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Human Resources Management & Leadership

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ABSTRACT

Human resource management is that specific area of management, which is related to the selection, development, utilization and planning, organizing and controlling the work of labor force, so that the organization can effectively fulfill its objectives. And do it frugally. Leadership refers to that quality of a particular person by which he guides other persons, that is, leads different persons or a group of persons to achieve certain goals. In fact, if seen, the success of management is based on the effectiveness of the leadership.
Human resource management (HRM) is the efficient and consistent approach to managing an organization's most valuable assets—the people who work there and contribute to the achievement of business objectives individually and collectively. "Human beings" The terms "resource management" and "human resources" (HR) have largely been replaced by the term "personnel management", which describes the processes involved in managing people in an organization. In general, HRM means employing people, developing their resources, using them, keeping their services in line with the work and the need of the establishment, and providing compensation in return (maintenance).
The goal of human resource management is to help an organization meet its skilling goals of attracting, retaining, and effectively managing employees. The appropriate word here is probably "planning", e.g. An HRM approach seeks to ensure alignment between the management of an organization's employees and the overall strategic direction of the company.

Keywords: HRM, Modern analysis, Labor Mobility, Corporate Management & Leadership

I. INTRODUCTION

1.1 Meaning and Definitions of Human Resource Management

The 21st century is the globalization, market, information technology century, the century of knowledge dominates. In the new economy, human resource management is bound to change accordingly. Therefore, the human resource management system will be built on the computer network platform Internet / Intranet, the formation of a new human resource management.
Human resource management, refers to the use of modern scientific methods, and a proper training, organization and deployment, so as to keep the best ratio of some combination of human and material resources for human, material and human mind, Psychological and inappropriate behavior Induction, control and coordination, give full play to people's

initiative to make the best use, it is affordable to personnel, people fast to achieve organizational goals.

Management synonyms such as personnel are often used in a very narrow sense, referring to activities such as recruiting employees, arranging pay and benefits for members and their work-life needs. So if we talk about the actual definition, according to Torrington and **Hall (1987) the definition of personnel management is as follows:**

"a series of activities which: firstly characterize the objectives and nature of the working relationship between the workers and their employing establishments and secondly ensure that the agreement is fully carried out.

Whereas Miller (1987) suggests that HRM is concerned with:

"….is the decisions and action that concern the management of employees at all levels in a business that are related to the implementation of strategy, the implementation of skillful policies toward creating competitive advantage.

1.2 Meaning and Definitions Of Leadership

Leadership refers to that quality of a particular person by which he guides other persons, that is, leads different persons or a group of persons to achieve certain goals. In fact, if seen, the success of management is based on the effectiveness of the leadership.

According to Kuntz and O'Donnell, "Leadership is the art or process of influencing individuals so that they act voluntarily to achieve group goals."

According to Neuner and Keeling, "Leadership is concerned with motivating and directing the employees, so that the practices, programs and plans of the enterprise can be easily implemented."

F. Yes. According to Moore, "Leadership is the ability to get the followers to act according to the will of the leader."

Human resources is a concept that views the population as more of an asset than a liability on the economy. As a result of investment in education, training and medical services, the population is transformed into a human resource. Human resource is the capital that can be used in production.

This human capital is the reservoir of skills and knowledge of production embedded in them. It is a formula for recognizing the link between talented and engaged people and organizational success. It deals with related concepts in industry/organizational psychology and theory. There are 3 interpretations of HR depending on the context.

II. IMPORTANT FUNCTIONS

2.1 Human resource management performs the following important functions:

1. Recruitment and Selection
2. Training and Development (People or Organization)
3. Performance Appraisal and Management
4. Promotion / Transfer
5. Eliminate redundant employees
6. Industrial and Employee Relations
7. Record keeping of all personal data.
8. Salary and related compensation, pension, bonus etc.
9. Providing confidential advice to 'internal employees' regarding work related problems.
10. Career Development
11. Aptitude Test
12. To study the movement of time related to human resource activities.
13. Performance Appraisal

III. MODERN ANALYSIS

Modern analysis emphasizes that human beings are not "objects" or "resources", but creative and social beings in a production organization. The 2000 edition of ISO 9001 aims to identify the sequence of processes and the relationships between them and to define the responsibilities and Rights have to be defined and stated.

In general, most federal countries such as France and Germany adopted this and promoted such job descriptions, especially in trade unions. The International Labor Organization also decided to meet again in 2001 and revise Article 150 in 1975 on human resource development One view of these trends is to build a stronger social consensus on political economy and a good social welfare system facilitates the mobility of workers and makes the whole economy more productive as it allows workers to develop skills and experience in different ways and allows them to move from one unit to another or There is less difficulty or difficulty in adapting oneself to the environment. Another view is that governments should be more aware of their national role in facilitating human resource development in all sectors.

IV. LABOR MOBILITY

An important controversy about labor mobility refers to a broader philosophical issue associated with the phrase "human resource": governments in developing countries often accuse developed countries of promoting immigration of "guest workers" who are actually immigrants from developing countries. Is part of and are essential to the development of their civilization

They argue that this adjustment is akin to colonial commodity fiat, in which colonial European powers set an arbitrary price for natural resources, which were obtained from that nation's natural sources.

Thus, in many ways the "human resources versus human capital" debate is similar to that of natural resources versus natural resources. Over time, the United Nations has generally supported the developing countries' point of view and has requested substantial "foreign aid" so that developing countries lack human capital and the ability to train new people in trade and the arts. Do not lose

One extreme of this view holds that current developed countries, which have benefited from the theft of "human resources" during their development, should compensate for historical injustices such as African slavery. This is a very controversial aspect, but it explains the general theme of human resources being converted into human capital and thus becoming less of value in the host society, such as in "Africa", whose people are treated by the society. They are used as "workers" by showing artificial scarcity.

The General Assembly of the Secretary-General of the United Nations [e.g. A/56/162 (2001)], [see UN Experts Meeting on Human Resource Development] A comprehensive inter-sect oral approach to human resource development is changing the approach to human resource development. ST/TCD/SER.E/25. June 1994 was chosen to give priority to schemes such as socio-economic development and poverty alleviation in particular.

It is the step taken to create planned and integrated public policies, for example in the areas of education, health and employment that promote the growth of vocational skills, knowledge and performance. (Lawrence, J.E.S.) .

V. CORPORATE MANAGEMENT

Within the very narrow landscape of corporate management, there is a stark contrast between the diversity reflected and required in the workplace, which is as diverse as the global client base. Foreign language and cultural skills, talent, humor and good listening are examples of attitudes that are special requirements of such workplaces. After looking at these facts from the point of view of human capital it appears

That human contribute much more than "work" to a production unit: they bring their character, their morals, their creativity, their social relationships, and in some cases even their animals and children, and change the workplace environment. At an organizational level, the term corporate culture is used to describe the characteristics of such processes.

Hiring, firing and job descriptions are considered to be the history of the 20th century, with traditional but very narrow ideologies. Due to the competition in the modern global economy, most of the corporate companies have adopted human capital approach which reflects the modern majority ideology. Some of these oppose the term "human resources" as redundant. However, it is still in vogue and if it is linked to resourcefulness, it has an emerging and continuing relationship with public policy.

In general, according to macroeconomics, its summary is that it represents the absence of a mechanism to display choice or talent. One explanation, therefore, is that "firm-specific human capital", which is the correct and modern definition of "human resource" according to macroeconomics, is unable to reflect the contribution of "human resource" in any modern theory of political economy. .

VI. MODERN CONCEPT OF HUMAN RESOURCE

Although human resources have been a part of businesses and organizations since the first days of agriculture, the modern concept of human resources began in the early 1900s with more attention to ways to increase production efficiency. By the 1920s, psychologists and employment experts in the United States led the human relations movement, which judged employees on the basis of their psychology and compatibility with the company, rather than as replaceable parts.

The movement grew in the mid-20th century, emphasizing that leadership, unity, and loyalty are important contributors to an organizational success. Although this approach was strongly challenged by more rigid and less flexible management techniques in the 1960s and beyond, human resource development has found an enduring role in organizations, agencies, and nations for more than just maintaining discipline. But it is also the focal point of development policy.

VII. IMPORTANCE OF LEADERSHIP

It is the means of management without which the organization remains inactive. It is such a driving force that takes the enterprise towards progress by making the best use of human resources and faces the difficulties faced at every step. John G. Glober says that "there is no other reason as responsible for the failure of business establishments as inefficient leadership."

The importance of leadership in business management can be explained as follows-

(1) Source of inspiration-

Leadership is the source of inspiration. The development of human relations is possible only through efficient leadership. The leader brings out the personal qualities of the person and motivates them to do more work.

(2) The foundation stone of getting cooperation-

The leadership obtains the cooperation of its associates and followers through various means. In the absence of efficient leadership, the feeling of hatred develops among the employees and mutual disputes arise on small matters.

(3) To keep the employees loyal to the undertaking-

Efficient leadership plays an important role in keeping the employees working in the business enterprise loyal to their purpose. It brings activism in place of passivity in his efforts.

(4) Management as a social process-

Management is transformed into a social process through efficient leadership. Due to this, on one hand, the employees are ready to sacrifice everything for the progress of the enterprise; on the other hand, the managers also try to provide them all possible help and facilities.

It is clear from the above discussion that efficient and visionary leadership is the foundation stone of any organization. This takes the venture to the heights of success. In its absence, the existence of the undertaking ceases to exist.

VIII. CONCLUSION

The theoretical discipline is based primarily on the assumption that employees are individuals who have individual goals and needs and should not be thought of like basic business resources like trucks and filing cabinets. This sector takes a positive approach towards employees, recognizing that almost all employees aspire to contribute productively to the enterprise and that the main impediments to their efforts are lack of knowledge, inadequate training and process failures.

Young professionals working in the Human Resource Management (HRM) field are seen as having a more innovative approach to management than the traditional approach. Its techniques compel the managers of an enterprise to express their goals with specificity in this way. It should be done in such a way that it can be understood and adopted by the employees and they can be made available with the necessary resources for the successful performance of the assigned tasks.

Thus HRM techniques when properly implemented are indicative of the effectiveness of the enterprise's goals and overall operational practices. Many people in HRM also play an important role in reducing risk in organizations.

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Relevance of Value Proposition in Building Brand Image

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ABSTRACT

In this article, we fill a gap in the value proposition literature by identifying features that make the value propositions of companies different from other resources, along with factors that make them valuable. Value proposition helps customers focus on their core needs, the needs could be from functional, emotional or psychological domain This focus brings commitment along with customers it also connects its other stakeholders in the company lie suppliers and financers to stay with the company Value proposition gives and creates a reason to stay with the company for all stakeholders just like a kind of direction leads to developing loyalty in the customers. Loyalty is hardest to achieve for any company. Companies can create demand but loyalty is something comes with integration of all functions and strategy formulated by the company. Loyalty is key to success for organizations it develops character in the customers to overcome new attractive schemes from competitors along with some added benefits as well and this leads to repetition in the buying habits of the customers.

Keywords- Value Proposition, Brand Image, Value, Perception.

I. INTRODUCTION

This paper focuses on the usefulness and advantages of this abstract concept of Value Proposition and how this formless and shapeless attribute which comes with official communication from company side strongly leads in the formation of the brand image of a company. Value proposition directs customers to think and focus on the key benefits of the brand and evaluate the brand on its key feature and ignore other attributes which helps in killing the competition from the market. Which finally helps in realizing the actual benefit as no benefit actually satisfies a customer until it connects with the mind of the customer in achieving acceptance and connecting emotionally with customers and psychologically and both are matter of abstract feature of human mind? It is designed to capture the distinct identity of the brand by communicating with customers the expected benefits they can achieve and realize by owning or using the product/ service. Brand image is also a framework developed in the minds of customers through integration of multiple aspects it's about how customers think or perceive about the brand there is relationship between company/ brand and its customers is also built on the foundation of transaction. Transaction of delivery of promise by brand and customer's expectations .Company/brand must create value in its customer's life to stay relevant as customers add value in company's portfolio when they pay to become its customer. It has to be reciprocal.

II. MEANING OF VALUE PROPOSITION

It is an official statement of a company that makes promise to deliver value or bundle of value to its customers. What customer would derive out of product or service when customers buy its product/service or we can say what value a brand/product /company will offer to its customers in exchange of their money or transaction

III. NEED FOR VALUE PROPOSITION AND HOW IT ADDS STRENGTH

Companies/Brand can't satisfy the need of every customer, this brings the need to identify people through segmentation process and select their target market. Then companies choose value drivers of their target market that prompt or attract them to go for the product/service.

IV. CRITERIA TO SELECT VALUE PROPOSITION

A Brand/company offers many features/attributes which create values but before opting for value proposition statement, need to consider the proportion of below elements well which feature or attribute will influence the customers most and most likely to add value in their targeted segment. Convert benefits of feature into value it will bring in life

- Customer base(Size of the target segment)
  If a feature or attribute is considered highly valued but customer base is too little to do business to bring targeted revenue then must consider the second most valued element with owns sizable market to generate revenue.
- Opt for balance ratio in Influence intensity and Market size, this combination helps brands achieve optimality.
- Social System- Cultural factors, beliefs and perception design of targeted geographic location must be taken into consideration to optimise and create acceptance and relevancy with people's need.

V. BASICS AND SIGNIFICANCE OF VALUE IN CUSTOMER'S LIFE

Value is a state of mind. When customers are in particular state of mind, they buy product that satisfy that state. Company targets that state of mind. People with same state of mind will value the product/service most probably in same manner or perhaps with certain difference in intensity. "If a customer is in a state of mind of adventure then events related to it would add value else it's of no value for you at least for that moment. While working on value proposition, companies need to integrate all the functions and divisions of organization to strengthen their focus to conclude on which dimension of its customer's life it want to bring solution and create value for each feature has its own benefits and how that benefit adds up advantage in customer's life; need to mention in Value Proposition.

A value could be created in following ways for their customers-

- Accessibility
- Affordability
- Distribution system
- Process (Bringing Transparency
- Social Status
- Enhancing Productivity
- Reducing fear, anxiety
- Trust

VI. TOOLS FOR VALUE PROPOSITION

VII. HOW TO DEFINE VALUE PROPOSITION

It must be designed in a way that it helps companies/ brand extract benefit out of market and gives advantage in the market in term of identification and selection on the attributes of values what are the measures a company needs to consider while defining Value Proposition statement.

1. Understand the Mission of a company, meticulously analyze the things you want to create for the market and how it will add value in the lives of people
2. Who are your target market and what they value most and which value trigger them to buy the product, need to be analyzed well. Consider the factors that add value.
3. Competitor analysis and evaluation helps in bringing awareness about how you are different from your competitors or which different attributes and benefit you can focus to design. How you differentiate yourself from your competitors and create your own space in the market. It could be in terms of again functional, emotional
4. Core competency could be one of the things that a company could add in value proposition statement as it talks about the strength of the company. That brings confidence in the minds of customers.
5. Cultural demographics are vital in creating value proposition as priorities and way of life and priorities changes culture to culture and it defines the value a person derives out of product. Tendency to value any attributes gets influenced with culture of a region Like India is a country where respect for elders matters more than equality with elders. The same is explicit in our language. It brings more value if offered with explicit respect than with equality.

VIII. USEFULNESS OF VALUE PROPOSITION IN BUILDING BRAND IMAGE

- It helps new companies gain acceptance and play very specific role in building brand image in the market by having clear promise of value delivery.
- Value Proposition helps in building and integrating the resources in the value chain and meeting the criteria to build desired value proposition.
- Brings congruence between the stakeholders by clarifying and communicating the expectation it wants to build in the market by the customers
- Helps in investment from the external sources.
- Helping in retention of the customers by letting them focus on the core need
- Leading to ignoring new competition and new features by the other brands or companies.
- Psychological. differentiation could give you identical place in the market
- Align company's strategical decisions on new developments in terms of product portfolios with existing strategy.
- Provides direction in marketing and advertising decision as it must communicate the promise company wants to deliver in the market for its target segment and this integrated communication helps in building brand image. Integration of all mentioned points leads to building image of the company as the way company delivers it promise to its customers and the how much congruence and integration

is among the stakeholders helps brands to maintain its promise to it market segment this leads to building perception about the company contributing in forming brand image.

IX. CONCLUSION

The delivery and improvement of value propositions to external stakeholders is what determines whether a new Company operates as a functional/actual business, or rather exists as an opportunity still merely wanting to become a business. It creates platform for with clarity and strength to approach market quiet before the product reaches into the market with emotional and psychological and an image of functional value.

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Some Investigations on Glass-Reinforced Aluminium Laminate (GLARE) for Marine Applications

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ABSTRACT

Fiber metal laminates (FMLs) have been used as one the best materials suited for shipbuilding, aeronautical and aerospace applications because of their superior mechanical properties over traditional materials. In this work, the glass fiber aluminum laminates were prepared in the laboratory. The degradation in tensile strength of Glass Laminate Aluminum Reinforced Epoxy (GLARE) due to aqueous environments has been investigated for marine applications. A Universal Tensile testing machine has been used for the testing of the GLARE specimen for its tensile strength. The tensile strength was decreased by approximately 20% after the 15 days of immersion.

Keywords: GLARE, Glass fiber, Aluminum, Tensile strength, Composite

I. INTRODUCTION

During the past decades, increasing demand in the aircraft industry for high-performance, lightweight structures has stimulated a strong trend towards the development of refined models for fiber-metal laminates (FMLs). Fiber-metal laminates are hybrid composites built up from interlacing layers of thin metal and fiber-reinforced adhesives. They are mostly used in the aerospace and marine industry due to their good strength and lightweight. There are several different materials constituents used in manufacturing FML to study and improve its characteristics [1-3].

