resources can be storage space, use of software applications or servers. You buy more if you need more resources; you give back resources that you no longer need. Cloud computing infrastructure enables companies to cut costs; by outsourcing computations on-demand. However, clients of cloud computing services currently have no means of verifying the confidentiality & integrity of their data and computation. The paper tableaux a Publish-Subscribe model to balance the real and perceived risks with the value of adopting a cloud solution that improves the security of data over the cloud.

Keywords: technology, cloud computing, confidentiality, integrity, publish, subscribe.

I INTRODUCTION

Cloud computing is a network-based environment that focuses on sharing computations or resources. Actually, clouds are Internet-based and it tries to disguise complexity for clients. Cloud computing refers to both the applications delivered as services over the Internet and the hardware and software in the datacenters that provide those services. Cloud providers use virtualization technologies combined with self service abilities for computing resources via network infrastructure.

In cloud environments, several kinds of virtual machines are hosted on the same physical server as infrastructure. In cloud, costumers must only pay for what they use and have not to pay for local resources which they need to such as storage or infrastructure. Nowadays, there is having three types of cloud environments: Public, Private, and Hybrid clouds. A public cloud is standard model which providers make several resources, such as applications and storage, available to the public. Public cloud services may be free or not. In public clouds which they are running applications externally by large service providers and offers some benefits over private clouds.

Private Cloud refers to internal services of a business that is not available for ordinary people. Essentially Private clouds are a marketing term for an architecture that provides hosted services to particular group of people behind a firewall. Hybrid cloud is an environment that a company provides and controls some resources internally and has some others for public use. Also there is combination of private and public clouds that called Hybrid cloud. In this type, cloud provider has a service that has private cloud part which only accessible by certified staff and protected by firewalls from outside accessing and a public cloud environment which external users can access to it. There are three major types of service in the cloud environment: SaaS, PaaS, and IaaS [2].

In cloud, similar to every proposed technology, there are some issues which involved it and one of them is RAS factor. For having good and high performance, cloud provider must meet several management features to ensure improving RAS parameters of its service such as:

- (a) Availability management
- (b) Access control management
- (c) Vulnerability and problem management
- (d) Patch and configuration management
- (e) Countermeasure
- (f) Cloud system using and access monitoring.

II CLOUD SECURITY ISSUES

Innately, Internet is communication infrastructure for cloud providers that use well-known TCP/IP protocol which users' IP addresses to identify them in the Internet. Similar to physical computer in the Internet that have IP address, a virtual machine in the Internet has an IP address as well. A malicious user, whether internal or external, like a legal user can find this IP addresses as well. In this case, malicious user can find out which physical servers the victim is using then by implanting a malicious virtual machine at that location to launch an attack [3]. Because all of users who use same virtual machine as infrastructure, if a hacker steals a virtual machine or take control over it, he will be able to access to all users' data within it. Therefore, The hacker can copy them into his local machine before cloud provider detect that virtual machine is in out of control then the hacker with analysis the data may be find valuable data afterward [4].

III SECURITY REQUIREMENTS FOR SECURE CLOUD COMPUTING

Information Security should cover a number of suggested themes. Cloud computing security should also be guided in this regard in order to become an effective and secure technology solution.

- (a) **Identification & authentication:** In Cloud computing, depending on the type of cloud as well as the delivery model, specified users must firstly be established and supplementary access priorities and permissions may be granted accordingly. This process is targeting at verifying and validating individual cloud users by employing usernames and passwords protections to their cloud profiles.
- (b) **Authorization:** Authorization is an important information security requirement in Cloud computing to ensure referential integrity is maintained. It follows on in exerting control and privileges over process flows within Cloud computing. Authorization is maintained by the system administrator in a Private cloud.
- (c) **Confidentiality:** In Cloud computing, confidentiality plays a major part especially in maintaining control over organizations' data situated across multiple distributed databases. It is a must when employing a Public cloud due to public clouds accessibility nature.
- (d) **Integrity:** The integrity requirement lies in applying the due diligence within the cloud domain mainly when accessing data. Therefore ACID (atomicity, consistency, isolation and durability) properties of the cloud's data should without a doubt be robustly imposed across all Cloud computing deliver models.
- (e) **Non-repudiation:** Non-repudiation in Cloud computing can be obtained by applying the traditional e-commerce security protocols and token provisioning to data transmission within cloud applications such as digital signatures, timestamps and confirmation receipts services (digital receipting of messages confirming data sent/received).
- (f) **Availability:** Availability is one of the most critical information security requirements in Cloud computing because it is a key decision factor when deciding among private, public or hybrid cloud vendors as well as in the delivery models. The service level agreement is the most important document which highlights the trepidation of availability in cloud services and resources between the cloud provider and client.

- (g) **Main problems with cloud computing:** Security problems that may exist in the cloud are so high, that even the whole IT industry has undergone a revolution; however, it is not perfect [5]. Existing security technology still cannot solve some of the problems associated with cloud security; there are so many security characteristics of the cloud it is difficult to give fully display. Security policy is needed to ensure healthy and stable development of cloud computing.
- (h) **Cloud Transparency** Transparent security would entail cloud providers disclosing adequate information about their security policies, design, and practices, including disclosing relevant security measures in daily operations. Public clouds are more likely to be seen as having a greater degree of transparency as compared to the Hybrid or Private Cloud models. This is due to public cloud vendors having a "standardized" cloud offering thereby targeting a wider client base. Private clouds are usually built for specific organizations having more attention focused on offering customization and personalization cloud functionality [6].

IV OBJECTIVES & SCOPE

The methodology implemented here is based on the concept of developing an efficient framework which is base on the concept of interconnected federated cloud. The framework should be such that the various applications used in interconnected federated cloud and access of resources over this network is efficient and also the framework provides less communication overhead means during the transmission of data to the receiver no data should be loss and it consumes less power. The security against various attacks especially DOS and DDOS attacks can be detected and prevented by the framework. Since DOS attack can be significantly increased by using malicious workloads of greater complexity, which can involve a proportional increase of memory consumption or processing delay. Moreover, since both the brokers and the subscribers need to maintain internal status information in order to operate correctly, state-full attacks may be performed against them.

V METHODOLOGY

- (a) If 'N' is the number of users in the network with number of local brokers and data centers.
- (b) Let 'Ui' user requests for a publish service item 'Ti'.

- (c) Each of the nodes contains a set of items that are being serviced at 'v'.
- (d) Some of the items are not scheduled at the node 'v'.
- (e) Here managers are used for the insertion of item in the serviced node 'v'.
- (f) Now Manager uses the scheduling of the item sets at each serviced node 'v'.
- (g) All the managers which maintains publish services is attached with the global manager.
- (h) If any of the local service uses more time to access the item cached at node 'Vi', then at that local manager scheduling is done by the global Manager.

- (a) If 'N' of request are send from User 'Ui' to DataCenter 'Di'
- (b) If 'Ri' is the resources to be involved in the communication.
- (c) For each of 'Ri' → 'Di'
- (d) Compute power for each of the resource
- (e) $P_{T,IP} = 2, H, P_{tr1} + (H - 1), P_{IP}$
- (f) If check 'Rold'==Rnew' request for new resource and new resource is same or not.
- (g) Send only 'Rold'
- (h) Else
- (i) Send Rnew
- (j) End

VI PUBLISH & SUBSCRIBE

```

While(true){
Tcurrent = get Raccess from VM;
foreach Resource{
//resource is unallocated
If (!Tcurrent[Resource])
For each Useri → Resource
Allot Useri → Tcurrent
Else
WaitT → till Resource(Alloted)
Store → Stable
If U ← Access Subscribe
U → Subscribe Command
    
```

```

Check Validity U
Allot Subscribe → U
End
End
    
```

VII PROPOSED SCHEDULING

The proposed methodology uses the combination of two scheduling techniques Shortest Job First and Priority based Scheduling. The processing can be applied for the public as well as Hybrid Cloud. The formal algorithms steps of the proposed methodology are given below:

Notation	Description
Ui	Various Users of the cloud
DCi	Data Centers
UBi	Broker of the cloud
Bi	Burst Time for the Job Ji
Ji	Sequence of Jobs
Ti	Process time
Pi	Priority of Job Ji

VIII VARIOUS NOTATIONS USED IN ALGORITHM

- (a) If 'N' is the number of requests to send from 'Ui; users of the cloud 'C' with 'Bi' burst time of each of the user 'Ui' to the data Centers 'DCi' through brokers 'UBi'.
- (b) If 'T1, T2,Tn' is the various burst time from various users "Ui" for the request of the Jobs 'Ji'.
- (c) If 'P1,P2,.....Pn' be the priority of various jobs 'Ji' for the request.
- (d) Compute Priority vector for all d matrices using
- (e) $A_w = \gamma_{maxw}$
- (f) Make a matrix with priority vector using
 - a. $\Delta = [w^1 w^2 \dots w^d]$
- (g) Compute 'C' for the consistent comparison matrix.
- (h) Compute PVS which is a vector included value of priority of jobs.
- (i) Check the 'Ji' having highest priority from 'Pi'.
- (j) Now also check the burst time 'T' of the job 'Ji' having highest priority 'Pi'.
- (k) If burst time 'Ti' is very less then execute the scheduling of the job 'Ji'.
 - a. Otherwise the job having shortest burst time 'Ti' is executed.

IX CONCLUSIONS

The methodology implemented here can be analyzed and compare with the existing system on the basis of following factors.

- (i) Communication overhead and delay.
 - (ii) Reliability
 - (iii) Delivery Time
 - (iv) Success Rate
- (a) Expected Outcomes of the proposed work may be It may be possible to get better Adaptability & Attack Resiliency in proposed cloud architecture.
 - (b) Vulnerabilities assessment of the proposed secure cloud architecture will be done against DoS and DDoS or else attacks.
 - (c) Counter measures of the above attacks on the proposed secure cloud architecture will be done.

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Solar Powered Micro Irrigation System: A Promising Option

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ABSTRACT

Solar power is very curious subject flaming all over world in all sectors from space station to agro-irrigation because of unlimited availability of free solar radiation without proprietorships and non-judicial! Concerning to use of solar power in micro irrigation sector is in primeval stage because of lack of unawareness on design aspects and exceptional types of electro-mechanical machines to pressurized micro irrigation system. In broad-spectrum micro irrigation is a pressurized irrigation system requires electrical/gasoline powered centrifugal pump-set to generate unswervingly pressure for irrigation of crops mainly for 16-20 hours to meet the crop demand on daily basis. Means, while irrigating the crops for 16-20 hours on daily basis, recurring cost of electricity or fuel becomes enormous resulting in non-sustainability and viability of agri-irrigation projects. That's the reason in many parts in the world agriculture is diminishing and agriculture land is turning to desertification. Second hot issue is shortage of power! Demand vs supply ratio of power is so truncated every year, that none of the Government is enduring to overcome this ratio in future in spite of allocation of huge funds. UN report says that there is a deficit of 21-85% electricity in many countries and increasing @ 7-15 % every year. Hence, more thrust is given to alternative renewable and sustainable source of energy i.e. Solar Power! Although, solar radiation is freely available, it has limitation and is not so cost effective to afford & reliable to everyone. Countries positioned across the equator have wide scope of harvesting maximum solar power @ 350 watt/m². Potential of solar energy decreases while proceeding towards north-south poles @ 3 to 5 % per degree of latitude. However, solar energy harvesting is dependent on temperature, relative humidity, clouds, latitude, longitude and obstructions at the particular location. Therefore, it is necessary to acquire the climatic data from nearest meteorological station. Base on meteorological data, potential of solar energy harvested can be estimated for design purpose along with solar module and allied equipment. Since solar radiation is available in a day time for generation of power, the entire irrigation to crops has to be concluded in a day time most preferably. Obviously all the design calculation is based on the fluctuation of solar radiation from morning to evening and season to season to meet the crop water demand. The concern article throws light on fundamental of solar energy and design principles & considerations and its usefulness micro irrigation system.

I SOLAR PHOTOVOLTAIC (PV)

The photovoltaic effect refers to photons of light exciting electrons into a higher state of energy, allowing them to act as charge carriers for an electric current i.e. solar cells convert sunlight energy into flow of electrons. The photovoltaic effect was first observed by Alexander-Edmond Becquerel (French Physicist) in 1839. The term photovoltaic denotes the unbiased operating mode of a photodiode in which

current through the device is entirely due to the transduced light energy. Virtually all photovoltaic devices are some type of photodiode. Solar cells produce direct current electricity from sun light, which can be used to power equipment or to recharge a battery. The first practical application of photovoltaic was to power orbiting satellites and spacecraft, but today the majority of photovoltaic modules are used for grid connected power generation and domestic lightings.

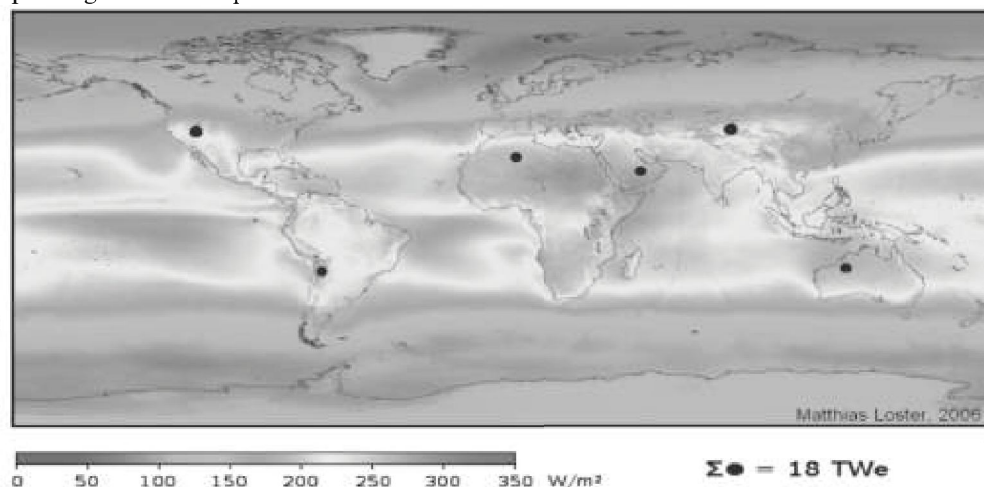


Fig. 1: Global Solar Power available (Twe = Terawatt – 10¹² watt)

Table: 1
Potential of solar energy for various countries given for reference only.

Position	Countries	Solar Power (W/m ²)
Near to Equator	Ecuador, Colombia, North Brazil, Gabon, Congo, DRC, Uganda, Kenya, Rwanda, Somalia, Maldives, Indonesia, Tanzania, South Sudan, Ethiopia, Malaysia, Central Africa, Cameroon, Nigeria, Ghana, Liberia, Sierra Leon, Burkina Faso, Senegal, Guyana, Venezuela, Costa Rica.	300-350
Near to Tropic of Cancer	Taiwan, Philippines, South China, Vietnam, Thailand, Burma, Bangladesh, India, Srilanka, Nepal, Pakistan, Afghanistan, Iran, Saudi Arabia, Iraq, Israel, Jordan, Syria, Egypt, Algeria, Tunisia, Mexico, Mauritania, Mali, Niger, Chad, Libya, Egypt, UAE, Oman, Myanmar.	250-300
Near to Tropic of Capricorn	Botswana, Brazil, Chile, Madagascar, Mozambique, Namibia, Paraguay, and South Africa.	250-300
Above Tropic of Cancer	Japan, North & South Korea, China, Turkey, Russia, Ukraine, Germany, France, Spain, Italy, USA, UK, Other European countries.	200-250
Below Tropic of Capricorn	Australia, New-Zealand, Argentina, Chile	200-250

Countries positioned across the equator have wide scope of harvesting maximum solar power @ 350 w/m² (refer figure1). Potential of solar energy decreases while proceeding towards north-south poles @ 3 to 5 % per degree of latitude.

However, solar energy harvesting is dependent on temperature, relative humidity, clouds, latitude, longitude and obstructions at the particular location. Therefore, it is necessary to acquire the climatic data from nearest meteorological station. Base on meteorological data, potential of solar energy harvested can be estimated for design purpose along with solar module and allied equipment.

II REVIEW – MICRO IRRIGATION

Micro Irrigation is the term used to describe the method of irrigation which is characterized by the following features:

- Water is applied at a low rate.
- Water is applied over a longer period of time.
- Water is applied at frequent intervals.
- Water is applied directly to into the plant's root zone.
- Water is applied via a low pressure delivery system.

Micro Irrigation System delivers water to the crop using a piping network & driplines with drippers spaced at certain intervals along the row of crops is generally powered by electrical motor pump-set or diesel engine pump-set. Each Drippers / emitters supplies a measured, precisely controlled uniform application of water, nutrients and other required growth substances directly into the root zone of the crops thereby growth of plant enhances and resulted in higher yield.

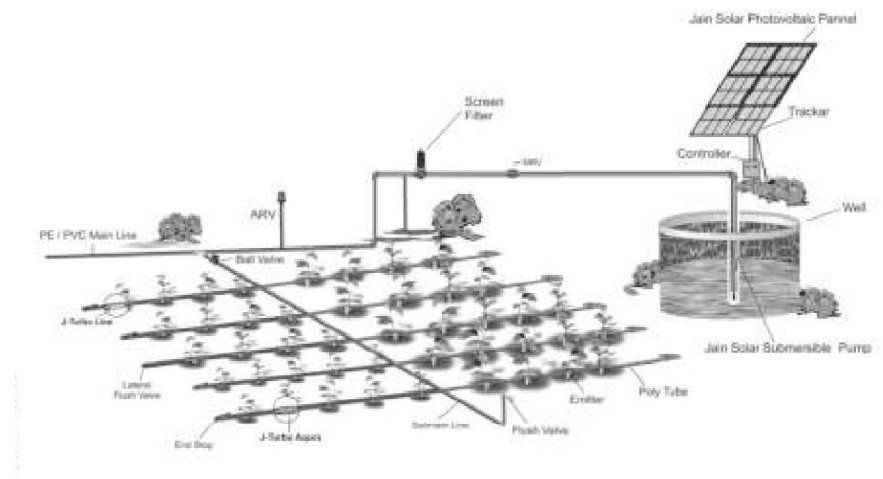


Fig.: 2 Schematic Layout of Jain's Solar Powered Micro Irrigation System.

III SOLAR POWERED MICRO IRRIGATION (SPMI)

In Solar Powered Micro Irrigation System, solar energy (solar photovoltaic modules) is being used to powered motor pump-set unit in place of conventional electrical motor pump-set or diesel engine. To get better understanding a typical schematic layout of solar powered micro irrigation system is shown in figure 2. SPMI system comprising of Control Head Unit, Piping network, Driplines, Solar Photovoltaic Module, Control Panel and Motor Pump-set.

IV DESIGN PRINCIPLES & CONSIDERATIONS

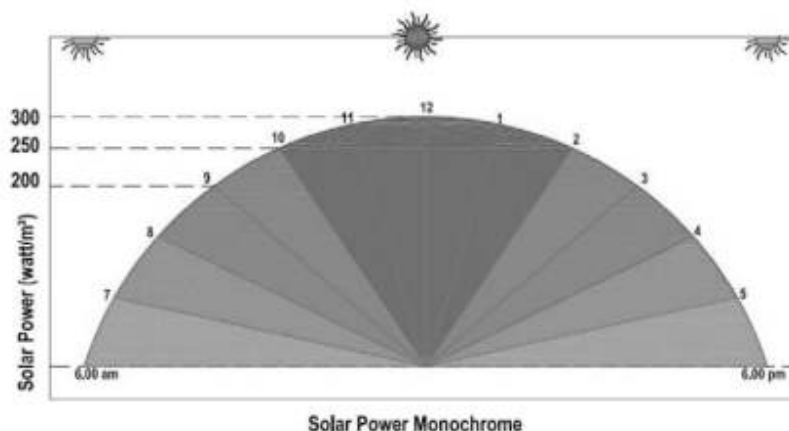
Since solar radiation is available in a day time for generation of power, the entire irrigation to crops has to be concluded in a day time most preferably. Obviously all the design calculation is based on the fluctuation of solar radiation from morning to evening and season to season to meet the crop water demand. However, following factors have to be considered and integrated while designing micro irrigation system.

- (a) Average solar radiation- morning to evening on monthly and seasonal basis.
- (b) Optimization of ET_{crop} (Net Crop water demand) on daily, alternate and monthly basis.
- (c) Soil based water retention capacity.
- (d) Master plan of crops.
- (e) Water availability and assessment to meet crop water demand.
- (f) Operation / management of system.
- (g) Optimization of requirement of motor-pump-set (solar powered)
- (h) Photovoltaic Solar Module.

- (i) Techno-commercial parameters.

Master planning of crops is very important while going for Solar Powered system. Conventional planning of crops is not useful & suitable and may become expensive in overall. Therefore, master planning of crops should be proportional to meet demand of ET_{crop} to maximum harvest of solar radiation. Means there should not be shortage of solar radiation while crop water demand is at max stage. Precautions like soil based retention capacity should be increased by adding soil conditioner and organic manure to avoid the risk of depleting moisture level beyond wilting stage of crops even though there is gap of irrigation. Sufficient water application should be made to meet the water demand of crops in the day time in the available solar radiation. Design of micro irrigation components i.e. piping network, filtration system and driplines etc. should be adequate and harmonized to cope up the demand of crop at fluctuated solar radiations on daily and seasonal basis. In other word design of micro irrigation system has to be harmonized with harvested solar power (radiation) to meet the crop water demand.

Average solar energy can be harvested to 200-300 watt/m² in various countries base on latitude and longitude. It varies from season to season and mainly affects the clouds and haziness. Maximum solar power can be harvested in summer season and minimum in rainy seasons due to cloudiness. Hence, the frequency of irrigation in rainy season is low and maximum in summer. Similarly in a day time solar energy is minimum in morning, maximum in noon and again minimum during evening. From the below sketch/graphs it is very clear that the design of micro irrigation should be done to meet the water demand of crop in day time corresponding to available solar radiation only.



V SOLAR POWERED SUBMERSIBLE MOTOR-PUMP SET

incorporated while designing and manufacturing of such kind of motor-pump-set.

It is a centrifugal type pump driver by DC motor. The design of impeller is made in sign wave form resulted in constant discharge (output) and head in the designated range irrespective of solar radiation. Phenomenon of pressure /discharge compensation is

Comparative Case study of Electrical, Diesel and Jain's Solar powered Micro Irrigation System 1 ha module.

Sr.	Heads	Electrical Powered	Diesel Powered	Solar Powered
1.	Area under Micro Irrigation	1 ha	1 ha	1 ha
2.	HP/KW used in general	7.5/ 5.6	10 / 7.5	2 / 1.75
3.	Power / Fuel consumption p.a.	25,000 units	10,000 litre Diesel	Zero
4.	Cost of Power p.a. (Rs)	125,000	600,000	Zero
5.	Water Used for crops	30 lacslitres pa	36 lacslitres pa	15 lacslitres pa
6.	Capex (Rs)	50,000-1,00,000	50,000-1,00,000	1,00,000-2,00,000
7.	Opex (Power/Fuel) in year (Rs)	10,000-20,000	20,000-40,000	Zero
8.	Maintenance cost per year (Rs)	5,000-10,000	5,000-10,000	Zero
9.	Irrigation frequency	Day – Night	Day – Night	Day time.
10.	Working hours of labour&cost	16 hours (Day + Night)	16 hours (Day+night)	8 hours in Day
11.	Dependency factors	Govt Policy & Electrical department	Govt Policy & Fuel Price &forex rate	No dependency.
12.	Risk factor– hazardous & Safety	High risk. Electrical shock.	High Risk. Fire hazardous.	Zero Risk. Safe.
13.	Pollution & Environment	No direct pollution	High Pollution	Pollution free.

VI CONCLUSION

At this stage lot of research and development is going on to find out the cost effective and friendly solar powered system in India at various levels. Though investment at initial stage is high, considering the recurring cost and dependency like government

policies, international price of crude oil & currency fluctuation, Jain's solar powered system is much more sustainable and economical and promising option for farmers all over the world to adapt to overcome the power crisis, become self-sufficient and independent in power.



(Crop – Cotton under Jain Solar Powered Drip System)

A Novel Concept and Innovation - Green Light for Safety, Fuel Saving, Pollution Control and Motion Indicator in Automobiles

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ABSTRACT

Green light for safety, fuel saving, pollution control and motion indicator in automobiles is a novel innovative idea being propagated by the author. The Introduction of green light at rear end of the vehicles will give us the information about the motion of the vehicle in traffic on road and will also increase the life of gear, clutch plate and engine thus giving high fuel efficiency. It will provide safety to all vehicles on road. It will minimize pollution on road. Thus, GREEN LIGHT will prove a boon to Indian automobile industry and world too. The concept has been tested on Indian roads and yielded excellent results.

I INTRODUCTION

This invention relates to introduction of GREEN LIGHT for safety, fuel saving, pollution control and motion indicator in automobiles.

At present, every vehicle is provided with red light, orange light and white light at the rear end of the vehicle. Red light shows the application of brake, orange light shows the direction of turning of the vehicle and white light is on when the vehicle is put in reverse gear. In most of the vehicles orange light or indicators are provided at front, rear and sides of the vehicles.

Now, there is no such light which can tell about the motion of the vehicle, whether the vehicle's engine is using its power to move or going on in rolling condition.

According to the proposed invention a GREEN LIGHT is introduced at the rear end of the vehicle. The green light is 'ON' when the vehicle is using its engine's power to move. At present, when we drive behind the vehicle we continuously make assumption about the motion of the vehicle in front of us. This GREEN LIGHT will give exact information about the motion of the vehicle. Therefore, by this information the frequent use of accelerator is avoided in the vehicle behind, thus saving fuel indirectly.

It consists of a circuit connected to gear, clutch and accelerator of the vehicle to the GREEN LIGHT. It has also got a FAIL SAFE circuit connected to red light and a buzzer which is on when the GREEN LIGHT get fused at the rear end of the vehicle. It involves use of 3 micro switches at gear, clutch and accelerator a two way switch(in demonstrative prototype), a green led light, a green led indicator on dash board, a red led indicator on dash board a buzzer and a battery. The GREEN led light at the rear end of the vehicle with green led indicator on dash board glows when the vehicle is put into gear, clutch is in the released position and accelerator is in pressed position. This show that vehicle's engine is using its power to move & you can freely go

behind the vehicle because of green light motion indicator.

II DETAILED DESCRIPTION OF THE INVENTION

A specific embodiment of the invention will now be described with the help of circuit diagram. The circuit consists of 3 micro switches, a two way switch(in demonstrative prototype), a green led light at rear end of the vehicle, a green led indicator on dash board, a red led indicator on dash board, a buzzer and a battery. The 3 micro switches are connected to neutral gear clutch and accelerator in series. Then this is connected in series to a green led light at rear end of the vehicle and green led indicator on dash board with a two way switch. The buzzer and red light indicator on dash board are connected to the two way switch and a battery.

The modified vehicle will have following components related to the green light.

- (a) Gear switch
- (b) Clutch switch
- (c) Accelerator switch
- (d) Two way switch
- (e) Green led indicator on dash board
- (f) Buzzer
- (g) Red led indicator on dash board
- (h) Green led light at the rear end of the vehicle
- (i) 12 V Battery
- (j) Two way switch first terminal point
- (k) Two way switch middle terminal point
- (l) Two way switch bottom terminal point
- (m) resistance

The circuit proposed with above component for which Patent is pending is a failsafe circuit. Whenever the green led light at the rear end of the vehicle gets fused this failsafe designed circuit will get activated and red led indicator on dash will start glowing and buzzer will get blowing giving a warning to the driver to get repaired his vehicle's green light at rear end of the vehicle.

According to this invention when the vehicle is put into gear, the gear switch gets on, when the clutch is released the clutch switch gets on and when the accelerator is pressed the accelerator switch gets on with two way switch in first position the green led light at the rear end of the vehicle glows with the green led indicator on the dash board glows and tells the driver about the on & off position of the green light at the rear end of the vehicle.

III FIELD TRIALS

The author has carried out extensive trials on vehicles in day night conditions different drivers and with different makes of vehicles. The results are tabulated on Table 1. The average saving as works out as follows-

Table 1

Field Trials with Bajaj Super Scooter

Driver No.	Wt. of Driver & Pillion	Age in Years	Green light fitted or Not	Fuel Quantity in ml.	Initial Reading	Final Reading	Distance Travelled in Km.	Extra milage due to Green Light
1	59 kg.	24	No	100	53470.000	53473.750	3.750	
	and 60 kg.		Yes	100	53474.000	53477.975	3.975	0.225
2	58 kg.	35	No	100	53479.000	53482.900	3.900	
	and 60 kg.		Yes	100	53483.000	53487.275	4.275	0.375
3	60 kg.	45	No	100	53488.000	53492.000	4.000	
	and 59 kg.		Yes	100	53493.000	53497.275	4.275	0.275
4	62 kg.	46	No	100	53498.000	53501.275	3.275	
	and 60 kg.		Yes	100	53502.000	53505.555	3.555	0.280
5	52 kg.	48	No	100	53506.000	53510.140	4.140	
	and 60 kg.		Yes	100	53511.000	53515.250	4.250	0.110
6	79 kg.	34	No	100	53516.000	53519.950	3.950	
	and 60 kg.		Yes	100	53520.000	53524.150	4.150	0.200

Direct Fuel Saving Data Calculation of Green Light Project

$$\begin{aligned}
 \text{Average} &= \frac{\text{Total of Differences in Km.}}{\text{No. of Differences}} \\
 &= \frac{0.225+0.375+0.275+0.280+0.110+0.200}{6} = .25\text{km}
 \end{aligned}$$

The same trials were done with Hero Honda for which results are tabulated on Table 2. The average savings works out as follows.

Table 2
Field Trials with Hero Honda 100 cc

Name of Driver	Wt. of Driver & Pillion	Age in Years	Green light Fitted or not	Fuel Quantity in ml.	Initial Reading	Final Reading	Distance Travelled in Km.	Extra milage due to Green Light
1	50 kg.	18	No	50	29623.000	29625.400	2.400	
	and 54 kg.		Yes	50	29626.000	29628.900	2.900	0.500
2	54 kg.	19	No	50	29630.000	29632.500	2.500	
	and 50 kg.		Yes	50	29634.000	29636.975	2.975	0.475
3	58 kg.	34	No	50	29638.000	29640.250	2.250	
	and 50 kg.		Yes	50	29641.000	29643.550	2.550	0.300
4	52 kg.	48	No	50	29645.000	29647.150	2.150	
	and 50 kg.		Yes	50	29648.000	29650.800	2.800	0.650
5	80 kg.	49	No	50	29652.000	29654.550	2.550	
	and 50 kg.		Yes	50	29656.000	29658.800	2.800	0.350
6	59 kg.	24	No	50	29660.000	29662.250	2.250	
	and 50 kg.		Yes	50	29663.000	29665.650	2.650	0.400

In-Direct Fuel Saving Data Calculation of Green Light Project

$$\text{Average} = \frac{\text{Total of Differences in Km.}}{\text{No. of Differences}}$$

$$= \frac{0.500+0.475+0.300+0.650+0.350+0.400}{6} = 0.45 \text{ km}$$

IV BENEFITS OF THE INNOVATION

The green light gives us many advantages. It gives safety to vehicles on road because we get the actual information about the motion of the vehicle. It gives direct fuel saving to the vehicle because of green led indicator on dashboard of the vehicle as it monitors the use of gear clutch and accelerator thus giving high fuel efficiency. It also saves fuel indirectly in vehicles behind of the vehicle with green light as it reduces the frequent use of accelerator because of the information of the motion of the vehicle got from green light. In this way the use of the accelerator is reduced which decreases the pollution on road to a great extent because the frequent use of accelerator is avoided in all vehicles in traffic. Its cost is very less. It is an universal circuit and can be fitted to all vehicles irrespective of the fuel used in the vehicle. Following are the benefits summarized:-

(a) Direct Fuel Saving in Automobiles due to dashboard indicator which increases life of clutch plate and engine and gives high fuel efficiency.