In 1980, Vogelesang and Schijve made the first FML using aluminium (Al) alloy and aramid fibre reinforcement. It is known as Aramid-Reinforced Aluminium Laminate (ARALL). It was found that it has fatigue properties better than in a monolithic single metal due to the resistance of fibre to the fatigue crack growth (fibre bridging). In 1987, AKZO established another type of FML called Glass laminate aluminium reinforced epoxy (GLARE) that started to be produced and commercialized in four grades in 1991. All these grades use unidirectional fiberglass, but of different orientation directions. Also, they use different types of aluminium alloy. It was found that GLARE 1 and GLARE 2 of unidirectional (0°) fiberglass can withstand much higher loads in the direction of the fiberglass orientation than in the other directions, GLARE 3 which uses an equal amount of fiberglass in the perpendicular directions can withstand equal loads in both directions, while

GLARE 4 which uses twice the amount of fiberglass in one direction than in the perpendicular direction can withstand twice the load in one direction than in the other direction. The fatigue properties of all GLARE grades are excellent [4-5].

Another type of FML which consists of carbon fibre had been investigated at Delft University of technology, which is much stiffer than ARALL called carbon-reinforced aluminium laminates (CARALL). CARALL is produced in three unidirectional different fibre orientations; 0°, 90°, and 45°. Carbon fibre provides stiffness higher than aramid fibre and glass fibre. The application of carbon fibre in FMLs has excellent resistance to crack growth which was the driver behind the investigation of carbon fibre in FMLs. But there is a problem in using carbon fibre with aluminium in a moisture environment which is the galvanic corrosion between the materials, so aluminium has to be isolated from the carbon fibre through using thermoplastic polyetherimide coatings.

II. METHODS AND MATERIAL

Unidirectional E-glass fibre and Epoxy (Resin & Hardener) is purchased from Carbon Black Composites, Mumbai. Aluminium sheet of grade 5052 is purchased from Nextgen Steel & Alloys, Mumbai. Commercially available glass fibre mat and aluminium has been used for making specimen. For the experimentation unidirectional roll of glass fibre was purchased having 50 cm width having 0^{O} fibre orientation woven with polymer fibres. The fibre was initially cut from roll in lengths of 550 mm and width of 300 mm. The GLARE was prepared shown in the figure 1.

Figure 1: Glass fiber metal laminate Sheet

The specimen had been cut and prepared as per the ASTM standards D3037/3039 for tensile test as shown in Figure 2.

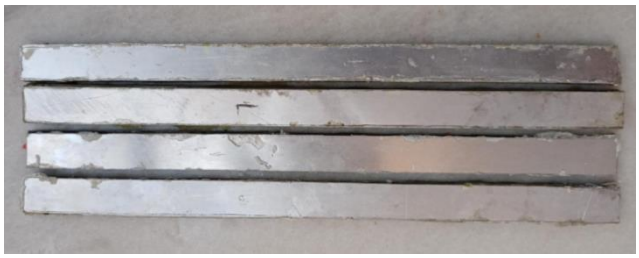

Figure 2: Tensile specimen cut from GLARE

The specimen were dipped into a water bath of 15 days. The water absorption were recoeded after 3 days for total 15 days. The tensile strength was evaluated after 15 days of water emmersion.

III. RESULTS AND DISCUSSION

Moisture absorption: The prepared specimens were immersed in the water bath for 15 days. The weight of the specimen was observed in 3, 6, 9, 12 and 15 days respectively as shown in Table 1. The weight was recorded in specimen. It was observed that there is a significant increase in the weight of the specimen. This is due to the absorption of water into the composite matrix.

Table 1: Weight gain in specimen

No. of Days	Weight of specimen (gm)
0	30.010
3	30.121
6	30.282
9	30.410
12	30.520
15	30.643

Table 2: Tensile results

Testing day	Tensile strength (MPa)
1st day	140.78
15th day	112.22

Samples were tested on Universal testing machine for tensile strength over the period of 15 days. First test was done on 1st day to know the tensile strength.

Then second test was done on 15th day. The specimen after fracture has been shown in Figure 3.

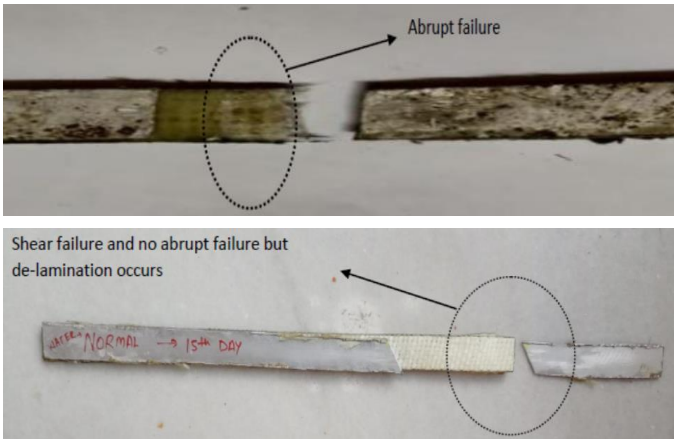

Figure 3: Tensile specimen after fracture on the 1st day and 15th day

Abrupt failure in tensile test was observed in the specimen before dipping into the water. The tensile strength of 140.78 MPa was recorded (Table 2). The specimen was taken from the water bath and again tested for tensile strength. The tensile strength of 112.22 MPa in the wet specimen. A 20.28% decrease in the tensile strength was observed. It is due to the plasticization effect of absorbed water molecules into the gaps of composite layers. The absorbed water molecules behave as a plasticizer which gives the FML structure more flexibility than before. The absorbed water molecules degrade the epoxy matrix which leads to the generation of residual stresses within the laminates and thus hinders the strength of FML. Because of the weakening and softening of matrix phase, microscopic cracks are developed in it, which leads in the reduction of tensile strength. These changes in matrix phase also degrades the interfacial bond between composite surface and metal layers of GLARE.

IV. CONCLUSION

- Glass Laminate Aluminum Reinforced Epoxy have been manufactured using Aluminum 5052 as metal and two layers of glass fabric as fiber for the production of Fiber Metal Laminate.
- The maximum moisture was absorbed by the GLARE specimens when dipped in normal water.
- GLARE specimens when tensile tested showed shear type failure and abrupt failure at 1st day of testing and at 15th day respectively. There was a 20.28% of decrement in tensile strength was observed in the specimen.

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Impact of Hydrous Ethanol-Diesel-Al_2O_3 Nano Emulsified Fuel on Diesel Engine Performance

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ABSTRACT

The environmental degrade and the fossil fuels diminishment are stimulating the world's desire to discover novel, effective and efficient alternate renewable fuels. The emulsified fuels have gained a lot of attention in the current years to supersede the conventional petroleum fuels. The aim of the present work was to study the hydrous ethanol-diesel-Al_2O_3 nano emulsified fuelen TR-2 and it's testing on 4-cylinder, turbocharged and water-cooled common rail direct injection diesel engine. Authors reported improved diesel engine performance, combustion and emission characteristics with hydrous ethanol-diesel-Al_2O_3 nano emulsified test fuels. HEDA emulsified fuel combustion can exhibit a toxic effect on living beings and the environment in the prolonged period of time because of the presence of Al_2O_3 nano particles.

I. INTRODUCTION

Limited stocks of conventional petroleum fuels (gasoline and diesel) and severe degradation of environment encourages the whole world to find the most suitable alternative fuel in terms of cost, application, availability, engine components compatibility and environment friendly [1]. Water addition in diesel blended fuels reduces environment harmful pollutants nitrogen oxides (NO_x) and particulate matters (PM) in significant amount because of temperature lowering and micro-explosion phenomenon respectively [2, 3]. Proposed emulsified fuel eliminates the exhaust gas after-treatment system that avoids any modification into engine with reduced cost and complexity [3]. Several benefits of ethanol blending make it superior alternative renewable fuel source over others such as efficient combustion, high energy density, lower pollution, non-toxic and non-corrosive nature, easy storage & distribution and applicability to all types of vehicles [4, 5]. Aluminium oxide (Al_2O_3) nano material is the cheapest and mostly used among all nano materials which improve cetane number, calorific value (CV), brake specific fuel consumption (BSFC), brake thermal efficiency (BTE), heat release rate (HRR), cylinder pressure and exhaust emissions. Engine performance improvement by blending of Al_2O_3 nano particle compromises the negative effect of lower CV value of water [6, 7].

II. LITERATURE REVIEW

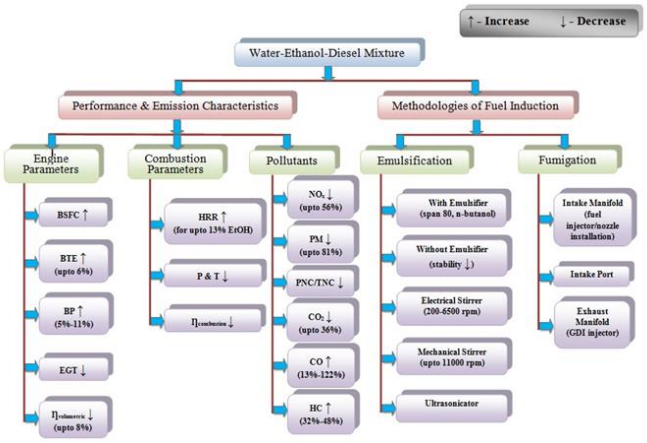

Figure 1: Conclusive literature review schematic diagram showing effect of hydrous ethanol-diesel (HED) mixture on performance, combustion and emission characteristics of diesel engine with methodologies of fuel induction

III. METHODOLOGY

Emulsified HEDA fuel blends will be prepared in five stages. In the first stage, mixture of Span-80 (HLB-4.3) and Tween-80 (HLB-15) in the concentration of 2% will be prepared by the use of ultrasonicator at high frequency 40 kHz at 30°C for 30 minutes or till both the surfactants mixed thoroughly. To prepare surfactants mixture, volume percentage of both the surfactants will be measured by the following relation to achieve the suitable HLB value 10 for HEDA blends:

$\% (A) = \{(X - HLB_B) \times 100\} / \{HLB_A - HLB_B\}$;

$\% (B) = 100 - \% (A)$

Where A, B are surfactants, X is the required HLB value. By considering (A) as Span-80 and (B) as Tween-80, we will get 46.7% of Span-80 and 53.3 % of Tween-80.

In the second stage, Pemulen TR-2 (0.4%) will be mixed slowly into rapidly agitating Triple demineralized water (blend specification) using magnetic stirrer at 750 rpm and 30°C for 15 minute until Pemulen TR-2 powder is wetted in the solution completely. In this stage, foaming may occur.

In the third stage, ethanol (blend specification), diesel (blend specification) and surfactant (2% fixed) will be combined by mechanical agitator for approx. 15 minutes at about 1200 rpm. In the fourth stage, second stage prepared solution and neutralizing alkali NaOH (18% solution-0.5 parts of Pemulen TR-2) or Triethanolamine (2 parts of Pemulen TR-2) or Amino methyl propanol (1.5 parts of Pemulen TR-2) will be mixed into running third stage solution at same operating conditions as in third stage (mechanical agitator, 15 minutes, about 1200 rpm)..

In the fifth stage, Al_2O_3 nano particles (100 ppm) will be added into the solution prepared in fourth stage with the aid of ultrasonicator at a frequency of 40 kHz for 30 minutes at 30°C. The ultrasonication technique is the best suited technique for nano particles dispersion to prevent agglomeration of nanoparticles into base fluid. Check pH after sixth stage. PH should be 7.3 to 7.8. If pH is too high, start test procedure again and holding out a small amount of neutralizer.

IV. DIESEL ENGINE EXPERIMENTAL SETUP

The engine setup consists of turbocharged four cylinder water cooled four stroke CRDi diesel engine coupled with eddy current dynamometer for obtaining different loading conditions. Turbocharger is of variable geometry type (VGT) and ECU controlled. The engine setup includes all necessary instruments and sensors like temperature sensor, pressure sensor, position sensor, and speed sensor etc. for measuring the coolant temperature, fuel temp., inlet air temp., manifold pressure, fuel pressure, atmospheric pressure, camshaft and crankshaft position. The setup has electronic panel which consists of fuel tank, load indicator, speed indicator, fuel measuring unit, air box, dynamometer loading unit, engine and calorimeter rotameter. Engine and calorimeter rotameter give us water flow rate to engine and calorimeter. The computer will be connected with our engine and electronic panel with the help of "Engine Soft" software. The setup has

capabilities to find parameters to evaluate combustion and performance characteristics. For measurement of exhaust emissions HC, CO, CO_2 and NO_x, AVL 4000 Di-Gas Analyzer will be used and smoke opacity will be measured with the help of AVL 437 smoke opacity meter. The actual picture of proposed C.I. engine test rig, AVL 4000 Di-Gas Analyzer and AVL 437 smoke opacity meter is shown in Figure 2, 3, and 4 respectively. Detailed specifications of the engine are given in the Table 7.

Figure 2: Actual picture of multi-cylinder C.I. research engine

S. No.	Description	Specification
1	No. of Cylinders	04
2	Volume	1994 cc
3	Bore x Stroke (mm)	84.45 X 88.95
4	No. of Valves per Cylinder	02
5	Camshaft	SOHC (Belt Drive)
6	Compression Ratio	17.5:1
7	Firing Order	1-3-4-2
8	Cooling	Water Cooled (Mechanical Fan)
9	Fuel Injection	Common Rail Direct Injection
10	Injection Pressure	1400 bar (Max.)
11	Turbocharger	VGT – Variable Geometry Turbocharger (ECU Controlled)
12	EGR	Cooled, ECU Controlled
13	Injectors	Piezo Technology
14	Injector – No. of Holes	08
15	Torque/Power	260 Nm @1750 – 2500 RPM, 90 hp@4000 RPM

Table 1: Engine Specifications

V. EXPERIMENTAL MATRICES

The following experimental matrices will be followed during the investigation.

Type of Fuel	Brake Load	Performance, Combustion and Emission Characteristics
Diesel HEDA I HEDA II HEDA III HEDA IV HEDA V	No Load, 20% Load, 40% Load, 60% Load, 80% Load, 100% Load	Brake Power, Torque, Fuel Consumption, Brake Thermal Efficiency, Volumetric Efficiency, Lubricating Oil Temperature, Cylinder Head Temperature, Exhaust Gas Temperature Pressure – Crank angle Diagram, Heat Release Rate pattern, Ignition Delay, Rate of Pressure rise Exhaust Emissions (UBHC, CO, CO_2, PM & NO_x)

Table 2: Experimental matrices

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Android Based Automated Wheel Chair

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ABSTRACT

This project gives the automated function in wheelchair. This is an android based automated wheelchair that can be used by differently able. It uses android based smart phones which have inbuilt axis accelerometer sensors and Bluetooth wireless technology. The proposed concept exploits this feature of the smart phones to use at as a transmitters and control device.

Keywords: Accelerometer sensors, wireless Bluetooth, Frame (Materials), Seat, Backrests, Wheels, Controls, Batteries.

I. INTRODUCTION

This is an android based automated wheelchair that can be used by differently able. It uses android based smart phones which have inbuilt axis accelerometer sensors and Bluetooth wireless technology. The proposed concept exploits this feature of the smart phones to use at as a transmitters and control device.

Fig.1 Automated wheel chair

1.1 Transmitting section:

Accelerometer – the smart phones accelerometer is a semiconductor IC that measures motion and its intensity in 2 axis.

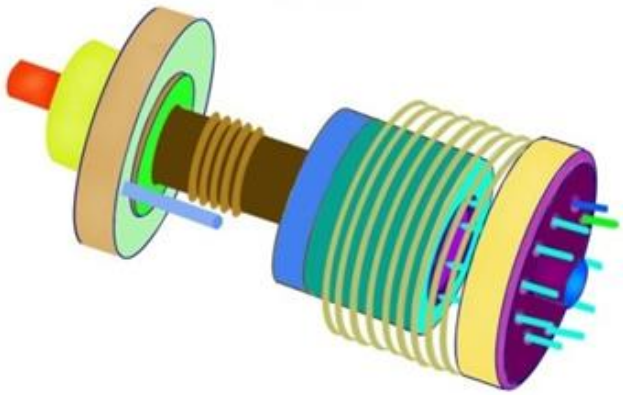

Fig.2 Accelerometer

1.2 Receiving section:

Microcontroller – Its need involves the reception of data signals that are transmitted by the smart phone via Bluetooth module and control the working of servo and DC motors. The wheel chair interacts with

the smart phone app by means of this a mega 16 microprocessor via Bluetooth.

1.3 Touch screen:

Touch screen software is developed on the eclipse IDE platform. The commands will be generated by means of the direction to which the wheel chair has to move. Here the obstacle detection path will be interfaced to both the units accelerometer and touch screen mode. The table as per the locomotion of the device is given below. The following are keys and their associated letters stored in the buffer IC kit to move the wheelchair in the specified direction. The touch screen input used in the proposed system is a 5-wire resistive type. It consists of five keys. In addition a brake control switch is used to stop the wheelchair when used in this mode.

1.4 Obstacle detection:

Obstacle detection is a major parameter in order to cross check any discrepancy in the path over which the device is moving. To detect the obstacle, IR sensor pairs are mounted on the front and the diagonal end. The front end IR sensor will detect the collision with respect to wall or any obstacle. The range of these IR pairs is predefined in the data sheet. The front end sensor pair can sense the obstacle at approximately 15cm for 2.8 V.

II. LITERATURE SURVEY

In this paper the robotics or sensor technology promises enormous scope for the development of an advanced and digital wheel-chair. The wheel chairs used by the patients earlier have some limited function such as manual locomotion and may be slip-offs from the slant passages or the staircases. In this project we are trying to include sensors with an android platform to develop an automated wheel chair which can help the patient to control the direction of the wheel chair based on accelerometer, to detect the obstacles, and touch recognition by using android software. [1]

In this particular article the wheelchair is controlled by using hand gesture. Here mems sensors and wheelchair are two main units. Mems sensors are basically used here for gesture detection. After gesture detection the sensor converts it into 6 digit binary value. This value is then given to. Pic microcontroller and accordingly the wheelchair moves. Other controllers are used for the movement of wheelchair. [2]

In this article the wheelchair is controlled by voice commands as well as using hand gestures. Here there is a speech recognition model which use mems sensors along with a wheelchair control unit. Hidden Markov models are the main voice recognition commands. The mems sensors give the voltage to the microcontroller according voltage to the microcontroller according to the titration of hand. ARM controller is used in this article. [3]

There are wheelchairs with joystick interface but many people are unable to use this facility. Navigation at low level can allow the users an efficient driving assistance. In this article the wheelchair consists of GUI i.e, graphic user interface, sensors and on-board computers. Here the wheelchair uses the indoor navigation facility and user interface for user abilities. [4]

This article has proposed an intelligent wheelchair which has dual control for navigation. The voice recognition and touch screen are two modes of input control commands. There are different values for different program on the screen. To move the wheelchair in various directions the user has to touch the screen accordingly. Voice control is also used in order to know the wheelchair. The wheels move using brushless DC motors at the rear end and PWM technique is used for controlling it. [5]

In this paper a smart wheelchair is developed. This wheelchair is much easier to use than the standard power wheelchair. A smart wheelchair component system (SWCS) is developed which is created doing minimum modifications. Four different manufacturers are used for evaluation of SWCS prototype. [6]

This articles deals with WST i.e. wheelchair slow Transit system band elderly auxiliary travel model. Support, transit components and connection components are three fundamental composition frames involved in the system. Diverse conditions are

III. CONCLUSION

The principle of complete model is to move a vehicle by using the mobile phone system with the help of Bluetooth technology as the interfacing media and android application for the command action. An inbuilt accelerometer system is used here for the motion of the vehicle. This accelerometer is interfaced with the system by means of android platform.

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Smart Waste Manager Device for Waste Management

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ABSTRACT

The purpose of this study is to identify the effect of high-tech bins on people's interest in disposing trash. The method used in this study is a quantitative descriptive method and literature study to analyses community perceptions of smart trash bin. The results of this study state that the mind-set of the community in disposing trash increased after the existence of smart trash bin project. These results were obtained because the community became more interested in disposing trash in the presence of unique designs and diverse functions of these high-tech bins. This study concluded that smart trash bin can increase people's interest in disposing garbage in its place.

Keywords: Research Paper, Technical Writing, Science, Engineering and Technology

I. INTRODUCTION

Introduction At this present time, the condition of the people's mindset about disposing trash is fairly sad, especially in Indonesia. In fact, there are still many people who don't care about the environment, for example by littering in everywhere. This is based on two things. The first one is the condition of the garbage facility which is lacking in terms of quality and quantity, and the second one is the mindset of the people who still consider the most practical waste disposal by letting it lie on the roadside or dumped it into the river. Therefore, many researchers conducted research and writing on solutions to increase people's interest in disposing trash to the right place. One of them is by upgrading ordinary trash bin into trash bins with advanced technology called Smart Trash Bin as a form of effectiveness and efficiency in disposing and managing waste. One of the articles which discuss about the trash bin technology came from Japanese authors, Fujii, Fujita, Ohnishi, Yamaguchi, Yong, and Park, which resulted in expenditures in the form of recycling bins (called smart recycling). Its technology reduces carbon dioxide emission and lower the overall costs [1]. The other finding about high-tech trash bin is the form of trash bin with a waste sorting from Sinha & Couderc [2], also there is similar research from Lee & Wu [3]. Both of these papers discussed about the technology of bins with a waste sorting system. Even Indonesian writers, Prengky, Bayu, Steven & Julyar wrote a similar paper about an intelligent automatic waste sorting tool that can separate metal and non-metal types of waste [4]. These findings are useful for optimizing waste collection and management. But the findings are still less of effective in attracting the public's interest in disposing garbage into the trash bin.

II. METHODS AND MATERIAL

The implementation of product design uses the Kaizen method, which is carrying out continuous improvement or continuous improvement [13]. Kaizen has four stages which are commonly abbreviated as PDCA or plan, do, check, action. This method is used because it helps the implementation to be simple and easy in application in real life. This method also allows for further product development in the future.

3.1 Plan

- Identification of problems

The implementation team identified problems in handling waste in the community by searching the library, there was an innovation in the trash can that notified the cleaning staff when it was full [14], then there was an automatic trash can that could open the trash can without touching it [15]. This has not been able to completely overcome the problems faced, especially in sorting the types of waste.

- Analysis Data

The implementation team processes and analyzes the data so that the proposed features of the product are obtained. From the results of the analysis, six needs were obtained, namely capacity, waste sorting sensor, product design, hand sanitizer features, convenience, and trash can cover.

- Product development process

After identifying the problem and analyzing the data, then the product design process is continued using the QFD method, namely by comparing the product to be designed with the previous product to get the best specifications of the product to be made, the following is the process:

- Identification of customer needs Table 1-6 are the results of identifying customer needs based on interviews with their level of (*importanceimportance*).

III. RESULTS AND DISCUSSION

4.1 Prototype

Prototyping of Smart Trash Can is done by creating a 3D design using the Solidworks application. The design of the prototype on the Smart Trash Can is carried out by considering the material, effectiveness, and working mechanism. The size of the tool is made as minimal as possible so that someone can be comfortable and easy when they want to dispose of garbage using the Smart Trash Can. Figure 2 is the prototype of Smart Trash Can. The prototype size used is 60 cm in diameter and 60 cm in height and is divided into 3 automatic containers that function to accommodate types of organic, inorganic, and metal waste. In the manufacture of the Smart Trash Can, a casing or body with iron material is used so that it can accommodate up to 15 kg of garbage.

Users can use the product by attaching waste to the sensor, then the LCD will show what type of waste was detected so as to provide education to the public about the types of waste so that people can dispose of waste according to the type of waste. Then one of the containers will open and the user can put trash in it. In addition, the Smart Trash Can prototype has a hand sanitizer feature that can be used to clean hands and also functions as self-protection from Covid-19. must be in 10 pt Italic. Email address must be in 9 pt Courier Regular font.

A. Figures and Tables

Place figures and tables at the places where they needed. All tables should be in Classic 1 format with borders to heading and subheading columns. Large figures and tables may span across both columns. To do so select text above one column table and convert it in two column and then select text below one column table and convert it into two column. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a

sentence. We suggest that you use border for graphic (ideally 300 dpi), with all fonts embedded) and try to reduce the size of figure to be adjust in one column. Figure and Table Labels: Use 8 point Times New Roman for Figure and Table labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader.

Figure 1: A sample line graph using colours which contrast well both on screen and on a black-and-white hardcopy

IV. CONCLUSION

The Smart Trash Can has been created which is designed to increase public awareness and knowledge about environmentally sound waste management as an effort to support the global action plan for Sustainable Development Goals (SDGs). Smart Trash Can is a detector of organic, inorganic, and metal waste, as well as a hand sanitizer feature that is intended to make users care more about cleanliness after disposing of garbage, all of these features are controlled by Arduino Uno. Smart Trash Can has been tested 30 times on each feature and has good results because each feature is able to run well, so it is hoped that Smart Trash Can can be mass-produced and can be a solution to the waste problem in Indonesia.

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A Study on Effect of Electromagnetic Field on the Fracture Properties of Steel and Aluminium

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ABSTRACT

Different environment such as temperature, electric field, magnetic field, etc, influences the mechanical properties of metals. And many researchers are working on this area to improve the properties of materials for the optimum performance. This paper reviews the electromagnetic effect on the properties of steel and copper. The studies presented in this review referred to the effects and influence of magnetic field on mild steel and copper on the basis of behaviour of magnetic field intensity (lines) inside these materials leads to the martensitic transformation in which the structure changes from Face Centered Cubic to Body Centered Cubic (FCC˜BCC) lattice structure. On the other hand, if an alternating magnetic field is created around a 'copper wire through it' for more than 20 hours, fracture toughness decreases. Increase in temperature increases the resistance which affects the performance of the metals.

Keywords: Magnetic field, fracture properties,

I. INTRODUCTION

Small electric motors get used in large numbers in developing countries. The rotors of small electric motors used in small centrifugal pumps, table fans, working machines etc should be such that the energy loss in the rotor's material due to hysteresis effect is minimum. Different materials behave differently under electromagnetic environment. The engineering aspects involved while selecting the rotor shaft should also consider the energy considerations. In the present work is carried out to know, how the electromagnetic environment influences the mechanical properties specially the dynamic properties such as the repeated loading which the material has to undergo-such that the designers can make use of the generated information in proper selection of candidate materials for optimum performance.

In the recent years, the use of various metals in magnetic field environment has increased tremendously. Many technical devices such as motors, generators, MHD devices, fusion reactors, superconductors, magnetic levitation trains etc. [2], employ elastic structures in magnetic fields. It has created a need for reliable structure to support the high Lorentz forces produced by the magnetic field. To design such structures, it is necessary to consider the possible influence of the magnetic field on the mechanical properties of candidate structural materials. Aluminum alloy, steel and copper are the most widely used material for making the structure of the above-mentioned devices.

It is well known [1-6] that the properties of ferromagnetic materials are affected by magnetic fields. The magnetic field promotes martensitic transformation [11] in steel which changes both the tensile properties and fracture properties [1-5]. The most common effect on the tensile properties is an increase in the rate of work hardening, which increases the ultimate tensile strength, while decreases the ductility. The fatigue properties of ferromagnetic material may increase or decrease depending on the stability of material and the intensity of magnetic field [1]. type, with subscripts and superscripts in a slightly smaller font size. This is acceptable.

II. LITERATURE REVIEW

The better your paper looks, the better the Journal looks. Thanks for your cooperation and contribution.

In this literature review detail study relevant literature concerning our topic. Primarily we will discuss the research work done by various researchers regarding effect of electromagnetic field on fracture properties of metals. The external parameters generally considered in the plastic deformation of metals and ceramics are the temperature, pressure or stress and time. Usually neglected are the effects of the electric and magnetic fields.

Zhao Yong et al [1], suggested in his paper that metal fatigue and damage can be slowed down with the use of an alternating magnetic field. Through the study of dissipative structure theory, a new idea has been formed, it is suggested that under some specific conditions and using some specific methods which can promote the formation of dissipative structure- a metal system may be changed from a chaotic state to a new state of order. In this way, metal fatigue and damage can be checked and even eliminated.

He showed in his work that the fatigue life of A3 steel could be increased 4 times by the application of magnetic field. The result obtained by him are shown in table given below-

Table 1 The test Results[1]

	Open air			Magnetic field		
	Specimen No.			Specimen No.		
	1	2	3	1	2	3
Life cycle	76830	93050	76880	296980	339550	275610
Average life	73256			297380		

Y. Shindo, D. Sekiya [2], revealed in their paper that, the magnetic field effect can increase the value of the stress intensity factor. They consider a problem of soft ferromagnetic isotropic

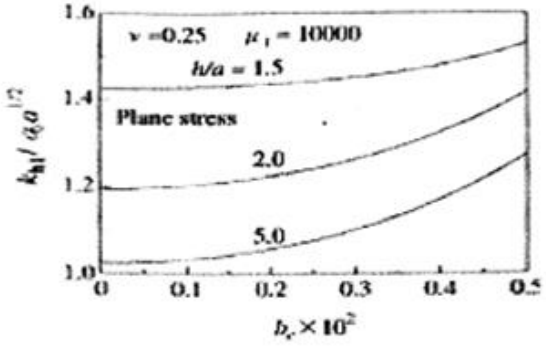

FIG 1(a) Stress intensity factor versus magnetic field(h/a = 1.5,2.0,5.0) linear elastic strip with central crack under magnetic field, and show the effect on stress intensity factor (shown in fig 1 (a) and fig 1 (b).

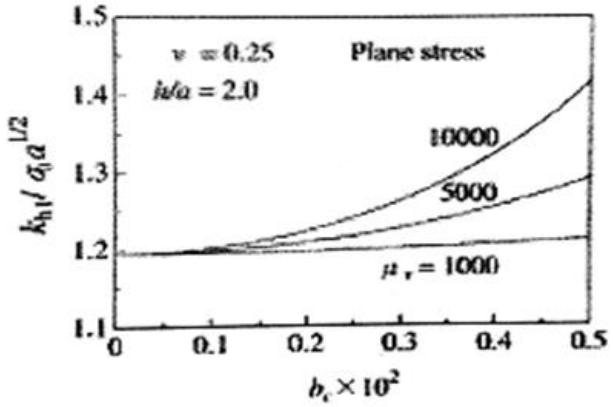

FIG 1(b) Stress intensity factor versus magnetic field (μ_r = 100,1000,10000)

S.-X. Zhao, paper [3] studied the eccentric crack problem in soft ferromagnetic elastic strip under uniform magnetic field. In this paper the result

indicate that the stress intensity factor increases slowly when the magnetic induction is smaller than about half of its corresponding value, and continue to increase at a high rate as the magnetic induction increases.

D. N. Fang, paper [4] studied the effect of magnetic field on the fracture toughness of soft ferromagnetic materials using experimental techniques and theoretical models. The results indicate that there are no significant variations of the measured fractured toughness of the manganese-zinc ferrite ceramic in the presence of the magnetic field.

Y Zhang, [5) studied the high temperature tempering behavior in a structural steel under high ic field. The purpose of his work is to investigate the growth behavior of cementite in a structural steel under a high magnetic field. Evidence of the influence of the magnetic field on recovery and orientation distribution characteristics of the matrix. Insight into these issues is of great theoretical significance.

The mechanical properties of specimens[5] tempered at 600°C are given in table 2 It is seen that the tensile strength of the specimens tempered under magnetic field are slightly higher than those for the non field ones where the impact toughness remains almost unchanged in the two cases.

Table 2 Mechanical properties of steel tempered at 600^0C for 1 hr without and with a magnetic field [5]

Field Induction	Yield Strength (MPa)	Tensile Strength (MPa)	Impact Toughness (MJ/m^2)
0 T	935.33	1033.73	0.974
14 T	945.33	1040.17	0.968

In D. Binesti [12] paper, core losses of an 18.5 kW asynchronous motor were measured and computed, by means of a suitable electromagnetic fields package, improved for core loss calculation. The results show that a 1 to 3 % improvement in efficiency is possible by replacing the conventional soft laminations by new materials.

Fundamentals of Fracture Mechanics

It is now well known to designers that fatigue accounts for a majority of material failures. Fatigue failure is characterized by slow but steady crack propagation in weaker sections of a structural component under fluctuations of load, temperature, or other stress producing parameters. Traditionally, the fatigue strength of a component is expressed in terms of the number of cycles to failure for a given level of stress fluctuation. This description ignores the mechanics of crack initiation and its subsequent growth with time. Modem fracture mechanics provides the designer with more reliable predictions of fatigue life.

The fundamental principle of Fracture Mechanics is that the stress field ahead of a sharp crack in a structural member can be characterized in terms of a single parameter, K, the stress intensity factor. This parameter, K, is related to both the nominal stress level (σ) in the member and the size of the crack (a).

Thus members or the test specimens, that have flaws can be loaded to various levels of K, either by increasing 'σ' and/or 'a', analogous to the situation where various unflawed members can be loaded to various stress levels, σ.

Since the failure of most equipment or structural members is caused by the 'propagation of cracks to a critical value, an understanding of the magnitude and distribution of the stress field in the vicinity of the crack front is essential to determine the safety and reliability of equipment and structure.

Definition of 'fatigue'

ASTM defines 'fatigue' as 'The process of progressive localized permanent structural change occurring in a material subjected to the conditions, which produce fluctuating stresses and strain at some point or points and which may culminate in cracks or complete fracture after sufficient number of fluctuations'.

Fatigue Crack Growth under Constant Amplitude Loading

For structural materials, fatigue crack propagation has been shown to be crack extension in every load cycle

(striations, fractographic observations by electron microscope) (Schijve 1979) if the stress range and ratio are sufficient. A cyclic loading of the type shown in Fig. 3 will cause a crack to propagate across a metal plate if the stress range and stress ratio are sufficient. The crack will propagate some incremental amount with each application of a load cycle.