- (b) Indirect Fuel Saving in Vehicles coming behind by giving the important information about the motion of the vehicle reducing the frequent use of accelerator and brake thus saving fuel.
- (c) Due to reduced use of accelerator the pollution is minimized to a great extent in heavy traffic and cities.
- (d) Green light will provide safety in Vehicles because it will alarm the vehicles coming behind about the exact motion of the Vehicle. Will help in preventing accidents.
- (e) This will provide carbon credit to our country by reducing the carbon content in the atmosphere.
- (f) The cost of this green light motion indicator circuit is very less but the benefits advantages are more.
- (g) It has got a failsafe circuit whenever in future the green light gets fused. The buzzer blow and red light indicator glow on dashboard and when the driver gets repaired it then only it will stop blowing.
- (h) The Led light is used in green light motion indicator which consumes very less power thus will required less power consumption in operation.

- (i) By red light we always get a negative feeling to stop & stop. But by this green light we will always get a positive feeling to move forward and forward. A great Positive feeling.
- (j) It is universal circuit. It is applicable for all vehicle, two wheelers, four wheelers etc.
- (k) It will act as motion indicator in Automobiles and have to be implemented in all vehicles to get the most benefit from it. It will prove a boon and milestone in Automobiles Industry in India and world too.
- (l) It is first of its kind in world's Automobile being introduced by India. It is under patent process at patent office Mumbai.
- (m) It will also help in increasing the speed of traffic in cities as we will get important information about the motion of the vehicle.

- (n) It has been telecasted on Doordarshan in 2012 and 2015. The practical demonstration of green light is observed by Engineering Students and Pollution Control Engineers and public and where much satisfied by it and appreciated it very much.

V CONCLUSION

By modifying the tail indication in automobiles with a green light and simple circuit designed by the author for which patent application has been filed can, not only save valuable fuel but can ensure better road safety and earn lot of carbon credits for the country.

A Study on Seepage Problems of Chamravattam Regulator cum Bridge

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ABSTRACT

Chamravattam regulator cum bridge is the largest road bridge in Kerala, which was constructed in the form of a barrage to store the water in Bharathapuzha River. Within a short span of time after construction, a large amount of seepage was observed beneath the structure. This project aims to study about the seepage problem of Chamravattam regulator cum bridge. The study was conducted with the help of 2D Finite element model, Geo-slope. Using the model the quantity of seepage, exit gradient and uplift pressure distribution in different cross sections were found. The check for resistance to the uplift and piping phenomenon was done in the cross-section where the seepage flow was found maximum. The obtained results were compared with the existing site conditions. The possible reasons for seepage problems were found.

Key words: Seepage, Exit gradient, Uplift pressure, Piping phenomenon, Geo-Slope

I INTRODUCTION

Barrages or regulator cum bridges are low level dams which are intended to store water in its upstream to feed water for the purposes like irrigation, domestic and industrial uses. Comparing to big dams, these structures will have a small head of water in its upstream. Gates will be provided to control the water storage and head of upstream water. These structures also contributes to ground water recharge.

Most of these structures are constructed over pervious soil media, which causes seepage of water below the structure. This seepage in a very high quantity will affect the stability of the structure. So hydraulic stability is an important factor that affects the performance of a hydraulic structure. Seepage problem mainly depends on foundation soil characteristics and head at upstream and downstream. Seepage flow through the foundation soil is driven by the differential pressure created from water level difference between upstream and downstream. The seepage flow, as it increases will wash away the soil beneath the structure, leading to piping phenomenon, which ultimately leads to the failure of structure. The uplift pressure acting on the foundation of structure can also cause the failure of structures.

Chamravattam regulator cum bridge is a barrage constructed across Bharathapuzha River in 2013. Within one year after the construction of structure, heavy amount of seepage was observed beneath the structure. This paper aims to study about the seepage problems of Chamravattam Regulator cum Bridge.

II BASIC DATA AND DESCRIPTION OF STRUCTURE

Chamravattam regulator cum bridge is the largest road bridge in Kerala state. It is situated 6 km away from Ponnani, where Bharathapuzha joins Arabian Sea. It is having a length of 978 m and has got 70 shutters to regulate the flow of water. The project was supposed to serve water to fourteen panchayats and two municipalities. The main aim of the structure was to distribute excess water in the river to those areas where drinking water shortage is a problem during summer season.

At present condition, the downstream aprons of the bridge are almost completely collapsed, which is mostly observed in between the chainage 340 m and 390 m from eastern bank of the river. Also till 200 m chainage, the aprons were constructed in an unscientific manner with a length of 6 to 7 meters long. The loose rubble packing were found to be destroyed in almost whole length and the rubble stones used were found to be lighter than the required weight.

The basic characteristics of the bridge, which are used as input data for the analysis of the seepage problem are as follows.

- (a) The total width of the structure is 33.35 m.
- (b) There are two rows of sheet piles are provided along the length of the structure.
- (c) Upstream sheet pile is 2.9 m deep.
- (d) Downstream sheet pile is 5.75 m deep.
- (e) The borehole data of 31 different points along the length of the structure.
- (f) The crest elevation is 1.5 m.
- (g) The maximum water level at the upstream is 4.5 m

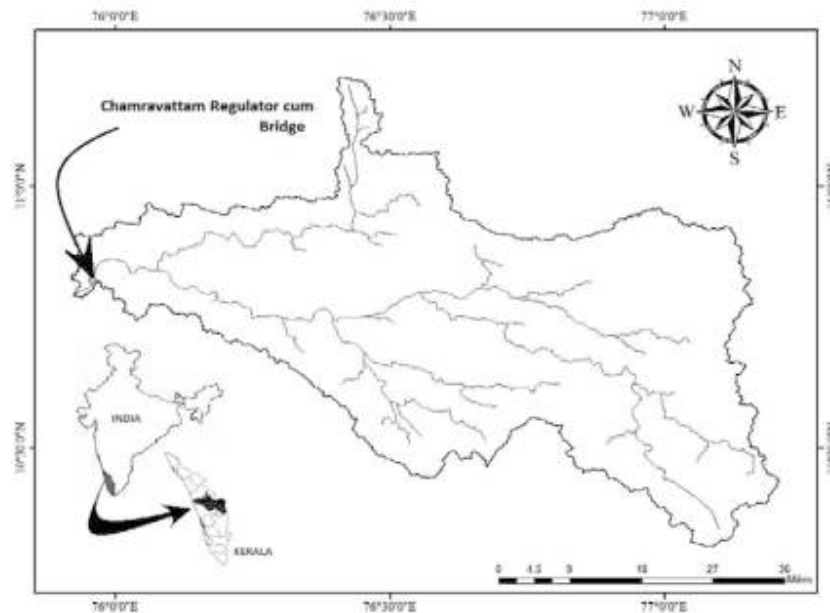


Fig. 2-1: Location of Chamravattam Regulator cum Bridge in Bharathapuzha

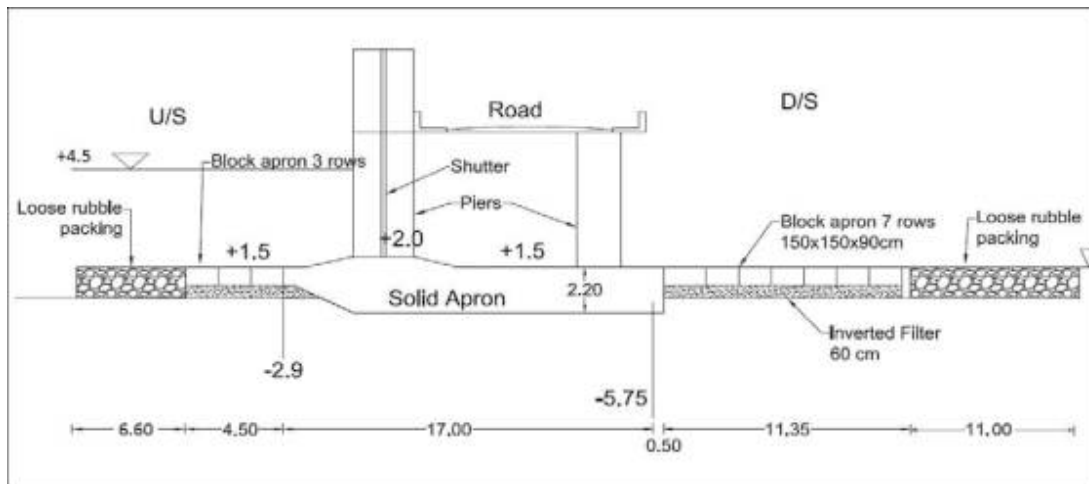


Fig. 2-2: Cross-section of Chamravattam Regulator cum Bridge

III METHODOLOGY OF THE PROBLEM

The analysis of the seepage analysis is the primary step to study about the hydraulic failures that occurred in the hydraulic structure and to find an optimum precaution for that. GEO SLOPE SEEP/W is one of the advanced and accurate method to study about the seepage phenomenon. A numerical model is a mathematical simulation of a real physical process. SEEP/W is a numerical model that can mathematically simulate the real physical process of water flowing through a particulate medium. This model is based on Darcy's law which relates quantity of seepage and head which causes the flow. Finite element

numerical methods are based on the concept of subdividing a continuum into small pieces, describing the behavior or actions of the individual pieces and then reconnecting all the pieces to represent the behavior of the continuum as a whole. This process of subdividing the continuum into smaller pieces is known as meshing. The pieces are known as finite elements. The basic equation will solve in this element level. The basic equation of SEEP/W model is

$$[K]\{H\} = \{Q\} \quad (1)$$

Where:

[K] = Hydraulic conductivity of soil
 {Q} = a vector of the flow quantities at the node.
 {H} = a vector of the total hydraulic heads at the nodes,

The steps of seepage analysis using this software are:

- (a) **Defining the problem:** In this step, we input the cross section of structure, soil layer properties and boundary conditions (Upstream head and downstream head). Then the model will get discretize into finite element mesh of quadrilateral elements.
- (b) **Solving the problem:** The model works based on the principle of Darcy's law. Through this process, the model will find total head, gradient of seepage flow and quantity of seepage flow at each point in the flow domain.
- (c) **Analyzing the results:** This model is not capable of taking us instantaneous conclusions, instead we need to analyze the outputs from the software to reach in a conclusion. The uplift pressure at the bottom of the foundation helps to study about the stability of structure to withstand against uplift pressure. The gradient of flow at the downstream represents the safety against piping phenomenon. The flow quantity at the outlet can be used to find the intensity of

seepage at that particular point.

IV ANALYSIS OF THE PROBLEM

While studying about the seepage problems of Chamravattam Regulator cum bridge, my first aim was to find the cross section which is most vulnerable to seepage phenomenon. The seepage analysis was carried out for 31 different cross sections along the length of structure. The flows at outlet point were calculated for each cross section. The highest amount of seepage flow obtained was $5.47E-05 \text{ m}^3/\text{sec}/\text{m}$ at 370 m from one bank. The highest value of exit gradient was obtained also at the same point (0.2797). These results clearly define this point as the most vulnerable one along the length of structure. Now the hydraulic stability of the whole structure can be obtained from analyzing the results from this particular cross section. The two major parameters that affects the hydraulic stability are uplift pressure acting at the bottom of foundation and gradient of flow at the point where seepage flow exit at the downstream.

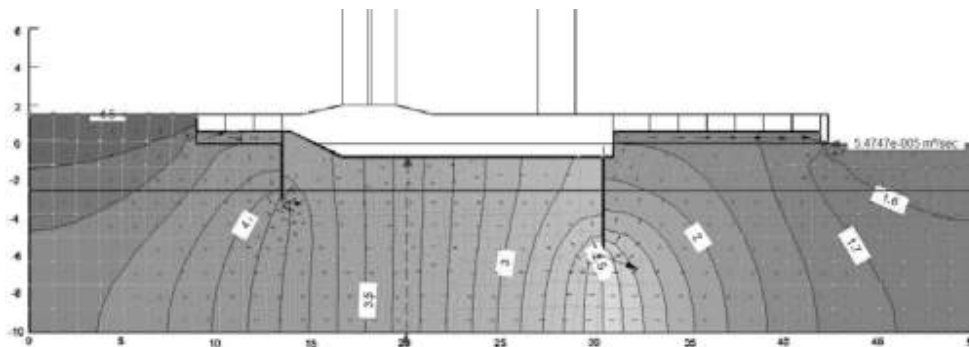


Fig. 4-3: Finite Element mesh for different soil layers below the foundation of structure

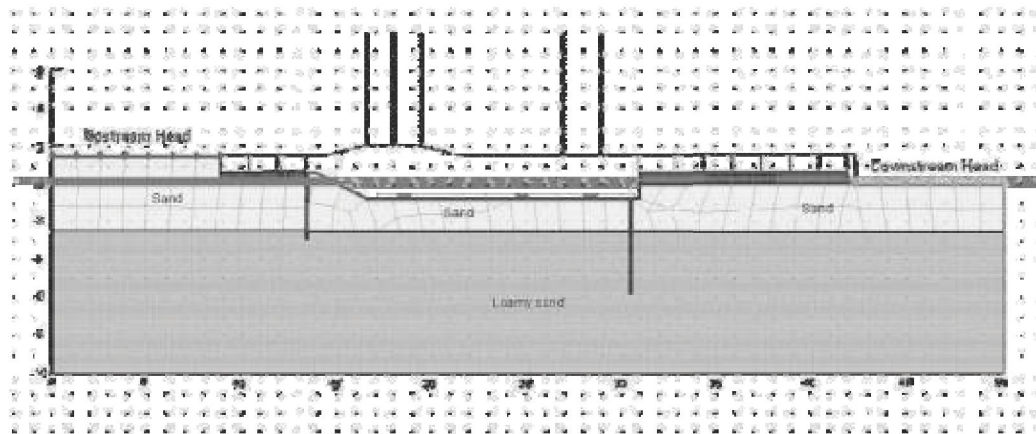


Fig. 4-4: Seepage of water underneath Chamravattam RCB at 370m chainage

For a hydraulic structure to have stability against uplift, the uplift pressure acting below the floor

should be balanced by the weight of the floor.

$$\text{Thickness required at a point} = \frac{h}{(G - 1)} \quad (2)$$

Where:

h = Head of water with respect to top of the floor
 G = Specific gravity of floor material

According to IS: 11130-1984 additional 10% floor thickness should be provided to counter act the uplift force to meet worst possible combinations of

loads like seismic loads.

$$\text{So, thickness required to be provided, } T = \frac{1.1h}{(G - 1)} \quad (3)$$

Thickness required to be provided at different points were calculated by using the above formula and compared with the existing site situation to check the hydraulic stability of the structure.

The next parameter that affect the hydraulic stability of a structure is exit gradient. According to IS 6966 (Part1) 1989, the exit gradient which a soil at the end of a structure exactly balances the weight of soil is mathematically expressed as

$$\text{Critical exit gradient; CEG} = \frac{(S - 1)(1 - n)}{FOS} \quad (4)$$

Where:

S = Specific gravity of soil
n = Porosity of soil

$$\text{Safe exit gradient; GES} = \frac{(S - 1)(1 - n)}{FOS} \quad (5)$$

V RESULT ANALYSIS

The result from the seepage analysis conducted on 31 different cross section were as follows:

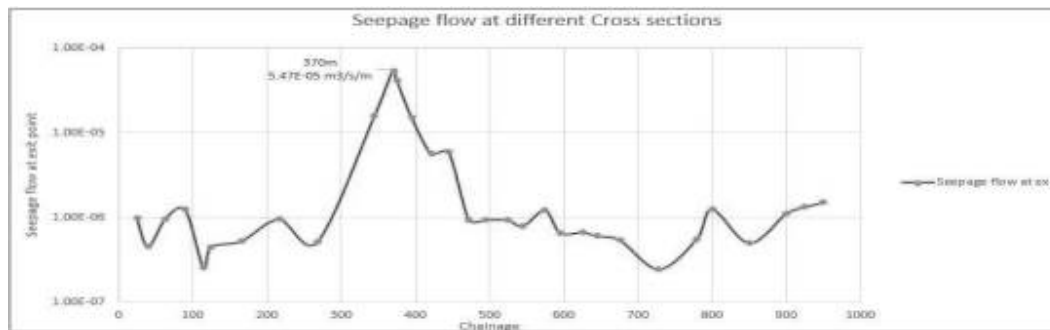


Fig. 5-5: Seepage flow for different cross sections

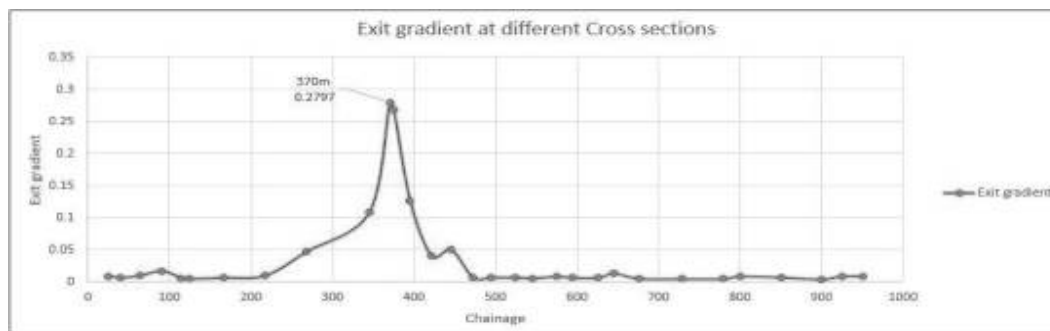


Fig. 5-6: Exit gradient of flow at different cross sections

As mentioned earlier, the maximum flow and maximum exit gradient were obtained in 370m chainage, which clearly represent it as the most vulnerable section along the length of river. So if this section is found to be safe, the whole structure can be considered safe and vice versa. In this

section, up to -2.5m it is medium sand and below that is loamy sand.

The thickness required to counter balance the uplift pressure were checked at different points of the above cross section and the results were as fol

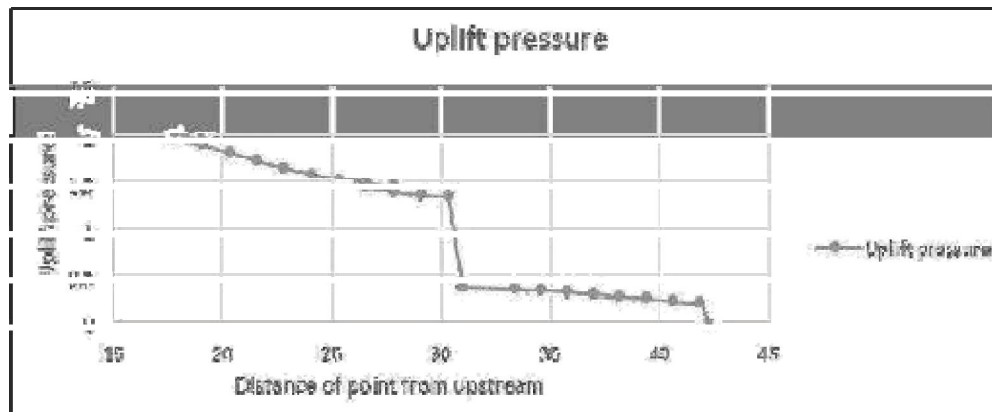


Fig.5-7: Value of uplift pressure at different points along the cross section

Table 5-1:
Checking thickness requirement to withstand uplift force

Chainage	Uplift pressure	Req.thickness	Provided	Safety,
17.84	2.00658	1.57660	2.7	Safe
19.09	1.92544	1.51284	2.7	Safe
20.35	1.84456	1.44930	2.5	Safe
21.61	1.76465	1.38651	2.2	Safe
24.12	1.61170	1.26634	2.2	Safe
26.63	1.47992	1.16279	2.2	Safe
27.88	1.43009	1.12364	2.2	Safe
30.40	1.38542	1.08854	2.2	Safe
30.48	0.46874	0.36830	2.2	Safe
30.99	0.40831	0.32082	0.9	Safe
34.62	0.38019	0.29872	0.9	Safe
37.05	0.34030	0.26738	0.9	Safe
39.47	0.29092	0.22858	0.9	Safe
41.90	0.24566	0.19302	0.9	Safe
41.93	0.23769	0.18676	0.9	Safe
42.37	0	0	0.9	Safe

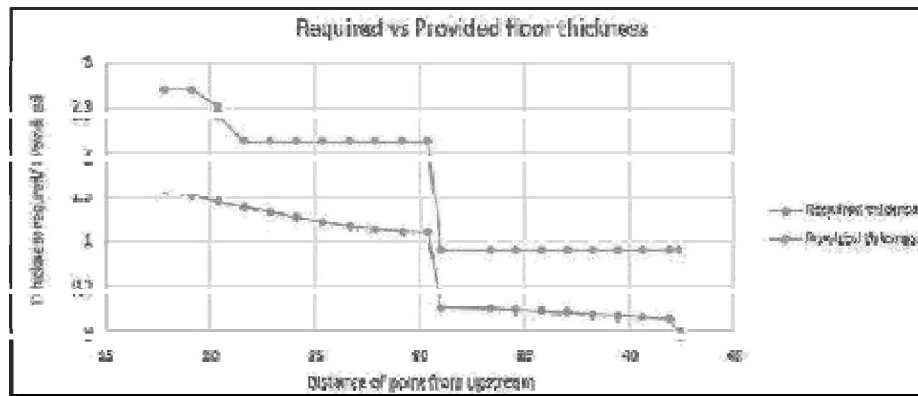


Fig. 5-8: A plot of required thickness vs provided thickness

From the result of the analysis, the floor of the regulator cum bridge was found safe against uplift at every point. Check for exit gradient is another criteria in finding the stability of the structure.

$$\begin{aligned}\text{Critical exit gradient; CEG} &= (S - 1)(1 - n) \\ &= (2.6 - 1)(1 - 0.4) \\ &= 9.6\end{aligned}$$

After substituting factor of safety,

$$\begin{aligned}\text{Safe exit gradient, GES} &= \frac{(S - 1)(1 - n)}{\text{FOS}} \\ &= 0.96 / 6 \\ &= 0.16\end{aligned}$$

The value of exit gradient obtained from the model was 0.2797, which is much more than the safe limit of exit gradient, but at the same time it is much lower than critical exit gradient.

VI CONCLUSIONS

From the analysis of results from GEO SLOPE - SEEP/W package, which calculates seepage quantity, exit gradient and uplift pressure underneath the foundation the conclusions derived are

- The Finite Element Model was able to demonstrate the seepage flow below the foundation of Chamravattam Regulator cum Bridge successfully.
- The points obtained from model as most vulnerable to seepage seems matching with the site conditions.
- The uplift pressure acting below the floor of the structure does not affect the stability of the structure.

- The exit gradient of structure even though does not satisfy the safety limits, is much lower when compared to the critical exit gradient.
- In field the effect of seepage observed was much higher than what is obtained from model results.
- These results conclude with the possibility of some defect in construction of bridge.
- Also due to excessive digging of sand from downstream of river, the bed level might have gone down. For proposal of a solution to the existing problem, a survey needs to be conducted to study about the existing condition of field.

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The Economics of Public Health Care in India: Some Introspections'

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ABSTRACT

India is rapidly growing country in the world. Since Independence, India has made a positive attempt to improve the status of people in our country by introducing various policies and programmes at social sectors. The Health sector is also one of the important sectors which will come under social sector. There is a responsibility of the government that to maintain the health status of its citizen and also provide a good health facilities to all. In various five years plans, Govt has given high priorities for public health facilities providing special allocations in the budget. Now a days the issue of public expenditure took vital important, especially in the health sector. It also impact on the per capita income of the nation and progress of the country. Still there is a lack of facilities in health sector including poor infrastructure facilities; lack of doctors, medicines, lack of advanced technology, motivation etc. These are all affects on the progress of the country. Hence, presently India took it as a challenge and made a positive attempt to create a globalised health standard in the country. It can create a number of job opportunities, business opportunities to attract the foreign investment and mainly to improve the health status of all people especially focused on rural people. This paper is deals with the public health expenditure in India.

Keywords: Health, Budget, Expenditure, Public, State

I BACKGROUND

The predominant obligations of the health sector in India, under the 7th Schedule of the Constitution, however, are primary with the state governments. The study of health care expenditures, in general, has been a case of research and discussion in present times globally. Public health outlay consists of recurrent and capital expenses from a government budgets, external borrowings and grants and social health insurance funds. Health expenditure in India was last measured at 4.55 in 2013, according to the World Bank organization global health expenditure. Health is the state subject in India and consequently, analysis of public health expenditures by States assumes greater significance. To understand how priority has been accorded to the health sector, the health expenditure is presented in per capita terms as a ratio of Gross Domestic Product (GDP), Gross State Internal Product (GSDP) and finished expenditure of the Centre and State power respectively. To understand the implications of changing chart of the government spending a methodical analysis of compositional change in health expenditure and the encounter of the change in disparate health strategies and macroeconomic conditions is analyzed. Public expenditure on health has been less than one percent of GDP in India. The health sector in India is the obligation of the state, innate and additionally the central government. The centre is accountable for condition services in coalition regions lacking an assembly and is additionally accountable for growing and monitoring nationwide standards and regulations including the states alongside backing associations, and sponsoring countless schemes for implementation by state governments. It is well

known factor that expenditure on health is a functional instrument to the socio-economic welfare of the people (Rao and Choudhury 2012).

The impact of this situation on health expenditure depends on how the government has accorded priority to the health sector. Regarding to the health strategy initiatives, the National Rural Health Mission (2005) of India has set a motivated aim of rising in government health spending to 2-3 per cent of GDP. This Mission has additionally mandated that some of the central funds, that were proceeding routed through states budget (particularly under Central Sponsored and Plan Schemes CSS/CPS), will bypass the state budget and will be implemented through states implementing agencies. Consequently, this changing nature of central transfer can affect the health expenditure of the state governments. Though has shown the positive impact on health expenditure. The health expenditure shows increasing trend after the implementation of NRHM- national rural health mission (about 1.4 % of GDP in 2014). Though, the state governments are also asked to increase their funding (along with the centre) in health. The central devolution of fund to states is established on conditionality i.e., states demand to increase their own spending on health at a specified rate in tandem with increased central funding.

Experts felt it is hard to monitor the central funds by passing through state implementing associations and differentiate whether these funds have been requested efficiently at the ground level. Further, along with this changing path of central transfer, the commercial connection amid centre and state in a combined construction becomes unnecessarily complex. The finished analysis confirms that India

and its states are shying away from fulfilling its constitutional promise of 'Right to Health' for its citizens. We observed that public health sector has not ever been given adequate resources to present well in India. Given the low level, failing and fluctuating actions of health expenditure above the last twenty-five years, it is not stunning that the health sector management had not been satisfactory. The failing nature of larger health

outcome though can easily be reversed with increased allocation in this sector. Specifically, India needs to double or triple its health expenditure from its continuing level. Along with the commitments of health expenditure, it becomes vital to safeguard that the allocated supplementary area funds become consumed efficiently across its constituent states

Table -1
Health Expenditure in different Countries: Selected Indicators (2014)

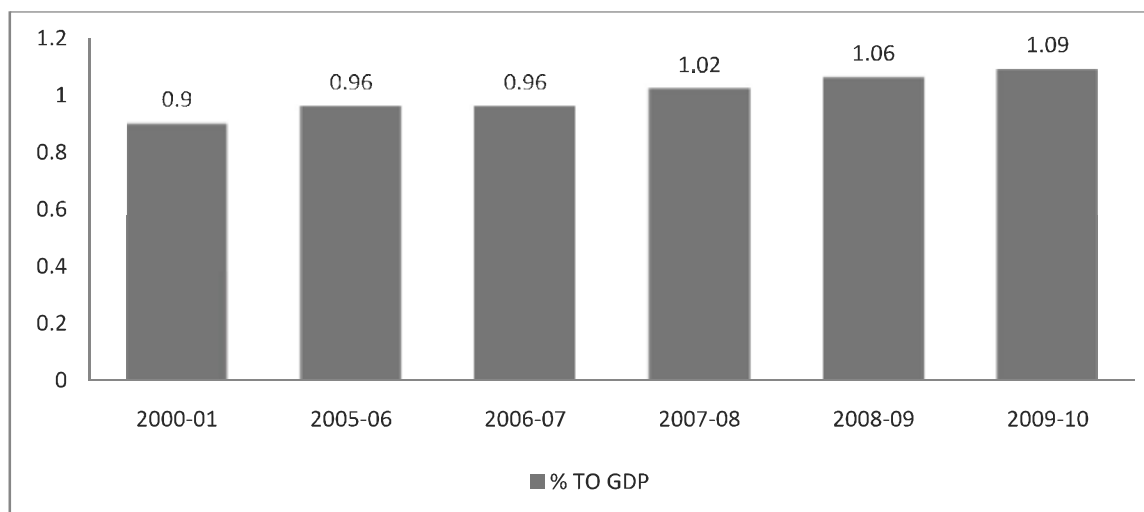
Countries	Per capita total expenditure on health(PPP int.\$)	Per capita government expenditure on health(PPP int.\$)	Total expenditure on health as percentage of GDP	OOP Expenditure as a % of private expenditure on health
Australia	4357	6031	9.4	18.8
Bangladesh	88	31	2.8	67.0
Brazil	1318	947	8.3	25.5
Canada	4641	5292	10.4	13.6
China	731	420	5.5	32.0
France	4508	4959	11.5	6.3
Germany	5182	5411	11.3	13.2
India	267	75	4.7	62.4
Japan	3727	3703	10.2	13.9
Philippines	329	135	4.7	53.7
Sri lanka	369	127	3.5	42.1
UK	3377	3935	9.1	9.7
USA	9403	9403	17.1	11.0

Source: Data.worldbank.org/indicator/SH.XPD.TOTL.ZS

The per capita income of total expenditure on health is (17.1) high in U.S.A (, Germany (11.3), Canada (10.4), UK and France (9.1 & 11.5) respectively. All the developed nations' expenditure on health is more than developing

countries. India (4.7) is developing country so it needs to contribute to health expenditure plans. Health care expenditure is necessary for the social and human development.

Table -2
Trends in Public Health Expenditure (as per cent of GDP) in India 2010



Source: GOI, "National Health Profile 2010", Ministry of health and family welfare, New Delhi and also compiled from various budget documents.

Trends in public health expenditure show consistent increase. In 2001 it was 0.9(per cent of GDP) and 2007-08 it was 1.02. Also it shows in 2008-09 it was 1.06 and in the year and during 2009-10 it was 1.09 of total GDP were found spent. Though gradual increase can be seen over the

period of time, however it was not found satisfactory by the experts and also it is very low when compare to the other major countries of the world.