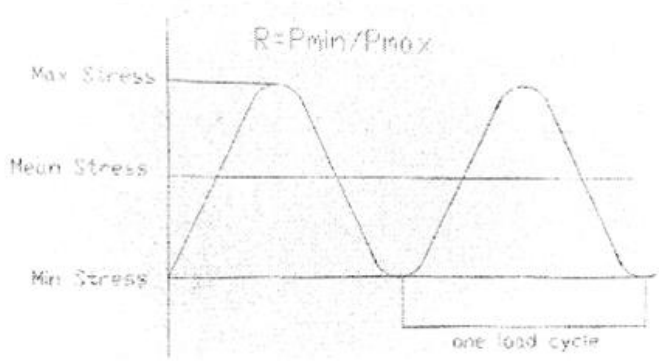

Fig3. Constant amplitude cyclic stress

σ_{max} = Maximum stress,

σ_{min} = Minimum stress

Mean stress, $\sigma_{min} = (\sigma_{max} + \sigma_{min})/2$

Stress range, $\tilde{}O' = (\sigma_{max} - \sigma_{min})$

Stress ratio, $R = \sigma_{min} / \sigma_{max}$

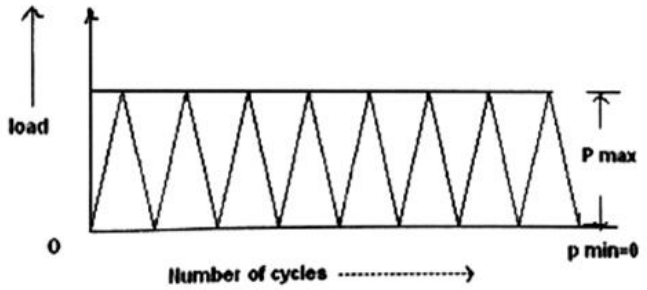

Fig 4 Typical load cycle for constant amplitude loading

The above figure shows a typical constant amplitude loading. Maximum load is P_{max} and minimum load is P_{min}. (P_{min} - 0 here).

Electron Microscopy The Scanning Electron Microscope (SEM) is a vital and essential tool for fracture research. The SEM has a broad range of magnification levels from lOx to 30000x with a large depth of focus compared to optical microscopy. Specimens are inspected directly and are prepared for the SEM easily and non-destructively. Fractographs produced by the SEM are unique and easy to analyses in that they have a 3D appearance. Samples to be analyzed using the SEM cannot be very large (although larger SEMs do exist) and in some instances it may only be possible to analyze a fracture surface macroscopically due to its size unless it is possible to segment the specimen to a size that will fit in the SEM. Although cutting a specimen up can destroy features on a fracture surface that would be vital in determining the cause of failure.

The aim of fractography is to analyse the fracture surface in order to gain some useful information about the material and its failure. It is important so that the fracture mechanism can be determined. This is also useful in forensic engineering and establishing the cause of fracture. It is possible to use this information to prevent potential future failures and advance materials technology. For example fracture tests are performed and analysed for research purposes in order to determine the materials properties. However service failures can be analysed for insurance and accountability purposes to determine the cause of failure.

Fractography is performed on a variety of levels depending on the specific purpose. Optical fractographic techniques include macro fractography which is used to describe visual fractal analysis whereas micro fractography describes low magnification (<= x25) analysis. Electron fractography uses an electron microscope for very high magnification and high resolution fractographs.

III. FRACTURE MECHANISMS

A fracture surface should be treated as a record of the history of a component failure. Detailed within the fracture surface is evidence of loading history, environmental conditions and material quality [13]. For the purposes of this resource, fracture surfaces are classified as brittle, ductile and fatigue although some specimens may clearly fit into a number of fracture categories. For example a fatigue failure fracture surface may exhibit a ductile final fracture region.

This will be taken into account and the fracture image will appear in all of the categories where it is relevant.

Brittle Fracture Brittle fractures have no plastic deformation and are usually characterized by a lack of necking with smooth/shiny facets (as shown below), an appearance associated with fast crack growth [14]

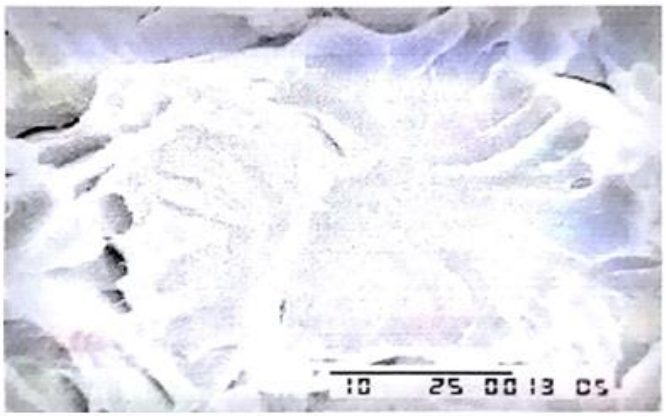

Fig 5 SEM image of brittle fracture in plain carbon steel

A brittle failure mode such as cleavage or inter granular (fracture along the grain a macroscopic level, chevron or radial markings may be boundaries) is seen, On observed as shown below.

Fig 6 Radiating Ridge Fracture Surface (Callister, W.D., Page 186)

Ductile Fracture Conversely ductile fractures can be characterized by necking of the material due to plastic deformation. A fibrous/rough and dull fracture surface can be observed associated with slow crack growth. Plastic deformation is produced by a ductile failure mode such as micro void coalescence leading to dimple rupture which can be seen below. Failure at the edges of the sample occurs at 45° to the loading direction due to the maximum shear stress being at 45° to the loading stress.

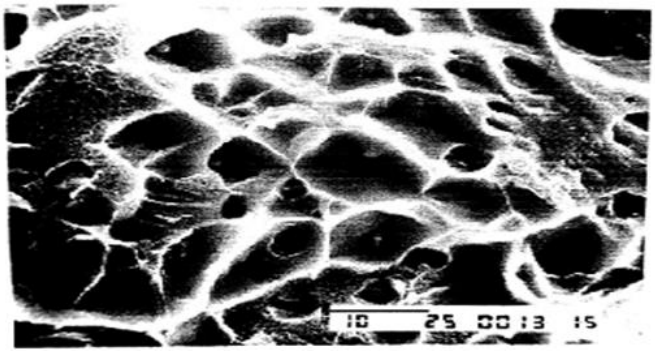

Fig 7 SEM Image of ductile fracture in plain carbon steel

Ductile tensile failure begins with uniform plastic deformation leading to localised micro void coalescence and then dimple rupture in the necked region which experiences a tri-axial stress state on formation of the neck. Dimple rupture leaves pits and holes on the surface structure.

Factors affecting the failure mode are:

- Material Microstructure
- Temperature
- Strain Rate
- Environment (leading to corrosion)

Material inside a magnetic field Suppose a material placed in an external magnetic field. If the material is paramagnetic, a small magnetization occurs in the direction of the field. If it is ferromagnetic, a large magnetic field occurs in the direction of the field and if the material is diamagnetic a small magnetization occurs opposite to the direction of the field. The lines of the magnetic field B, thus, become denser in a paramagnetic material but become less dense in a diamagnetic material.

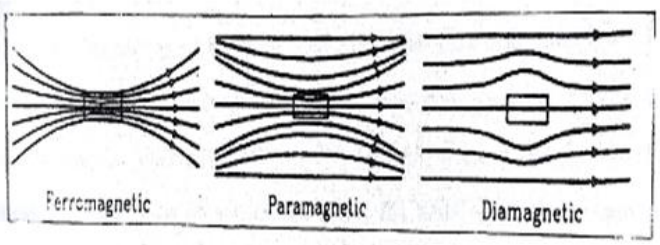

Fig 8 Showing the magnetic field lines inside material when placed in a magnetic field

The magnetic material is a small but positive quantity (=10-3 to 10-5) for paramagnetic substance; of the

order of several thousands (positive) for ferromagnetic materials and small but negative for diamagnetic substances. The relative permeability)..Ir = I + X is slightly more than I for ferromagnetic material and slightly less than I for diamagnetic material [6].

IV. CONCLUSIONS

From the above study, Fatigue life of IS-l 020 steel is increased due to magnetic field effect. These effects have been justified on the basis of material behaviour inside the magnetic field and the martenstic transformation in mild steel. SEM is used to analyse the fracture surface in order to gain some useful information about the material and its failure for example in forensic engineering and establishing the cause of fracture. SEM analysis was done to find out the existence of the extent of micro pores & voids. Encouraging results were obtained which proved that not only micro pores & voids exist in the new contact wire but also its manifestation lies in the form of cracks in the used copper wire. Fracture toughness value of the copper wire decreased due to electromagnetic effect. So, it can be concluded that there is a need of intensive study to redefine the design procedure of the contact wire used for electric traction from the point of view of adding the concept of fracture mechanics to it and for design of core which are used in small electric motors so that reduce the losses and consume optimum power.

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Advanced Irrigation System

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ABSTRACT

With the advancement of automation technology, life is getting simpler and easier in all aspects. In today's world Automatic systems are being preferred over manual system. Automatic system is a growing system of everyday object from industrial machine to consumer goods that can complete tasks while you are busy with other activities. India's population is reached beyond 1.2 billion and the population rate is increasing day by day then after 25-30 years there will be serious problem of food, so the development of agriculture is necessary. Today, the farmers are suffering from the lack of rains and scarcity of water. The main objective of this paper is to provide an automatic irrigation system thereby saving time, money & power of the farmer. The traditional farmland irrigation techniques require manual intervention. With the automated technology of irrigation the human intervention can be minimized. Whenever there is a change in temperature and humidity of the surroundings these sensors senses the change in temperature and humidity and gives an interrupt signal to the micro-controller

I. INTRODUCTION

India is the country of village and agriculture plays an important role for development of country. In our country, agriculture depends on the monsoons which has insufficient source of water. So the irrigation is used in agricultural field In Irrigation system, depending upon the soil type, water is provided to plant. In agriculture, two things are very important, first to get information of about the fertility of soil and second to measure humidity content in air. Nowadays, for irrigation, different techniques are available which are used to reduce the dependency of rain. And mostly this technique is driven by electrical power and on/off scheduling. In this technique, an temperature and humidity sensors are placed near the plant and near the module and gateway unit handles the sensor information and transmit data to the controller which in turns the control the flow of water through the pump.

II. METHODS AND MATERIAL

User Interface: User interface allow the user to inter act with the system by sending information to the controller by presenting information to user about the system. Its generally a computer or a smartphone

- Controlled Devices: Controlled devices include a wide range of equipment that this arduino and sensor is capable of. Here in our project it is a motor.

- Programming Computer: Some system controllers allow the user to program the system with the systems own user interface. Other system require PC to program. Here we are accessing arduino IDE with the help of a PC.
- Controllers: Relay controllers provide the intelligent control functions in automatic irrigation control.
- Sensing Devices: Sensing devices can report values, such as temperature and humidity etc or states.
- I/O Interface Devices: These devices provide the logical communication link between the controllers and the controlled device systems

S.no.	Components	Quantity
1.	12v motor	1
2.	Water storage tanks	3
3.	Pipes	20ft
4.	Arduino	5
5.	Solenoid valve	3
6.	Non return valve	2
7.	Filter tank	1

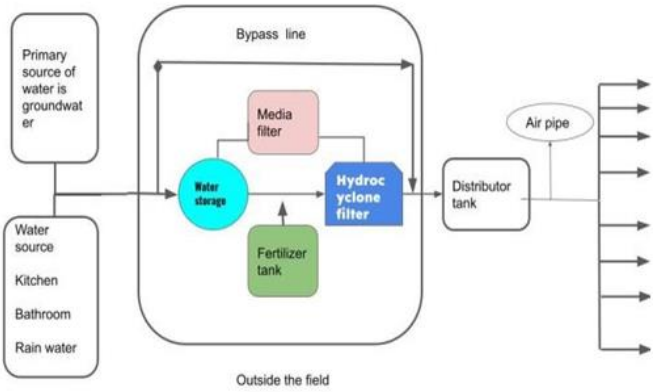
III. ADVANTAGES OF AUTOMATIC IRRIGAION CONTROL

Prevents Disease and Weeds Specialized drip irrigation systems direct water specifically to each plant's root ball, rather than sprinkling the entire garden like a typical rainstorm. As a result, surrounding weed seeds cannot germinate, so you'll have less weeding to do. Water at the roots also prevents leaf diseases caused by standing droplets on the foliage. Because the water does not strike the leaves or flowers, blight diseases have no chance of proliferating..

A. Conserves Water and Time

Hand watering with a hose or watering can takes substantial time and early morning and evening watering rituals take away from family and work. Both drip and sprinkler irrigation systems have timers that can be present for daily or weekly watering so you do not need to monitor the watering because the timer shuts the water off when it has finished. Your water bill should be lower if the irrigation system is effective.

B. Layout of the project



In above fig there are two tanks are connected and these tank are connected In series with filter tank the water visible impurities are being filter out by net filter and other impurities are removed through layer filter as well as it maintain the minerals in water due the layer of coal and rock

The main line is connected through the by pass line of fertilizer tank which supply fertilizer as per requirement according to the Arduino

After that the flow rate of water Increase by motor so that water flow rate is same at the start and at end of the fertilizer tank

IV. CONCLUSION

The automatic irrigation control using arduino uno has been experimentally proven to work satisfactorily and we could successfully set the timer and managed to control the motor over time.This process not only records values of temperature and humidity it also controls the motor accordingly.Analyzing the weather condition motor will automatically maintain water supply making it possible to maintain greenery without human intervention.

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Automatic Water Tank Cleaner Machine

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ABSTRACT

Aim of this project is to develop a mechanical system for cleaning domestic cylindrical water tank. The mechanical system includes two main mechanisms which are rack and pinion gear mechanism and reciprocating four bar linkage mechanism. The rack and pinion arrangement is used to move whole mechanical system up and down for cleaning the cylindrical tank. The rack is fixed on the motor and the four-bar mechanism is attached to the motor shaft. PVC brushes are attached to the ends of the four-bar linkage. Four bar linkage is made in such a way that it can be adjusted according to inside diameter of the tank. When the motor is started the linkage rotates and with the help of brushes, cleaning of wall and base of tank takes place. The purpose of this project is to reduce the human efforts and to avoid the chemical influence on health of person entering the tank for cleaning.

I. INTRODUCTION

In recent studies it has been found that no automation based machine used in cleaning of overhead tank. This is because of the irregular shape and various heights of the tank locations. With previous survey made an attempt to make a machine by automation process for cleaning tank. An alternate solution has made a plan to solve this problem. In India, the usage of sintex tanks by the people is approximately 71% After studies made the information that have faced a lot of difficulties like continuous work in the dirty places, irregular payment and other various reasons. Continuous work and irregular payment may also be the major reason for this attempt. So came to a conclusion that cleaning the overhead tank using automation process can be useful to solve all these problems. In this case, machine has the capability to clean the tank easily and quickly. Designing of our machine is based on the survey report conducted.

II. METHODS AND MATERIAL

Manual scrubbing in which wall and floor of tank are scrubbed to remove dirt, sediments, fungus and stains, but this method is more tedious and time consuming. The water tank can also be cleaned by using chemicals to remove the dirt and sediments. The chemicals used may affect the human health. Pressurized water can be sprayed on the walls of the tank which will remove the dirt from the tank surface. These methods are time consuming and require more efforts for cleaning. To find such an approach, there is need of studying the existing approaches and algorithms that had already been used for automatic overhead water tank cleaning system.

This motivates us for the literature review. The organization of this paper is as follows. In Section 2, systematic presentation of the literature review is done; which involves the list of the related approaches along with the summary of the related work that is more relevant to developed approach. Section 2 concludes with our findings from the literature review and motivation behind identified problems. Section 3 focuses on the formulation of the identified problems. Section 4 is dedicated to the proposed approach. Section 5 emphasizes on the experimental results. Section 6 addresses the conclusions along with the future work.

2.1 Necessity of Cleaning:-

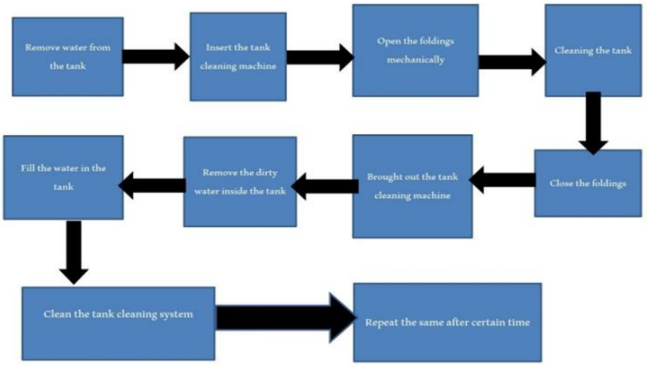
Water Tank Every day we use the tank water for brushing and bathing, for cleaning and moping, for washing clothes and in other household chores. With the passage of time, sediments scale and algae get deposited on the walls, ceiling and floor of the water tank. This deposition contaminates the water and makes is unfit for use. With time algae and bacteria grow and breed in this water infect it and could make us fall sick eventually. Hence water tank cleaning is very important.

III. PROBLEM FORMULATION

This section presents the formulation of the identified problem, which based representation of an overhead water tank cleaning system. All the reviews on theoretic approaches involve the same common terminologies. The problem of cleaning the water tank by the conventional can be formulated as: All methods of cleaning water tank as discussed above are time consuming and require more human efforts. So the alternate method is required for cleaning purpose which will overcome the drawbacks of all other methods. Therefore, we are developing water tank cleaning equipment which requires less time and human efforts for cleaning.

IV. PROPOSED APPROACH

This section is subdivided into 5 sub-sections wherein the report presents the detailed working of automatic overhead water tank cleaning system that is incorporated in our work along with our approach. Sub-section A includes the information about the main components used in the project. The material and methods is mentioned in Sub-Section B. Working of system is explained in SubSection C with the aid of flowchart. Our proposed approach is introduced in Sub-Section D. Sub-section E provides detailed working of the proposed approach.



Working flowchart.

Firstly, whole water is removed from the tank. Detergent is then sprayed on the inner wall of the tank for easy removal of dirt. The whole system is inserted in retracted position into the tank. The four bar linkage is then adjusted according to the tank diameter in such a way that brush at end of the shaft touches the bottom of tank. Now the motor is switched ON. The four bar linkage starts rotating along with the shaft. This causes scrubbing of inner wall of tank by the brush attached to the ends of linkage. For cleaning upper portion of the tank the whole mechanism is reciprocated along the guide ways with the help of handle connected to the rack and pinion arrangement. In this way the tank gets cleaned within minimum time.

V. CONCLUSION

The water tank cleaner was used to clean the water tanks by using rotating brushes. This method was more effective and safe than the conventional methods. This method is capable to clean water tanks within less time and human efforts Advanced model for tank cleaning system is cleaning the tanks thus making the operation user friendly. The working prototype is promising both in terms of imparting cleanliness and avoiding excess manpower. The future scope of the project is to extend it with auto feeding mechanism by which the manpower involved in feeding gets removed. Through the help of the auto feed mechanism it is easy to clean the tanks without excess man power. The project can be even extended to increase the cleanliness of the tank by insulating the frame and other components using stainless steel.

VI. FUTURE SCOPE

1. This system is user friendly and time saving also the cost is less hence it can be used in the future water tank cleaning purpose.
2. In future the advance system may also be invited like the vacuum cleaner type system that can clean the tank without removing the water from the tank.
3. 1.3The system could be more compact and light weighted and more user-friendly and efficient by improvement in the design and using some other advance equipment.

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Solar Pesticide Spraying and Cutting Machine

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ABSTRACT

Agriculture is demographically the broadest economic sector and plays a significant role in the overall economy of India. For the growth of Indian economy, mechanization is necessary. The main purpose of mechanization in agriculture is to improve the overall productivity and production. The socio-economic conditions of peoples living in villages of developing countries including India, human muscle power can be good alternative to fulfil the energy requirements for performing many activities like water pumping and grass cutting.
Keywords: Solar Panel, Sprayer, Grass Cutter, Wheel Control.

I. INTRODUCTION

Agricultural sector is changing the socio-economic environment of the population due to liberalization and globalization. About 75% people are living in the rural area and are still dependent on agriculture. Agriculture has been the backbone of the Indian economy. Spraying of pesticides is an important task in agriculture for protecting the crops from insects. Farmers mainly use hand operated or fuel operated spraypumpforthistask.Thisconventionalsprayercauses user fatigue due to excessive bulky and heavy construction. This motivated us to design and fabricate a model that is basically trolley based solar powered Grass Cutter, Pesticide Sprayer & LightingSysteminasingleunit.DuetouseofSolarenergyf or operating pump & grass cutter, there will be elimination of engineoffueloperatedspraypump&cutterbywhichther ewill be reduction in vibrations and noise.The elimination of fuel will make our spraying system eco-friendly. Solar powered system can give less tariff or price in effective spraying, grass cutting & Lighting operation. Solar energy is absorbed by the solar panel which contains photovoltaic cells. The conversion ofthesolarenergyintoelectricalenergyisdonebythesecel ls. This converted energy utilizes to store the voltage in the DC battery which used to function whole unit.

II. METHODS AND MATERIALS

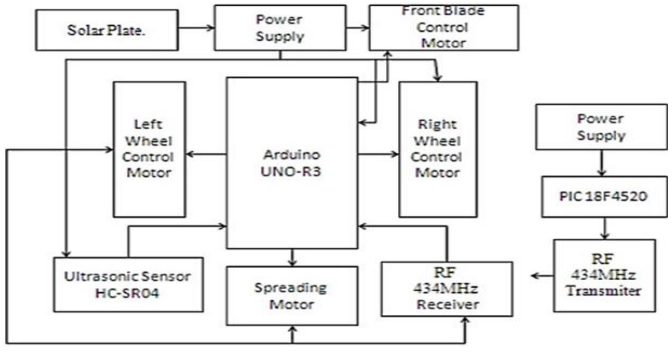
In this project we are fabricating a prototype ofthesolarpoweredgrasscutter,PesticidesSprayer&Ligh ting unit. With the help of a multi operational vehicle, the following objectives can be achieved:

- Tominimizehumaneffortintheagriculturalfield.
- ToperformTWOoperations(Sprayingpesticidesa nd grass cutting) at single time.
- Toincreasesproductionandsavetimeoffarmers.
- Nopollutionproblems.

Farmercanoperatethisvehicleeasilywithouttiringforlo ng times. In this project the main part is the Arduino UNO R3 whichcontrolstheallassemblyofproject.Theuseris

withthe RF control remote, the user must select that in which mode the system has to operate either it is in manual mode and the automodeinmanualmodetheuserhastodecidethatwhereto moverobotbutinautomodetherobotwilldecidethatwhereit wants to go. By using ultrasonic sensor, the robot will move. The blade of the robot is handmade design the motor used for thecutteristhebrushlessdcmotorandithastherpmof35000 it operates on 12v dc supply.The battery is source part for the project the battery is supplyingthe12vdcforthe motorandpump.TheChargedon the solar plate once the battery is fully charged the robot will move properly. Also, the second application is the pesticide spreadinghereweusethe12vdcoperatedpumpwiththe1.5m lengthpipeandthespreadingnozzleisconnectedattheoneend ofthepipe.Forsupplyingwatertotheandstoringpesticide we use the water tank of 2 liter. RF control remote used here has the range of 300ft(100m). In this range the use has to give instructiontotherobot.TheRFusesthefrequencyof434 MHz and we use the encoder and decoder ic at the transmitter and receiver respectively. The ic are HT12E and HT12D. Also, at transmitter the with encoder ic we use the another ic PIC181f4520becausetheencodericisthe4-bitencoderbutwe require the greater than 4-bit control for that we use the PIC18f4520.

B. Proposedsystemblockdiagram



III. COMPONENTS USED

A Tmega328P the A Tmega328P is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core. Atmega328 microcontroller is used in basic Arduino boards i.e., Arduino UNO, Arduino Pro Mini and Arduino Nano. The high-performance Microchip Pico Power 8-bit AVR RISC-based microcontroller combines 32 KB ISP Flash memory with read-while-write capabilities, 1024B EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented Two-Wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

IV. OBJECTIVE

- To reduce human efforts which in result reduces the fatigue load on farmers.
- To reduce overall time for the agriculture spraying and grass cutting.
- Use of multi-nozzles in order to spray large areas at a faster rate.
- This all operate the mechanical on the trolley with Blue-Stick app.
- The purpose of grass cutter is to avoid energy crisis and human efforts. Also, Solar based grass cutter keeps the environment clean and healthy.
- We need not to take precautions like facemasks and gloves against the hazardous chemicals.
- Easy to operate by unskilled workers.

V. ADVANTAGES

- The pesticide sprayer operates with minimal pollution.
- Low power consumption.
- Non-conventional energy is used for charging the battery.
- Flow from nozzle is continuous and at variable height.
- Power is supplied to motor directly from batteries. Hence there will be no fuel required.
- When solar rays are not available at that time battery can be charged by electric charger.
- Vibration free machine.
- Limited human contact with chemicals.
- Height of nozzle is adjustable.
- Its cost is less than electrically operated pump.

VI. DISADVANTAGES

- Battery is operated up to limited hours.
- Since, sensor and actuators are not employed. So, when there any obstacle comes, manual interference is required.
- Precision of grass cutter blade may reduce due to excessive use.
- In irregular area of land, it can be difficult to operate.
- In rainy days in muddy environment, it can be difficult to operate.

VII. RESULT

The machine reduces human efforts and time since it is operated by android app available easily in any smart phone. The cost is reduced, since it has many features in a single machine. There is less human contact with hazardous chemicals which decreases the health issues and skin diseases. The solar energy is used as power source so the non-renewable energy sources won't be used. The two nozzle sprays more pesticide in both direction at a time. The 2-litre tank can spray pesticide for approximately one and half hour continuously. The battery is charged through solar panel which works for six hours. Since the machine is operated by the operator, the speed and movement of the machine can control via the Arduino Bluetooth RC.

VIII. CONCLUSION

By doing this project we conclude that, we can reduce the human efforts and this will be helpful for farmer. As it is operated on solar energy so the it is best application that does not affects on environment. This project work has presented progress towards achieving a future precision autonomous farming system. This system is designed to help farmers in reducing their time and energy spent for pesticide spraying and weed cutting. This system will reduce labour problem in future. So, this system will be the best replacement for currently used systems like hand sprayers and tiller mounted sprayers. The performance of the equipment will increase when it is operated on the smooth surface or less uneven surface and it will be more effective when it is used on the crops having nearly similar height and having the less space between two crops.

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Automobile Cabin Air Filter

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ABSTRACT

Air filter system plays a significant role in getting good quality air in automobile Cabin. It improves human comfort in terms of efficiency and also reduces air pollution. The work of an air filter is to filter the dirt particles from the intake air, supply cleaner air to the cabin and recirculate the filtered air. Optimum utilization of filters can significantly reduce the cost of filter replacements frequently and keep the filter in use for a longer time.

This paper will be discussed health and Cabin air purifiers that deliver best-in-class air purification performance for cars of all sizes, with a compact. It combines electrostatic and mechanical filtration to deliver low noise, 360° airflow, and high CADR. It provides more than 95% filtration efficiency against PM 2.5, pollen, dust, yellow dust, and industrial emissions.

Keywords: Automobile Cabin Air Filter, Mobile Operated Filter, IOT based Air Filter.

I. INTRODUCTION

Early in the history of the vehicle, oil was affordable and appeared to be boundless. Additionally, no one everconsidered the fundamental issues of today, such as greenhouse gases or global warming. But while people's awareness of these issues has grown in recent years, oil prices have also climbed significantly during theprevious several decades. Consumers are led to health safety by taking into account all of these factors of the health and ongoing improvements in government rules for lowering pollution in the automobile sector. This improves the automobile sector in health safety.

The air that is supplied to the air induction system is drawn into the case through the filter and then transferred to the desired area of the vehicle's cabin.

It is important that the air that passes through the filter is evenly spread.The cost of changing filters more frequently can be reduced by using filter elements to their maximum potential, extending the life of the filter. The design of the air induction system is important in determining the air flow's quality. Human performance was impacted by the diffuser's design and the flow around it when air was drawn in. This is due to various air-gathering characteristics.

Pressure losses in the air induction system are decreased as a result of reduced air pollution and consumption. High airflows and minimal pressure losses are required for the ideal air induction system. A full understanding of flows and pressure drop throughout the system is necessary for air induction system optimization. Numerous tools are used to predict the flow as well as experiments that are

conducted in the flow. The best option for analyzing the flow of a whole air induction system is thought to be an air cabin filter. Here, we are concentrating on the evaluation of air filter performance standards for its best application in the automotive industry

II. METHODOLOGY

The objective of the proposed cabin Air Filter is to improve the overall performance of a simple filter. The schematic representation with block structure shown in figure 1 the parts of the developed system such as ESP8266 (WiFiModule and Arduino uno), MQ135 (air Sensor), DHT 11 (Humidity and Temperature Sensor), LCD display, I2C Module(Serial Interface Mode), Relay Module, Filter (Circular in Shape), 5V Regulator, Power 12V Supply Unit.

You can remove in-car air pollution with a cabin air purifier, ensuring that you and your family always breathe clean, healthy air. Cabin purifies the air inside your car in just six minutes, and because fresh air keeps you refreshed and alert, Cabin also helps you drive more safely.

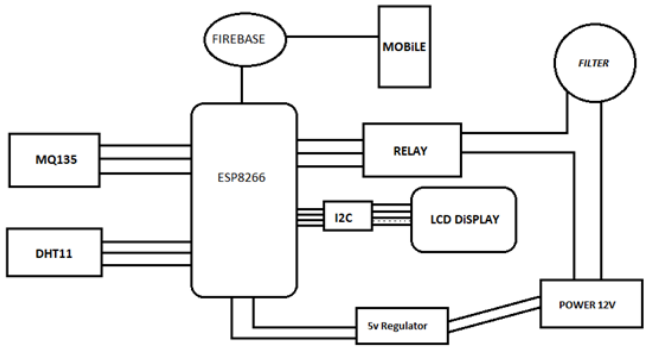

Figure 1. Block Structure

Truck drivers typically work long hours in filthy locations such as mines. Driver health and awareness while driving are critical for avoiding workplace accidents. Inside the cabin, air quality might degrade, which can contribute to driver tiredness. To develop systems that can monitor and enhance the air quality level within the cabin while also alerting the driver to essential health features such as oxygen level, temperature, humidity, and pollution levels in the air for human requirements.

Table 1. Specification of the hardware components

Components	Specification
Relay switch	Contact rating: 10A,240VAC/24VDC Max. carrying current: 14A Max. switching power: 2400VA, 240W Initial resistance: Max. 100mΩ at6VDC, 1A
MQ 135Gas Sensor	Sensing resistance: 1MΩ – 8MΩ Operating voltage: 5V ± 0.1
Display	Type: HD44780 Operating voltage: 4.7V – 5.3V Display: 2 × 16 characters Pixels: 5 × 8-pixel box Operating bits: 8-bit and 4-bit mode
Arduino UNO	Microcontroller: ATmega328P Operating voltage: 5V Flash memory 32KB Clock speed 16MHz Analog I/O pins: 6 Digital I/O pins:14
DHT 11 Humidity Temperature sensor	Operating voltage: 3.3V-5V DC Measurement range 20-95%RH, 0-50°C Operating bits: 8bit (temperature), 8bit (humidity) Compatible interfaces: 2.54 3-pin interface and 4-pin grove interface
I2C Serial Interface Adapter Module	Operating voltage: 5V DC I2C control using PCF8574 Operating interfaces: 8 modules on a single I2C bus I2C Address: 0X20~0X27
5V regulator	Min. Input voltage: 7V Max. Input voltage: 35V Current rating $I_{c=}$ 1A Max. Output voltage: $V_{Max=5.2V}$ Min. Output voltage: $V_{Min=4.8V}$

NodeMCU ESP8266 Wifi Module	Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106 Operating Voltage: 3.3V Input Voltage: 7-12V Flash Memory: 4MB Clock Speed: 80MHz Small sized module to fit smartly your IoT Projects

III. RESULTS AND DISCUSSION

The purpose of smart air cabin filters on basis of the air quality of specified areas they retreated by removing PM2.5, dust, pollen, yellow dust, and industrial emission. Also get real-time data through internet capability in this filter module, for better work performance in driving for long distances.

This filter is works on Humans who generally feel comfortable between temperatures of 22 °C to 27 °C and relative humidity of 40% to 60%. In this application, air at 35 °C and 60% relative humidity will be conditioned into the human comfort zone, with the thermodynamic process plotted on a psychrometric chart automated through an internet-based setup is implanted on that.

The filter properties and the distribution of the particles are generally homogeneous and independent of the surrounding of inside the model of the filter and its level of usage. The relatively high concentration of PM trapped in these filters poses the high air quality inside a car.

IV. CONCLUSION

From the review of some articles, different finding are concluded as mention below.

- Air filter is the integral part of ventilation system that filtration of air for better quality of air in automobile cabin and other reference places thatis required.
- Air intake through the filter maintain the pressure of a cabin.
- Parameters that affect the air filter performance areas:
  - Type of air filter is in use.
  - Requirements of air quality
  - Performance analysis of filter
  - Size of filter
  - Material of the filter element
- Due to larger particle's penetration into the filter,the filtration efficiencies for uniform flowdistribution is better than non-uniform flowdistribution. For small particles the filtrationefficiency decreases for the uniform flowDistribution.

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Road Infrastructure and Road Safety

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ABSTRACT

Roadway Factors, including roadway and roadside design elements, play an important role indetermining the risk of traffic accidents. Negative road engineering factors include those where aroad defect directly triggers a crash, where some element of the road environment misleads a roaduser and thereby creates human errors.In particular, the geometry of the road influences both thefrequency and severity of road crashes.In this regard, concepts such as the "Forgiving Road SideDesign" and the "Positive Guidance" approach need to be integrated into the engineering design ofroads to minimize the risk of road accidents.Tools such as the International Road AssessmentProgram (IRAP)'s road safety audits ("Star Rating" reports) can help countries to identify the riskfactorsinroaddesign.

I. INTRODUCTION

The road network has an effect on crash risk because it determines how road users perceivetheir environment.In this sense, the roadway provides instructions to the road users on what theyshould be doing. Negative road engineering factors include those where a road defect directly triggersa crash, where some element of the road environment misleads a road user and thereby createshumanerrors.
A framework for relating the series of events in a road crash to the categories of crash-contributingfactorsistheHaddonMatrix.Accordingtothematrixdevelopedby Dr.WilliamHaddonJr.in1970,thereareth reedifferenttypesoffactors thatcontribute to roadcrashes:

a) HumanFactors
b) Vehicle Factors
c) Roadway/Environment Factors.

Roadway Factors include roadway androadsidedesignelements.AccordingtotheHighwaySafetyManual(HSM)oftheAmericanAssociation of State Highway and Transportation Officials (AASHTO), three percent (3%) of road crashes are due to only roadway factors, but thirty four percent (34%) ofroadcrashesareacombination of roadway factors and other factors (Figure 1).Research also showed that road andenvironment factors were responsible for seventeen percent (17%) of total expressway crashes in theRepublicofKoreaduringtheyear2011.