Table -3
Fund flow to Health Sector by Source in India, 2004-2005

Source of funds	Expenditure (in millions)	Percentage Distribution
A)Public funds		
Central government	90,667	6.78
State government	1,60,171	11.97
Local bodies	12,292	0.92
Total-A	2,63,130	19.67
B)Private funds		
Households	9,51,538	71.13
Social Insurance funds	15,073	1.13
Firms	76,643	5.73
NGOs	879	0.07
Total -B	1,044,133	78.05
C) External flows		
Central government	20,884	1.56
State Government	3,272	0.24
NGOs	6,337	0.47
Total -C	30,493	2.28
Grand Total	1,337,756	100.00

II SOURCES

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Fund flow table status how much total health expenditures contribute towards public sector-19.67, private sector-78.05 and external flows 2.28. Under private funds, all four expenditure contribute some portion like 71.13%, 1.13%, 5.73 and 0.07%. Basically, in the health system, it is mainly privatised. Public funds not more than private funds, so public sector is quite unsatisfactory up to the mark.

Table-4
Household Health Expenditure by Different Source of care in India

Type of service	2011-12	2013-04	Growth rate (Rs)
Outpatient –rural	44190.49	53510.17 (43.15)	13.15
Outpatient-urban	26504.12	244325.01 (21.13)	14.12
Inpatient-rural	7526.46	11067.15 (11.11)	17.44
Inpatient-urban	5250.12	7954.1 (6.22)	15.11
Child birth	2168.11	2491.23 (3.44)	6.12
Ante-natal care(ANC)	2383.27	3128.22 (3.30)	14.57
Post-natal care (PNC)	1028.12	1419.21 (2.40)	17.49
Immunization	55.4.71	611.34 (0.52)	13.33
Contraceptives	422.34	583 .22 (0.46)	14.42
Self-care	1147.27	1438.23 (1.64)	13.7
Total	90620.3	325944.7 (100)	135.49

Note: figures in parentheses indicate percentages.

Source: estimated from the 52nd round of the NSS, using 2001 population census and applying growth rates worked out from the 50th and 55th rounds of the NSS quoted in financing and delivery of the health care services in India. NCMH, 2005.

From consumption expenditure on health care with government contribution for developing countries

like India. It shows that since 1995-96, household expenditure on health has been increasing 13.94 overall totals. India spends 33,253cr in 1995-96 again in 2001-2002 it increased to 72758.72cr. Overall estimation found to close 100000cr during 2003-2004.

Table - 5
Five year Plan Outlays on Health Sector in India

Five plans	total plan outlay (Rs. in crore)	Health sector allocation (Rs. in crore)	CAGR	
			Total plan outlay	Health sector
First plan	1960.0	65.3(3.4)	-	-
Second plan	4672.0	145.8(3.1)	18.97	17.43
Third plan	8576.5	250.8(2.9)	12.92	11.46
Fourth plan	15778.8	613.5(3.9)	12.97	19.59
Fifth plan	39426.2	1252.6(3.1)	20.10	15.35
Sixth plan	109291.6	3412.2(3.1)	22.62	22.19
Seventh plan	218729.6	6809.4(3.1)	14.89	14.82
Eighth plan	434100.0	14102.2(3.2)	14.89	15.67
Ninth plan	859200.0	35204.9(4.1)	14.63	20.08
Tenth plan	1484131.3	58980.3(3.9)	11.55	10.85
Eleventh plan	2156571.0	140135.0(6.5)	7.76	18.92

NOTE: figures in brackets indicate percentage to total plan investment outlay; health sector includes health, family welfare and AYUSH; CAGR-compound annual Growth Rate.

Source: Government of India (2010), “National health profile 2010”, Ministry of Health and family welfare, New Delhi.

During 1st plan health sector received 3.4 % of total plan outlay. During the eleventh plan, allocation on total health sector was Rs140135 cr. The CAGR plan outlay during the second plan was 18.97% during the forecast period the maximum growth rate was high in the sixth plan and lowest was in the tenth plan.

Table - 6
Level of Health Expenditure by the Private and Government Sectors in India (in %)

Year	Private	Government
2008	77.3	19.4
2009	73.4	18.3
2010	77.6	18.5
2011	75.0	23.0
2012	73.8	24.3
2013	71.6	25.6
2014	70.2	26.7

Source: GOI National Health profile 2014, Ministry of Health and Family and Welfare, New Delhi.

In 2008 expenditure on health by the private sector and public sector is shown is 77.3 and 19.4 respectively. Government expenditure has increased from 2011 onwards. It is found that health expenditure by the privatized sector is more than the government expenditure. The Govt. health care expenditure is not sufficient in order to meet the growing healthcare demand.

III DISCUSSION

Health is the most crucial sector of the economy as it decides the level of human progress as well as the working efficiency of a workforce. This study has found that the expenditure on the health sector in India is extremely low after contrasted compared with the advanced nations. The Health sector in India is the liability of the state, local and additionally the central government. Better health is central to human happiness and well-being. But in terms of service deliverance, it is extra concerned with the state. To know the implications of changing outline of power paying a methodical analysis of compositional change in health expenditure and the impact of the change in different health strategies and macroeconomic conditions is analyzed. The centre is held responsible for growing and monitoring nationwide standards without a legislature and is also responsible for developing and monitoring national standards and regulation, relating the states with funding agencies, and sponsoring many schemes for implementation by state governments. The health expenditure is presented in per capita terms as a ratio of Gross Domestic Product (GDP), Gross State Internal Product (GSDP) and finished expenditure of the Centre and State power respectively. Among the determinants of health expenditure, the per capita income and fiscal capacity of a particular state turn positive and important in ascertaining the per capita area expenditure on health in Indian states. The impact of both these variables curved out to be together with elevated coefficient worth for EAG states (Empowered Action Group) difference to the other. The health strategy reform (NRHM) has made a

huge difference in area of health expenditure in India. The expenditure on health is recorded considerably important after the implementation of NRHM difference to the pre- NRHM periods. The state's priority on various public health issues is keep changing today. The governmental participation additionally influences the condition expenditure in India. The macroeconomic and health strategy adjustments in India have generated little hopes, fear and difficulty in spending on various health issues.

Health strategies turned ineffective even to come to the needy level of resources for providing basic health facilities. Fund allocation towards rural span (with missing health facility), preventive services, medicines and equipment was recorded to be noticeably low and inadequate with a declining trend. After the National Rural Health Mission (NRHM, 2005), public funds in health somewhat increased but remained lower than the ambitious commitment of 2–3 percent of gross domestic product (GDP). Central fund transfer to the state, which was (before NRHM) bypassing across the state budget, nowadays bypasses the state budget. This has arose in discontinuation of a little of the condition programmes/schemes running in the states and additionally made the centre–state finance relation extra complex.

IV CONCLUSION

Health care expenditure is extremely important for the social and human development for every country. The paper aims at analyzing the level and development of area expenditure on health in India. The per capita income of total expenditure on health is high in all the developed countries when to compare to developing countries. Though there is significantly increased in plan allocation by the central government in the eleventh five-year plan under the NRHM. The expenditure on health is recorded significantly high after the implementation of NRHM compare to the pre-NRHM periods. The state's priority variable turned significant only for EAG (Empowered Action Group) states but not for the other states. The

following participation also influences the health expenditure in India. The levels of complete power spending on health are absurdly low after contrasted with global standards, not just in per capita terms but as well as allocate for GDP. Government expenditure on health records to less than one percent of GDP. The government has to enhance potential, equality and quality of its health care services as well as maintain essential care to the poor and marginalized sections of the population.

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Factors Affecting Students Performance in Context of Improving Higher Education: A Case of Private Institute

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ABSTRACT

Education is of several types and patterns. There is for example, the arts education, the scientific education, the religious education, the physical education. In India, as in other countries, much stress has been laid on the promotion of technical education since the attainment of independence. India's economic ills are sought to be overcome through a process of industrialization for which, in turn, technical education is very essential. In other words, technical education is a vital prelude to India's property. The scope of technical education is very comprehensive. It incorporates within itself all subjects of study in engineering and technology. Civil engineering, Mechanical engineering, Electrical engineering, Mining engineering, Aeronautical engineering, Metallurgical engineering, Industrial engineering, Chemical engineering, Agricultural engineering, Production engineering, and a host of other fields of engineering form part of technical education. "Quality in technical education is a complex concept that has eluded clear definition. There are a variety of stakeholders in higher education including students, employers, teaching and non-teaching staff government and its funding agencies, accreditors, valuers', auditors, and assessors (including professional bodies). Each of these stakeholders has a different view on quality, influenced by his or her own interest in higher education. For example, to the committed scholar, the quality of higher education is its ability to produce a steady flow of people with high intelligence and commitment to learning that will continue the process of transmission and advancement of knowledge. To the government, a high quality system is one that produces trained scientists, engineers, and architects, doctors and so on in numbers judged to be required by society. The present work enlightens same path, so as to fulfil the demands of market and to improve quality of education in the present work some quality tools such as LINEAR PROGRAMMING, TQM, QUALITY FUNCTION DEPLOYMENT, with chi square testing and mat lab, have been used. Basic primary tool used is LPP which helps in converting demand of customer to action. It helps in understanding unspoken needs of customer which are desperately needed to be fulfilled. In this improvement work main focus was on improvement of labs and teaching staff, for maintenance of labs & improvement in teaching, use of quality circle is stressed with concept of TPM and Kaizen approach. Most interesting thing of using these tools was that they helped in achievement of desired target without much added resource, only refinement of procedure; moreover maintenance helps in gaining knowledge with saving extra expenditure. This also helps in up gradation of quality of products which satisfies external customer.

Key words : QFD,CHI Square Testing, LPP, MATLAB, Statical Analysis

I INTRODUCTION

India's higher education system is the world's third largest in terms of students, next to China and the United States. Unlike China, however, India has the advantage of English being the primary language of higher education and research. India educates approximately 11 per cent of its youth in higher education as compared to 20 per cent in China. The main governing body at the tertiary level is the University Grants Commission (India), which enforces its standards, advises the government, and helps coordinate between the centre and the state. Universities and its constituent colleges are the main institutes of higher education in India. At present in 2011, there are 227 government-recognized Universities in India. Out of them 20 are central universities, 109 are deemed universities and 11 are Open Universities and rest are state universities. Most of these universities in India have affiliating colleges where undergraduate courses are being taught. According to the Department of higher Education government of India, 16,885 colleges, including 1800 exclusive women's colleges functioning under these universities and institutions and there are 4.57 lakh teachers and 99.54 lakh students in various higher education institutes in India. Apart from these higher education institutes there are several private institutes in India that offer various professional courses in India. Distance learning is also a feature of the Indian higher education system.

II REVIEW OF LITERATURE

All of the research review supports the hypothesis that student performance depends on different socio-economic, psychological, environmental factors. The findings of research studies focused that student performance is affected by different factors such as learning abilities because new paradigm about learning assumes that all students can and should learn at higher levels but it should not be considered as constraint because there are other factors like race and gender that can affect student's performance. Some of the researchers even tried to explain the link between students achievement, economic circumstances and the risk of becoming a drop-out that proved to be positive (Goldman N., Haney W., and Koffler S., 1988, Pallas A., Natriello G., McDill B., 1989, Levin H., 1986) B.A. Chandrashekhar and A. Mishacloudis (2001), explained the effects of age, qualification distance from learning place etc. on student performance. The performance of students on the module is not affected by such factors as age, sex and place of residence but is associated with qualification in quantitative subjects. It is also found that those who live near the university perform better than other students. Yvonne Beaumont Walters, kola soyibo, (1998) further elaborated that student performance is very much dependent on SEB (socio economic back ground) as per their statement, "High school

students' level of performance is with statistically significant differences, linked to their gender, grade level, school location, school type, student type and socio-economic background (SEB). Kirby, Winston et al. (2002) focused on student's impatience (his time-discount behaviour) that influences his own academic performance. Goethe found out that weak students do better when grouped with other weak students. (As implied by Zajonc's analysis of older siblings (1976) it shows that students' performance improves if they are with the students of their own kind. There are often different results by gender, as in Hoxby's K-12 results (2000); Sacerdote (2001) finds that grades are higher when students have unusually academically strong roommates. The results of Zimmerman

(1999, 2001) were somewhat contradictory to Goethe results but again it proved that students performance depends on number of different factors, it says that weak peers might reduce the grades of middling or strong students.

- (a) Read already published work in the same field.
- (b) Goggling on the topic of your research work.
- (c) Attend conferences, workshops and symposiums on the same fields or on related counterparts.
- (d) Understand the scientific terms and jargon related to your research work.

III METHODOLOGY

Statistical techniques including regression analysis were used as a methodology. Data collected was primary through a well-defined questionnaire. A sample of private college students was taken where these variables were recognized and response was clear and understandable. Public sector educational institutions were not the focus of the study. A sample of 30 students was taken from a group of colleges. Students were grouped in a classroom they were briefed clearly about the questionnaire and it took on average half an hour to fill this questionnaire. Selection of students was at random. Out of these students only those were selected at random who were voluntarily willing to fill the questionnaires. The data was collected using a questionnaire administrated by the Research team in the 3rd month of 3rd year. The questionnaire dealt mainly with student profile based on his attitude towards Study, Strictness, Attendance, Age, Previous academic achievements, Daily life, etc. All 6 questionnaires were filled with the response rate of 100%.

The sample age composition was from 18 years to 22 years of age at maximum because Rajiv Gandhi Technical University of does not allow students over 22 years of age to be admitted in graduate classes.

IV BASIC IDEOLOGY



V LINEAR PROGRAMMING-

Linear programming (LP) techniques consist of a sequence of steps that will lead to an optimal solution to problems, in cases where an optimum exists. There are a number of different linear programming techniques; some are special-purpose (i.e., used to find solutions for specific types of problems) and others are more general in scope. This supplement covers the two general-purpose solution techniques: graphical linear programming and computer solutions. Graphical linear programming provides a visual portrayal of many of the important concepts of linear programming. However, it is limited to problems with only two variables. In practice, computers are used to obtain solutions for problems, some of which involve a large number of variables.

Linear programming is a powerful quantitative tool used by operations managers another manager to obtain optimal solutions to problems that involve restrictions or limitations, such as the available materials, budgets, and labour and machine time. These problems are referred to as constrained optimization problems. There are numerous examples of linear programming applications to such problems, including:

- (a) Establishing locations for emergency equipment and personnel that will minimize response time
- (b) Determining optimal schedules for airlines for planes, pilots, and ground personnel
- (c) Developing financial plans
- (d) Determining optimal blends of animal feed mixes
- (e) Determining optimal diet plans
- (f) Identifying the best set of worker-job assignments
- (g) Developing optimal production schedules
- (h) Developing shipping plans that will minimize shipping costs
- (i) Identifying the optimal mix of products in a factory

VI LINEAR PROGRAMMING MODELS

Linear programming models are mathematical representations of constrained optimization problems. These models have certain characteristics in common. Knowledge of these characteristics enables us to recognize problems that can be solved using linear programming. In addition, it also can help us formulate LP models. The characteristics can be grouped into two categories: components and assumptions. First, let's consider the components. Four components provide the structure of a linear programming model:

- (a) Objective
- (b) Decision variables
- (c) Constraints
- (d) Parameters.

Linear programming algorithms require that a single goal or objective, such as the maximization of profits, be specified. The two general types of objectives are maximization and minimization. A maximization objective might involve profits, revenues, efficiency, or rate of return. Conversely, a minimization objective might involve cost, time, distance travelled, or scrap. The objective function is a mathematical expression that can be used to determine the total profit (or cost, etc., depending on the objective) for a given solution. Decision variables represent choices available to the decision maker in terms of amounts of either inputs or outputs. For example, some problems require choosing a combination of inputs to minimize total costs, while others require selecting a combination of outputs to maximize profits or revenues.

VII THE MODEL

Simple linear regression analysis was used to test the hypothesis-

Coefficients are $b_1, b_2, b_3, b_4, b_5, b_6$

VIII THE DATA

A student profile was developed on the basis of information and data collected through survey to explain student's attitude towards explanatory variables. The first variable "attendance in class" explains student's attitude towards class attendance, which reflects his level of interest in learning. Student's attitude towards time management for studies is reflected through number of hours spent in study after college, is taken as second variable. Third variable of the study is family income that reflects the comforts and facilities available for

study. The fourth variable is "Question banks/reference book", that is, how many books a student refers for his studies. The fifth variable is "type of study" which shows whether the student studies in a group or studies individually. The last variable shows the residential status of student, describing whether the student is a Day scholar or a Hosteler.

Student's performance in intermediate examination is taken as dependent variable and rest of the variables, which construct student profile, are taken as independent variables.

This table explains expected relation of dependent variables these expected relations are also myths pervading in Indian society so the results of this study are to accept or reject these myths. The table explains students performance due to student's attitude towards studies based on student's profile developed on the basis of information and data collected. It is assumed that student is still carrying his profile as it is.

VARIABLE	EXPECTED RELATIONSHIP	EXPLANATION
Attendance in Class	Positive	A regular student is more serious in studies
Family Income	Positive	It is assumed affluence gives more facilities to learn
Study hours per day after College	Positive	It is assumed that more study hours results in good grade/division/ performance
Books Referred	Positive	More books referred results in better grasp of the concept
Type of Study	Positive	Group study results in healthier studying environment, hence better result
Hosteler/Day Scholar	Positive	Hostelers are found to be more dedicated in their studies

IX EXOGENOUS (INDEPENDENT) VARIABLE

ATT= Attendance % age, it represents how many classes student attends in a week and that shows seriousness and attitude towards studies.

SH= Study hours, it represents how many hours a student spends on study after attending the class in college again it shows how much serious the student takes the studies.

FI= family income, it represents the level of affluence of the student, how much facilities, comfort the student can acquire.

BR= Book reference, it represents the quality of knowledge student is gaining, whether he is using a quality book or only a question bank.

TS= Type of Study, it represents the type of study like group or individual in which he study with many suggestion or study individual.

RS= Residential status, it represents the status that whether he is a day scholar or hosteller so that how much beneficial time he is getting.

Endogenous (dependent) variables
Y= Student's performance

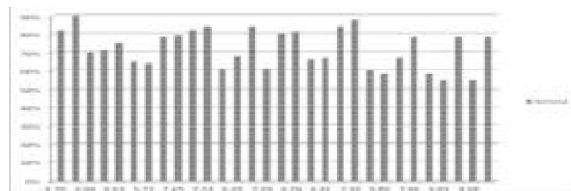
X ANALYSIS OF DATA

S N	RESU LT	SGP A	CGP A	Compartment (SUBJECT)	Family income (Lakhs)	Attendance	Reference book/ Question Bank	Hosteler/Day scholar	Study Hours per day	Type of study
1	FAIL	6.06	6.76	ME403	4.20	82%	Reference book	Day Scholar	1.75	Group
2	FAIL	6.63	6.91	ME404	3.2	90%	Question Bank	Day Scholar	1.75	Group

3	PASS	6.31	6.66		3.4	70%	Reference book	Hostler	2	Individual
4	FAIL	6.13	6.26	ME403	3.3	71%	Question Bank	Hostler	1.5	Group
5	PASS	6.63	6.52		5	75%	Reference book	Day Scholar	1.5	Individual
6	FAIL	3.88	3.88	BE401, ME403, ME405	3	65%	Question Bank	Hostler	near test	Individual
7	FAIL	4.06	5.71	BE401, ME403, ME405	3.5	64%	Question Bank	Day Scholar	near test	Group
8	PASS	6.88	6.89		5	78%	Question Bank	Day Scholar	2	Group
9	PASS	7.75	7.15		3.6	79%	Question Bank	Hostler	2	Individual
10	PASS	7.5	7.70		2.5	82%	Reference book	Day Scholar	2.5	Individual
11	PASS	8.19	7.74		3.6	84%	Reference book	Day Scholar	2.5	Individual
12	FAIL	3.88	5.16	ME403, ME404, ME405	2.8	61%	Question Bank	Day Scholar	near test	Group
13	FAIL	6.19	6.29	ME403	2.3	68%	Question Bank	Hostler	1.5	Group
14	PASS	7.00	7.39		3.7	84%	Question Bank	Hostler	2	Individual
15	PASS	7.31	7.35		3.2	61%	Reference book	Day Scholar	2	Individual
16	PASS	7.31	7.16		3.9	80%	Question Bank	Hostler	2	Group
17	PASS	7.19	6.76		2.3	81%	Question Bank	Day Scholar	2	Group
18	FAIL	4.94	4.82	ME403, ME404	2.1	66%	Question Bank	Day Scholar	near test	Group
19	FAIL	5.19	6.31	ME403, ME405	3.8	67%	Question Bank	Day Scholar	1.5	Individual
20	PASS	7.31	7.03		2.5	84%	Reference book	Day Scholar	2	Individual
21	PASS	7.69	7.43		4.1	88%	Question Bank	Day Scholar	2.5	Individual
22	PASS	5.94	6.71		2.8	60%	Question Bank	Day Scholar	1.5	Group
23	PASS	6.13	5.86		2.3	58%	Question Bank	Day Scholar	1.5	Group
24	FAIL	4.88	5.89	ME403, ME405	2.5	67%	Question Bank	Day Scholar	near test	Individual
25	PASS	7.56	7.66		4	78%	Reference Book	Day Scholar	2.5	Individual
26	FAIL	3.88	4.97	BE401, ME403, ME405	2.4	58%	Question Bank	Hostler	near test	Individual
27	FAIL	5.06	6.01	ME403, ME405	2.7	55%	Question Bank	Hostler	near test	Individual
28	PASS	7.50	7.36		3.4	78%	Question Bank	Hostler	2	Group
29	FAIL	4.13	4.58	BE401, ME403, ME405	2.6	55%	Question Bank	Day Scholar	near test	Individual
30	FAIL	6.63	6.08	ME403	2.2	78%	Question Bank	Hostler	1.5	Individual

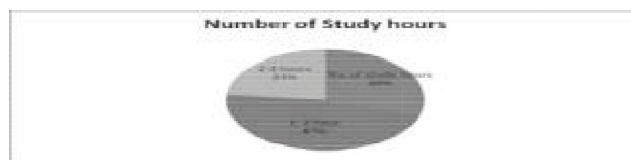
XI RELATION OF ATTENDANCE TO CGPA OF STUDENTS

Attendance % age, it represents how many classes student attends in a week and that shows seriousness and attitude towards studies.



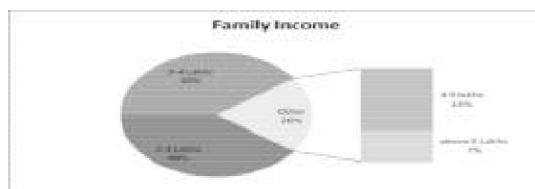
XII NUMBER OF STUDY HOURS

Time student spends on study after attending the class in college again it shows how much serious the student takes the studies.



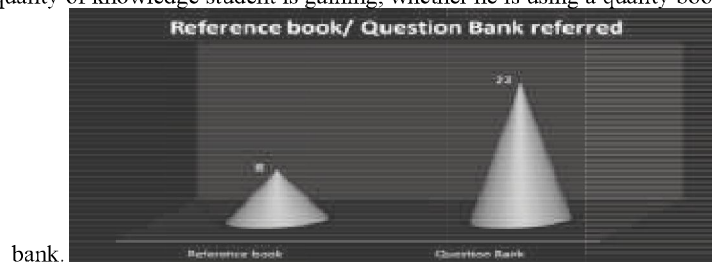
XIII FAMILY INCOME

It represents the level of affluence of the student, how much facilities, comfort the student can acquire.



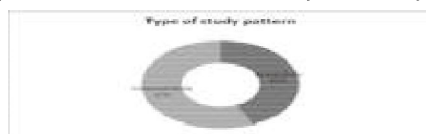
XIV REFERENCE BOOKS / QUESTION BANKS REFERRED

It represents the quality of knowledge student is gaining, whether he is using a quality book or only a question bank.



XV TYPE OF STUDY PATTERN

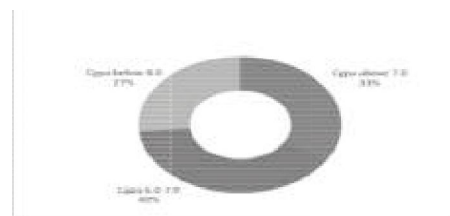
It represents the type of study like group or individual in which he study with many suggestions or study individual.



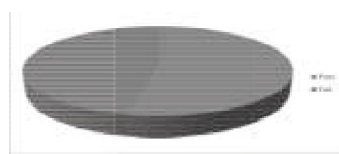
XVI THE RESULTS OF INTERMEDIATE EXAMINATION ARE TAKEN AS STANDARD OF STUDENT PERFORMANCE.

$$I. Y = a + b_1ATT + b_2SH + b_3FI + b_4BR + b_5TS + b_6RS$$

XVII RATIO OF CGPA DISTRIBUTION AMONG STUDENTS



XVIII RATIO OF PASSED AND FAILED STUDENTS



XIX COMPARISON OF EXPECTED RESULTS AND RESULTS OF THE STUDY-

Variable	Expected Relationship	Explanation	Results Of study
Attendance in class	Positive	A regular student is more serious in studies	Positive
Family income	Positive	It is assumed affluence gives more facilities to learn	Negative
Study hours per day after college	Positive	It is assumed that more study hours results in good grade/division/performance	Negative
Book referred	Positive	More books referred results in better grasp of the concept	Positive
Type of study	Positive	Group study results in healthier studying environment, hence better result	Negative
Hosteller/Day Scholar	Positive	Hostellers are found to be more dedication in their studies	Positive

XX CHI SQUARE SOLUTION FOR VALIDATION OF RESULT

parameter	A	B	C	D	E	Total
Family income	4.2	3.20	3.40	3.30	5	19.10
Study hours	1.75	1.75	2	1.50	1.50	8.50
sgpa	6.06	6.63	6.31	6.13	6.63	6.63
TOTAL	12.01	11.58	11.71	10.93	13.13	59.36

XXI CALCULATION FOR CHI SQUARE (χ^2)

$$(\chi^2) = \sum \frac{(o-e)^2}{e} \quad d.o.f = (m-1)(n-1)$$

Expected frequency is calculated as

$$E_{r,c} = (n_r * n_c) / n$$

<i>o</i>	<i>e</i>	<i>o-e</i>	<i>(o-e)²</i>	<i>(o-e)²/e</i>
4.2	3.86	0.34	0.1156	0.03
3.2	3.73	-0.53	0.2809	0.075
3.4	3.77	-0.37	0.1369	0.036
3.3	3.52	-0.22	0.0484	0.014
5	4.23	0.77	0.05929	0.014
1.75	1.72	0.03	0.0090	0.005
1.75	1.66	0.09	0.0081	0.004
2	1.68	0.32	0.1024	0.061
1.5	1.57	-0.07	0.0049	0.003
1.5	1.89	-0.39	0.1521	0.08
6.06	6.43	-0.37	0.1369	0.021
6.63	6.20	0.43	0.1849	0.03
6.31	6.27	0.04	0.0016	0.002
6.13	5.85	0.28	0.0784	0.013
6.63	7.03	-0.40	0.1600	0.022

$$(\chi^2) = \sum \frac{(o-e)^2}{e} = 0.536, < \text{TABULATEDVALUE}, (\chi^2)_{0.05} = 15.51$$

Therefore, hypothesis accepted

Chi-Square Distribution

Degrees of Freedom (df)	Probability (p)										
	0.95	0.90	0.80	0.70	0.50	0.30	0.20	0.10	0.05	0.01	0.001
1	0.004	0.02	0.06	0.15	0.46	1.07	1.64	2.71	3.84	6.64	10.83
2	0.10	0.21	0.45	0.71	1.39	2.41	3.22	4.60	5.99	9.21	13.82
3	0.35	0.58	1.01	1.42	2.37	3.66	4.64	6.25	7.82	11.34	16.27
4	0.71	1.06	1.65	2.20	3.36	4.88	5.99	7.78	9.49	13.28	18.47
5	1.14	1.61	2.34	3.00	4.35	6.06	7.29	9.24	11.07	15.09	20.52
6	1.63	2.20	3.07	3.83	5.35	7.23	8.56	10.64	12.59	16.81	22.46
7	2.17	2.83	3.82	4.67	6.35	8.38	9.80	12.02	14.07	18.48	24.32
8	2.73	3.49	4.59	5.53	7.34	9.52	11.03	13.36	15.51	20.09	26.12
9	3.32	4.17	5.38	6.39	8.34	10.66	12.24	14.68	16.92	21.67	27.88
10	3.94	4.86	6.18	7.27	9.34	11.78	13.44	15.99	18.31	23.21	29.59
	N										

Validation through matlab(taking 3*3 matrix)

```
[x,y,z]=solve('4.2*x+3.2*y+3.4*z=10.8','1.75*x+1.75*y+2*z=5.50','6.06*x+6.63*y+6.31*z=19')
```

```
[p,q,r]=solve('4.2*x+1.75*y+6.06*z=12.01','3.2*x+1.75*y+6.63*z=11.58','3.4*x+2*y+6.31*z=11.71')
```

```
%subplot(2,2)
```

```
%subplot(2,1,1);
```

```
%hold on
```

```
x
```

```
y
```

```
z
```

```
p
```

```
q
```

```
r
```

```
%i=[x y z];
```

```
%j=[p q r];
```

```
%plot(i,j);
```

```
%subplot(2,1,2);
```

```
%plot(y,q);
```

```
%subplot(2,2,1);
```

```
%plot(z,r);
```

Value obtained x=y=z=p=q=r=1

XXII DISCUSSIONS

The objective of this study was to quantify the relationship between the different factors that are considered responsible of affecting the student performance along with providing base

for further research regarding student performance. Selecting these combination of variables do have some objectively like. It was expected that relationship between dependent variable and student attitude towards attendance is positive because regularity shows the effort and seriousness of student about his or her studies. It is believed that the relationship between dependent variable and student family income is positive because money can buy you all comfort that you need to concentrate on your studies but the result could not prove this relation because student belonging to more prosperous/affluent family do not give proper weight to studies although this value is very small but still it reflects the insignificance of affluence that is affluence cannot make a student serious about his studies or if a student want to study then affluence is not a prerequisite but still it requires more research to explain the phenomenon. It is still believed strongly that relationship between dependent variable and student attitude towards time allocation for per day after college are positively related but the result could not prove this relation because more study hours are not significant as far as student performance is concerned. It may depend on intelligence level, intellect, memory or method or learning of the student although this value is very small yet it reflects of personal characteristics of student. Further research is required to explore this relation. It is believed that book reference also has great effect on performance of students that if students are referring to books it helps in increase of concepts and deep knowledge about the topic, and if one is studying from question banks then he cannot grasp more knowledge; yes but he can touch every topic with little knowledge. Selecting a type of study i.e. between Group and Individual affects the student performance. It is believed that Group studies have more impact over individual studies. If a student is studying in group he is scoring better marks than him who is studying individually. One more important attribute is Day scholar or Hosteller. It is found that student that are Hosteller perform better than Day scholar.

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A Novel Technique to End Menace of Plastic Waste – Ryrolysis

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ABSTRACT

This paper proposes a technique that can kill two birds with one stone: It will put an end to the menace of non-biodegradable plastic wastes and discarded tyres which host dengue- and malaria-causing mosquitoes; and it will do so by recycling the plastic and tyres by breaking them into smaller molecules transforming them into usable fuel for industrial boilers and furnaces besides in generating electricity. The proposal is for setting up plastic and discarded tyres recycling units which uses a technique called pyrolysis. The term Pyrolysis has its genesis in the Greek word 'pyro' meaning "fire" and 'lysis' meaning "separating". The thermal cracking or pyrolysis degrades the polymeric or plastic materials by heating them in the absence of oxygen at temperatures ranging from 450-600 degree Celsius.

I INTRODUCTION

Pyrolysis is a chemical reaction which involves molecular breakdown of larger plastic molecules into much smaller ones in the presence of heat ranging between 4500 Celsius and 6000 Celsius. But it has to be done in the absence of oxygen to prevent burning that is extremely harmful for health and environment.

The chemical process of heat-induced breaking down of plastic molecules leads to smaller molecules that lead to the formation of pyrolysis oil, gas and carbon black. "The plastic thus recycled turns into a carbonised char and a volatile fraction that may be separated into condensable hydrocarbon oil and a non-condensable high calorific value gas,

Its constructively reusable potential ensures that civic authorities are not posed with the huge problem of dealing with non-biodegradable plastic wastes and discarded tyres, nor have to worry about dumping those at landfills.

It is important that the heating process is done in the absence of oxygen - because oxygen can burn the plastic and tyres, to release toxic gases like dioxins, furans, mercury and polychlorinated biphenyls into the atmosphere. The burning of polyvinylchloride (PVC) liberates hazardous halogens and pollutes air and adversely impacts the climate. The toxic substances pose a threat to vegetation, human and animal health, and the environment.

II RECYCLING UNITS

Burnt plastic releases another toxic gas, polystyrene, which affects the human central nervous system. The hazardous brominated compounds act as carcinogens and mutagens.

Dioxins settle on the crops and in waterways where they eventually enter the human food chain and the body system, she explained.

It is proposed that recycling units using the pyrolysis technique be set up at ward-level in the city and village-level across the state to ensure that non-biodegradable plastic waste is not only completely eliminated but also reused positively without harming the environment in any manner. Ideally this model can be replicated across the country.

The management of municipal solid waste such as plastic is at the core of increasing concerns over city's municipal waste management system. Further detailed study can be carried out on the various aspects of plastic recycling through pyrolysis, effective solid waste disposal and explore the feasibility of generating bio-diesel from municipal plastic waste.

Much of the ongoing efforts at solid waste management in big cities are not directed towards the non-biodegradable wastes and their proper recycling. According to a study over 91 per cent of municipality solid waste being collected daily across Indian cities make their way to landfills, dumping yards or open lands. The pyrolysis units can take care of agricultural, domestic and plastic wastes and recycle them into useful by-products which can also be sold or disposed appropriately.

III ALARMING SITUATION

A new report by World Economic Forum and Ellen MacArthur Foundation released recently has predicted that by 2050, there will be more floating plastics in oceans than fish. Keeping in view of the gravity of the plastic menace the focus needs to shift to plastic recycling especially its thermal utilisation. A manufacturer in India could be identified who matched the needs for treating waste and provides the lab scale prototype which would be further scaled up to community level. This unit will be used to produce industrial plastic oil and the product will be analyzed in the lab for important parameters such as quality check. Japan, USA, UK and China manage their plastic wastes by extracting fuel from plastic solid waste. In India's

context, fuel from plastic can be an alternative sustainable fuel. However, there is a need for more study and research into the fuel from recycled plastic, says the environmental scientist. As per a United Nations Environment Programme (UNEP) estimate in 2007 global plastic waste accounted for over 250 million tonnes. That number is said to have gone up many times more since as the unmanaged plastic waste pose a serious threat to the earth and its fragile eco-system and environment. Not being biodegradable and with low density, plastic is a very difficult waste to dispose of in a landfill.

IV PLASTIC PYROLYSIS

Plastic and tire pyrolysis involves subjecting plastic/tyres to high temperature of 400 to 450 degree Celsius, in the absence of oxygen. That is because if oxygen is present the plastic will start burning.

During pyrolysis plastic or discarded used tyres break down into smaller molecules of pyrolysis oil, pyrolysis gas and carbon black.

Like plastic and tyres, pyrolysis end products are also hydrocarbons. Pyrolysis is great way of recycling waste plastics and tires.

V CONCLUSIONS

- (a) Recycles synergy of waste plastic and tire into usable fuel, Offers renewable energy source.
- (b) The end-product can be used as fuel in existing industrial boilers and furnaces and also for generating electricity.
- (c) It eliminates hazard of land pollution by waste plastics and tyres.
- (d) It converts waste into energy, Clears dumping yards and environment of non-biodegradable plastic and tyre wastes.

Performance Management System at Prism Cement Limited Satna (M.P.)

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ABSTRACT

Performance Appraisal is the important aspect in the organization to evaluate the employee's performance. It helps in understanding the employee work culture, involvement, and satisfaction. It helps the organization in deciding employee's promotion, transfer, incentive and pay increases. A Performance Appraisal is the final stage of the performance, management process (AMP). The entire process of performance management involves round the year association between supervisors and subordinates through stages of planning, coaching and evaluation of the performance at work. This research paper highlights the fact that by stressing effective performance management as a key tool of communication and motivation within organizations provides a competitive edge through strategic change and control. Developing external relationship, communicating this idea to employees and evaluating their commitment levels through structured parameters will help in achieving organizational objectives

I INTRODUCTION

Human Resource (or personnel) Management in the sense of getting things done through people is an essential part of every manager's responsibility but many organizations find it advantageous to establish a specialist division to provide an expert service dedicated to ensuring that the human resources function is performed efficiently.

"People are our most valuable asset" is a cliché, which no member of any senior management team would disagree with. Yet, the reality for

many organizations is that this People remain undervalued, under trained and underutilized.

An appraisal is a part of the evaluation stage that follows the successive stages of setting organizational targets, delegating individual responsibilities and importing the requisite training through various learning and development programmers. It is a formal assessment of the level accountability, behavioral patterns and development capabilities demonstrated by an individual within the time assigned to accomplish a task.

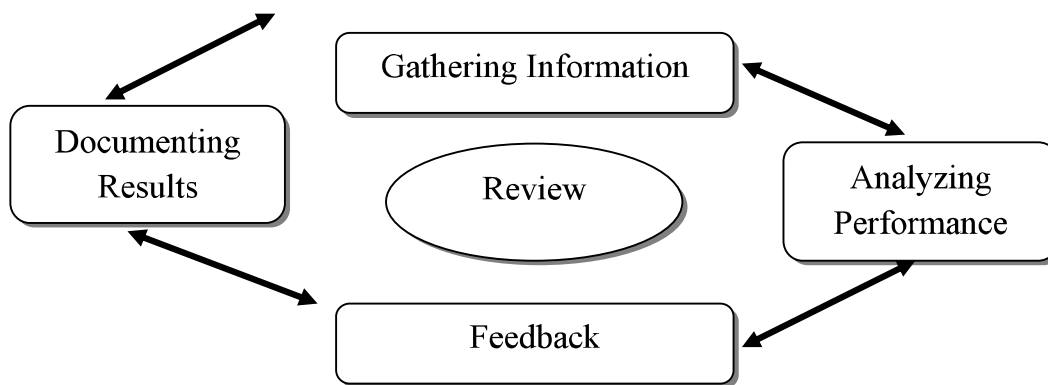


Fig 1 – Appraisal System

The system of performance appraisal is a 4-tier process that focuses on rendering the requisite support and guidance for the retention and development of the employees (fig 1). The procedure requires collecting, evaluating and disseminating the data regarding the employee's performance during tenure. This process involves a two-way communication between supervisor and employee after which the employee is rated are various performance indicators. The results of

the discussion are further, documented and used to enhance the future performance.

Companies the today's era focus on performance of employees which in turn helps the organization's performance. No doubt that effective performance management has become a core of HR. Organizations should develop employee competencies in a manner aligned with the organization's business goals. This can be achieved through performance management

systems which act as both behavioral change tool and enabler of performance management system improved organizational performance through being instrumental in driving change.

Performance appraisal is the method of evaluating the behavior of an employee at the work place, normally including with quantitative and qualitative aspect of job performance.

II MAIN OBJECTIVE AND METHODOLOGY

(a) Objective- To study the performance appraisal system at Prism Cement Limited, Satna (M.P.)

(b) Research Methodology – the method involved collection and analysis of primary and secondary data. Data refers to a collection of natural phenomenon description including the result of experience, observation or experiment. This may consist of numbers, words, or images, particularly a measurements or observations of a set of variables. For this research the primary data was collected through questionnaire using serving employees and personal interaction with them. Secondary data comprised readily available information on various company database, magazines, journal and write ups.

III DATA ANALYSIS & INTERPRETATION

(a) Performance Appraisal – Periodicity :

Periodicity	Score
1 Year	52.63%
1-2 Year	47.37%
2-4 Year	0%
4 Year	0%

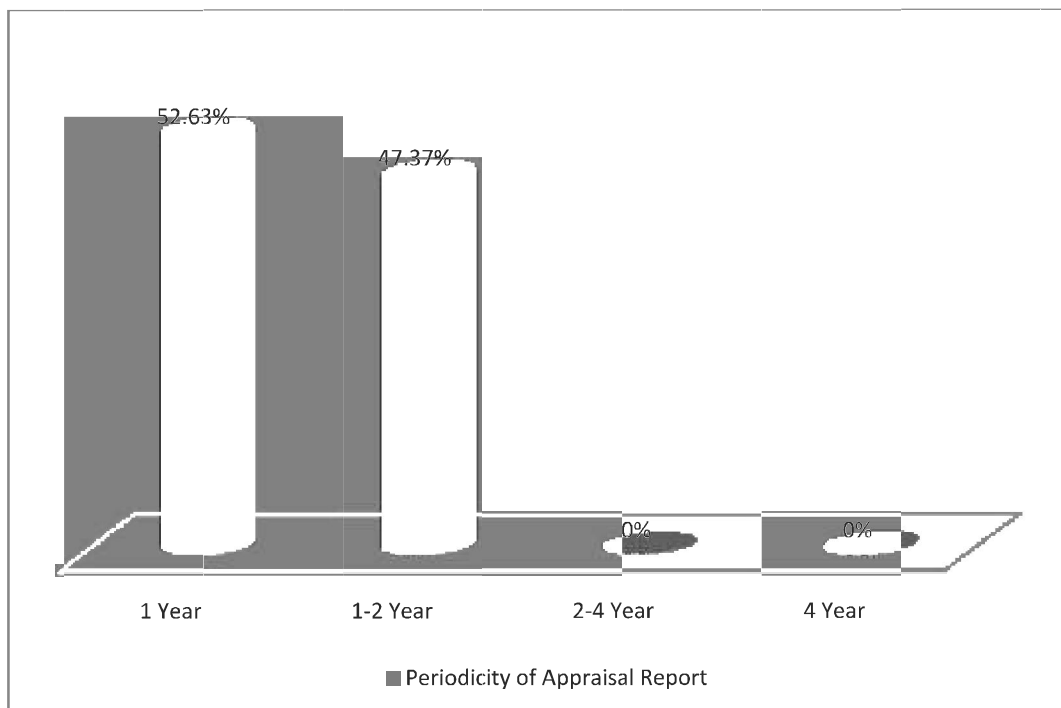


Fig 1 Periodicity of Appraisal Report

The data collected tabulated shows that performance of the employees of prism cement is appraised once or twice in a year.

(b) Performance Appraisal – Reporting Person

Who is Reporting Officer	Response
Immediate Superior	36.84%
H.O.D.	3.15%
Colleagues	0%
Others	0%

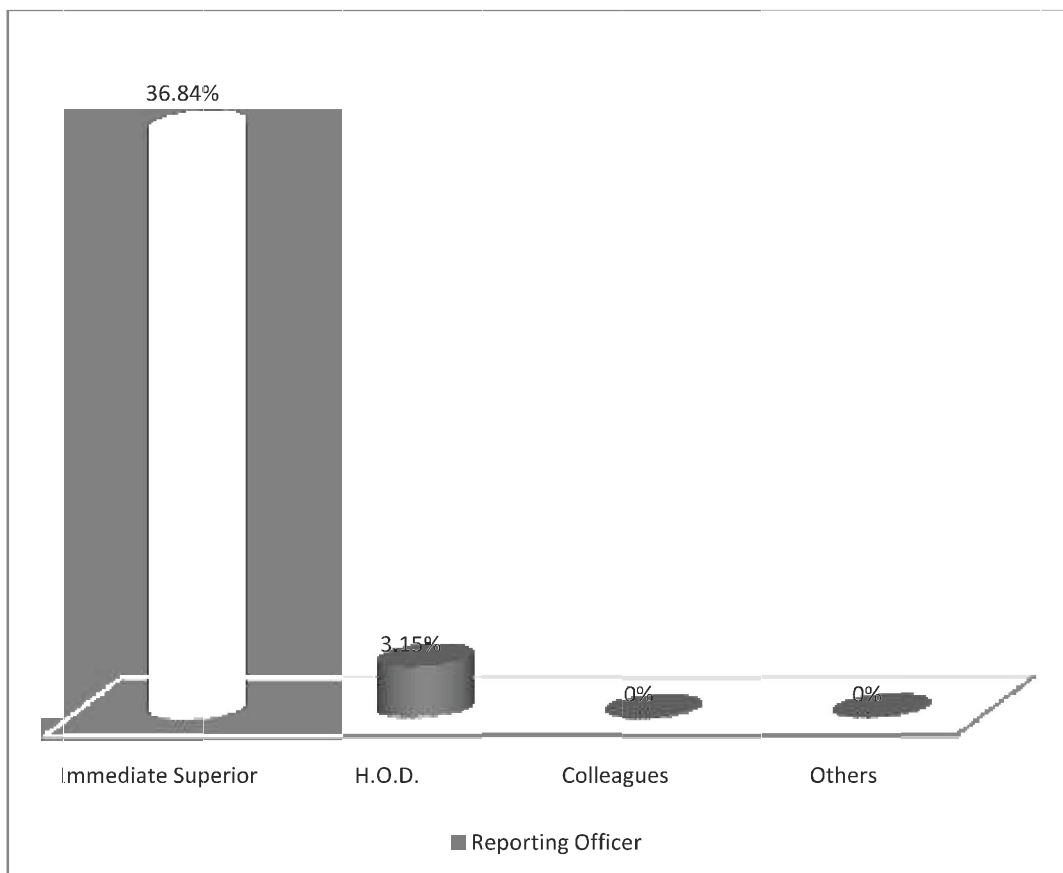


Fig 2 – Reporting Officer doing the Appraisal

The analysis of data as shown in Fig 2 brings out the fact that performance of employees is mostly appraised by their HOD but in case of newly

recruited employees the performance is appraised by their immediate supervisor.

(c) Time taken to appraise

How much Time taken to write report	Response
< 1 Day	36.84%
1 Day	31.57%
2 Days	21.05%
< 2 Days	10.52%

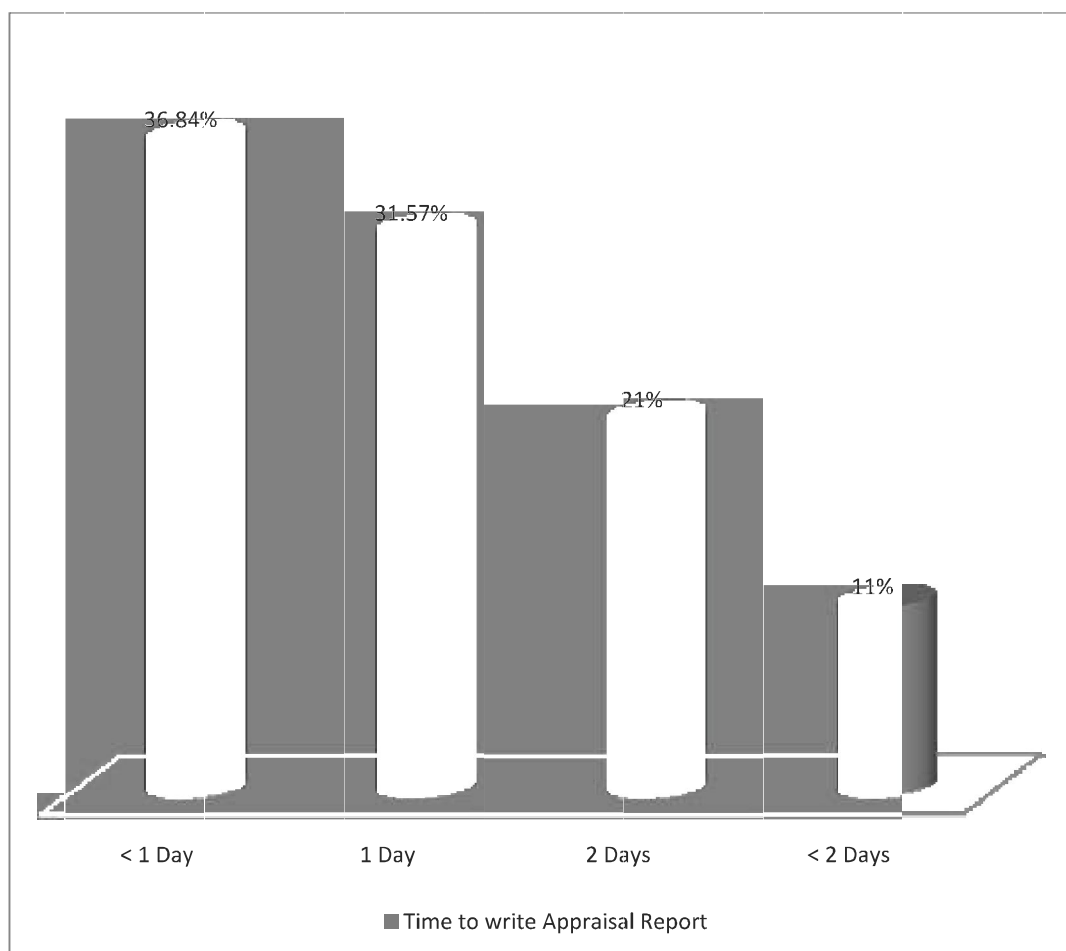


Fig 3 – Appraisal Report writing duration

The above data at fig 3 shows that there is no fixed criterion for the timings of performance appraisal of the employees of Prism Cement

Limited depending upon the recruitment it may vary from few hours to 2 days.

(d) The main aim of the appraisal

What is Aim of Appraisal	Response
Making reward decision	26.3%
Improving performance	52.63%
Motivation	10.52%
Formal Assessment	10.52%

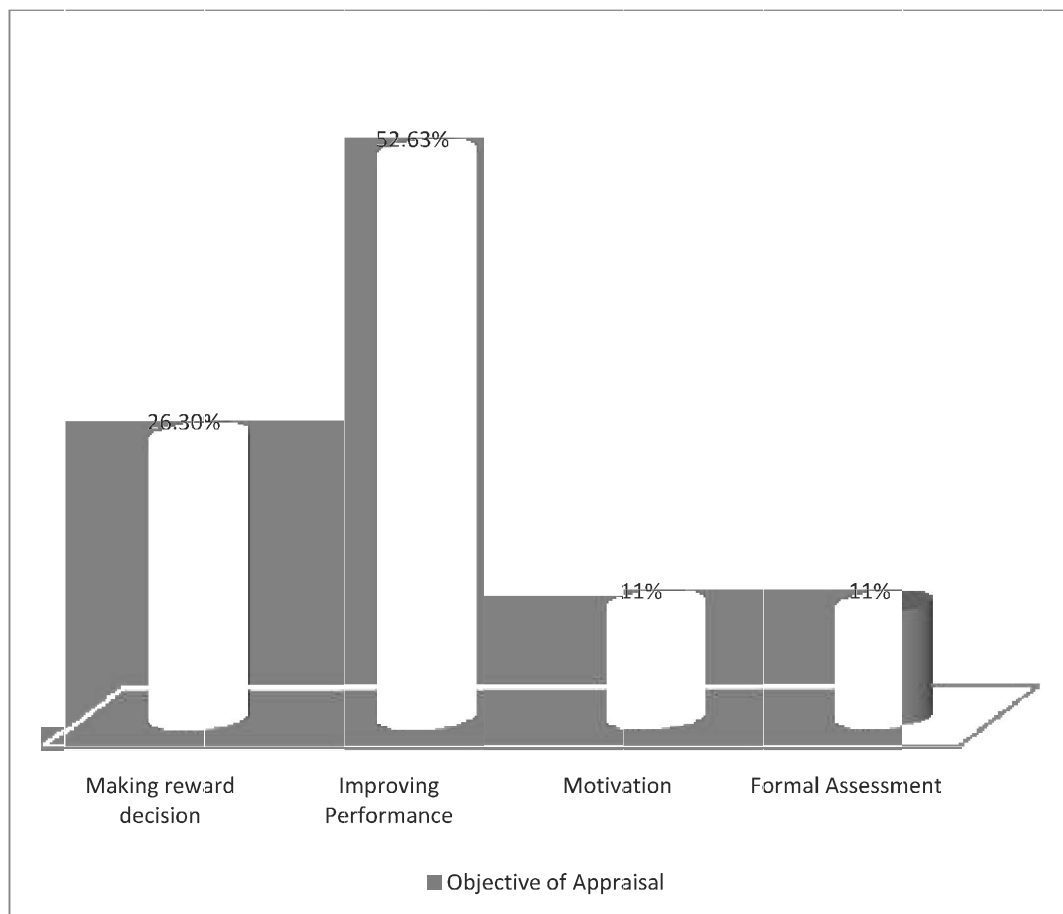


Fig 4 Objective of Appraisal

On the basis of the response fig 4 it is concluded that the main aim of appraisal is improving performance as stated by most of the employees,

while minorities felt that the objectives were like making reward decision, motivation and formal assessment.

(e) Outcome of Appraisal Reports

Outcome	Response
Considerable improvement	52.63%
Slight improvement	31.57%
Neither improvement nor deterioration	15.7%
Slight deterioration	0%
Considerable deterioration	0%

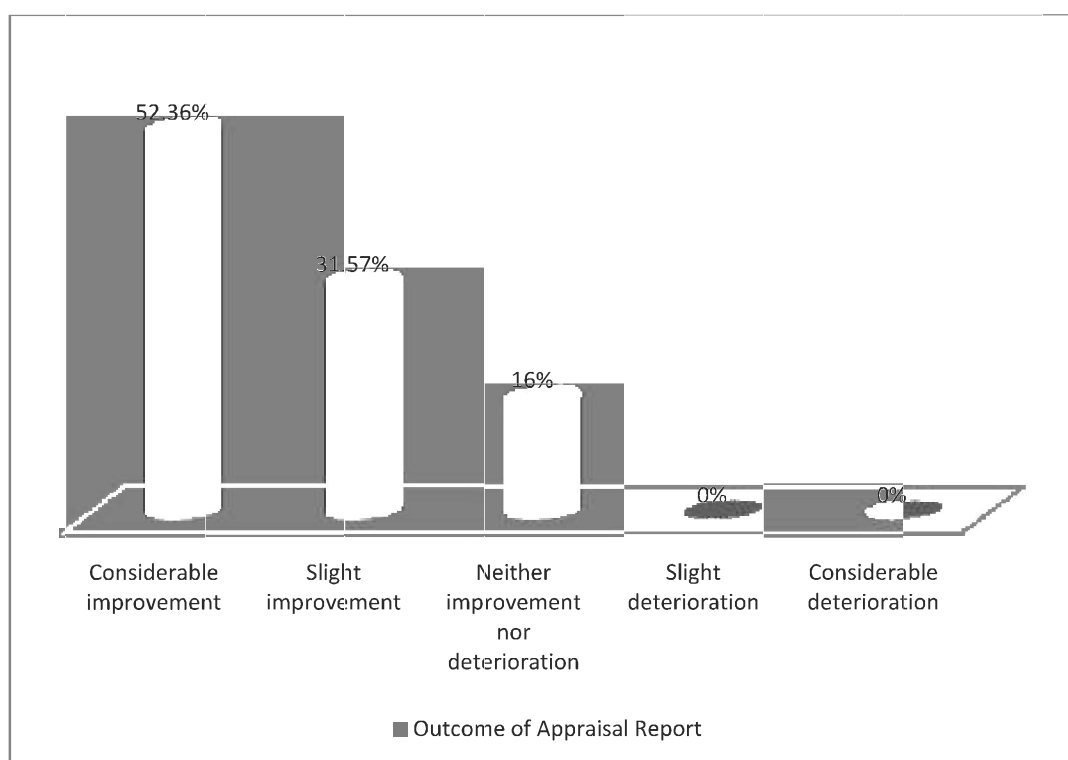


Fig 5 : Employees perception on Out come

Maximum numbers of employees feel that considerable improvement comes in their performance after their performance evaluation,

while some finds slight improvement but a few think that performance evaluation neither improves nor deteriorates their job performance

(f) Acceptability of Employees for Appraisal System

Acceptability	Employees Response
Strongly agree	26.30%
Agree	68.42%
Indifferent	0%
Disagree	5.26%
Strongly disagree	0%

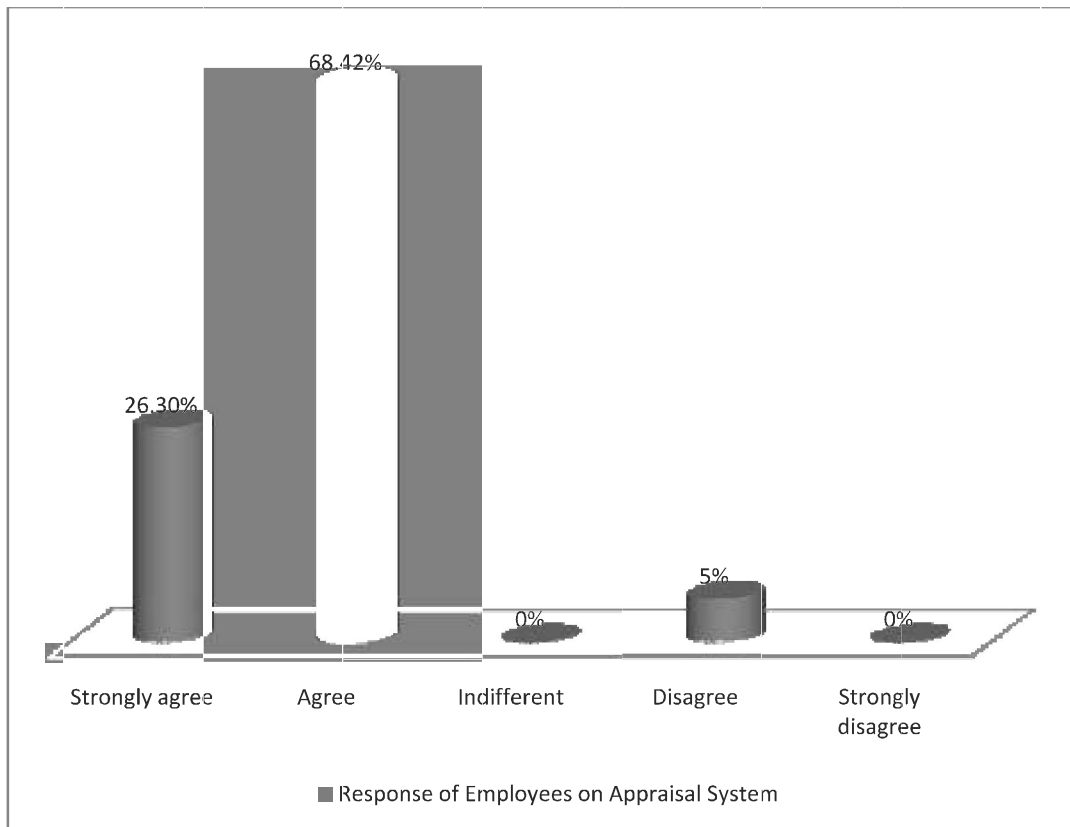


Fig 6. Appraisal System acceptability of employees

Maximum number of the employees agreed with the performance appraisal system at Prism Cement Limited while a few disagreed.

(g) Response by employees to some other questions

(i) Has your Supervisor given you prior notice of appraisal

Response	Percentage of responsibility
Yes	84.21%
No	10.52%
Can't Say	5.26%

The response shows that most of the employees are satisfied with, while 10% are dissatisfied and

only a few of the employees are neither completely satisfied nor dissatisfied with.

(ii) Do you feel appraiser has a fair idea of your performance

Response	% of respondents
Yes	84.21%
No	10.52%
Can't Say	5.26%

The above data shows that maximum number most of the employees are satisfied with, while second majority are neither completely satisfied

nor dissatisfied with, when asked whether they feel that their appraiser have a fair idea of their performance.

(iii) Has employee been appraised on the matters other than the actual performance.

Response	% of respondents
Yes	26.31%
No	63.15%
Can't Say	10.52%

The above Analysis showed that most of the employees are dissatisfied with, while 26% are satisfied and only few of the employees have not commented.

(iv) Is employee satisfied with the parameters an which his/her performance has been appraised.

Response	Respondant
Yes	74.94%
No	21.06%
Can't Say	0%

The analysis shows that most of the employees are satisfied with, while 21% are completely dissatisfied with.

framework for performance management system design has its core element as improving individual performance in accordance with the organizations performance, keeping in mind employee's personal good overcoming barriers to change through winning the psychological battle of employee involvement by effective performance and evaluating parameters has become the need of the hour. The KRA's (Key Result Areas) that determine the effectiveness of a PMS are –

IV CONCLUSION

The performance appraisal is normally done on annual basis in Prism Cement. The superior of the employees carries, out the appraisal and the superior's superior does the further revision. The dept is responsible for the administration of the performance appraisal system.

The process of appraisals for each category of the employees is as follows –

- Appraisal for the staff and middle management MBO.
- Appraisal for the top management – 360 degree appraisal.

It is we concluded that by stressing effective performance management as a key tool of communication and motivation within organizations a competitive edge through strategic change and control can be achieved. The

- (a) Building organizational capabilities –** This KRA contributes in enhancing skill based performance for quality work.
- (b) Taking a selective and focused approach and maintain quality research –** This KRA provides a transparent system for evaluation of employees' performance in terms of job description.
- (c) Service and education output –** This KRA contributes in managing talent in the organization.

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Thousand Voices in Unison: Wakeup Call on Water, Climate, Environment and Energy Problems

Compiled by the Task Force: ICWEES-16



I THE GENESIS

The International Conference on Water, Environment, Energy, and Society-2016 (ICWEES-16) was held on March 15-18, 2016, at AISECT University, Bhopal, M.P., India. A & M Texas University USA, ICEWaRM Australia and IETE Austria were Coorganisers/Collaborators of this conference. The primary objective of the conference was fourfold: (1) To emphasize the significance of water-environment-energy nexus for the well-being of society; (2) to bring engineers, scientists, policy makers, decision makers, administrators, economists, environmentalists, and social scientists together to discuss the role each has to play in social development; (3) to emphasize the participation of stakeholders and users-in decision making; and (4) to discuss the latest developments in science and technology and their applications in the water, environment and energy areas. **However the fifth objective which emerged during the deliberations in the Task Force was to short list some of the important Policy Recommendations in the form of an article and publishes them in 'Anusandhan' – the journal of AISECT University. During four days conference over thousand people participated as keynote speakers (32) paper presentation (450) audiences and organisers. Forty points emerged of common interest during the deliberation which should reach common men as well as policy makers so that the sound of alarm reaches maximum people and at least awareness is generated – the first step for action. An innovative approach to generate chain reaction.**

II RECOMMENDATIONS

The four days conference (ICWEES-2016) was attended by around 1000 professionals representing different parts of India and about 20 foreign countries. The participants were from all walks of life-academia, industry, government, and NGOs. During the four-day conference, 332 technical solicited papers and about 32 invited keynote papers were presented. Based on intensive deliberations, the following policy recommendations emerged:-

(a) Water & Water Resources

- (i) There should be a centralized data bank containing temporal and spatial data pertaining to water resources, environmental resources, and energy resources for the entire country. Data should be stored, processed and archived, following strict international standards or criteria of quality control and assurance. The data should be available to the public for use, preferably free of cost.
- (ii) Water, environment, and energy constitute a continuum that is fundamental to societal development. These three components are the drivers of economic development. Administration should therefore be organized following this continuum and redundancy in the administration should be eliminated.
- (iii) There should be a local area long term effective water plan for individual cities in terms of retaining and maintaining the water table.
- (iv) Interlinking of river need to be taken up on a long term national perspective with central Govt control to mitigate effects of draught and flood and make effective use of flood surplus water.
- (v) There must be national policy making rivers, water resources, lakes and other water bodies' national treasures or property. They belong to all people or citizens.
- (vi) There should be a river health policy. Integrated water indices must be employed to categorize and monitor water bodies, including rivers.
- (vii) There must be heightened emphasis and action plan for conservation, recycling, reuse, more efficient use, and saving of water.
- (viii) Water infrastructure, including periodic maintenance, rehabilitation, and regular upkeep, need national attention.
- (ix) In order to reduce the quantum of water unaccounted for in urban areas, which seems quite high, proper water metering and rational water pricing are essential.
- (x) Developments in data capture, analysis, modeling and computational systems have not received commensurate application in the water sector. Policy makers must take a note of this lag and ensure the application of best science in decision

making, project planning, and engineering design.