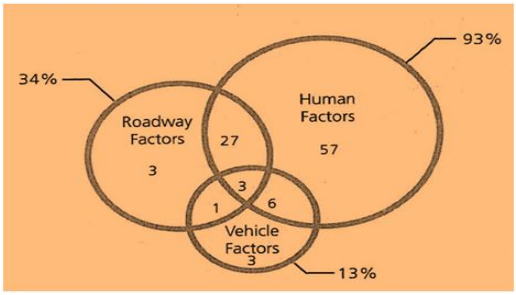

Figure1ContributingfactorstoVehicularCrashes(Source:AASHTO)

Safer roads and the mobility is one of the five pillars of the UN Global Plan for the Decade ofAction for Road Safety 2011-2020. The pillar emphasizes the need to raise the inherent safety andprotective quality of road networks for the benefit of all road users.This can be achieved throughmeasures including improved safety-conscious planning, design, construction and operation of roads.The activities under this pillar include encouraging governments to set a target to "eliminate high riskroads by 2020", identify hazardous road locations or sections where excessive numbers or severity ofcrashesoccurandtakecorrectivemeasuresaccordingly; andalsotopromotethedevelopmentofsafe new infrastructure that meets the mobility and access needs through use of independent roadsafety audit findings in the design and other phases of new road projects. One of the pillar activitiesalso emphasizes research and development in safer roads and mobility by completing and sharingresearchonthebusinesscaseforsaferroadinfrastructure.

II. ROAD PARAMETERS AFFECTING THE ROAD SAFETY

The geometry of the roadway plays a significant role in road crash frequencies as well as thecrash severity level. Different elements of the road design are important. However, a few parametersareconsideredtobemoreprominentandarediscussedbelow.

1. Cross-sectionoftheRoadway

Theverticalcrosssectionoftheroadwayparametersincludethewidthofthetravellane,widthandtypeoftheshoulder,andskidresistanceofthesurfaceofthetravelway.

The width of the travel lane does not only influence the comfort of driving and operationalcharacteristics of a roadway, but is also an important parameter affecting the road crash frequency aswell as crash severity.For any functional classification of roadway, whether it is an arterial road or alocal road, and for any environment of the roadway, whether it is an urban road or a rural road, whenthe lane width reduces, the probability of crashes increases drastically.For example, a study whichlooked at safety risks on a two-lane undivided highway, found that when the lane width was increasedfrom2.75meterto3.65meter,theprobabilityfor head-onorotherrelatedcrasheswasreducedbyfiftypercent(50%).

When the traffic volume is higher and the lane width is less, the probability for crashes,especially crashes like head-on or run-off the road, are greater. For example, in a multi-lane ruralhighwaywheretheaverageannualdailytrafficvolumeisgreaterthan2,000,theprobabilityforacrashonanarrowlanei.e.9feet(2.75meters) increasesbymorethanthirtypercent(30%).

A shoulder is the portion of the roadway contiguous with the travel lane that accommodatesstopped vehicles, emergency use etc. Generally, the shoulder width varies from 0.6 m to 3.6 m butthere are places where no shoulder can be accommodated.While it is desirable that a shoulder bewide enough for a vehicle to be driven completely off the travelled way, narrow shoulders are betterthan no shoulder at all.One study found that the probability for a road with a 60 cm wide shoulder oneach side, has thirty percent (30%) more crash risk than a road having a 1.8 metre wide shoulder oneachside.6

Regardless ofthewidth,ashouldershould be continuousand intermittent shouldersarebetter than no shoulders. The importance of wider shoulders is more acute in two-lane twoway roads.For a two-lane two-way road, if the daily average traffic volume is greater than 2,000, the probability ofcrashes for a very narrow width or no shoulder increases drastically, and if no shoulder is present thechanceofacrashincreasesbyfiftypercent(50%).

The shoulder type also governs the crash frequency. The shoulder material and thus thesurface condition have at least some impact on the recovery of an errant driver going out of the travellane. A paved shoulder is the best type of shoulder in terms of road safety and better than gravelshoulders. A gravel shoulder is better than a composite shoulder (combination of different types).However, a turf shoulder is considered to be the worst in terms of road safety and can lead to tenpercent(10%)morecrashes.

Literature shows that skidding crashes are a major concern in road safety. When the surfacefrictionisnotadequatetohelpstoppingavehicle,a vehiclegoesoutofcontrolandcrashesoccur.

Vertical and horizontal alignment, pavement types and texture affect a roadway's skid resistance.Different pavement distresses or faults like rutting, polishing, bleeding and also dirty pavements causepoorskidresistancesofroadsurfaces.

2. Roadside Condition

The safety of the road does not depend only on the characteristics of the roadway but alsodependsontheconditionoftheroadside.Theterm"clearzone"isusedtodesignatetheunobstructed, traversable area provided beyond the edge of the travel way for the recovery of theerrantvehicle.Theclearzoneincludesshoulders,bicyclelanesandanyadditionalspace,ifavailable.

The greater the width of the clear zone, the more room is available for an errant driver torecover before hitting an object; thus, a greater clear zone means a safer road. In locations whererightofwayorthewidthavailableforprovidingclearareasisnotsufficient,itisnotpracticalorfeasible to consider the concept of clear zones as expected in general. This type of environment ismorecommonindenselypopulatedurbanareas.Considerингsafetyaspects,alateraloffsettoverticalobstructions(signs,utilitypolesetc.)isneededtoavoidcrashes.

The presence of a median is another important factor governing crashes, especially head-on-collisions.Most two-lane highways do not have median barriers to avoid capacity reduction of theroadway.However, median barriers are highly desirable in multi-lane highways in terms of safety andoperational efficiencies. Generally, the median width varies between 1.2 to 4 meters. The wider themedian, the better the safety situation is: Harkey et al conducted a study that revealed that amultilane divided highway with a 30 meter wide median has a four percent (4%) greater probability ofcrashes than a highway with a 9.0 meter wide median.7Even for urban arterial roads, one studyfound that conversion from an undivided urban arterial to one with a raised-curb median could result,onaverage,inatenpercent(10%)reductioninroadcrashes.

3. Curvature of the Roadway

Thehorizontalcurvature ofaroadwayisimportantbecause whena vehiclemovesin acircular path, it undergoes a centripetal acceleration that acts toward the centre of the curvature. Inother words, centrifugal forces try to move away the vehicle from its desired line of movement i.e thatis the curved roadway. The roadways at curves are provided with a geometric feature on the curvedportion of the roadway known as "super elevation".In other words, the outer sides of the roadways atcurvesareelevatedwithrespecttotheinnerpart,sothata componentoftheself-weightofthevehiclehelpstopreventthevehicletomoveawayintheoutwarddirection.

However, the travel speed of the vehicle is also an important factor.If the travel speed of avehicle exceeds the suitable limit or design limit of the curve, then the vehicle loses control and aserious "out of control' crash may take place. For example, on a curved portion of a two-lane highway,if the provided super-elevation is lower than two percent (2%) of the

desired level, the probability ofroadcrashesincreasesbysixpercent(6%).

Transition curves are used between the straight part of the road and circular curves. Thistransition is provided through introducing spiral curves. If a transition curve is not properly provided,then centrifugal force will be applied to a vehicle all of a sudden, and depending on the speed andweight of the vehicle may translate into lack of control of the vehicle. Therefore, improper transitioncurveis moreriskyforheavierandfastmovingvehicles

The vertical grades or curvature of vertical curves of the roadways are also related to roadsafety.Whensteeperslopesareprovided,itbecomes moredifficultforavehicletobecontrolled.This is a more significant problem for heavier vehicles like trucks. A heavy truck faces difficulty inclimbing steep ascending grades, causing them to slow down.This in turn results in differentialspeeds among different types of vehicles. A two-lane highway located in steep terrain can have 15%more road crashes than a similar road located in a level terrain condition. Therefore, presence of aclimbing lane (additional lane) for heavier vehicles can reduce probability of crashes by 25% on a two-laneroadwaysection.

4. SightDistance

The alignment of the roadway has a great impact on road safety because a driver's ability tosee ahead is necessary for the safe operation of the vehicle and thus for the overall safety of thesystem. A sight distance of sufficient length is necessary so that a driver can control the operation oftheir vehicles to avoid hitting an unexpected object on the road. This is known as "Stopping SightDistance (SSD)". Another concept, of the sight distance is the "Passing Sight Distance (PSD)". For atwo-lane road where the speed is 60 kmph the SSD and PSD are 85 meters and 180 metersrespectively on level roadways. The passing sight distance is applicable to two-lane roads to enabledrivers to use the opposing traffic lane for passing (overtaking) other vehicles without interfering withoncomingvehicles.

While the concept of the SSD and the PSD are the prime importance in terms of road safety,the "Decision Sight Distance (DSD)" is another important topic to be addressed for the safety of theroad users. SSDs are sufficient for reasonably competent and alert drivers to come to hurried stopsunderordinarycircumstances,butgreater distancesareneedfordriversto takecomplexdecisions. The DSD is the distance needed for a driver to detect an unexpected or otherwise difficult toperceive information source or condition in a roadway environment; to recognize the conditions or itspotential threat; to select an appropriate speed and path; and to initiate and complete complexmaneuvers.10DSDprovidesdriversadditionalmarginsforerrorswheneverthereislikelihoodforerrors in information reception, decision making or taking actions by the drivers. The DSD variesdepending on the level of complexities and also on the road environment (e.g. urban, rural).Toaccommodate the variation in human capabilities in driving, a roadway is recommended to haveDecisionSightDistancesprovidedfordriversatallllocations.

Table 1, extracted from the AASHTO Green Book, shows the DSD for different levels ofcomplexitiesindifferentroadwayenvironments.

Table1DecisionSightDistance(DSD)

Metric						U.S.Customary					
Design Speed(km/h)	DecisionSightDistance(m) AvoidanceManeuver					Design Speed (mph)	DecisionSightDistance(ft) AvoidanceManeuver				
	A	B	C	D	E		A	B	C	D	E
50	70	155	145	170	195	30	220	490	450	535	620
60	95	195	170	205	235	35	275	590	525	625	720
70	115	325	200	235	275	40	330	690	600	715	825
80	140	280	230	270	315	45	395	800	675	800	930
90	170	325	270	315	360	50	465	910	750	890	1030
100	200	370	315	355	400	55	535	1030	865	980	1135
110	235	420	330	380	430	60	610	1150	990	1125	1280
120	265	470	360	415	470	65	695	1275	1050	1220	1365
130	305	525	390	450	510	70	780	1410	1105	1275	1445
						75	875	1545	1180	1365	1545
						80	970	1685	1260	1455	1650

AvoidanceManeuverA:Stoponruralroad 羊 t=3.0sAvoidanceManeuverB:Stoponruralroad 羊 t=9.1s

Avoidance Maneuver C: Speed/path/direction change on rural road 羊t varies between 10.2 and 11.2sAvoidanceManeuverD:Speed/path/directionchangeonsuburbanroad 羊tvariesbetween12.1and12.9sAvoidanceManeuverC:Speed/path/directionchangeonurbanroad 羊tvariesbetween14.0and14.5s
Source:TheAASHTOGreenBook

5. AccessManagement

Access management is the concept that access-related vehicular maneuvers and volumes canhave serious consequences on the performance of traffic operations and road safety. The benefits aresignificant, particularly in urban street environments where access points are numerous and trafficvolumesarehigh. Access management complements geometric design by reducing the likelihood of accessrelated vehicular conflicts or reducing the severity of the conflicts, by reducing the frequency of majorconflicts of movements. Generally, it can be expected that a doubling of access point frequency from10 to 20 per kilometer increases crash rates by roughly thirty percent (30%). Another doubling ofaccess frequency from 20 to 40 driveways per kilometer is expected to increase crash rates by sixtypercent(60%).Applicationsofaccessmanagementprinciplesalonetoexistingurbancorridorsgenerally results in reducing road crashes between 30 to 60 percent.11 In Malaysia, poor accesscontrolled or uncontrolled Federal Highways have much greater road crash rates than the well-controlledexpressways.

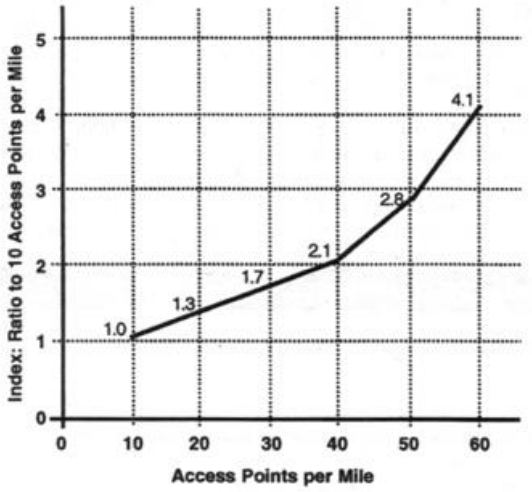

Figure2CompositeCrashRateIndices
Source:ITE(2008)UrbanStreetGeometricDesignHandbook

III. THE CONCEPT OF "FORGIVING ROAD SIDE DESIGN"

Roadwaysshouldbedesignedtoreducetheneedfordriverdecisionsandtoreduceunexpected situations. The number of crashes increases with the number of decisions that need to bemade by the road user. Uniformity in highway design features and traffic control devices plays animportant role in reducing the number of required decisions, and by this means, the driver becomesawareofwhattoexpectonacertaintypeofhighway.

The concept of the "forgiving road side design" includes the provision for a clear recoveryarea. When a vehicle leaves the roadway in a crash, the driver no longer has the ability to fully controlthevehicle.Ingeneral,thismeans,whenadrivercommitsamistakeduetounavoidablecircumstances, his or her mistakes will be forgiven by the design concept. The concept of "forgivingroadside design" should not be independently applied to each design element but rather adopted as acomprehensiveapproachtohighwaydesign.12

IV. THE "POSITIVE GUIDANCE" APPROACHING ROAD DESIGN

Basic knowledge of human characteristics and limitations, and human reliance on expectationto compensate for those limitations in information processing, is important in road design. This led tothe development of the "positive guidance" approach in road design. Information processing demandsbeyond the drivers' capabilities overload and confuse drivers. A common characteristic of high riskroadlocationsisthattheyplacelargeorunusualdemandsovertheinformation-processingcapabilitiesofadriver. Therearelong-termandshort-termexpectationsdevelopedinthedriver'sminds.Forexample, a long-term expectation includes no Stop sign will be placed at an approach location on ahigh speed road; however, there are places where high speed roads do have Stop signs. Short-termexpectations include after negotiating a series of gentle slopes, the driver will find a sudden change inthetypeofslopes.

Knowledge of both engineering principles and the effects of human factors can be appliedthrough the positive guidance approach. The "positive guidance" approach means that road designthatisbasedonthedrivers'limitationsandexpectations,increasesthelikelihoodofdriversresponding to the situations as necessary thus preventing crashes. Potential driver behaviour can beanticipated in the road design process to assess the design and when trade-offs are appropriate,should be applied. Properly designed highways that provide positive guidance to drivers can operateatahighlevelofsafetyandefficiency.

V. SOME FINDINGS FROM THE INTERNATIONAL ROAD ASSESSMENT PROGRAM (IRAP)

International assessments have shown that in low and middle-income countries, reasonableinvestments for improving road geometry can be easily recovered through benefits from road crashsavings. One useful tool is the International Road Assessment Program, or iRAP.For example, oneiRAP report13 showed that widening of selected 40-km road sections in Bangladesh could prevent8,400 deaths with a benefit-cost ratio of five. Similarly, providing 270-km of motor cycle lanes inMalaysiacouldsave900liveswithabenefit-costratiooffifteen.

Starratingsareanobjectivemeasureofthelikelihoodofacrashoccurringanditsseverity.They draw on road safety inspection data and the extensive real-world relationships between roadcharacteristics and crash data. Thus, a methodology based on one to five (1-5) star ratings on thecrash risk of any given roadway developed by the International Road Assessment Program (iRAP)helpstopreventroadaccidentsthoughprioritizationofroadinfrastructureproactively.

The Karnataka State Highway Improvement Project (KSHIP) funded by the World Bank in India,set a good example of how road design can help to improve the road safety situation. The initial targetset was to have "three-stars" for the demonstration corridors. The process ultimately resulted in thedesign of better roads.These new designs were expected to result in fifty five percent (55%) fewerdeathsandseriousinjuries thanthebaselinecondition.

VI. CONCLUSIONS

"Road infrastructure" plays a vital role in road safety. Although a small proportion of crashes areexclusivelycausedbyroadwayfactors,asignificantnumberinvolveroadwayfactorsinsomeway.Thesecondpillaroftheun Global Plan for the Decade of Action for Road Safety 2011-2020thusputsalotofemphasisonraisingthesafetyandprotectivequalityofroadnetworksforthebenefitofallroadusers.

Knowledge of roadway parameters affecting road safety can help to plan, design, build andmaintain the road infrastructure to facilitate a safe road environment. The design of roads plays amajor role in terms of road safety. The concept of "forgiving roadside design" should be applied andthe "positive guidance" approach should be adopted to reduce the

road crash frequency and severity.International experiences show that interventions in terms of road infrastructure to improve the roadenvironmentcanpayforthemselvesandthefinancial investmentscanberecoveredwithinareasonableperiodoftime.

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Study on Different Types of Tenders, Tender Processing, and Quantitative Technique for Tendering, Planning and Monitoring - A Review

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ABSTRACT

Indian construction industry has played a very important role in the procedure of financial exchange and furtherance for over five decades and is the primary input for the socio-economic increase of the country. Rising difficulty in design and participation of abundant stakeholders in current structure projects are huge confront for both clients and contractor to meet criterion of skills and capabilities required to successfully deliver a project at bidding stage. Implementation of tender procedure will increase the chance for bid certification and as well free development of technology. Most of the companies are proficient in engineering and technology. For certification of tender there will be many kinds of conversation and completion of latest techniques for that reason to the growth of knowledge among the employees and owner for revise each and every feature of work to be done correspondingly without loss. The decision to bid is a major monetary decision because of two reasons. First, the contractor assumes substantial costs for the training of estimation and tender at risk of not getting better them if he is not awarded the job. Second, and most prominently, the outworker commit himself as a surety of his work to attract the benefit done within the corporation.