- (xi) Small dams, tanks, and water harvesting structure conserve water and recharge aquifers at small scales and help provide irrigation water to scattered rain fed areas. Governments must multiply their efforts to realize the potential of these structures in providing water and food security to the people living in the countryside.
- (xii) In the water sector the greatest need is in the area of management of water resources, not so much in the science of water resources. Management entails enforcing laws of the land and their implementation, administration or governance, economics, society-the stakeholder, and working together.
- (xiii) All water structures, including dams, nuclear facilities, water supply systems, bridges, etc., must be assessed for their ability to cope with the impacts of climate change.

(b) Pollution & Waste Management

- (i) There must be a concerted effort to reduce air pollution in major metropolitan areas. Major causes of air pollution are automobiles and factories. The only way automobile pollution can be curbed is developing efficient public transportation systems, as has been done in Europe.
- (ii) One way to reduce industrial pollution is to reduce concentration of industries; in other words, industries should not be in selected areas. Industrial town should not permit residential colonies within and waste disposal treatment should be done independently for the industrial town as a whole.
- (iii) There is an urgent need to develop appropriate measures for solid waste disposal. Our cities and towns and villages should not become dumping grounds for waste.
- (iv) There must be a national policy for the disposal of E-Waste and Nuclear Waste including utilization of the E-Waste for the development of value added products.
- (v) There must be adequate sewage waste disposal facilities if our water bodies are to be sustained.
- (vi) There is a great deal of attention being paid to point-source pollution but non-point source pollution has not received commensurate attention.

(c) Environment

- (i) There must be a concerted effort at the central government level to reduce application of chemicals in agriculture. Chemical agriculture is having dire consequences on human health and this aspect has not received much discussion in the country.
- (ii) Climate change is impacting almost everything-water, air, soil, food, energy, ecosystem, and health. India must develop a centre on climate change studies.
- (iii) In a mission mode time a bound project, for plantation along highways and Railway tracks in rows of five trees on either side should be taken up to save the environment.
- (iv) Environmental studies and climate change should be included in all courses at UG, PG and school level.
- (v) There is need for extensive use of technology for check on deforestation and to prompt faster forestation. Forest area has reduced from 40% to 4% giving serious alarms.
- (vi) Government offices and authorities should not concentrate in big cities. Some of govt offices, regulating bodies and authorities should move to nearby rural areas to improve growth of rural area and reduce congestion of big cities.
- (vii) There is need to formulate newer standards for road building with longitivity & better sustainability using environmental friendly latest innovative technology & methodology. In present system the life of roads is very low. There is need to use newer technology to ensure better life and low maintenance cost of the roads in addition to use of ecofriendly cheaper waste material for construction.

(d) Energy

- (i) There is an urgent need to develop appropriate technology for the generation of renewable Energy - Solar, Wind, Biogas, etc. for the economic development. Potential of private universities needs to be tapped and funded to accelerate the process of green energy. Standardisation in this sector is need of the hour.
- (ii) Generation of Energy from waste is very important area which needs support from government in a big way.
- (iii) There must be a concerted effort to meet the challenges towards the generation of green conventional and non conventional energy including conservation & efficient energy auditing.

- (iv) For integrating various sources of energy a comprehensive plan need to be drawn for enforcing net metering.
- (v) Smart villages plan should be implemented in a big way with active participation of educational institution and industries. Effort should be made to make them energy efficient.
- (vi) For all the construction work for infrastructure and buildings, use of only green power (preferably solar) should be made compulsory.
- (vii) Transmission loss needs to be reduced though innovative technology in research and technology mode.

(e) General

- (i) There should be a formal mechanism of involving actively universities in plan, programme and research projects related to issue of national importance like Water, Environment and Energy with proper soft funding as well as accountability.
- (ii) While granting permission by central and state level Policy Makers/Govt Agencies for conference of such large dimension, nominating some representatives from the Govt will be an effective source of input for the concerned Ministry Agency.
- (iii) There is an urgent need to formulate comprehensive policy and mechanism by which Educational Institutes may be made an active partner by concerned Govt Department in implementing public interest plans.
- (iv) The nodal ministry should take initiative to have interaction with the conference organizers in such well attended conference as regard to identifying at least one or two segments /aspects of the conference to work further.
- (v) Different sectors of the society-stakeholders or users-must be closely involved and consulted in decision making for sustainable development. After all, decisions are made for the people. Social media can be employed as an effective channel for bringing the user closer to the decision maker.
- (vi) There is an urgent need to develop appropriate measures to resolve Water – Energy – Food Nexus Issues for the sustainable livelihood.
- (vii) As a policy restriction, all colonizers and builders should be asked to construct a public toilet complex for the labour employed by them for construction of the colony.

III CONCLUSION

Through various research papers, expert lectures case studies, presentations and keynote addresses, it came out clearly that we are approaching fast the danger zone of no return if urgent actions are not taken on war footing not only to stop the crisis on water, environment and energy but also reverse the deteriorating process. Three major tools are available. The biggest tool is technology. Technology can provide best answer to problems. Through research and application technology can provide the answer for action on all the above recommendations of the conference. The second tool is the awareness active and participation by all the stake holders. And the biggest tool to face the crisis and find solution is by unity of action between society, policy makers, action authorities and the government. Higher Education institutions can become nodal points. ICWEES-2016 has generated lot of data and came out with many solutions which have been sent to decision making authorities. It is hoped that some positive follow up will come out. AISECT University and other participations/collaborations to this conference will continue efforts as an active player by organising such international gatherings of stake holders on various issues to find solution through technology, research and participation.

Catalytic Oxidation of Sulphide Laden Tannery Wastewater without Sludge Production

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ABSTRACT

The beam house operations in tanning process of hides / skins comprises of soaking, liming, fleshing and deliming operations. The removal of animal hair and flesh from skin is facilitated by the liming operation. About 5m³/ton wastewater containing a credible concentration of sulphide and dissolved proteins are discharged. It is highly alkaline and having high BOD/COD ratio. The biological treatment of wastewater that occurs at neutral pH requires neutralization of the wastewater using acidic stream. This results in the emission of hydrogen sulphide which is considered to be highly toxic gas. The present investigation employed **Heterogeneous Peroxide oxidation process (HPO)** for the oxidation of sulphide in the lime sulphide liquor without sludge production with simultaneous removal of COD from wastewater. The screened effluent was adjusted to pH 9.7 using conc. Sulphuric acid and it is catalytically oxidized with Hydrogen peroxide 3.921mM/L and Nano Porous Activated Carbon (NPAC), 30 g/L at HRT 24 hr. The dosage of Hydrogen peroxide, mass of NPAC and HRT were optimized. The integrated catalytic and biological oxidation in FICCO (Fluidized Immobilized Carbon Catalytic Oxidation) reactor eliminated COD, sulfide, Total Kjeldahl Nitrogen, protein, Amino acids and Total organic compound by 66.66%, 98.95%, 75.67%, 44.21%, 48.98% and 62.18% respectively. The sulphide present in the wastewater was catalytically oxidized to sulphate and ammonia content was increased by 78.05% by cleaving protein molecules.

Key words: HPO; NPAC; FICCO; COD.

I INTRODUCTION

Leather industry is the significant contributor to the Indian economy and provides largescale employment opportunity. The total processing capacity of the world tanning industry is more than 10 million tons of hides and skins per year. Totally, 2500 tanneries are located in India including Tamilnadu 50%, West Bengal 20% and Uttar Pradesh 15% (CPCB, 2009). The beam house operations such as soaking, liming, fleshing, deliming in the process of hides/skins are common irrespective of the types of tanning process. The preservation and processing of raw hides and skins for tanning process cause severe pollution problem towards environment and mankind (Aravindhan *et al.*, 2004). In fleshing and liming process, unhairing is done by chemical dissolution of the hair and epidermis with an alkaline medium of sulphide and lime. After skinning at the slaughterhouse the hide appears to contain excessive meat, fleshing usually precedes unhairing and liming. Liming and unhairing produce the effluent stream with the highest COD value. The removal of hair and flesh from skin is facilitated during the liming operation. Conventional process employs 10% lime (calcium hydroxide) and 2% sodium sulphide on hide/skin weight basis for loosening the hair. About 5 m³ of spent lime liquor is discharged per ton of raw hides/skins processed. Sodium sulphide being a good reducing agent interferes in the oxidation of organic wastes and contributes significantly to the BOD and COD concentrations in the wastewater. Lime sulfide is most environmental harmful chemical in tanning process (Schraeder *et al.*, 1998 and Huber *et al.*, 1990). The spent lime liquor is highly alkaline (pH 10-12) and 100% toxicity (Taylor *et al.*, 1987 and Marsal *et al.*, 1999). The major amount of pollution in terms of BOD (5,000-10,000 mg/l), COD

(10,000-25,000 mg/l), sulphide (500-800 mg/l), Total solids (24000-48000 mg/l), suspended solids (6,000-18,000 mg/l), chloride (4000 – 8000 mg/l) and sulphate (600 – 1200 mg/l) is contributed by sulphide-liming process. This sulfide containing wastewater has extensive hazardous to environment and treatment plant also (Davies *et al.*, 1997).

II PROBLEMS ASSOCIATED WITH PRESENCE OF SULPHIDE IN EFFLUENT

Under alkali conditions sulphide largely remain in solution. When the pI of the effluent falls below 9.5, hydrogen sulphide is evolved from the effluent. The rate of evolution of hydrogen sulphide increases with decrease in pH and is characterized by severe odor problem. This gas is toxic similar to hydrogen cyanide and even low-level exposure will cause headaches and nausea, and there is a danger of attack to the surface of the eye. At higher levels death can rapidly result and there are many deaths recorded from sulphide build up in sewage systems. Hydrogen sulphide gas is also fairly soluble, and when dissolved by condensation weak acids can be formed with resultant corrosion. This typically weakens metal roofing, girders and metal building supports. In sewers major problems can result by corrosion of metal fitting, reinforcement and pipe work. If discharged to surface water, there are toxicological dangers even at low concentrations. Sulphide can also be oxidized into non-toxic compounds by certain bacteria in rivers, but this creates an oxygen demand and if excessive there is damage to aquatic life. It also inhibits the methanogenesis process. Soluble sulfide ranging from 50 – 100 mg/l can be tolerated in anaerobic treatment with little or no acclimation. Sulfide has

high oxygen demand of 2 molO₂/mol sulfide and causes depletion of oxygen in water.

III TREATMENT OF LIME SULPHIDE LIQUOR

The presence of sulphide in wastewaters may dramatically interfere with microbial activities and consequently disturb the function of the system (Mesdaghinia *et al.*, 1991). Biological processes can be carried out only when concentration of sulphide is not exceeding 50 mg/L (Valeika, 2006). Aerobic treatment was not effective method for treatment of tannery effluent (Sekaran *et al.*, 1996; Ganesh and Ramanujam, 2009). Sekaran *et al.* (1996) have reported that anaerobic treatment of tannery wastewater in high rate close type reactors leaves sulfides in the range 31-795 mg/l, COD 395-1886 mg/l, BOD 65-450 mg/l and total organic carbon (TOC) 65-605 mg/l. So high sulphide concentration present in treated wastewater may not be suitable for aerobic biological treatment. In order to remove sulfide from wastewater streams, a number of physicochemical methods like direct air stripping, chemical precipitation and oxidation are in common use today. Many of the metals such as iron, zinc, copper etc. could be used to precipitate the sulfide into insoluble metal sulfide. Oxidation processes used for sulfide removal are aeration (catalyzed and un-catalyzed), chlorination, ozonation and hydrogen peroxide treatment (Valeika *et al.*, 2006; Anglada *et al.*, 2009). During the sulfide oxidation by aeration, there is some loss of sulfide directly into the atmosphere. Sulfide consumes the oxygen in the aerator and reduces the effectiveness of the equipment. In chlorination, chlorine reacts with certain metals and organic matter in the water to form hazardous chlorinated organic chemicals. Catalytic chemical oxidation of the sulfide with air removes the sulphide quantitatively but it is a time consuming and expensive process (Valeika *et al.*, 2006) used manganese oxide to oxidize sulphide in tannery effluent. The oxidation of Na₂S proceeds in two stages. In the first stage Na₂S reacts with MnO₂ to give manganese hydroxide. In the second stage, the catalysis reaction between Na₂S and air O₂ is taking part. Sekaran *et al.* (1995) was reported that removal of sulphide in lime yard wastewater by wet air oxidation in the presence of manganese sulphate as a catalyst. During the oxidation of sulphide in lime yard wastewater, 92% of the total oxygen demand and 90% of the dissolved protein were also removed. But manganese sulphate results in formation of Manganese hydroxide sludge and also when the level exceeds 0.01g/100 g of water, it gets solubilized (solubility of Manganese hydroxide at pH 9.5 = 5.9×10^{-4} g/l), thus Mn level in the water increases contributing to increase in metal pollution load. Hence, there has been a constant research on the development of methods for the removal of sulphide from lime sulphide liquor without sludge production. The focal theme of the present investigation was to employ heterogeneous

peroxide oxidation process (HPO) and fluidized immobilized cell carbon oxidation reactor (FICCO) for the oxidation of sulphide in the lime sulphide liquor without sludge production.

IV MATERIALS AND METHODS

(a) Source and collection of lime sulphide liquor and methods

The lime sulphide liquor was collected from model tannery in CLRI, Chennai. The wastewater was screened to remove the floating solids such as hair, flesh, trimmings etc. The screened effluent was taken to adjust pH 9.7 which was optimized using conc. Sulphuric acid on magnetic stirrer then allowed to remove grit solids in Imhoff cone for two hours. Then supernatant liquor was siphoned off without disturbing the settled grit solids. That liquid catalytically oxidized with Hetero Peroxide oxidation (HPO) process using 0.4ml/L of 30% Hydrogen peroxide and 30 g/L of Nano Porous Activated Carbon (NPAC) for 24 hr dosage amount and time were optimized then neutralized using lime after that it carried to FICCO (Fluidized Immobilized Carbon Catalytic Oxidation) using microorganism with NPAC 30g/L.

(b) Materials

All the reagents were purchased from Merck, India and nanoporous carbon was prepared in lab using two stage processes.

(c) Preparation and characterization of Nanoporous activated carbon (NPAC)

Rice husk, the precursor, was pre-carbonized at 400°C and activated using phosphoric acid at 800 °C. It was washed with hot distilled water several times and dried at 110 °C for 1 h in a hot air oven and stored over dehydrating agent in the desiccators (Swarnalatha *et al.* 2009). The prepared nanoporous activated carbon (NPAC) was used as base catalyst for the removal of sulphide and COD simultaneously.

(d) Physico-chemical analysis of the wastewater

The wastewater samples were analyzed for pH, BOD₅ (biochemical oxygen demand), COD (chemical oxygen demand), sulphide, sulphate, total organic carbon and total dissolved solids, in accordance with standard methods of analysis of wastewater (American Public Health Association, 1998). TOC analyzer used to measure presence of Total Organic Compound and Total Nitrogen (TN), UV/Visible spectroscopy done to know the degradation and FT-IR spectroscopy also done to initial and final treated water, TGA for Total solids also done. Ammonia Distillation unit were used to measure Total Kjeldahl Nitrogen and Ammonia present in the sample during all treatment processes.

(e) Treatment methods for lime sulphide liquor

The lime sulphide liquor was oxidized NPAC/H₂O₂ in FBR optimization of the dosage of NPAC/H₂O₂ and pH were carried out.

V RESULTS & DISCUSSION

The characteristics of initial wastewater samples are presented in table 1.

Table 1
Characteristics of Initial effluent

Parameters	Values
pH	12.59 ± 0.523
ORP	-524.8± 11.682
COD , mg/L	11523 ± 1657.88
BOD , mg/L	6975± 1372
TOC, mg/L	1644± 1155
NH ₃ , mg/L	96.55± 76.076
TKN, mg/L	624.1±393.69
Total Solids , mg/L	66626± 69248
Total Dissolved Solids, mg/L	25513± 14082
Total Suspended Solids, mg/L	41113 ± 55166
Sulphide , mg/L	1211± 402.43
Sulphate , mg/L	958.4± 962.19
BOD:COD	0.339± 0.0906
Protein, mg/L	7331±1262.9
Amino acid	52702 ± 72022

(a) Characteristics of NPAC

The NPAC samples were characterized by surface area 291.15 (m²/g), average pore diameter 25.91 (Å), carbon 48.45 (%) and free electron density 16.052 × 10¹⁸ (spins/g).

(b) Fluidized bed Reactor (FBR)

The fluidized Bed Reactor in this present investigation to oxidize sulphide in lime sulphide liquor is presented in Fig.1, consists of three zones. The first zone is known as “react zone” comprised of the catalyst (either MnSO₄ or NPAC) which can be fluidized by air and wastewater at upflow velocity of 5 m/min. The quantity of air required for the oxidation of organics in wastewater is decided on the kinetics of oxidation of organics in wastewater. The air required for the fluidization and oxidation of organics is supplied through the perforated pipe lines provided at the bottom of the reactor. The pressure of air required is a function of upflow velocity, viscosity of medium, total solids content of the medium, temperature and height of the reactor. The second zone is the fluid separation zone. The unspent oxygen and nitrogen in air are separated using a triangular septum provided at the optimum height of the reactor. The separated air is collected through the perforated chamber. The third zone is the settling zone. The treated wastewater enters through the aperture is allowed to settle in the inclined baffled zone. The angle of the inclined plate was decided on the zone settling velocity of the suspended solids present in the wastewater. The settling tendency of the suspended solids was enhanced by providing the extended surface area to capture the particles. The media used to increase the surface area for interception of the suspended particles are by poly propylene plastic media of defined geometry. The screened suspended solids are sloughed off from the media on exceeding a critical thickness. The sloughed suspended solids slides back into the reactor through the aperture. The sludge accumulated in the reactor is withdrawn daily through sludge withdrawal pipe line provided in the reactor.

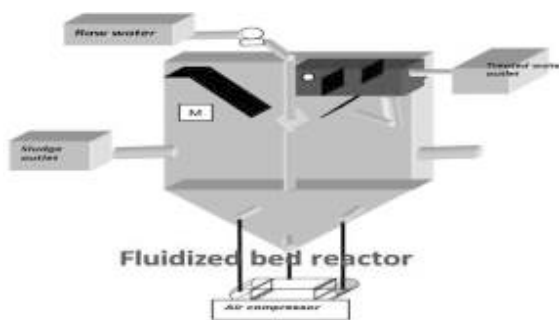


Fig. 1 Fluidized Bed reactor

VI OPTIMIZATION TECHNIQUES

(a) Optimization of pH

Hetero Peroxide oxidation process was optimized by batch process for 24hr with 0.4 mL of 30% H₂O₂ to know which would give better result accordance with pH so the sample were taken in different pH say 12,11,9.7,8 and 7. The removal of

COD is represented in fig. 2. Initial COD value was 11040mg/L and the residual COD after treatment at pH 12, 11, 9.7, 8.0 and 7.0 were 6760mg/L, 7520mg/L , 5500mg/L ,6080mg/L , 5600mg/L respectively. It clearly indicates that almost the removal of COD at pH 7.0 and 9.7 is greater than any other pH, but at the pH 7.0, the liberation of hydrogen sulphide is greater, thus we fixed the optimum pH as 9.7.

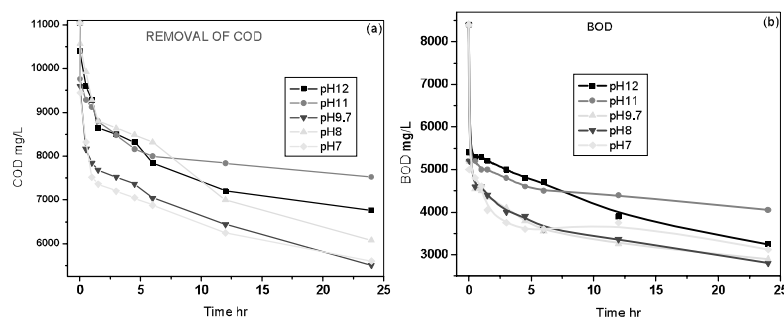


Fig. 2 Optimization of pH for the removal of (a) COD and (b) BOD on HPO process

Fig 2(b) indicates the removal of BOD and the removal was better in pH 7.0 and 9.7. In order to avoid the liberation of sulphide, optimum was fixed to be pH 9.7. The BOD:COD of initial sample was

0.25 and it increased during the process at different pH (Fig. 3a) and NH_3 formation was also increased by varying the pH (Fig. 3b).

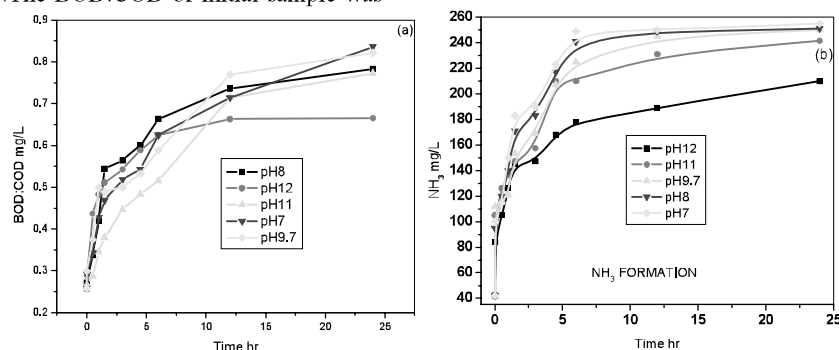


Fig. 3 Optimization of pH on the values of (a) BOD: COD and (b) NH_3 formation in HPO process

Fig 4(a) and (b) represents the removal of TN and TOC at various pH. The removal of total organic compound (TOC) and Total Nitrogen (TN) was

decreased throughout the entire process irrespective of the pH also given below.

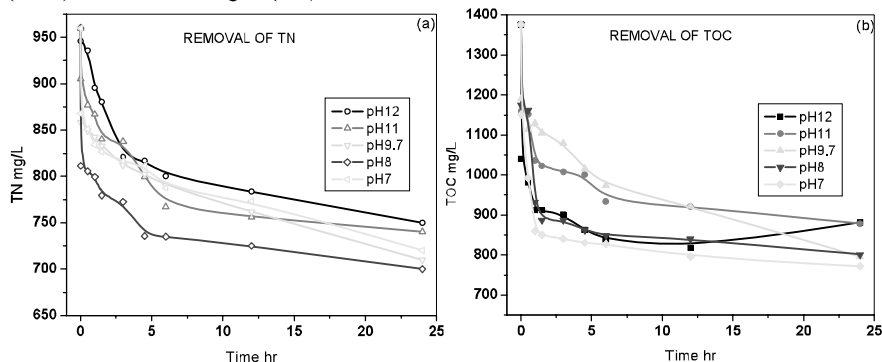


Fig. 4 Optimization of pH for the removal of (a) Total nitrogen and (b) Total Organic Carbon in HPO process

Sulphide removal is considered to be one of the important criteria in pH optimization. Though it decreases drastically in pH 7 and pH 8 (Fig 5), pH

9.7 was considered as optimum in order to avoid the evolution of H_2S gas (results in rotten egg smell) by decreasing the pH.

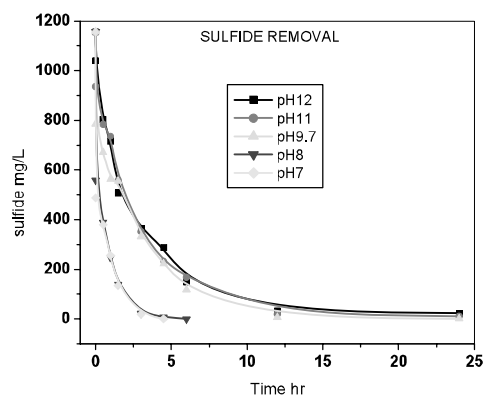


Fig. 5 Optimization of pH for the removal of sulfide on HPO process.

(b) Optimization of H_2O_2

Optimization of peroxide (0.2, 0.4, 0.6 and 0.8 ml of 30% hydrogen peroxide/L) was done at the optimum pH (pH 9.7) and the result showed the optimum was 0.4 ml of 30% hydrogen peroxide/L.

Though sulphide removal is high at 0.8 ml of 30% hydrogen peroxide/L, there is no considerable COD removal at this dosage when compared with the optimized peroxide volume.

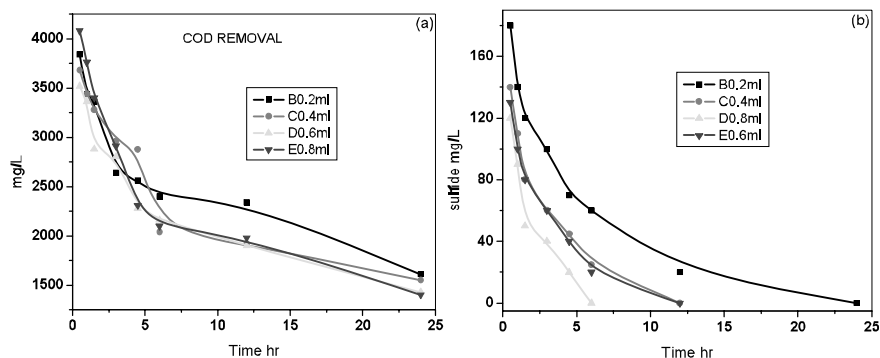


Fig. 6 Optimization of H_2O_2 for the removal of (a) COD and (b) Sulfide

(c) OPTIMISATION OF NPAC (Nano porous activated carbon)

Optimization of NPAC was carried for 20g, 25g, 30g, 40g/L of NPAC, fig 7 showed that the higher

reduction of COD, BOD, protein degradation in 40 g/L taken but the optimum was fixed as 30g/L by comparing the reduction verses cost.

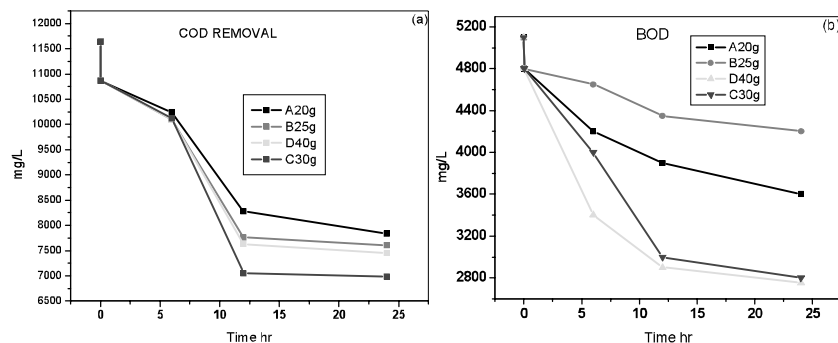


Fig.7 Optimization of NPAC for the removal of (a) COD and (b) BOD

VII OVERALL PROCESSES

HPO process was carried out at the optimum pH, peroxide and NPAC. It has been observed that the sulphide removal in this method might have

been due to the formation of sulfenic, sulfinic, cysteic acid during the oxidation process⁽⁶⁾ because of the decrease of the pH throughout the process. Then the samples were passed through FICCO reactor for further treatment at neutral pH.

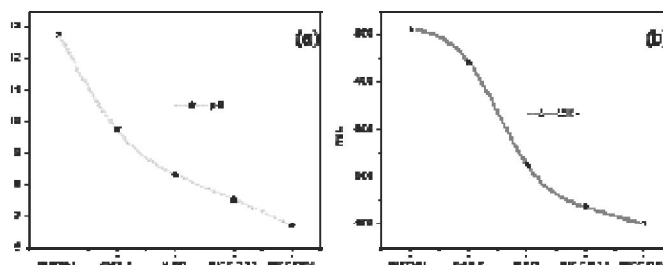


Fig. 8 The values of (a) pH and (b) ORP during the treated processes

During the entire process the oxidation of the sample was examined by the ORP of the sample. ORP of the initial sample was -524 mV and it was

reduced as -100 mV at the end of the treatment, which is the clear evidence for the oxidation.

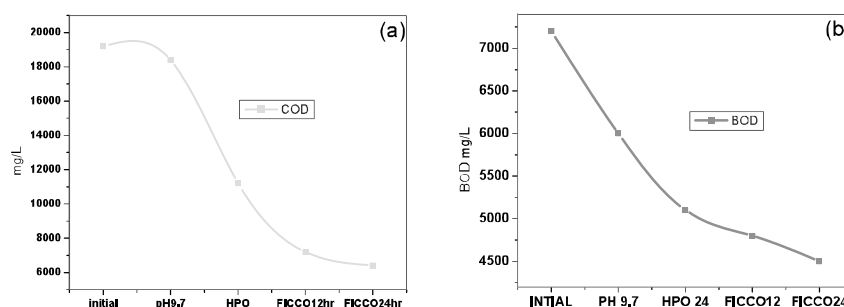


Fig.9 Removal of (a) COD and (b) BOD during the treatment process.

The COD of the initial sample was 19200 mg/L and it was reduced to 6400 mg/L (66.66%) during the various treatment processes. The BOD of the

initial sample was 7200 mg/L, which has been reduced to 4500 mg/L.

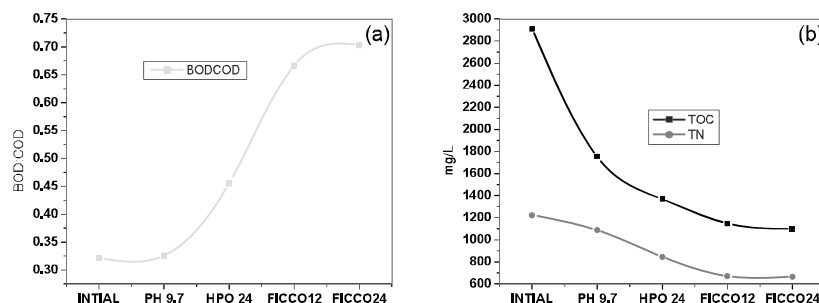


Fig. 10 The values of (a) BOD: COD and (b) Total organic carbon, Total nitrogen during treatment processes

It was found that the initial BOD:COD ratio was 0.33 which has been characterized as moderately biodegradable water because of high COD and low

BOD (O. Dahl et al., 1999, S. Lacorte et al., and E.T. Barness et al., 1994), this was increased considerably to 0.66 (high degradable samples).

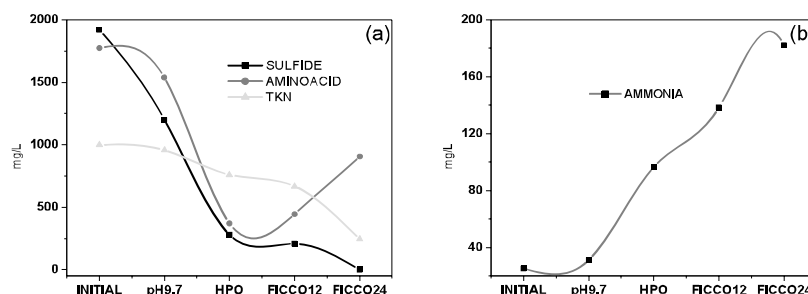


Fig.11 The values of (a) Sulfide, amino acid, Total Kjeldahl nitrogen (b)Ammonia during treatment process.

Amino acid of the sample were analyzed and it was found to be decreased during HPO due to the degradation of free amino acid present in the sample. Further it increases at FICCO which may be due to the degradation of higher molecular

weight protein to amino acids. Initial Protein present in the sample was 8228 mg/L which was decreased to 4590 mg/L at the end of FICCO. Thus most of the residual COD may be due to the non-degraded protein molecules. (Fig. 12)

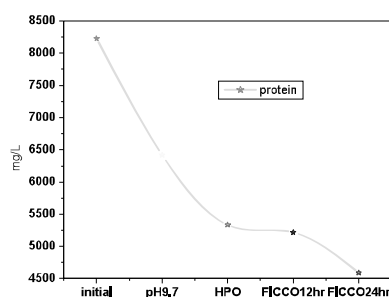
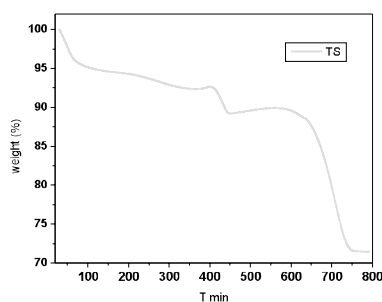


Fig.12 Removal of protein during treatment processes.

VIII INSTRUMENTAL ANALYSES

(a) Thermo gravimetric analysis (TGA) and UV-Visible spectroscopic studies



Initial sample was dried using Nitrogen Evaporator at 80°C using nitrogen gas and analyzed using TGA from 30°C to 800°C at 5°C/min. It was found that decrease in weight of 28.45% was due to the presence of organic molecules.

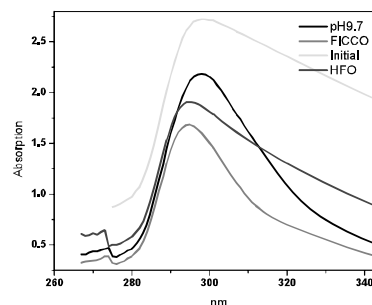


Fig.13 (a) TGA spectrum for Total solids (b) UV-Visible spectrum for the treatment system

UV-Visible spectrum of sample taken out for all processes it was observed that intensity and blue shift found on all processes. Initial sample show characteristic peak at 300 nm it was shifted gradually accordance with treatment process shows removal of organic pollutant taking place by treatment process.

(b) FT-IR spectroscopic studies

FT-IR spectrum of the initial sample and final sample were taken shown in fig No. sample was taken and dried using Nitrogen evaporator at 80°C then analyzed FT-IR spectroscopy.

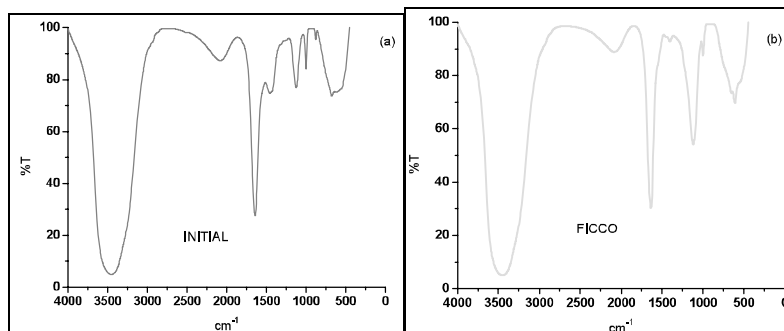


Fig .14 FT-IR spectrum of (a) Initial and (b) final treated lime sulfide water sample

A broad peak at 3460 cm^{-1} conforms the presence of -OH stretch, then at 1638 cm^{-1} sharp peak due to the sec. amide stretch, at 1450 cm^{-1} due to the presence of Aromatic C-C stretching, at 1122 cm^{-1} due to the hydronium sulfonate salts, at 673 cm^{-1} by C-S stretching frequency, at 1453 cm^{-1} due to the Stretching frequency of sulphate salt, at 999 cm^{-1} due to the stretching frequency of S-O-C molecule. When we compare from initial to final some of the peaks shift were observed the above figure shows a broad peak at 3460 cm^{-1} due to -OH stretch, at 1638 cm^{-1} sharp peak due to - sec. amide stretch, at 1405 cm^{-1} due to - Aromatic C-C stretching, at 1120 cm^{-1} due to hydronium sulfonate salts, at 673 cm^{-1} C-S stretching, at 1453 cm^{-1} Stretching frequency of sulphate, at 1000 due to the -S-O-C stretching frequencies were observed.

IX CONCLUSION

Treatment of sulfide laden wastewater processed using Heterogeneous peroxide oxidation (HPO) flowed by FICCO. In HPO, the sample was catalytically oxidized using 0.4 ml of 30% $\text{H}_2\text{O}_2/\text{L}$ (optimized) and 30 g/L NPAC. During the oxidation process high foam produced because of presence of high protein content in the wastewater at end of the process this foaming reduced well due to the removal of protein which was also confirmed using protein and amino acid estimation. With these treatments 66.66% of COD and sulfide (major problem) was eliminated 98.95% with the considerable removal of TOC, TKN and increasing of NH_3 . The ORP of the wastewater remains in negative showed still the presence of some of the reduced species.

X ACKNOWLEDGEMENTS

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Assessment of Molluscs as Indicator of Water Quality

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ABSTRACT

Molluscs species of three reservoirs Panshet, Khadakwasla and Ujjani reservoirs were studied. Good number of molluscs species were found in Ujjani reservoir comparatively. A Physicochemical study of three reservoirs was related with the abundance of molluscs. Presence of molluscs were due to alkaline nature, more calcium content and salts with high BOD, COD Nutrients, plant population of Ujjani reservoir located in downstream which had relatively more dissolved salts than Panshet and Khadakwasla reservoir located in the upstream with less human pressures showed less number of molluscs.

Keywords: Molluscs, Ujjani reservoir, Alkalinity, Calcium, BOD, COD, Nutrients.

I INTRODUCTION

Panshet Dam, Khadakwasla Dam and Ujjani Dams are situated in Bhima basin, Maharashtra. Panshet and Khadakwasla Dam/ Reservoirs are situated upstream whereas Ujjani Reservoir is in the downstream. The catchment area of Panshet dam and Khadakwasla are approx. 120 sq.km is surrounded by Hills which are extension of the main ridge of western ghats and rise to a height of 1200 m to 1300 m where Ambhi river and Mutha river are unpolluted as the catchment area is having good forest cover and comparatively less urbanization and industrialization.

Ujjani Reservoir is the terminal water body in the Upper Bhima River Basin. Its huge catchment area of 14850 sq. km is having more than 90 % urban, rural, industrial and agricultural activities which affects in its water quality day to day. Mula-Mutha tributary of Bhima River from Pune city carry discharges of more than 40 sewage lines and joins Bhima river at Paragon. There are more than 86% of untreated wastewaters discharged into the tributaries of Bhima river from the fast growing cities – Pune and Pimpri Chinchwad having combined population more than 6 million. Dam or Reservoir Project details are given in table 1.

- (a) **Molluscs and Water Quality:** Molluscs are filter feeders hence they take in suspended materials from water, making water clear but they decrease the phytoplankton biomass. Mollusc abundance was observed extensively in Ujjani reservoir.



Molluscs are of immense importance from ecological point of view. They even have beneficial both economically and medicinally (Wosu, 2003). They have been important to humans since historic times as a source of food, jewellery, tools and even pets. Fresh water molluscs play significant role in public and veterinary health (Supian and Ikhwanuddin, 2002). Some fresh water snails are vectors of diseases of humans and livestock, serve as the intermediate hosts for a number of infections such as helminth diseases caused by trematodes (Abd El-Malek, 1958; Dazo et al., 1966; Barbosa and Barbosa, 1994; Brown, 1994; Karimi et al., 2004; Cañete et al., 2004; Kazibwe et al., 2006; Mostafa, 2009). The ecology of these organisms is considered to be affected by environmental factors like physico-chemical parameters (Garg et al., 2009), availability of food, competition, predator-prey interactions (Williams, 1970; Harman, 1972; McMahon et al., 1974; Lassen, 1975; Ofiozie, 1999), substrate architecture (Kershner and Lodge, 1990) and macrophytes (Bronmark, 1985; Costil and Clement, 1996; Ofiozie, 1999).

As molluscs are common components of the benthic communities, understanding their role in the aquatic ecosystems and their contribution to biomass production is deficient (Supian and Ikhwanuddin, 2002).

- (b) **Study area:** Three reservoirs of Bhima Basin, Panshet and Khadakwasla at the upstream and Ujjani a terminal reservoir at the downstream.



Fig 1 : Location of Panshet, Khadakwasla and Ujjani Reservoir

Panshet Reservoir and Khadakwasla Reservoirs are located in pristine environment, and their catchment area drains almost nil sewage whereas

Ujjani Reservoir drains more than 86 % of untreated sewage and domestic from its huge catchment ha city Rivers Mula-Mutha and Bhima.

Table 1:
Project details of the Reservoirs under study.

S.No.	Official name	Panshet Dam	Khadakwasla Dam	Ujjani Dam
1	Location	Velhe Pune District	Khadakwasla Village	Ujjani, Solapur istrict
2	Coordinates	18°23'15"N 73°36'46"E	18°26'30"N 73°46'5"E	18°04'26"N 75°07'12"E
3	Opening date	1972	1964	1980
4	Height	63.56 m	31.79 meter	56.4 m
5	Length	1,039 m	1939 meters	2,534 m
6	Volume	4,190 km ³	85.91 MCM	3,320,000 m ³
7	Impounds	Ambi river	Mutha River	Bhima River
8	Catchment area	120 sq.km	200 sq.Km	14,850 Sq. km
9	Surface area	65 sq.Km	14.8 Sq.Km	337 Sq.Km

Table 2:
Comparative differences in Catchment area of Three Reservoirs

S.No.	Catchment Land	Panshet Reservoir	Khadakwasla Reservoir	Ujjani Reservoir
1	Forest Cover	Approx 40%	Approx 10%	No Forest cover
2	Agricultural	Approx 30 %	Approx 20 %	Approx 10 %
3	Industrial	< 1 %	< 3 %	> 80%
4	Urban	< 1 %	< 10 %	> 90%
5	Population	< 10 %	< 30 %	> 80%

(c) **Flowdiagram** : Figure 2, below shows molluscs needed more salts for their life cycle. Their shell needs calcium for its build up,

which they can absorb well in alkaline waters. More organic content was indicated by high BOD and COD.

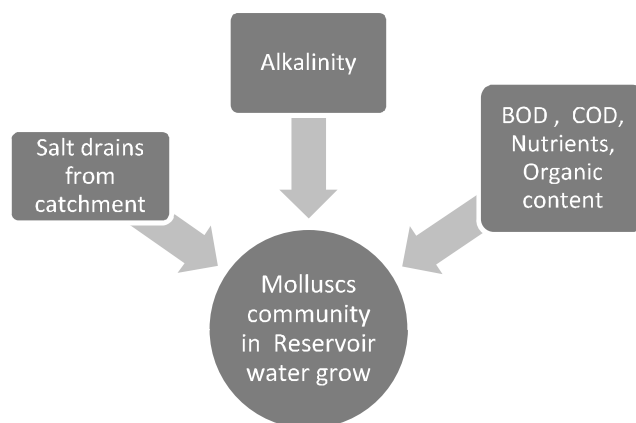


Fig. 2: Molluscs as Indicators of Water Quality

II METHODOLOGY

(a) **Mollusc Collection** Molluscs were sampled using a D-frame net with approximately 30 x 20 cm in border area of 2m². Three replicate samples were taken at each site. The collected specimens were kept in plastic containers. Then the animals were preserved in 7% alcohol for further study. Dead specimens with dry shells were also collected samples were brought to laboratory. In the laboratory, samples were washed in two sieves (2 and 0.5 mm mesh) and sorted and identified. It was

done from 5 locations in each of the three reservoirs. Tables 1-3 shows seasonal variation of molluscs.

(b) **Water Sample Collection** - Surface water from sampling locations were collected in well labeled cleaned polyethylene bottles rinsed by deionized & reservoir water. Analysis of physicochemical parameters is done as per APHA (2005), Standard Methods for the Examination of Water and Waste Water, 21st edition, American Public Health Association, Washington, DC., USA.

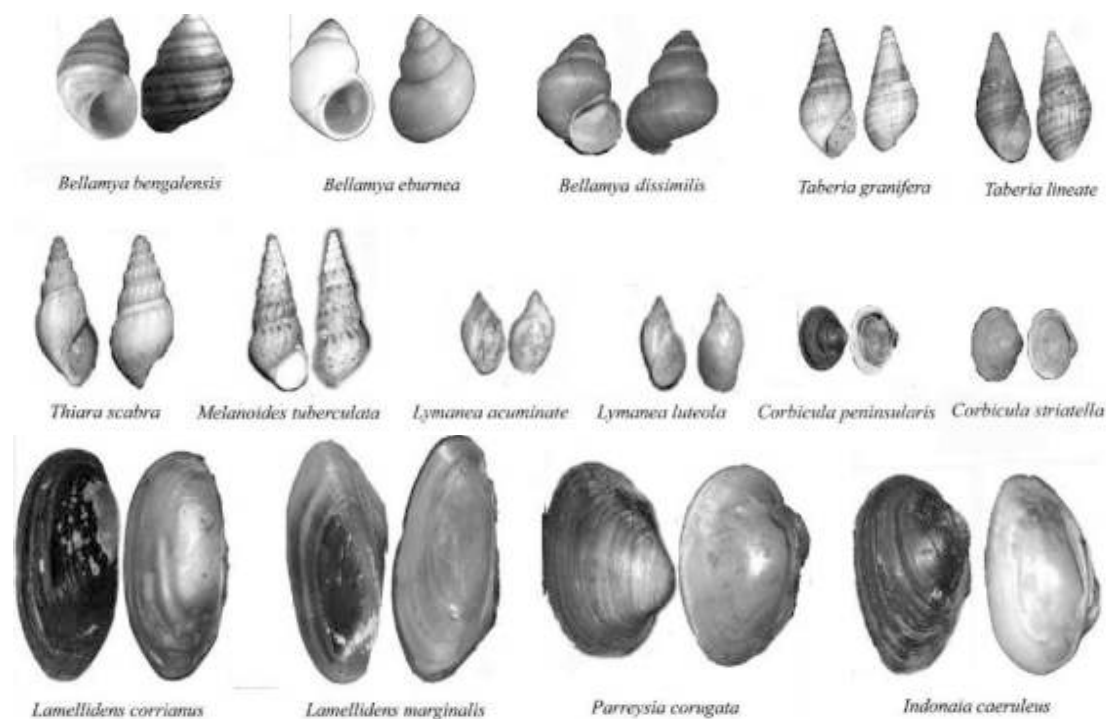


Fig. 3 : Images of Mollusc species from Reservoirs

Mollusc sp were collected and counted from every 100 sq ft area in five locations of three reservoirs, Panshet, Khadakwasla and Ujjani during three

seasons. During summer season heaps of snails were found dead on the bank of Ujjani reservoir.

Table 3
Mollusc abundance in Monsoon for 3 reservoirs

S.No.	Molluscs sp	Panshet	Khadakwasla	Ujjani
	Molluscs sp			
1	<i>Bellamaya bengalensis</i>	-	++	++++
2	<i>Bellamya eburnea</i>	-	+++	++++
3	<i>Bellamya dissimilis</i>	+	++	++++
4	<i>Tuberia granifera</i>	++	+++	++++
5	<i>Tuberia lineate</i>	++	+++	++++
6	<i>Thiara scabra</i>	++	+	++++
7	<i>Melanoides tuberculata</i>	-	++	++++
8	<i>Lymanea acuminata</i>	+	++	++++
9	<i>Corbicula peninsularis</i>	+	+++	++++
10	<i>Corbicula striatella</i>	++	+++	++++
11	<i>Lamellidens corrianus</i>	-	+++	++++
12	<i>Pareysia curvugata</i>	-	++++	++++
13	<i>Lamellidens marginalis</i>	++	++++	++++
14	<i>Indonaia caerulea</i>	++	+++	++++

+++++) Most Abundance; (+++) Less Abundance; (++) Present; (-) Absent;

Table 4
Mollusc abundance in Winter for 3 reservoirs

S.No.	Molluscs sp	Panshet	Khadakwasla	Ujjani
	Molluscs sp			
1	<i>Bellamaya bengalensis</i>	-	+++	++++
2	<i>Bellamya eburnea</i>	++	+++	++++
3	<i>Bellamya dissimilis</i>	+	++	++++
4	<i>Tuberia granifera</i>	++	+++	++++
5	<i>Tuberia lineate</i>	++	+	++++
6	<i>Thiara scabra</i>	-	+++	++++
7	<i>Melanoides tuberculata</i>	++	+++	++++
8	<i>Lymanea acuminata</i>	++	+++	++++
9	<i>Corbicula peninsularis</i>	-	-	++++
10	<i>Corbicula striatella</i>	++	+++	++++
11	<i>Lamellidens corrianus</i>	++	+++	++++
12	<i>Pareysia curvugata</i>	-	+++	++++
13	<i>Lamellidens marginalis</i>	-	+++	++++
14	<i>Indonaia caerulea</i>	++	+++	++++

(+++++) Most Abundance; (+++) Less Abundance; (++) Present; (-) Absent;

Table 5
Molluscs abundance in summer for three Reservoirs

S.No.	Molluscs sp	Panshet	Khadakwasla	Ujjani
	Molluscs sp			
1	Bellamya bengalensis	-	++	+++++
2	Bellamya eburnea	++	+	+++++
3	Bellamya dissimilis	-	++	+++++
4	Tuberia granifera	++	+++	+++++
5	Tuberia lineate	+	+	+++++
6	Thiara scabra	++	+++	+++++
7	Melanoides tuberculata	-	+	+++++
8	Lymanca acuminata	+	+++	+++++
9	Corbicula peninsularis	++	+++	+++++
10	Corbicula striatella	++	+++	+++++
11	Lamellidens corrianus	-	+++	+++++
12	Pareysia curvugata	-	+++	+++++
13	Lamellidens marginalis	-	+++	+++++
14	Indonata caerulea	++	+++	+++++

(+++++) Most Abundance; (+++) Less Abundance; (++) Present; (-) Absent;

Table 6 :
Physicochemical parameters of three Reservoirs (Average Values)

S.No	Parameter	Parameter	Objective	Panshet	Khadakwasla	Ujjani
1	pH	-	8.5	8.4	8.4	7.4
2	EC	μS/cm	300	78	88	169
3	DO	mg/l	5	8	7	5
4	BOD	mg/l	2	1	2	120
5	COD	mg/l	10	5	6	74
6	Na+	mg/l	250	3	7	63
7	K+	mg/l	12	0.8	0.6	24
8	Ca++	mg/l	75	7.6	6.9	58
9	Mg++	mg/l	200	7.8	6.8	6.8
10	TH	mg/l	300	66	67	126
11	HCO3-	mg/l	200	0	2.5	162
12	CO3=	mg/l	200	0	3.1	172
13	TALK	mg/l	300	0.77	6.5	268
14	Cl-	mg/l	250	8.5	6.7	74
15	SO4=	mg/l	150	7.8	6.8	74
16	NO3-N	mg/l	45	6.9	8.1	0.83
17	PO4-P	mg/l	0.1	0.69	0.8	0.81
18	SiO2	mg/l	50	6.6	8.3	82
19	Fe	mg/l	0.3	0.83	0.78	0.69
20	TDS	mg/l	500	79	104	178

III RESULTS

Ujjani reservoir shows most abundance of molluscs. Unlike Ujjani reservoir Panshet and Khadkwasla reservoirs show less abundance and

sometimes scanty presence of molluscs. This is shown in Figure 4. While counting the number of mollusc (+++++) abundance were given more than 25 for each (+) and (-) would indicate absence of molluscs.

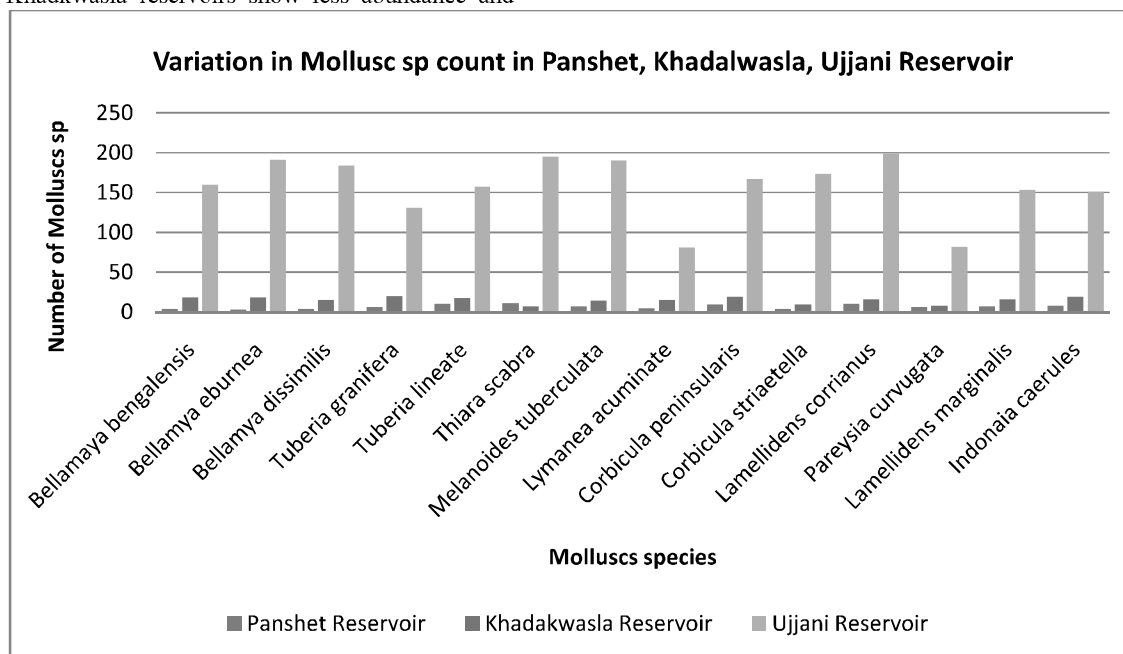


Fig. 4 : Variation of Molluscs species in Panshet, Khadalwala and Ujjani Reservoirs

IV DISCUSSIONS

The study of relationship of abundance of molluscs to water quality parameters is depicted from abundance tables 3-5 and table 6 for physicochemical parameters for its comparative differences. Ujjani reservoir is having comparatively high salt content ranging from 100 to 500 mg/l, alkalinity more than 100 mg/l and Calcium content more than 50 mg/l with high BOD, COD and the nutrient content from its huge catchment area which is highly urbanized. The presence of aquatic plants in Ujjani reservoir makes home for molluscs and affects the dissolved oxygen concentration. Green plants release oxygen into the water during photosynthesis. Photosynthesis occurs during the day when the sun is out and ceases at night. Thus in Ujjani reservoir with significant populations of algae and other aquatic plants, the dissolved oxygen concentration may fluctuated daily, reaching its highest levels in the late afternoon.

Molluscs have a variety of different feeding mechanisms. The bivalve molluscs can filter-feed fine particles from water. Some of the single-shelled molluscs (limpets) possess a ribbon-shaped tongue or radula, covered with rasping teeth, which

enables them to scrape algae from the pebbles or hard bottom.

(a) Significance of mollusc:

The freshwater molluscs play a very important role in nature and help in assessment of ecological status of the water bodies. Being herbivores, they form the lower strata of aquatic trophic linkages and perform many other ecological activities. Hence, studies pertaining to their diversity, distribution and ecology become imperative. Bivalves intimately correlated with the physico-chemical regime of the reservoir. These species can be considered as bioindicators of pollution as they were found to respond prominently to nutrient inputs, discharge of sewage and excreta produced by animals and humans. A progressive increase in their number with increasing pollution load indicates that they possess great tolerance against the contaminants present in water and flourish well in their presence. Findings of the present work shall be utilized by future researchers and ecologists as supplementary information in public and veterinary health sciences, ecotoxicology, water quality assessment and river and reservoir management studies.

V ACKNOWLEDGEMENT

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Investigation on Analysis of Different WDM Optical Network Topology

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ABSTRACT

This work presents a novel approach for topology analysis in Optical WDM Network. The idea is to make a system in which different topologies can be analyzed. The need for this type of approach is to improve the performances of the Optical WDM Networks, as time goes performance of these networks degrades, due to arrival of new applications.

I INTRODUCTION

A wavelength-routed WDM network can provide end-to-end optical communication channels (lightpaths) through optical fibers and intermediate nodes with optical cross-connects. These optical channels eliminate extra signal processing at network intermediate nodes along the physical path through which the lightpath is routed. However, it may not be possible to establish a lightpath between every node, because of scalability and economic concerns. Hence, some traffic may need to be routed electronically from one lightpath to another at network intermediate nodes until it reaches to destination, this approach is called multi-hopping. due to limits of electronic processing speed, it is not possible to utilize all bandwidth of an optical fiber using a single high capability channel.

II WAVELENGTH DIVISION MULTIPLEXING

WDM is an approach that can exploit the huge opto-electrical bandwidth mismatch by requiring that each end-user's device operate only at electrical rate, but several WDM channels from dissimilar end-users may be multiplexed on the same fiber [3]. With WDM, a number of distinct wavelengths or frequencies are used to implement separate channels. An optical fiber can carry several channels in parallel, each on a particular frequency. The number of wavelengths that each fiber can carry concurrently is limited by the physical characteristics of the fiber and the state of the optical technology used to combine these wavelengths onto the fiber and isolate them off the fiber. With currently available trade technology, a few tens of wavelengths can be supported within

the low-loss window at 1550 nm, but this number is expected to grow rapidly in the next few years. Therefore, optical fiber links employing WDM technology have the potential of delivering a collective throughput in the order of Terabits per second (Tb/s), enough to satisfy the user growing demand on a sustained, long-term basis [4].

III DESIGNING OF THE OPTICAL WDM NETWORK

We have designed four various network topologies having 9 nodes. We have designed an .xml code file to design each network. The .xml contains the list of nodes and fiber links in the network. Per node information is composed by the X and Y coordinates of the node measured in kilometres over a Euclidean plane, number of E/O transmitters, O/E receivers, node population, node type (or node level), number of nodes and the name of each node. Per link information is the maximum number of wavelengths per link and the number of optical fibers.

Table 1
9-Node Bus topology

Number of nodes	9
Total links	8
Lightpath Capacity	60 gbps
No of Wavelengths	40
Number of traffic level	1
Type of connection	Bidirectional

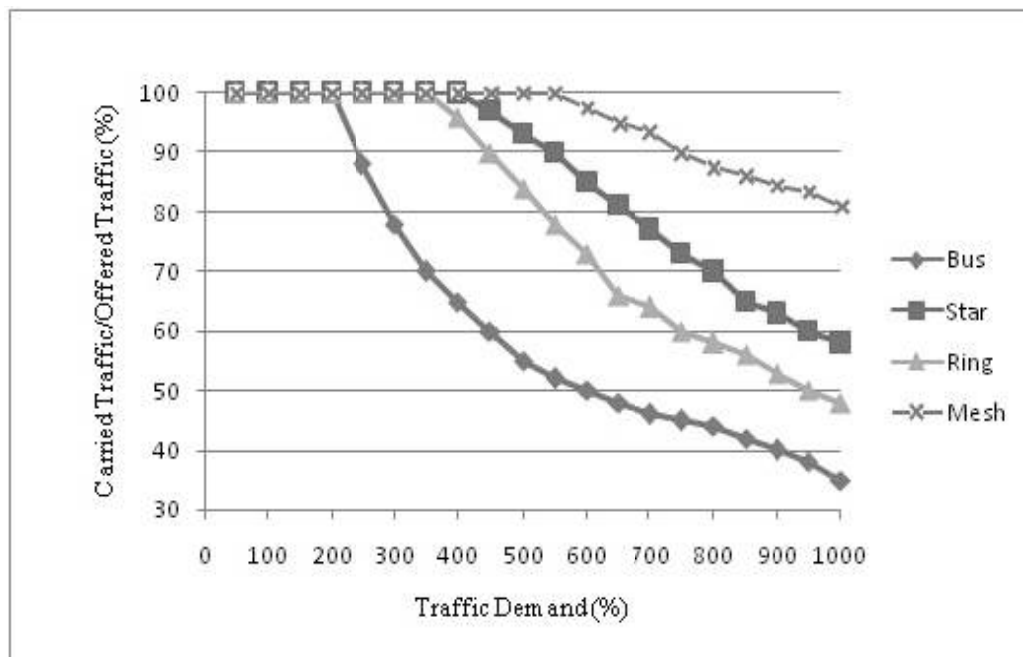


Fig. 1 Carried Traffic/ Offered Traffic Vs Traffic Demand

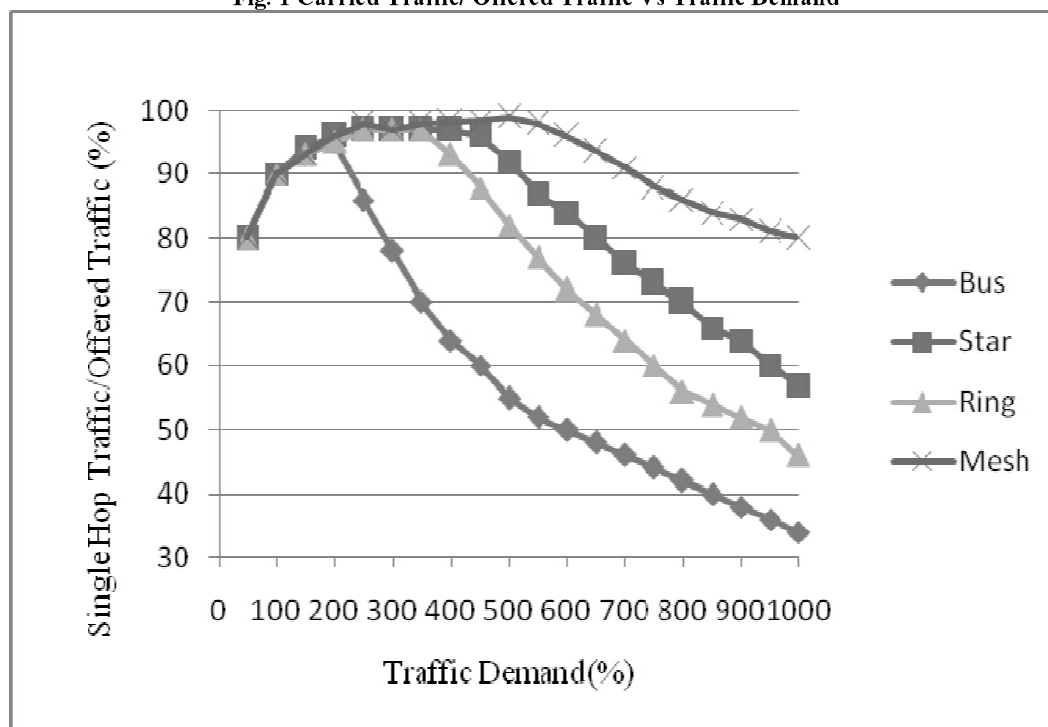


Fig. 2 Single Hop Traffic/Offered Traffic Vs Traffic Demand

IV CONCLUSION

In this work we introduced the concept of Optical WDM Networks used in analysis of traffic & topology in 9-Node WDM Optical Networks. We presented required criteria for a Optical WDM Network. We also identified components can be applied in Networks as well as other areas also.