I. INTRODUCTION

Tendering is the most commonly used techniques of construction to call different types of bidders along with their own documentation. Tendering is defined as the "process of preparing and submitting for acceptance conforming offer to carry out work for price thus converting the estimate to bid.

Following the aims and objectives for nature of tendering:

- Provide an environment that encourages interest and competitive offers from suitable qualified and experienced construction contractors.
- Obtain a fair price and best value for undertaking process of construction works.
- Obtain a clear understanding of rights and obligationsof all parties.
- Allow resolution for general issues requiring clarification to all tenders.
- Allow resolution for specific matters only relevant to a particular tender's bid.
- Reduce the likelihood of misunderstandings and disputes during the construction phase.
- Secure a construction contractor to undertake and meet the required project scope, time, cost

and qualityparameters.

- Mandatory requirements

All project tenders must comply with the competition and consumer act 2010. The Australian consumer law prohibits anti-competitive practice and also refers to as restrictive trade practices.

Tendering is a means for a contractor to win the right to deliver a construction project. However, tendering could also happen between the interface of contractor and subcontractor ; contractor and supplier, client and consultant, owners and engineers, engineers and workers, etc.The term tendering is to describe all the actions performed by the awarding authority to produce, publish and manage tendering documents.The main aim of study is to examine the credibility of different kinds of contracts in construction of roads. They are as follows:

1. FIXED PRICE CONTRACT
2. PERCENTAGE RATE CONTRACT
3. PPPT METHOD
4. EPC METHOD
5. HAM METHOD
6. SWISS CHALLENGE METHOD

Fixed price contract:

Under the fixed price contract, the contractor agrees to perform the work specified and described in contract for a fixed price. The price of fixed contract can only change upon the execution of change order, under which the owner and the contractor either

a. Agree for the contractor to perform additional works that falls outside the scope of original work for an agreed uponextra competition.
b. Agree to remove certain work fro he original scope of work and reduce the rice of contract in proportion to the work the contractor no longer has to perform.

Percentage rate contract:

- Contractors should submit the rate percentage above or below the current schedule rates.
- Simplifying corresponding rates of all comprehend forcontractor.
- Appropriate for small value of contracts, When an item of work is few and belongs to same category.

PPPT method:

Common forms of Public Private Partnership in the roadsector are:

- Design-Build-Finance-Operate-Transfer
- Build-Operate-Transfer (TOLL)
- Build- Operate-Transfer (Annuity)

Concessionary turnkey type of contract including financing in addition to design and construction, operation and maintenance of public and private revenue earning projects.

It is way of overcoming the budgetary constraints needed infrastructure for growth.

EPC method: EPC is a popular model being adopted globally in many projects like road constructions, rooftop solar projects, etc. Ahead Government chose EPC over PPP in 2014, road construction rate had decreased significantly to around just 3km per day. EPC stands for Engineering, Procurement Construction.

Ham method:

Ham stands for Hybrid Annuity Model, is a combination of EPC model and BOT–Annuity model. Under these model the Government will dispense 40%of the project cost to the developer to start work while remaining investment has to be made by the developer.

TYPES OF HIGHWAY PROJECTS

EPC MODEL	BOT MODEL	HAM MODEL
Govt. invites bids on EPC	Invitation of bids by NHAI	IT MIX OF

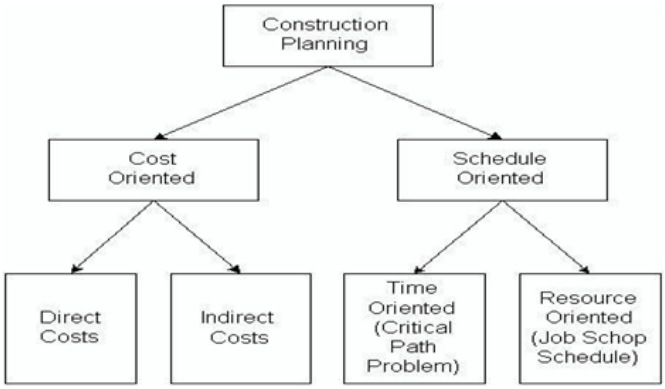
Govt. bears construction cost.	Has to create special purpose vehicles	EPC AND BOT MODELS. (Discussed in details in presiding table)
Govt. bears procurement of raw materials.	SPV may be private company or Govt. company	
Participation limited to engineering Expertise	Financing, design and construction developing , collecting toll	

SWISS challenge model:

Swiss challenge is a way to award a project to a private player on an unsolicited proposal. Such as projects may not be in the bouquet of projects planned by the state or state owned agency, but are given in gaps in physical or social infrastructure that they propose to fill. And the innovation and enterprises that private players bring. (Latest updating technique right now implemented in developing of both residential and infrastructure in AMARAVATHI, ANDHRA PRADESH).

Planning and Monitoring:

- Planning of construction activities is a rudimental and provocation activity in the management and execution of construction projects. Its involves the choice of technology, the definition of task, estimation of required resource and duration of individual tasks.
- A solid marketing plan will help you attain gross income and sales goals. A SWOT analysis (strengths, weakness, opportunities & threats) is an effective technique for creating a winning marketing plan. SWOT is also used in strategic plan creation as a foundation technique. Construction activities are usually executed by following the techniques includes a breakdown structure; program elevation and review technique, or PERT, or chart; and Gantt charts. A work breakdown structure reduces complexity by breaking down the work to be done in individual tasks that are the responsibly of a particular employee.
- A Construction plan is found to be good is premise for developing the budget and the schedule of work. Developing the construction plan is the difficult task in the management. Construction planning consists of two cases they are:



Category of vehicle	Average Dimension in (m)		Projected area on Ground (m^2)
	Length	Width	
Car	3.72	1.44	5.39
Bus	10.1	2.43	24.74
Truck	7.5	2.35	17.62
L.C.V	6.1	2.1	12.81
trailer	7.4	2.2	16.28
3-wheeler	3.2	1.4	4.48
motorbike	1.87	0.64	1.2
Bicycles	1.9	0.45	0.85

II. LITERATURE REVIEW

Aftab Hameed Menon, Ismail Abdul Rahman;

In Malaysian, traditional lump sum system, design and build/turnkey system says that the typical contractual relationship under traditional method in order to take the relation between client with contractor & consultant, and contractor with sub-contractor & supplier. Typical sequence of operations like brief, design, tender, construction. Management procurement: client with main contractor & consultant and by the same time with workers. Operations of management procurement brief, design, construction.

Tejas C. Patil, Ashish P. Waghmare, P.S.Gawande

The rapid evolution of e-commerce in the past few years has introduced many ways for organizations to perform tendering process and participate in bidding. With a new conceptual techniques by reducing time and cost factor. Buying goods or services or engaging a contract for civil works like building roads, houses, and factories is an important activity. Contractor should develop their own planning, creation and administration in three steps they are:

- Planning department
- Contract creation department
- Contract administration department

Dr. Jim Mason, department of architect

It deals with the topic of Building Information Model with the pace of innovation and need to legal solutions and accommodate new approaches. Intelligent contracts work best were they are of short term or of instantaneous effect. The hypothesis advanced is that certain aspects of the construction contract cannot be fully intelligent and the best that can achieved in short to medium sale of contracts.

Fani Antoniou, Georgious N. Aretoulis

The choice of most appropriate contract type regarding the method of contractor compensation is one of the most essential and complex decision. In addition with the construction process s always technologically complex as it is comprised of numerous task and objectives.

Vladimir Obradovic, Petar Jovanovic

The implementation of these research are important to both project managers who wish to improve their performance and successes rate and organization in their human resource policy.

There is a very high positive correlation between emotional intelligence and professional success.

For recruiting staff to the position of project managers should consider the concept of emotional intelligence. But not only for the project managers has it also revealed to decide on human resource development program.

H. Randolph Thomas, Ralph D. Ellis

Many of the small or medium sized construction companies will show less interest on operational planning. Its better to develop for pre-bid plans reduce costs and shorten schedules and improve labor productivity. The planning process consists of eight steps pressingly important for the growth of the company with high profits and minimizing of work load among the labors with their safety vision.

Yong-Cheol Yang, Chan-Jung Park, Ju-Hyung Kim &Jae-Jun Kim

For getting accuracy of work in the site done in the site of day to day progress. These can be done by the means of DPR under the progress of planning department in camp area to the office of client along with the pictures of construction. Through these the client can understand the condition of site in the office itself. But in these article it is explained for a multi- apartment building.

Unmesh. Y.Polekar, Rohit.R. Salgude.

It consists of proper planning and scheduling is most efficient part in completion of project without time lagging and knowing in glance for the material required. And regular monitoring of the project will give satisfactory work for the workers and engineers working in that project. Mainly the planning office should know about the conditions corresponding to the respective manner by using some kind of software techniques.

Md Imran Khan, Maneeth P D, Brij Bhusan S

Its gives the information on the procedures adopted for recording, reporting & collecting information related to the performance of project by the use of DPR and MPR to estimate the progress stage of the project which have to be cross checked by the pre-bid scheduling if any lagging of plan should be taken to the view of that engineer to give the corresponding reason and explanation for the delay of work.

Mr. Nilesh D. Chinchore, Prof. Pranay R. Khare

it deals with the construction equipment planning and its uses in very crucial time at which the time management may be rectified by a firm to continue its standards. With these the resource leveling and allocation for different kinds of works with multiple equipment to complete the project in means interval of time. Construction planning aims at identifying construction equipment for executing project task assessing equipment performance capability.

III. CONCLUSION

Is a mix of both EPC (Engineering Procurement and Construction) and BOT (Build Operate Transfer) model? Under EPC model, NHAI pays private players to lay roads. The private player has no role in the road's ownership, toll collection or maintenance (it will be taken by the Government). Utilization of BOT model have been indicated that private players have an agile role they build operate and maintain the road for specified number of year's say15-16 years. Before transferring asset back to the Government. Now HAM combines EPC (40 per cent) and BOT (50 per cent). On behalf of the government NHAI releases 30%of total project cost. All kinds of loan clearance will be taken up by the government. According to different states they were giving % as say in Tamil Nadu is giving 40% as well Karnataka giving 85%of the total project cost. As per the scope of emergency they were releasing the high percentages. Material escalation will also paid bythe government.

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Sustainability of Rainwater Harvesting System in Term of Water Quality

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ABSTRACT

Water is considered an everlasting free source that can be acquired naturally. Demand for processed supply water is growing higher due to an increasing population. Sustainable use of water could maintain a balance between its demand and supply. Rainwater harvesting (RWH) is the most traditional and sustainable method, which could be easily used for potable and nonpotable purposes both in residential and commercial buildings. This could reduce the pressure on processed supply water which enhances the green living. This paper ensures the sustainability of this system through assessing several water-quality parameters of collected rainwater with respect to allowable limits. A number of parameters were included in the analysis: pH, fecal coliform, total coliform, total dissolved solids, turbidity, NH3–N, lead, BOD5, and so forth. The study reveals that the overall quality of water is quite satisfactory as per Bangladesh standards. RWH system offers sufficient amount of water and energy savings through lower consumption. Moreover, considering the cost for installation and maintenance expenses, the system is effective and economical.

I. INTRODUCTION

Dhaka is a densely populated city with an area of 1425 km2 [1] which is already labelled as a mega city [2–4]. This sig- nificant population craves a larger amount of water for dif- ferent purposes. Therefore, there is always a shortcoming of supplied water due to an imbalance between demand and supply. Dhaka Water Supply and Sewerage Authority (DWASA) is the only authoritative organization available to deliver consumable water to Dhaka City dwellers. DWASA [1] provides 75% of total demand of water in which about 87% is accumulated from groundwater sources, and the remaining 13% is collected from different treatment plants. Dhaka presently relies heavily on groundwater, with approximately 80 to 90% of demand coming from this source. Overreliance on groundwater sources is depressing the water level. Every year the groundwater table is dropping down around 1 to 3 m due to the extreme amount of withdrawal. Figure 1 shows the groundwater level depletion trend for Dhaka City. Moreover, scientific studies on the groundwater revealed that excessive exploitation has been lowering the aquifer level, thus limiting natural recharge [5, 6]. Additionally, overexploitation for longer periods may account for several natural hazards such as unexpected landslides, sustained water logging, reduction in soil moisture, and changes in natural vegetation [2, 7–9].

Conjunctive use of groundwater and surface water would be one potential solution to reduce heavy reliance on ground- water. Surface water treatment

plants are treating polluted water before delivering it to a supply pipeline. But the level of pollution of surface water has limited the applicability of the treatment process. DWASA supplies 2092.69 million liters of water daily against the current demand for 2815.7 million liters [1], which indicates that the city is facing a huge shortage of water daily. All the scenarios between water demand and supply prevail the immediate need for adopting alternative solutions to release the pressure on water sources. Moreover,

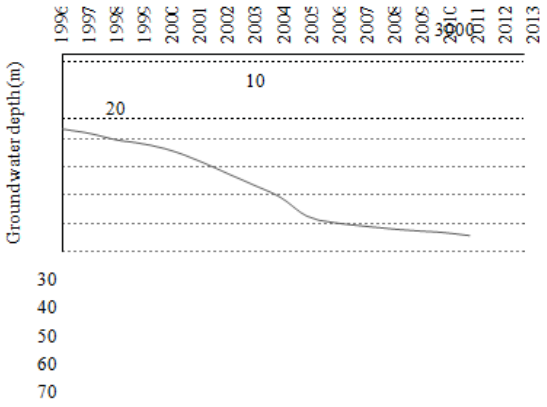

FIgURe 1: Groundwater depletion in Dhaka City [1].

current water practices have limited attention to the climate change impacts on water availability [10]. Surveys on climate projections provide evidence on critical impacts of climate on natural water sources that eventually affect human societies and ecosystems [11].

Rainwater harvesting (RWH) could be the most sustain- able solution to be included in the urban water management system. It could mitigate the water crisis problem, reduce the burden on traditional water sources, alleviate nonpoint source pollutant loads, control water logging problems, pre- vent flooding, help in controlling climate change impacts, contribute to the storm water management, and so forth [12– 16]. Water scarcity and the limited capacity of conventional sources in urban areas promote RWH as an easily accessible source [17]. The system could be utilized locally and com- mercially for securing water demand in water-scarce areas all around the world. Harvested rainwater could be idealized and used like supply water if the water-quality parameters satisfy the desired level. The monitoring of collected rainwater is of great concern as it is the potential for health risk because of the presence of chemical and microbiological contaminants [18]. Therefore quality assessment of collected water is essen- tial before use. This paper is mainly focused on scrutinizing and assessing water-quality parameters as per allowable limit and also on the financial benefit acquired by using this technique. Finally this paper suggests a rainwater harvesting system as a potential source of water supply in Dhaka City.

II. WATER SCENARIO IN DHAKA CITY

About 75% of total demand of water in Dhaka is supplied by DWASA, and the rest comes from privately owned tube wells. At present DWASA can yield about 2092.69 million liters (ML) [1] per day in which about 1840.04 MLD is collected from 586 deep tube wells (DTW), and the remaining 252.65 MLD is supplied by two surface water treatment plants [1]. More details are given in Figure 2.

Buriganga, Balu, Turag, and Tongi Khal are the main four water bodies surrounding the city and could be an ideal sources of water supply [19, 20]. But these water bodies already lost their potentiality as sources of supply due to the huge pollutions. Untreated municipal and industrial wastes make the river water so contaminated that most of the water quality parameters surpassed their allowable level. However, the water supply authority mainly relies on groundwater

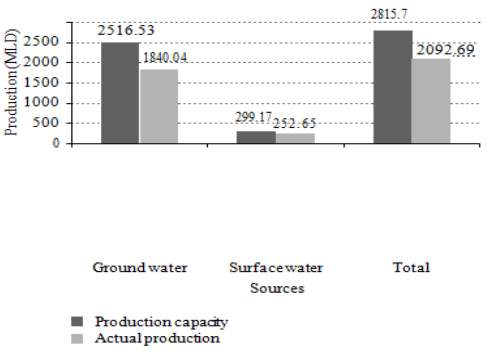

FIgURe 2: Water production per day in Dhaka city [1].

sources and needs to install more tube wells to fulfill demand [21, 22]. Installation of more tube wells must lower the groundwater level. Therefore it is urgent to find a sustainable solution that could alter the usage of groundwater. Rainwater harvesting would be one of the most conceivable and viable solutions to release the pressure on the groundwater table as the system utilizes natural rainwater without affecting groundwater sources.

III. WATER SUPPLY AND DEMAND VARIATION

In order to understand the variation between demand and supply, the total demand needs to be known. That could be calculated through population data and per capita demand. According to Bro [23], per capita demand for 2006 was about 200 liters, including 10% provisions for commercial use and 40% due to system loss during supply. As per capita demand will be assumed to be decreased in the future by proper inspection and management, for 2015 the total per capita demand will stand at 180 liters per day and for 2025 and 2030 at 160 liters per day. According to DWASA, 2011 [24], the water supply is about 1356.67 MLD (considering service flow with 40% leakages), and the total demand is 2200 MLD (assuming 85% service area). So the deficit is about
843.33 MLD. As demand is more than just supplied water, deficit prevails, which is increasing every day. Therefore the water crisis becomes a normal issue due to this huge deficit in Dhaka City during the dry period. The trend of deficit is due to difference in demand and supply as shown in Figure 3. In 1963 the total demand was 150 million liters (ML), which turned into 2240 million liters in 2011 due to the augmentation of the population. Within 48 years demand became 15 times more than expected. In a similar way, the deficit also crosses predicted values. In 1963 the deficit was 20 ML, and in 2010 it became 190 ML, which was more than calculated. But after that, the shortage became something better than in the previous year. This indicates that supply capacity is improving, and authorities are trying to reduce the shortages. The overall deficiency of supplied water triggers the need for augmentation and improvement of the water supply system to meet the increased demand in future [5].