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Association Rule Based Pattern Analysis with Liver and Diabetes Dataset

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ABSTRACT

Association rule mining is important tool for data analysis. The associations rule mining technique finds the relation between two different attributes on the basis of support and confidence value. The association rule mining technique gives two algorithms for analysis of data, one is memory based and the other is memory independent. The memory based algorithm is well known algorithm called apriori algorithm and memory independent algorithm is called FP-growth algorithm. The rough set based rule generation technique is a new approach for classification. In this technique rough set generates a number of rules, these generated rules design the class builder and finally data are classified. The rough set based classification technique reduces the number of attributes during the classification process. For the optimization and better prediction of classification gravitational search optimization technique in combination of rough set theory is used. This paper discusses the rough set theory, rule generation algorithm and Gravitational Search Algorithm (GSA), proposed algorithm and proposed model for the classification process.

I ROUGH SET THEORY

The rough sets theory deals with uncertain and fuzzy materials and helps simplification. In the rough sets theory, humans use their general knowledge to classify the world around them as abstract or concrete. Everything is classified according to its characteristics, and those with nearly identical characteristics may be put into the same group. One of the main advantages of rough set theory is that it does not need any preliminary or additional information about data. The main problems that can be approached using rough sets theory includes data reduction, discovery of data dependencies, and estimation of data significance, generation of decision algorithms from data, approximate classification of data, discovery of patterns in data and discovery of cause-effect relationships [10]. The following is the concept of rough sets theory.

II GRAVITATIONAL SEARCH ALGORITHM [GSA]

The Gravitational Search Algorithm (GSA) is simulation of Newton's gravitational force behaviors. In this algorithm, possible solutions of the problem in hand are considered as objects whose performance (quality) is determined by their masses, all these objects attract each other by the gravity force that causes a global movement of the objects towards the objects with heavier masses. The position of each object corresponds to a solution of the problem, and inertial masses are determined by a fitness function. The heavy masses, which represented a good solutions, move more slowly than lighter ones, this represents the exploitation of the algorithm. The GSA starts with a set of agents, selected at random or based on some criteria, with certain positions and masses representing possible solutions to a problem, and iterates by changing the

positions based on some values like fitness function, velocity and acceleration that gets updated in every iteration

III PROPOSED METHODOLOGY

The proposed algorithm of rough set based classification technique uses gravitational search algorithm. The rough set based classification technique uses rule generation technique from the process of rough set. The rough set is a combination of fuzzy logic and classical set theory. In process of objective function minimization gravitational search algorithm for the process of rule optimization is used. The process of rule optimization technique reduces the number of rules during the class builder process. The GSA algorithm divides the all rule segment in three class i.e. upper class, lower class and average class. Following are the steps of algorithm-

- (a) Data are passes through RGI
- (b) RGI gives the number of rules
- (c) All rules divide into three section lower upper and average
- (d) The training phase data are passes through GSA sampler
- (e) The sampling of data passes through class builder balanced the data for minority and majority ratio of class
- (f) The sampled data assigned to k-type binary class
- (g) Binary class data are coded in bit form
- (h) if code bit value is single assigned the class value
- (i) Else data goes to training phase
- (j) . Balanced part of training is updated
- (k) Find accuracy and relative mean Error
- (l) Exit

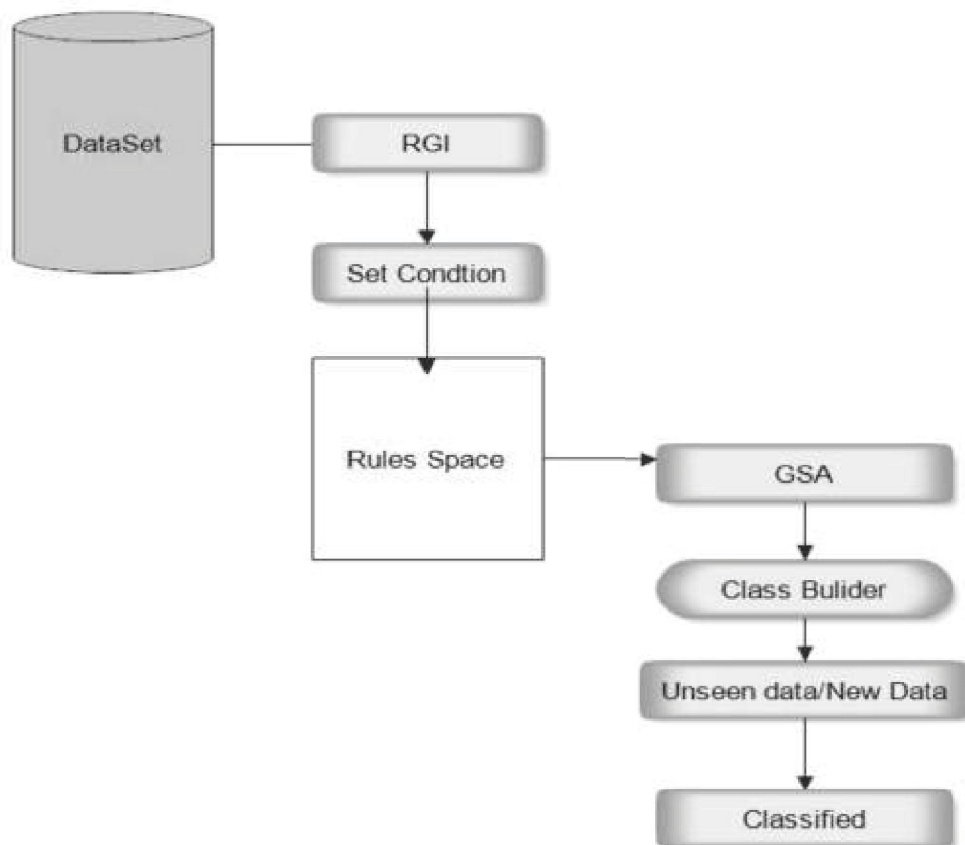


Fig. 1: Proposed models for rule based classification based on rough set and GSA algorithm.

IV EXPERIMENTAL RESULTS AND PROCESS DATASET DESCRIPTION LIVER AND DIABETES DATASET

(a) Attribute information:

- (i) mecv mean corpuscular volume
- (ii) alkphos alkaline phosphotase
- (iii) sgpt alamine aminotransferase
- (iv) sgot aspartate aminotransferase

- (v) gammagt gamma-glutamy transpeptidase
- (vi) drinks number of half-pint equivalents of alcoholic beverages drunk per day
- (vii) selector field used to split data into two sets
- (viii) Missing values: none

(b) Performance Evaluation and Result Analysis

Table 1
Accuracy and elapsed time tabulation

Data set Name	Method	Support	Confidence	Accuracy (%)	Elapsed Time (sec)
Liver	CBA	0.3	0.5	81	6.245
	RGI	0.3	0.5	82	5.308
	Proposed	0.3	0.5	86	4.633
Diabetes	CBA	0.3	0.5	81.49	7.245
	RGI	0.3	0.5	83.32	8.451
	Proposed	0.3	0.5	87.72	9.678

The result tabulated at table 1 shows that the Accuracy and Elapsed time with using CBA, RGI and Proposed techniques for the same and different dataset.

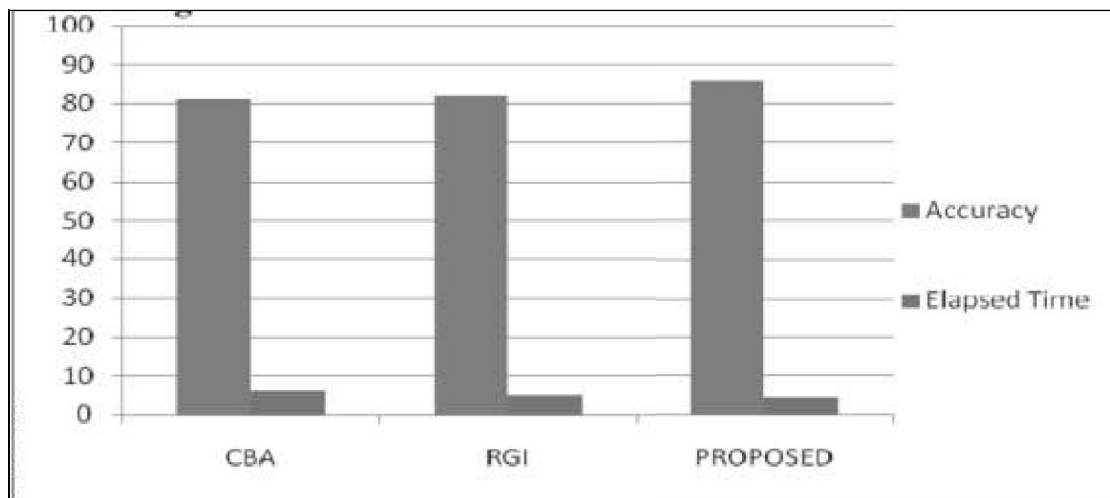


Fig. 2 Comparative performance graph for liver dataset using each method

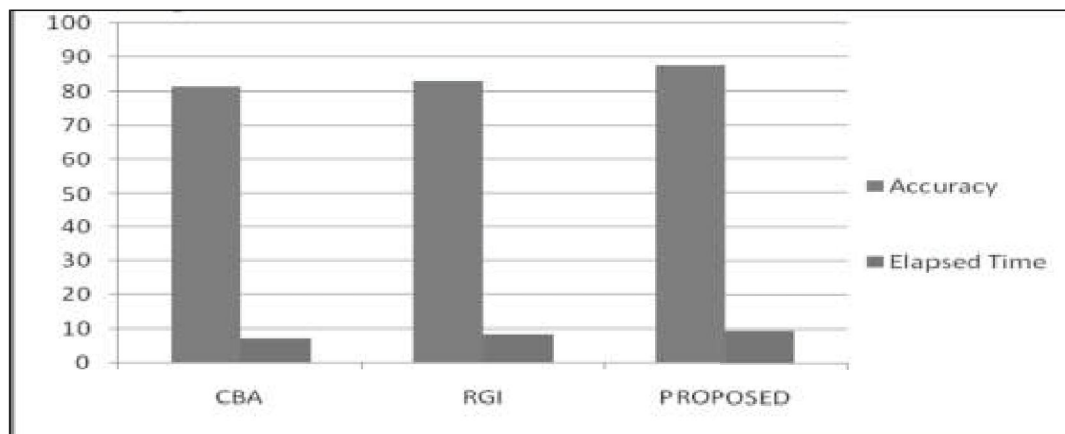


Fig. 3 Comparative performance graph for Diabetes dataset using each method

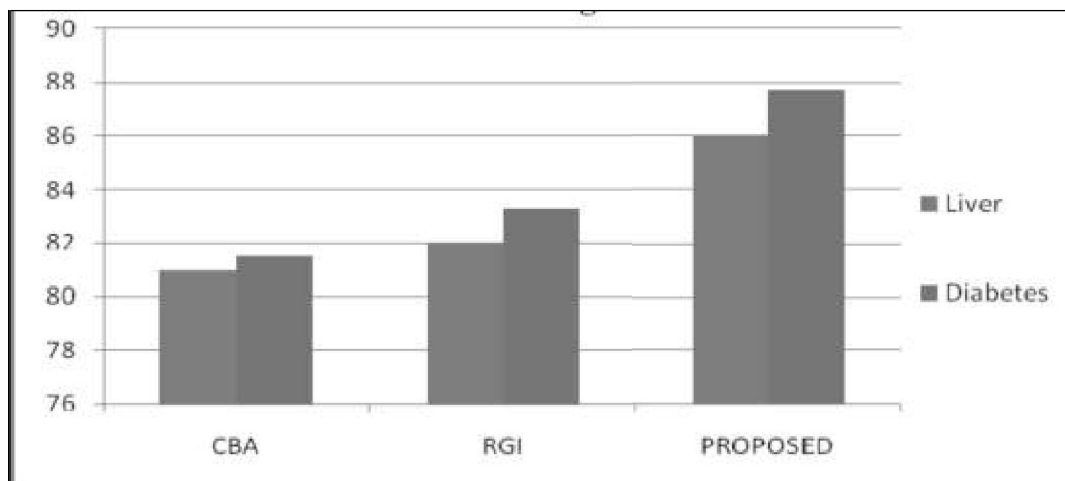


Fig.4 Comparative performance graph for Accuracy using Liver and Diabetes dataset using each method

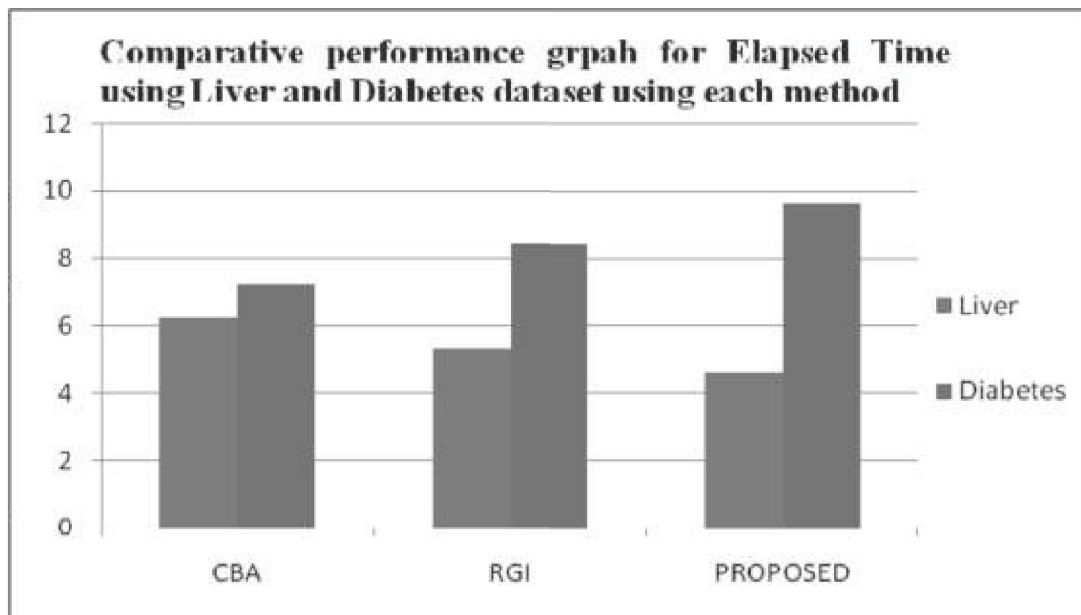


Fig. 5 Comparative performance graph for Elapsed Time using Liver and Diabetes dataset using each method

The Figure 2: shows comparative results of Liver data set, using CBA, RGI and Proposed method and here our proposed algorithm gives better result in the form of higher Accuracy and low Elapsed time as compared to the existing method.

Figure 3: shows that comparative result of Diabetes data set, using CBA, RGI using proposed method. Here our proposed algorithm shows better results in the form of higher Accuracy and low Elapsed time than the existing method.

Figure 4: shows comparative result of Accuracy for Liver and Diabetes data set, using CBA, RGI and Proposed method. Here our proposed algorithm shows better results in the form of higher Accuracy.

Figure 5: shows comparative result of Elapsed Time for Liver and Diabetes data set, using CBA, RGI and proposed method. Here our proposed algorithm shows better results in the form of low Elapsed time as compared to existing method.

V CONCLUSION

The Accuracy and Elapsed time was compared using proposed techniques against CBA & RGI for the same and different datasets. The analysis shows that results of Liver data set and Diabetes data set, using proposed method and proposed algorithm as compared to CBA & RGI give better result in the form of higher Accuracy and low Elapsed time than the existing method.

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Design of a High Gain Broadband Microstrip Patch Antenna for Cognitive Radio

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ABSTRACT

This research paper presenting the experimental investigations on the effect of metallic inclusions on a dielectric substrate for tailoring the properties of met materials and a dual band micro strip patch antenna along with the met material structure that is proposed at a height of 3.3 mm from the ground plane, which consists of a geometry incorporated with a special arrangement that is c fashioned arrangement. Actually this research paper principally paying attention on going up the probable parameters of high gain broadband microstrip patch antennas and analyzing the dual band procedure of the proposed antenna. dielectric properties of samples are measured with dissimilar metallic inclusions and the outcome are compared with and without inclusions. The proposed antenna is designed to resonate frequency at 2.488 GHz and 2.920 GHz frequency and the impedance bandwidth of the antenna is at 2.488 GHz along with the proposed metamaterial structure is improved with 20.5 MHz frequency and return loss is reduced by the 20.138 dB. At 2.920 GHz frequency the impedance bandwidth is improved by 25.5 MHz and return loss is reduced by 19.574 dB. For verifying that the proposed metamaterial structure possesses the designs of several samples leading negative values of Permittivity and Permeability within the operating frequency ranges presented along with their experimental results.

Index Terms – Metamaterials, Dual band operation, Returnloss, Microstrip Patch Antenna and Impedance bandwidth.

I INTRODUCTION

Actually Metamaterials are a broad class of imitation materials that could be engineered to demonstrate permittivity and permeability individuality to system necessities. With embedding unambiguous structures in a number of horde media the consequential material can be personalized to put on display sought-after individuality. Some Engineered Metamaterial have permeability and permittivity less than zero because product $\epsilon\mu$ is positive, refractive index (η) is positive and real. Many Metals such as gold or silver have negative ϵ at visible wavelength. Materials which have ϵ or μ negative but not both is denser to electromagnetic radiations. We know that this is the world of wireless communication systems and Metamaterials are a broad class of synthetic materials that could be engineered to show permittivity and permeability characteristics to system requirements. In spite of having a lot of advantages like low profile, low cost and omni directional radiation pattern. It has a number of drawbacks similar to less bandwidth and low gain. Several researches have been done to overcome the drawbacks. But this research paper discussed about the metamaterials have been lengthily useful for antenna applications newly to achieve.

- (a) Beam width control
- (b) Antenna miniaturization
- (c) Improved directivity

A novel application of Metamaterials has been found in enhancing the magnetic permeability of otherwise nonmagnetic materials. Metamaterial based antennas can display improved performance characteristics like more radiated power for the same input power in comparison with conventional microstrip antenna.

II PROPOSED DESIGN

- (a) **Shape & Geometry** - As we are seeing Figure 1 shows the top view of the proposed configuration and Figure 2 shows its side view. The proposed design consists layers of metallic patch on a layer of dielectric substrate. Both layers are in the shape of L. To excite the antenna, single probe feed is applied to the patch. The position of feed is also shown in figure no. 1.

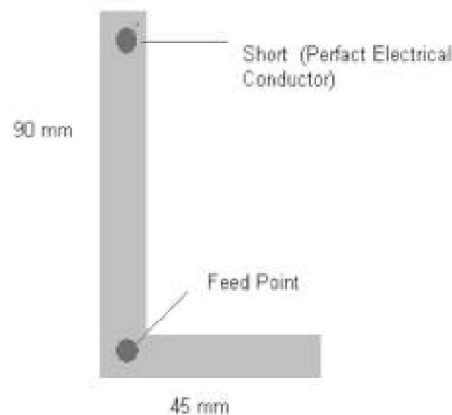


Fig.1

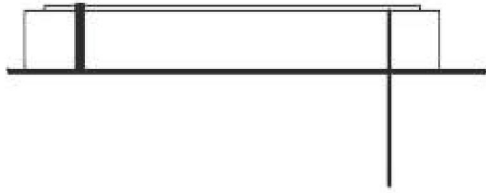


Fig.2

The RMPA parameters can be calculated with the formulas given below-

Width Calculation (W) is-

$$W = \frac{1}{2f\sqrt{\mu_0\epsilon_0\epsilon_r}} \sqrt{\frac{2}{\epsilon_r+1}} = \frac{c}{2f\sqrt{\epsilon_r+1}} \sqrt{\frac{2}{\epsilon_r+1}}$$

Where, c = free space velocity of light and ϵ_r = Dielectric constant of substrate.

The efficient dielectric constant of the broadband microstrip antenna is-

$$\epsilon_{eff} = \frac{\epsilon_r+1}{2} + \frac{\epsilon_r-1}{2} \left(\frac{1}{\sqrt{1+\frac{12h}{W}}} \right)$$

The actual length of the Patch (L) is-

$$L = L_{eff} - 2\Delta L$$

$$\text{Where, } L_{eff} = \frac{c}{2f\sqrt{\epsilon_{eff}}}$$

Calculation of Length Extension is-

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{eff}+0.3)}{(\epsilon_{eff}-0.258)} \frac{\left(\left(\frac{W}{h}\right)+0.264\right)}{\left(\left(\frac{W}{h}\right)+0.8\right)}$$

- (b) **Parameters & Dimensions-** The thickness of the patch 0.0006 mm, Permittivity of the substrate 4.5, Loss tangent of lower substrate is 0.0002, Radius of Short is 6 mm and the Thickness of the substrate 1.7 mm

III RESULTS & DISCUSSION

Figure 3 shows the variations of S11 with Frequency.

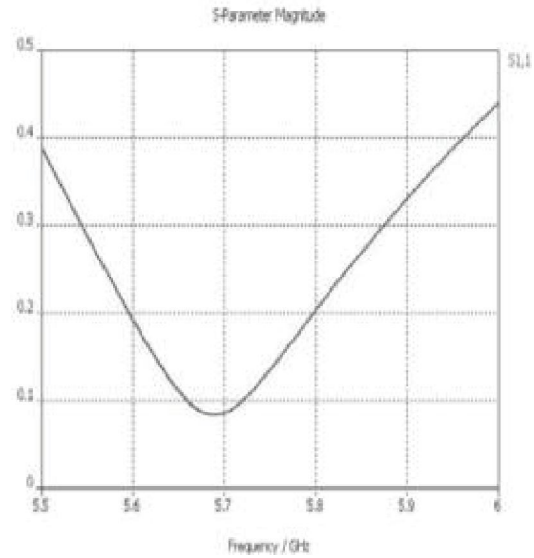


Fig.3

Figure 4 shows proposed metamaterial structure between the two waveguide ports.

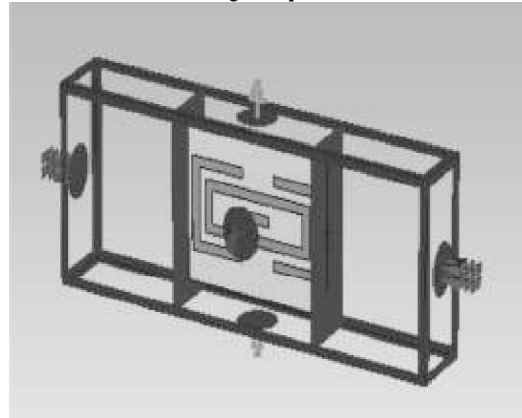


Fig. 4

Figure 5 shows the schematic metamaterial patch antenna.

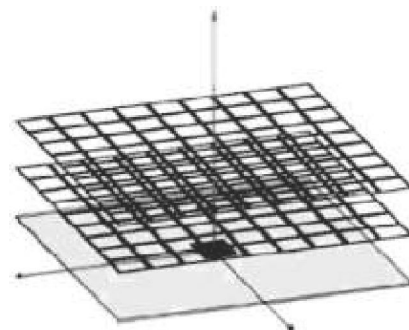


Fig. 5

Figure 6 shows the discrepancy of VSWR through frequency of the antenna. From Frequency 5.55 GHz to 3.75GHz the input VSWR is ≤ 2 .

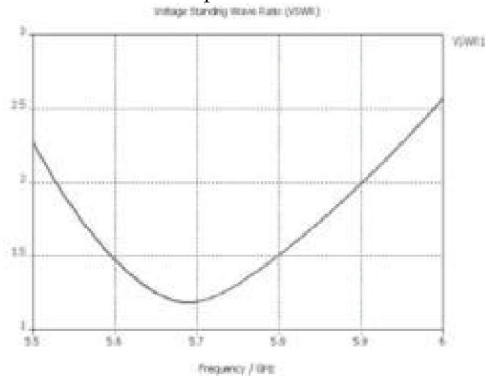


Fig.6

Figure 7 shows the Rectangular Microstrip Patch Antenna

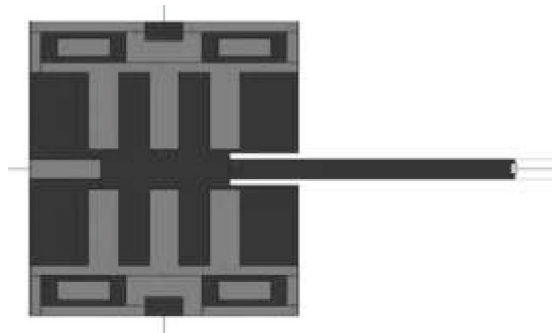


Fig. 7

Figure 8 shows Smith Chart

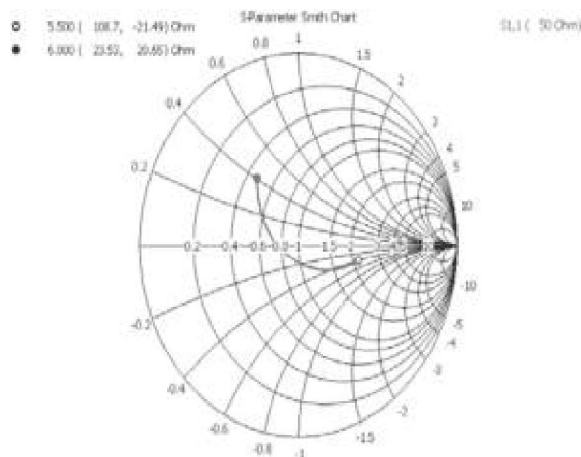


Fig.8

And if we'll talk about the distribution of the magnetic field then fig9 and fig10 shows the niceties regarding for the past said.

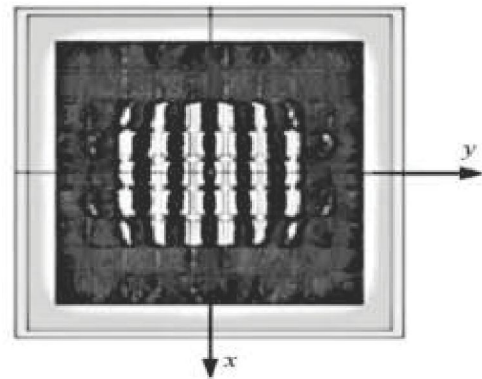


Fig.9

Fig 10 shows the first layer on the surface of the metamaterial cover an fig 10 shows the second layer from the substrate upward.

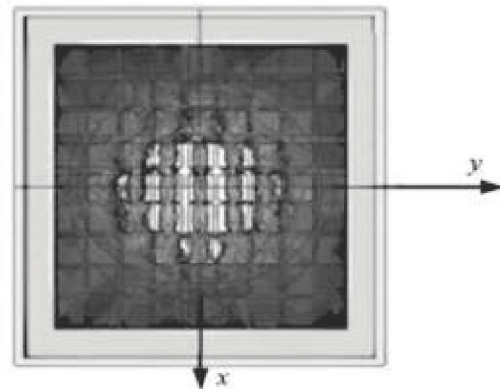


Fig.10

NRW's Method- Equations used for finding permittivity & permeability using NRW's approach.

$$\mu_r = \frac{2 \cdot c \cdot (1 - v_2)}{\omega \cdot d \cdot (1 + v_2)}$$

$$\epsilon_r = \mu_r + \frac{2 \cdot S_{11} \cdot c \cdot d}{\omega \cdot d}$$

$$v_2 = S_{21} - S_{11}$$

Where,

ϵ_r = Permittivity
 μ_r = Permeability

ω = Frequency in Radian

d = Thickness of the Substrate

c = Speed of Light, and

v_2 = Voltage Minima

IV ACKNOWLEDGEMENT

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Cost Efficiency of Public Hospitals – A Case Study on District Hospitals in Andhra Pradesh

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ABSTRACT

This paper aims to study the cost efficiency of public hospitals in the State of Andhra Pradesh (before bifurcation). For this purpose 12 district hospitals were selected from different regions of Andhra Pradesh state and their common Decision Making Units (DMUs) identified. The Data Envelopment Analysis (DEA) econometric tool has been used to measure the efficiency and the best performing hospitals have been ranked. The data was collected from Andhra Pradesh Vaidya Vidhana Parishad (APVIP) for five years. The analysis is done by classifying the data into Input, Output and Explanatory variables. The results show that few hospitals are ranked high due to consistent performance and other hospitals who scored less are low performing hospitals during the period of study.

I INTRODUCTION

The present study deals with the comparative study of the cost efficiency of select public hospitals in pre-bifurcation period of Andhra Pradesh. It is often argued that health care institutions are not expected to be efficient, as they do not adhere to neo-classical firm optimization behavior (Rowna, 2000). There has been rapid increase in the application of different methods to measure hospital efficiency; the most commonly devised method for the purpose is Data Envelopment Analysis method.

Data Envelopment Analysis (DEA) is an increasingly popular decision making tool based on linear programming technique for measuring relative efficiencies of a set of comparable entities. It has been extensively applied in performance evaluation and benchmarking of schools, banks, hospitals, manufacturing concerns etc. DEA was introduced by Charnes, Cooper, Rhodes (1978) to assess the relative efficiencies of the organizational units with multiple inputs to produce multiple outputs.

II OBJECTIVES OF THE STUDY

The objectives of the study are:

- To make a comparative study of the cost efficiency of select public hospitals in Andhra Pradesh.
- To Rank the public hospitals based on their efficiency.
- To measure the magnitude of gap between the low performing hospitals from High performing hospitals.

III LITERATURE REVIEW

Carnes, Cooper and Rhodes (1978) introduced the Non-Parametric method of measuring and comparing efficiency that can be used in service sector having multiple Decision Making Units (DMUs) with different units of measurement. The scale of operations is not the aspect of comparison but all the institutions or organization must have the common DMUs existing in the same basic environment. Robert W. Rutledge, Sharon Parsons and Richard Knaebel (1995) emphasized on the DEA methodology and its ability to determine the relative efficiency of each of the latest available data for a mid-sized non-profit hospital in the south east united states. DEA was able to simultaneously consider multiple inputs and outputs with which it classified months as efficient or inefficient. Bill Bingleong Wang, Yaser A Ozcan and Thomas T.H.Wan(1999) identified 6010 hospitals for analysis from the American Hospital Association's Annual Surveys for 1989 and 1993 and applied data envelopment analysis (DEA), to study hospital efficiency in the United States. Results suggest that large hospital generally demonstrated higher inefficiency. The major inefficiencies exist in the availability of hospital services, the number of operating beds, the utilization of hospital staffing and operating expenses.

Rowena Jacobs (2000) examined hospital Efficiency using data envelopment analysis and stochastic frontier analysis at UK department of health and compared the efficiency rankings from the cost indices with those obtained using DEA and SCF and paper concluded that each method has particular strengths and weaknesses and potentially measure different aspects of efficiency. Ramesh Bhat, Bharat Bhushan Verma and Elan Reuben (2001) focused on analyzing the hospital efficiency of district level government hospitals and grant in aid hospitals in Gujarat

using Data Envelopment Analysis. Duncan Mortimer and Stuart Peacock (2002) compared the policy value of DEA and SFA based measure against more commonly used indicators of hospital performance. The methodology they used is the comparative analysis of DEA and SFA in estimating the relative efficiency of hospitals in Victoria. Possible sources of measured inefficiency were investigated via Battese and Coelli(1995) effects model in the case of SFA based efficiency scores and via second-stage regressions in the case of DEA based efficiency measures. The content and consistency of DEA and SFA based targets and measures are then compared against simple cost/output ratios. Antonio Afonso and Sonia Fernandes(2005) have contributed to DEA efficiency scores and Malmquist indexes for a panel data set comprising 68 Portuguese public hospitals belonging to the National Health System (NHS) in the period 2000-2005, when several units started being run in an entrepreneurial framework. William W.Cooper, Lawrence M. Seiford and Joe Zhu (2007) have provided an introduction to DEA and some of its uses. Milan M. Marti, Marina S. Novakovi and AlenkaBaggia (2008) presented ample possibilities for using the DEA for the evaluation of the performance of bank branches, schools, university departments, farming estates, hospitals and social institutions, military services, entire economic systems (regions) and other things. DEA is a methodology of several different interactive approaches and models used for the assessment of the relative efficiency of DMU and for the assessment of the efficiency.

IV METHODOLOGY

(a) Model Used - Data Envelopment Analysis (DEA) Model

Data Envelopment Analysis (DEA) is a multi-factor productivity analysis model for measuring the relative efficiencies of a homogenous set of Decision Making Units (DMUs). The efficiency score in the presence of multiple input and output factors is defined as:

$$\text{Efficiency} = \frac{\text{Weighted sum of Outputs}}{\text{Weighted sum of Inputs}}$$

$$\text{Maximize} = \frac{\sum_{r=1}^s U_r Y_{rj}}{\sum_{i=1}^m V_i X_{ij}}$$

$$\text{Subject to: } \sum_{r=1}^s U_r Y_{rj} \div \sum_{i=1}^m V_i X_{ij} \leq 1; j = 1, \dots, n$$

$$U_r, V_i \geq 0; r=1, \dots, s; i=1, \dots, m$$

Y_{rj} = amount of output r from hospital j

X_{ij} = amount of input i to hospital j

U_r = weight given to output r

V_i = weight given to input i

n = number of hospitals

s = number of outputs

m = number of inputs

Maximize = an LPP concept to Maximize efficiency for utilizing the inputs for the better outputs level

In DEA the efficiency of an organization (district hospitals in this case) is measured relative to a group's observed best practice. This implies that the benchmark against which to compare the efficiency of a particular district hospital is determined by the group of district hospitals in the study and not a value fixed by hospitals outside of the group.

The basic DEA model helps to find answers to questions such as:

- (i) Which district hospitals (or hospital departments) are the most efficient?
- (ii) If all district hospitals are to perform according to best practice (i.e. the efficient peer hospitals), by how much could inputs/resources be reduced to produce the current output levels; or alternatively, by how much could outputs be increased with the current input levels?
- (iii) How much resources can be potentially saved if all district hospitals are operating at an optimal scale?
- (iv) Which of the efficient district hospitals can serve as role models for the inefficient ones (so that their method of doing business may be emulated)?

DEA easily accommodates multiple inputs and outputs without the requirement for a common denominator of measurement. This makes it particularly suitable for analyzing the efficiency of hospitals as they use multiple inputs to produce many outputs. Furthermore, it provides specific input and output targets that would make an inefficient hospital relatively efficient. It also identifies efficient peers for those hospitals that are not efficient. This helps the inefficient hospitals to emulate the functional organization of their peers so as to improve their efficiency.

However, like many other empirical methods, DEA has its limitations. First, it produces results that are sensitive to measurement error. For example, if one hospital's inputs are understated or its outputs overstated, it can become an outlier and significantly reduce the efficiency of other hospitals.

Second, DEA measures efficiency relative to the best practice within hospitals in the particular sample. Therefore, it is not possible to compare how district hospitals in Andhra Pradesh fare relative to their counterparts in India with respect to technical efficiency.

(b) Allocative Efficiency

The Allocative efficiency shows whether, for any level of production, inputs are used in the proportion which minimizes the cost of production, given input prices. It determines that level of activities which takes the minimum cost of production or operations for the best output levels. It concentrates more in minimizing the costs of inputs.

(c) Technical Efficiency

The technical efficiency concentrates on conversion of physical inputs, such as labor services and raw materials or semi-finished goods, into *outputs*. Technical efficiency is determined by the difference between the observed ratio of combined quantities of an entity's output to input and the ratio achieved by *best practice*. It can be expressed as the potential to increase quantities of outputs from given quantities of inputs, or the potential to reduce the quantities of inputs used in producing given quantities of outputs. Technical efficiency is affected by the size of operations (*scale efficiency*) and by managerial practices (*non-scale technical efficiency*). It is defined independent of prices and costs.

(d) Scale Efficiency

The scale efficiency determines the extent to which an organization can take advantage of returns to scale by altering its size towards optimal scale (which is defined as the region in which there are constant *returns to scale* in the relationship between outputs and inputs).

(e) Non-scale technical efficiency

The non-scale technical efficiency determines the proportion of *technical efficiency* which cannot be attributed to divergences from optimal scale (*scale efficiency*); sometimes known as managerial efficiency or pure technical efficiency.

(f) Productivity

Measure of the physical output produced from the use of a given quantity of inputs. This may include all inputs and all outputs (*total factor productivity*) or a subset of inputs and outputs (*partial productivity*). Productivity varies as a result of

differences in *production technology*, differences in the *technical efficiency* of the organization, and the *external operating environment* in which production occurs.

(g) Returns to scale

The returns to scale show the relationship between the outputs and inputs. Returns can be constant, increasing or decreasing depending on whether output increases in proportion to, more than or less than inputs, respectively. In the case of multiple inputs and outputs, this means how outputs change when there is an equi-proportionate change in all inputs

V DATA COLLECTION & ANALYSIS

(a) Data Collection

Data was collected using a questionnaire that included information on inputs, outputs. The secondary data have been collected directly from the APVVP, Andhra Pradesh VaidyaVidhanaParishad located at Kothi, Hyderabad, India. The data includes selected hospitals of both Telangana & Andhra Pradesh States. Personal interviews were conducted, the response from the finance officer, ETC officers and others was remarkable depending on which the variables were decided. The period of study covered 5 years which includes the financial years from 2005-06 to 2009-10.

(b) Input-Output Data Analysis and methods

(i) Sampling

The study focuses on approximately 50% population of 23 district hospitals in Andhra Pradesh (N = 12) before bifurcation into two separate States, Telangana State and Andhra Pradesh State on 2nd June 2014. These hospitals are distributed over the 3 regions of the state of Andhra Pradesh namely Andhra (5), Telangana (5) and Rayalseema (2).

(ii) Selection of inputs and outputs

Table 1
Variables and their Description

Variable	Type	Code	Description	Units
Input	Capital	Bed	Number of Beds	Numbers
Input	Operating	Drug	Expenditure on Drugs	Expenses
Input	Operating	Diet	Expenditure on Diet	Expenses
Input	Capital	L&Eq	Expenditure on Lab and equipment maintenance	Expenses
Input	Operating	DT	Expenditure on Domestic travels	Expenses
Input	Capital	BMW	Expenditure on Biomedical wastes	Expenses
Input	Operating	WEOOE	Water Electricity and other office expenses	Expenses
Input	Staff	CAS	Civil Assistant Surgeon	Numbers
Input	Staff	NPS	Nursing and Paramedical Staff	Numbers
Output		IP	In patients	Numbers
Output		OP	Out patients Cases	Numbers
Output		MJS	Major Surgeries Cases	Numbers
Output		TUB	Tubectomy Cases	Numbers
Output		DLV	Deliveries Cases	Numbers
Output		USG	Ultra Sonography	Numbers
Output		X-Ray	X-Ray Cases	Numbers
Output		ECG	ECG Casess	Numbers
Output		LAB	Laboratory Cases	Numbers
Explanatory		PHC	Preventive Health Care	Index (0-1)
Explanatory		MCH	Maternal and child health care	Index (0-1)
Explanatory		CDS	Communicable disease services	Index (0-1)
Explanatory		NCD	Non-communicable disease services	Index (0-1)
Explanatory		CMS	Curative Medical Services	Index (0-1)

(iii) Input Variables

The input variables are broadly classified into capital expenses, labour and Operating expenses. The degree of disaggregation within these categories depended on the homogeneity of an input category, the quality of data within which to measure this input. Nine variables were defined to measure input variable, common to all hospitals. The level of aggregation or disaggregation of each head (staff, capital or operating) depended on the information available. For example the input variable of staff could consist of total staff strength of a particular hospital. The input variable of total staff strength, under the head of staff input was disaggregated as per information available into number of doctors, nurses, paramedical staff, administrative staff and others.

The essential physical infrastructure like OPD, consultation room, ward etc. is measured by creating an index to assess the presence and the absence of the standard items of infrastructure. The information is collected by administering the questionnaire, consultation with the technical personnel and pilot study. Though it is compulsory to build up the hospitals with the required infrastructure, it was found in few instances that the equipments are not maintained properly depriving the services to the patients.

Three measures of the capital inputs were available; a measure based on the number of beds per hospital, expenditure on Lab and Equipment and the expenditure Bio medical waste, to measure the capital investment. Beds are often used to proxy for capital stock in hospital studies usually because a reliable measure if the value of assets is not available. Operating expenses includes the expenses on drugs, diet and water, electricity and other office expenses. The selected operating expenses were found in the budget on regular basis, where as other items which are released based on the special requirements and that are not regularly released in the budget are ignore for the purpose of reducing data redundancy.

Staff inputs were measured by total time devoted for attending parties and the total manpower employed for attending the patients.

(iv) Output variable

Hospitals provide six major services: outpatient services, in-patient services, major and minor surgeries, deliveries, tubectomy and Laboratory services. Given this homogeneity in types of services provided, the number of cases

treated/handled under each category was chosen as a representative measure of these output variables.

Improved health status is the ultimate output of hospitals or the health system at large. However, due to difficulties in accurately measuring improvements in health status, hospital output is measured by an array of intermediate health services that supposedly improve health status.

Although there is a general consensus that the ultimate measure of output should be an improvement in the quantity and quality of life, practical difficulties limit the use of the outcomes approach. Health is multi-dimensional and affected significantly by a host of other socio-economic factors. Consequently, output is measured as an array of intermediate outputs (health services) that supposedly improve health status.

(v) Explanatory Variables

The explanatory variables consist of qualitative variables, Preventive Health care is measures by devising an index for preventive health care services provided by the hospitals by equally weighing the presence and absence of the various standard services provided by the hospitals. It was hypothesized that this would help explaining variance of the number of cases treated. For this purpose an index was devised and the value of this index of services ranges between 0 and 1. Similarly indices are derived for the Maternal and child Health care services and curative medical services. These indices, when regressed against the data for OPD cases and Inpatient cases, help explain the variance and correlation if any between these services and the OPD and inpatient activities.

Assuming that a particular hospital participate in a national communicable and /or non-communicable disease programme if there is a need felt in the region in which the hospital is located.

In the present study an index is devised to measure in binary terms, 0 for the non-availability and 1 for the availability of the explanatory variables.

Buttler(1995) classifies hospital output into four broad categories: inpatient treatment, outpatient treatment, teaching and research. Measuring hospital output by such variables as inpatient days or outpatient visits does not capture the case-mix and the quality of service rendered. Even though the use of Diagnosis-related groups may handle the problem of hospital case-mix; the absence of data makes its use limited in most developing countries.

Table 2
Index for availability of Explanatory Variables

DCHS	PHC	MCH	CDS	NCD	CMS
Mahaboobnagar	1	1	1	1	0
Sangareddy	1	1	0	1	1
Nizamabad	1	0	1	1	1
Karimnagar	1	1	1	0	1
Nalgonda	1	0	1	1	1
Vizianagarm	1	0	1	1	1
Rajahmundry	1	1	1	0	1
Eluru	1	1	1	1	0
Machilipatnam	1	0	1	1	1
Nellore	1	1	0	1	1
Chittoor	1	1	1	0	1
Nandyala	1	1	1	1	0

(vi) Data Analysis

The technical efficiency scores are computed using data envelopment analysis program, version 2.1 (XLDEA 2.1) one of the leading and trusted DEA software. Hospital utilization ratios are also computed using Microsoft Excel.

Output-oriented model was used in this study, as the decision to use or not to use the district hospital services is at the discretion of the consumer/client/patient. It is an exogenous factor that hospital managers may not have total control of. But the performance speaks itself.

A DEA Model was run after feeding the input and output variables into the Program. Twelve District hospitals were selected and fed into the model for analysis of technical and allocative efficiency. The DEA Program used for analysis based on the work of Ramesh Bhat and Bharat BhushanVarma (2001). There are two programs available in the computer program. The first involved the constant returns to scale (CRS) and the second one involves the Variable returns to scale (VRS) model. As the selected hospitals are catering to a similar kind of population and operate at the same level, only CRS model is applied. The size of the hospital is not considered as the sample is taken for district

hospitals alone. In some studies small, medium and large size hospitals are taken to calculate the efficiency in DEA. But the major limitations of those studies include the failure to consider the size of the organization as part of the variables. In the present study this limitation is overcome by choosing only single range of hospitals that have around 200-350 Bed strength. All the twelve hospitals are operating at the district level; therefore the selected hospitals are single range and single type of hospitals.

VI RESULTS

Data was compiled in the required variables for only 12 hospitals. The findings indicate a minor variation in the size of the district hospitals as indicated by the authorized number of beds. Summary statistics of the key variables is given in Table below in the form of the DEA Efficiency Scores. The efficiency scores are obtained by calculating the selected inputs and outputs of the sample size and comparing them on yearly basis. The table below is the result obtained by using XLDEA2.1

Table 1
Five Yearly DEA Efficiency scores of hospitals for the period of 2006-2010

Hospital Name	2006-07	2007-08	2008-09	2009-10
Mahboobnagar	1.0000	1.0000	1.0000	1.0000
Sangareddy	1.0000	1.0000	1.0000	0.9713
Nizamabad	1.0000	1.0000	0.9638	0.9611
Karimnagar	0.6855	0.7073	0.7105	0.7923
Nalgonda	0.8326	0.9854	1.0000	1.0000
Vizianagaram	1.0000	1.0000	1.0000	1.0000
Rajamundry	0.9687	0.5328	0.6743	0.7207
Eluru	0.9219	0.9271	1.0000	1.0000
Machilipatnam	1.0000	1.0000	1.0000	0.9020
Nellore	0.6365	0.7431	0.7885	0.8033
Chittoor	1.0000	1.0000	1.0000	1.0000
Nandyala	1.0000	1.0000	1.0000	1.0000

The Efficiency scores are determined by the ratio of the sum of weighted outputs to the sum of corresponding weighted inputs (Mika Linna 2010). The Efficiency score values ranging from < 0 to 1 which shows the comparative efficiencies of all the hospitals. It follows the theory of constant returns to scale; where in the change in the proportionate inputs do not show an abrupt variation on the outputs or performance.

As depicted by the above table, the value $< 1.0000 >$ shows those hospitals that are performing efficiently wherein the increase in the input combination will show proportionately positive results as they are efficiently utilizing their available resources. These are the hospitals which are scoring well in their performance, as well as the cost control methods are properly organized and well managed. The measurement of cost efficiency is relatively straightforward using non parametric method (Ray and kim, 1995)

The Efficiency score of 0.80 for District hospitals indicated that on an average the hospitals could increase the output using the same level of resources or reduce the input usage or input cost by 20 percent to deliver the same amount of health care. Only 58 percent of selected district hospitals are able to efficiently use their resources. An interesting observation evident from the table is that the efficiency score for the given hospitals does not follow the exact pattern of increase or decrease of the efficiency.

The technical efficiency scores indicate which of the hospitals are on the efficient frontier and following the best practices are scoring one, and which are less efficient relative to hospitals on the frontier holding the score less than one. The higher the score, the higher the potential increase in output, while maintaining inputs relative to best practice. The various statistics for the input and output variable for the PHC is given in the table above.

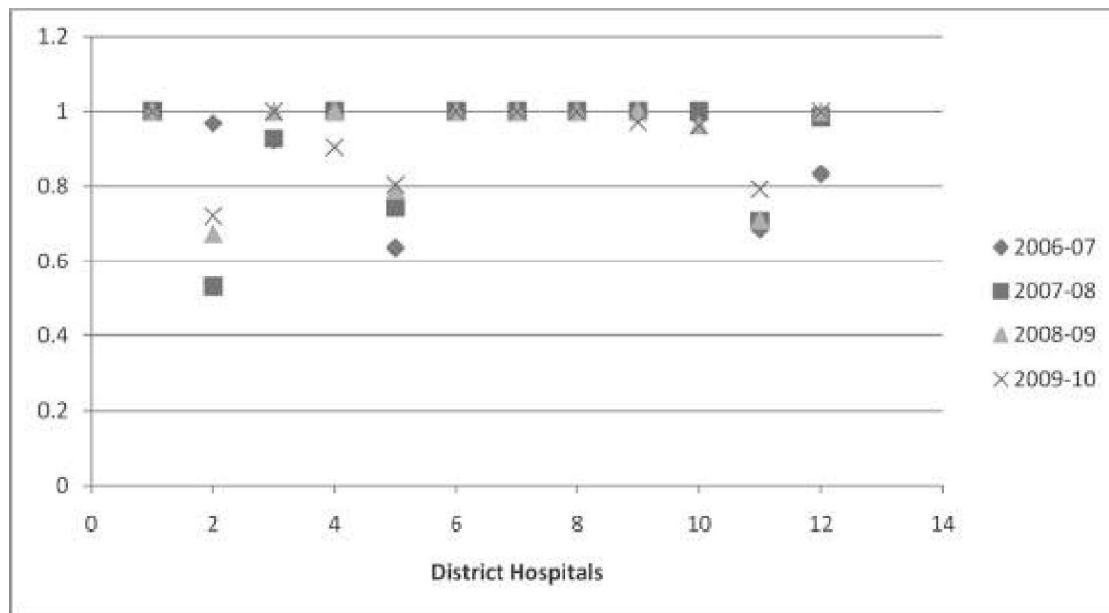


Fig. 1 Technical Efficiency of District Hospitals in Telangana & Andhra Pradesh

Technical efficiency scores only refer to relative performance within the sample. Hospitals given an efficiency score of one are efficient relative to all other hospitals in the sample, but may not be an efficient by some absolute of world standard necessarily. The plot for the individual technical efficiency scores has been plotted in above figure. The labels of the hospitals have been taken as the sequence given in the efficiency scores table. Fifty percent of the hospitals were operating in the efficient frontier throughout the period of the study. 33 percent of the hospitals are able to improve relative technical efficiency throughout the period of study, but they are still required to either reduce their inputs while maintaining the same number of completed treatments if they operate at what appears to be best practice. Else they can increase their outputs to attain the 100 percent technical efficiency by means of optimum utilization of the resources.

Three of the hospitals were found to be reducing their efficiency level that may be due to comparatively lesser population catered to by these hospitals. It may be observed that hospitals in remote areas are less dense or less urbanized areas would be relatively serving lesser population and therefore would be relatively less efficient.

VII CONCLUSION

The review of literature enumerates the suitability of Data Envelopment Analysis for the measurement of cost efficiency of hospitals. The sample hospitals cover the major regions of the Andhra Pradesh State in its pre-bifurcation period. The efficiency score helps ranking of the hospitals

on the basis of efficiency of hospitals, the hospitals having the score of 1.000 are consistently performing well with the given inputs by the government and hospitals below the efficiency score show the magnitude of gap to cover for performing well.

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A Novel Disaster Detection and Environmental Monitoring System Developed for Simhashtha 2016 at Ujjain

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ABSTRACT

In order to deal with disaster effectively, it is very important to identify the disaster scale and provide the accurate information about the site of disaster in real time. Sharing information on disaster situation helps to control and prevent the causalities during disaster. The Internet is a necessary tool to share the vital information about the disaster. This paper proposes an Internet of Things (IoT) based disaster alert system which can also be used to monitor the environmental conditions based on air, noise, temperature and humidity parameters. The system was successfully tested at Simhashtha-2016 at Ujjain.

Keywords – IoT, Disaster Alert System, Sensor, Environmental Monitoring.

I INTRODUCTION

Kumbh Mela is a mass Hindu pilgrimage of faith in which pilgrims Indian gather to bathe in a sacred river. It is the world's largest religious gathering. It is held every third year at one of the four places by rotation: Haridwar, Allahabad (Prayag), Nasik and Ujjain. Thus the Kumbh Mela is held at each of these four places every twelfth year. Ardh ("Half") Kumbh Mela is held at only two places, Haridwar and Allahabad, every sixth year. The rivers at these four places are: the Ganges (Ganga) at Haridwar, the confluence (Sangam) of the Ganges and the Yamuna and the mythical Saraswati at Allahabad, the Godawari at Ujjain, and the Shipra at Ujjain. Nearly ten million devotees across the country graced the festival with their presence on this auspicious day.

It has been observed that when any disaster or kiosk happens in the crowded place, the very first indication of problem is sound. In case of fire disaster it can be gases. In this study air sensors and sound sensors were used to detect the disaster indicators.

The system proposed in this study is based on Internet of Things (IoT). The IoT is a paradigm in which all physical objects such as home appliances, vehicles, buildings, cloths, animals, humans and devices etc. are connected to Internet and are known as 'things'. The main benefit of IoT is that it allows to monitor and control 'things' remotely and acquire its state data in real time whenever required. [1] [2] [3]

II SYSTEM DESCRIPTION

The system presented in this study is based on IoT. The system consists of sound sensor, gas sensor and temperature & humidity sensor. The sensors are connected to FLIP microcontroller board from FRUGAL-LABS [4]. FLIP Board is equipped with WiFi connectivity module which let it connect to the Internet. (Fig.1)

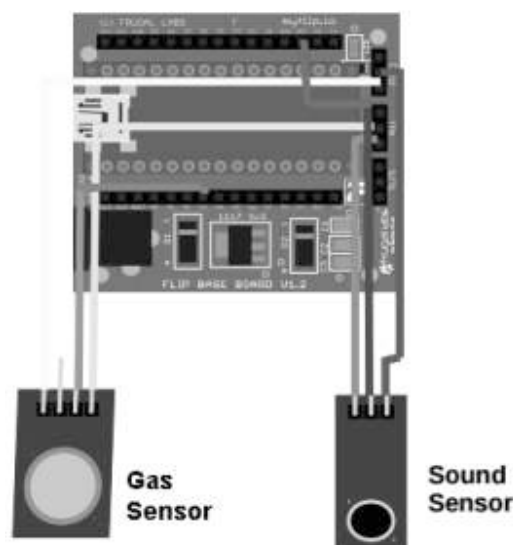


Fig. 1 – Sensor Node

Four sensor devices were installed at the place identified by AISECT University at Kumbh Ujjain Fig 2. All devices were connected to a dedicated cloud server via Internet connectivity. The devices connected were able to upload environmental data for noise and air to the cloud server using MQTT protocol. MQTT is a lightweight publish/subscribe messaging transport protocol developed for Machine to Machine (M2M) communication. It is also known as IoT protocol. Since MQTT is lightweight it gives faster connectivity to the system. [5]

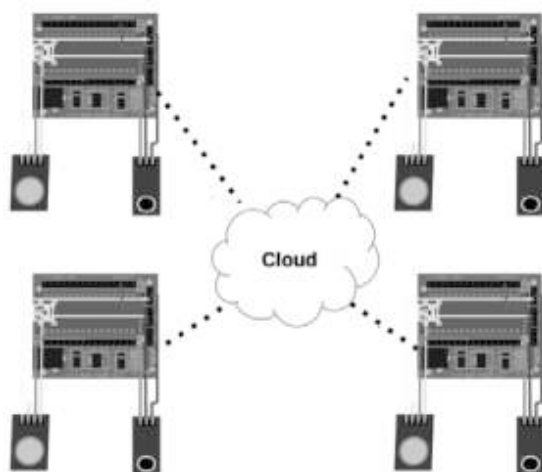


Fig. 2 – Device Communication

Devices used in this project are shown at Figure 3 and 4 the table no. 1 shows description of each device that was installed.

Table 1
Sensor on each device

	SENSOR 1	SENSOR 2	SENSOR 3
DEVICE - 1	GAS (MQ 135) SMOKE	ANALOG SOUND SENSOR	TEMPERATURE & HUMIDITY (DTH 11)
DEVICE - 2	GAS (MQ 5) CO	ANALOG SOUND SENSOR	NA
DEVICE - 3	GAS (MQ 7) CO2	ANALOG SOUND SENSOR	NA
DEVICE - 4	GAS (MQ2) LPG	ANALOG SOUND SENSOR	NA



Fig. 3 – Four sensor devices ready to operate

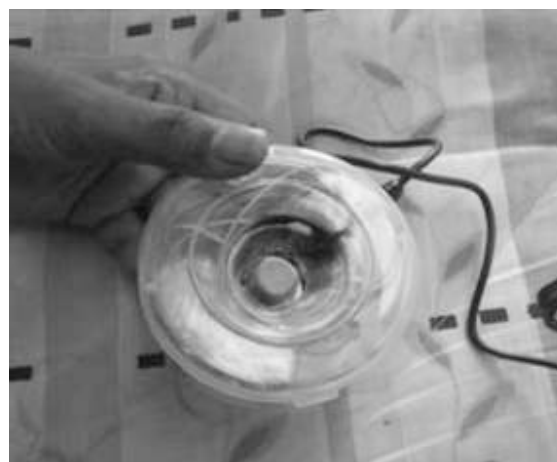


Fig. 4 – Close-up of a Sensor device

The main features of the system can be described in following points –

- The system is powered by *Internet of Things (IoT)*.
- The system provides 24x7 connectivity.
- When disaster occurs the user is alerted by the system.
- User of the system can monitor device remotely.
- The system provides user friendly data representation.
- The system has permanent data storage for future research.

III METHODOLOGY

The methodology of the system is fairly simple. Sensor devices continuously monitor the environment. The data is collected by these devices at predefined time. The data is uploaded to the dedicated cloud server for storage & analysis. When a disaster is detected immediately an alert is sent to control room and necessary actions can be taken. Finally the stored data can be utilized for further research.

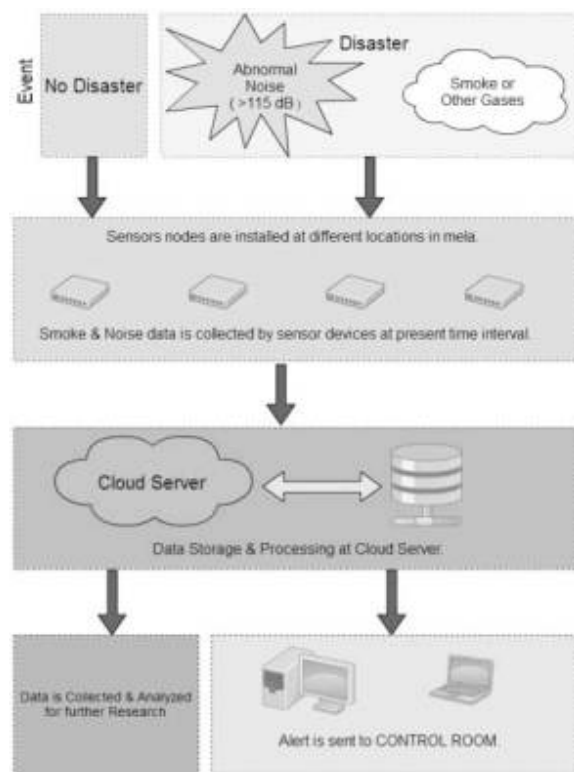


Fig. 5 – Methodology of System

IV RESULTS

The system has been implemented at Ujjain Kumbh 2016 at the place identified by AISECT University from 22 April 2016 till 21 May 2016. The Internet service for this purpose was provided by BSNL. During this period sensor nodes have collected environmental data at predefined time and uploaded it to the cloud. The data on the cloud server has been represented in graphical format. The data which has been displayed on user interface is for air quality, sound level, temperature and humidity.

With the help of this study no harmful level of gases has been detected in the environment except that a little smoke and LPG concentration in the air which wasn't much harmful for living. The figure 6 shows level of different gases in air.

The sound on the few occasions has been detected louder than the normal but not the indication for disaster. Sound detected was higher on 5, 6 and 9 May 2016. Possible causes are sound due to strong wind or noise made by vehicle horn or loudspeakers etc. Fig 7 depicts sound level graph monitored by the sensor.

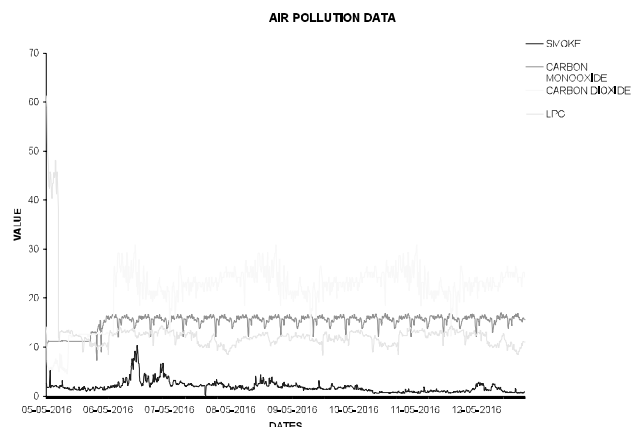


Fig. 6 – Air Pollution Level Graph

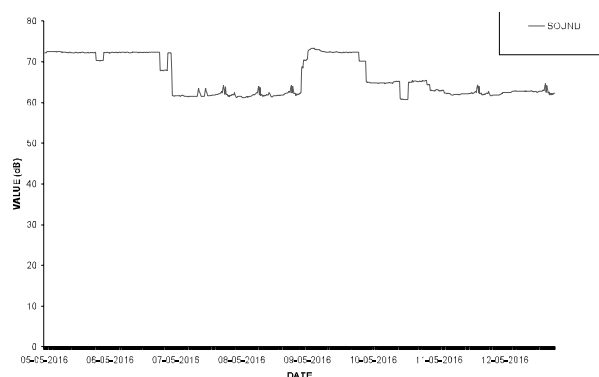


Fig. 7 – Sound Level Graph

The system was fundamentally designed to detect disaster based on noise and smoke and to alert control room in such case. Fortunately there was no disaster during Kumbh 2016. Nevertheless using this study it has been observed that there was high level of sound on 5th of May as detected by the system. It has been reported that there was heavy rain with strong wind due to which many tents at Kumbh mela were uprooted and few people were injured due to this on this day.

V CONCLUSION

This sensor based disaster detection system that works on air and noise parameter is helpful to design a reliable warning/detection system for disaster in real time and prevent or reduce human casualties. Since the system is based on IoT it works all the time and allows monitoring the environment from remote locations. The system has collected massive data which will be used to conduct further research for the design of the air and noise pollutions control system. It is proposed to use the system to study temperature and humidity level to find out ways to reduce it thus making human life safer and better for living. This is a preliminary study and use of the data collected may give many more innovative ideas during further analysis.

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