Figure 4 shows the variation of the water deficit with the present supply and variation of the population for

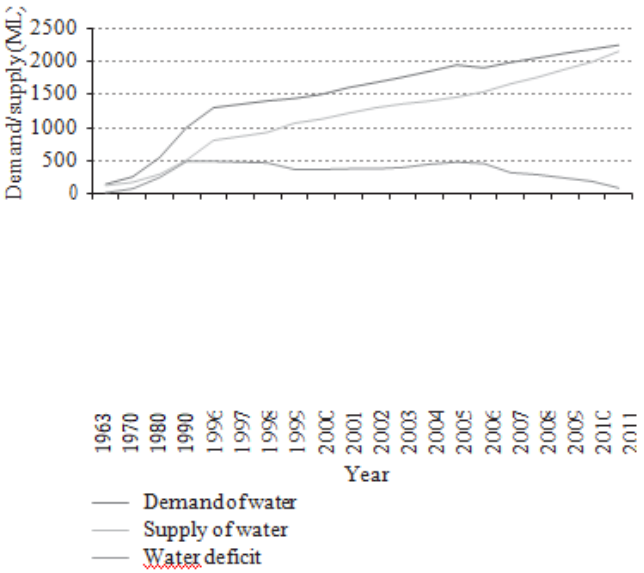

FIgURe 3: Relation among water demand, supply, and deficit in Dhaka City [1].

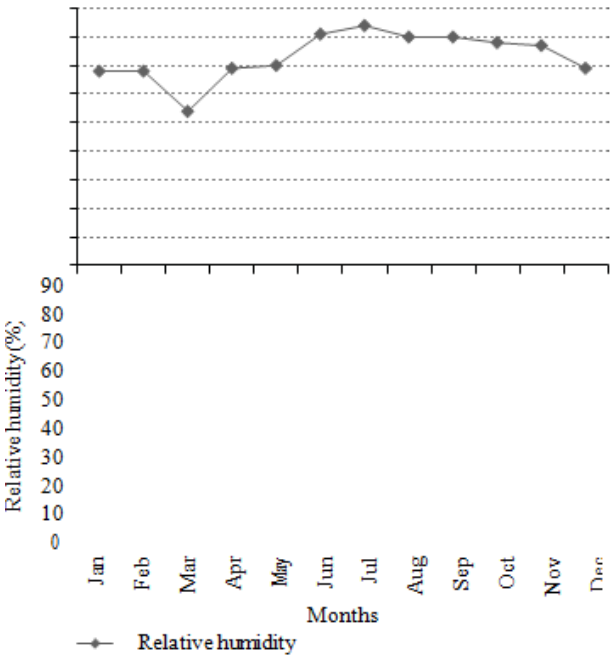

FIgURe 6: Monthly average relative humidity (%) in Dhaka City.

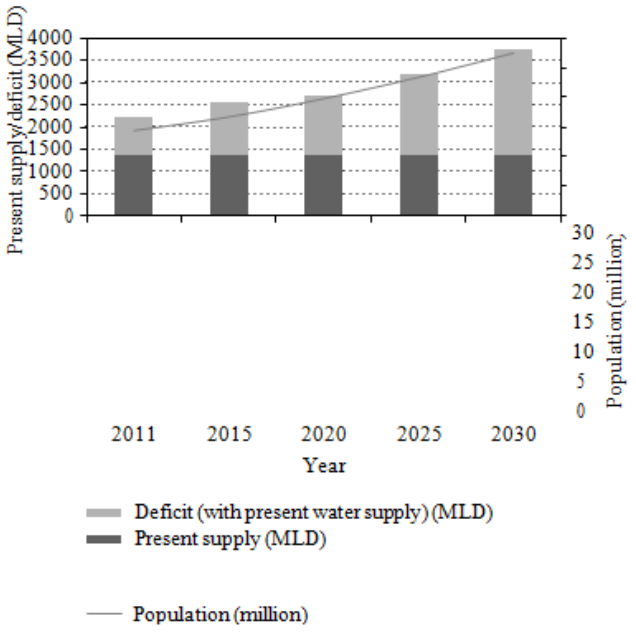

FIgURe 4: Present water supply, shortage, and population variation for projected years.

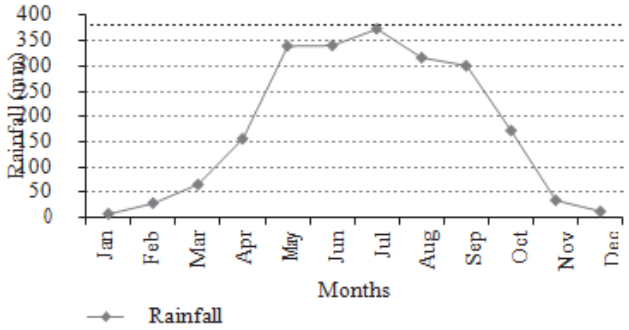

FIgURe 5: Monthly average rainfall in mm in Dhaka City.

the projected years. If the present supply prevails for the coming years, the deficit of water will be increasing to a high amount that could not be alleviated within the allowable limit.

Dhaka is located in a hot and humid country, and its annual temperature (25∘C) categorizes the city as monsoon climate zone. The city is blessed by a huge amount of rainfall during the monsoon period, which poses ample opportunity to use this rainwater in a sustainable manner [25]. Figures 5, 6, and 7 show the monthly rainfall pattern, monthly average relative humidity, and the maximum and the minimum monthly temperature trend, respectively, for Dhaka City.

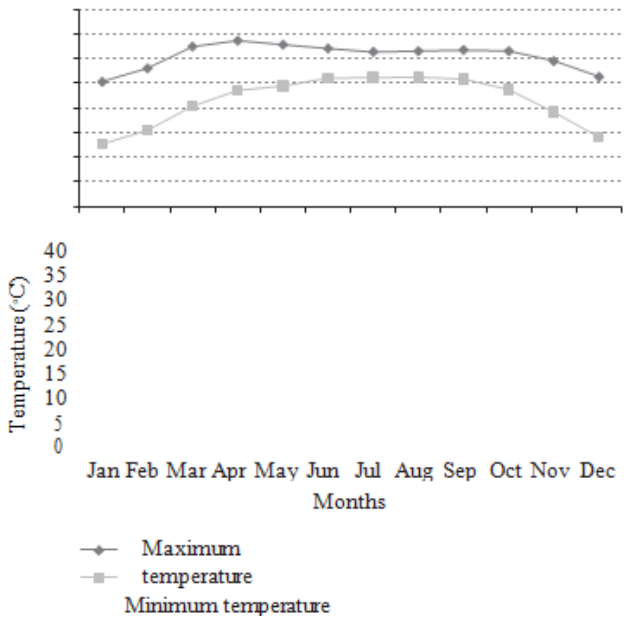

FIgURe 7: Maximum and minimum temperature (∘C) trend in Dhaka City.

The common practices of recharging natural aquifers are by direct rainfall, river water, and direct infiltration and percolation during floods [26]. Overpopulation makes these options inappropriate by reducing the recharge area. Cover- ing the vertical recharge inlets with pavement materials or other construction materials can cause water logging for even small duration heavy rainfall in most areas of Dhaka City. Inadequate storm water management infrastructures and improper maintenance of storm sewer systems further aggra- vates the scale of this problem. Harvesting of this storm water in a systematic way thus prevents water logging. Furthermore, utilization of collected rainwater highly releases the depen- dency on groundwater sources.

IV. RAINWATER HARVESTING

Rainwater harvesting is a multipurpose way of supplying usable water to consumers during a crisis period, recharging the groundwater and finally reducing the runoff and water logging during the season of heavy rainfall. Traditional knowledge, skills, and materials can be used for this system. During the rainy season, an individual can collect water on his

rooftop and manage it on his own. Reserved rainwater on rooftops can be used for self-purposes or domestic use. Water from different rooftops of a lane can also be collected through a piped network and stored for some time. This water can be then channeled to deep wells to recharge groundwater

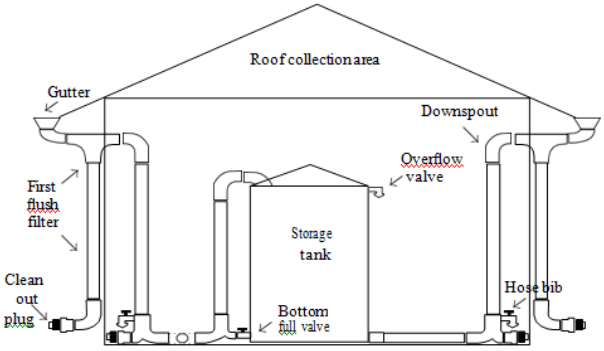

FIgURe 8: Schematic of a rainwater harvesting system.

directly, to ponds to replenish groundwater slowly, and to reservoirs to dilute reclaimed water for nonpotable use. Figure 8 shows the schematic view of a rainwater harvesting system.

Unless it comes into contact with a surface or collection system, the quality of rainwater meets Environmental Pro- tection Agency standards [27], and the independent charact- eristic of its harvesting system has made it suitable for scattered settlement and individual operation. If needed, a chemical treatment such as chlorination can be used to purify the water. The acceptance of rainwater harvesting will expand rapidly if methods are treated such as building services and if designed into the structure instead of being retrofitted [28].

V. BENEFITS OF RAINWATER HARVESTING

Rainwater harvesting is a simple and primary technique of collecting water from natural rainfall. At the time of a water crisis, it would be the most easily adaptable method of mitigating water scarcity. The system is applicable for both critical and normal situations. It is an environmentally fri- endly technique that includes efficient collection and storage that greatly helps local people. The associated advantages of rainwater harvesting are that

(i) it can curtail the burden on the public water supply, which is the main source of city water;
(ii) it can be used in case of an emergency (i.e., fire);
(iii) it is solely cost effective as installation cost is low, and it can reduce expense that one has to pay for water bills;
(iv) it extends soil moisture levels for development of vegetation;
(v) groundwater level is highly recharged during rainfall.

VI. QUALITY OF RAINWATER

The quality of harvested rainwater is an important issue, as it could be utilized for drinking purposes. Quality of captured water from roof top depends on both roof top quality and surrounding environmental conditions, that is, local climate, atmospheric pollution, and so forth [11]. Tests must be per- formed to check its viability and applicability before using as drinking water. Previous researches [29–31] showed that water quality of collected water did not always meet standard limits due to unprotected collection. Local treatment of harvested water could easily make water potable. Again rain- water could be also identified as non-potable sources for the purpose of washing, toilet flushing, gardening, and so forth, where quality is nota great concern. In this respect, treatment of collected water is of no such importance; rather it is used for household purposes. In this paper an assessment has been made on the quality of rainwater collected through a well- maintained catchment system.

VII. METHODOLOGY

Rainwater harvesting is a more effective technology that could be easily undertaken through normal

equipment dur- ing a water crisis. Qualitative assessment is important before introducing collected rainwater as potable water. In this paper, a case study has been made to check rainwater quality to identify its acceptability and suitability as household water. Water samples were collected from the selected residential building where a rainwater harvesting system was introduced successfully using laboratory prepared plastic bottles to col- lect samples. The samples were bottled carefully, so that no air bubble is entrained in the bottle. All parameters were mea- sured in the environment laboratory of Bangladesh Univer- sity of Engineering Technology (BUET).

The maximum amount of rainwater that could be enco- untered from a roof top is

$$V = A \times R \times C, \quad (1)$$

where V is the amount of harvestable water, A is catchment area, R is total amount of rainfall, and C is the runoff coefficient.

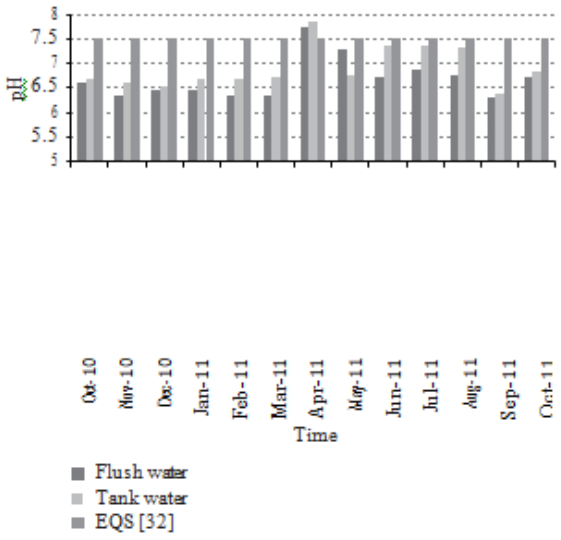

FIgURe 9: Variation of pH over time.

Equation (1) was used to calculate the amount of har- vested water from a residential building located at Dhaka, Bangladesh. The system was designed for meeting water requirements of 60 persons living in the entire building. Total area was about 3600 sq. ft. (square feet). Maximum ground coverage would be around 2250 sq. ft. (considering the floor area rule of RAJUK, the city development authority), and within this area 1850 sq. ft was used as catchment area where rainwater was collected. Per capita water consumption is about 135 lpcd for conservative use. The total demand for this building stands at about 8100 liter per day and 243,000 liters per month. In a practical case, the size of the catchment area is taken from maximum ground coverage. To get an overview of the amount of collected rainwater, monthly average rainfall data from January to December has been considered, includ- ing the dry and monsoon periods. The runoff coefficient value was taken as 0.85. For analysis purpose, a one-year rainfall data were considered. Volume of collected rainwater was also an important aspect in introducing rainwater for domes- tic purposes. In the selected time frame, maximum volume of water was collected during June, 2012, which was about 4.5 m3 and a minimum was collected during October, 2011. Significant amount of water could be collected during heavy rainfall. From this point of view, it could be said that, with larger catchment area, amount of harvested water would be significant to be used in household works.

VIII. RESULTS AND DISCUSSION

The main focus of this paper relies on several aspects, such as examining the quality of water with respect to standard values, analyzing associated financial benefits in terms of cost, and considering water and energy conservation and lastly suggesting the system as a potential source of water both in normal and critical situations.

In this section, the quality of harvestable water was checked considering several parameters such as pH, fecal col- iform, total coliform, total dissolved solids, turbidity, NH3– N, lead, and BOD5. The time period for analysis was from October 2010 to October 2011. Two different collecting points were considered: water collected before entering into the storage tank (called first flush water) and water collected from the

storage tank (tank water). Figure 9 shows the variation of pH over time. According to Bangladesh standards for drinking water [32], the allowable limit for pH is 6.5 to 8.5. Results showed that pH value for both flash and tank water was very near to this range during the tested time period. Therefore, the pH level of collected water did not pose any threat to water quality and conformed to the standard limit.

Figure 10 shows the variation of total coliform over time. The number of total coliforms present in the water was quite low until June 2011. After that a large number of total coliform grew in both flash and tank water. Figure 11 shows the varia- tion of fecal coliform over time. In the case of drinking water, it is expected that water should be free from all types of fecal and total coliforms. In the present case, at first in October 2010, few fecal coliforms were found in water. It remains zero until March 2011. But after that there was an increasing trend in the number of fecal coliform. In October 2011, there was huge number of fecal coliform, which is not expectable for drinking water. In both cases (fecal and total coliform), at first when rainwater was harvested, growth of coliform was lower but with time those increased to a large quantity. From June 2011, rainfall was not adequate and maintenance was not proper, which is why coliform grew to a huge quantity in the stored unused water. As pure water should be free

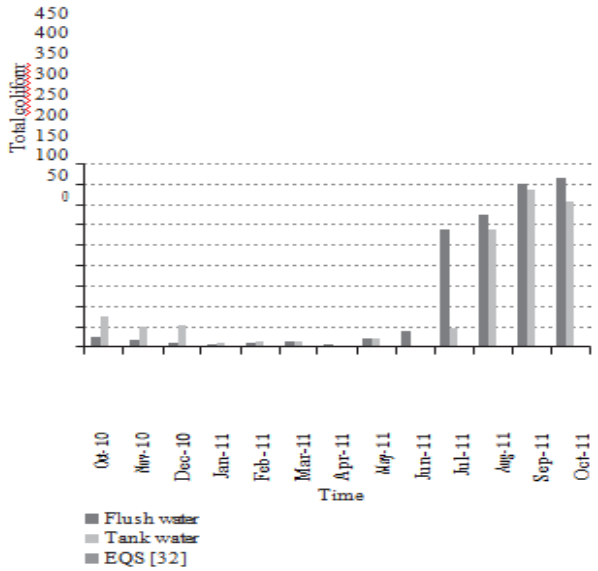

FIgURe 10: Variation of total coliform over time.

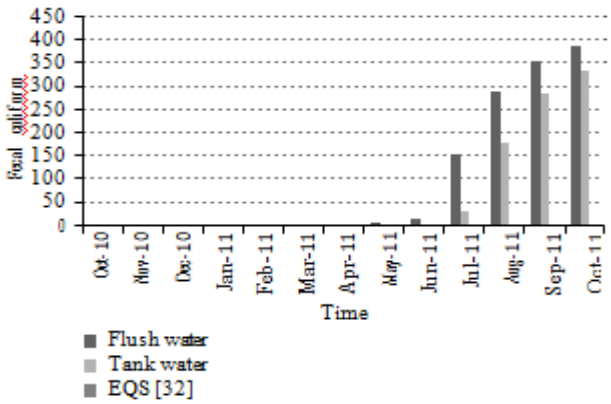

FIgURe 11: Variation on fecal coliform with time.

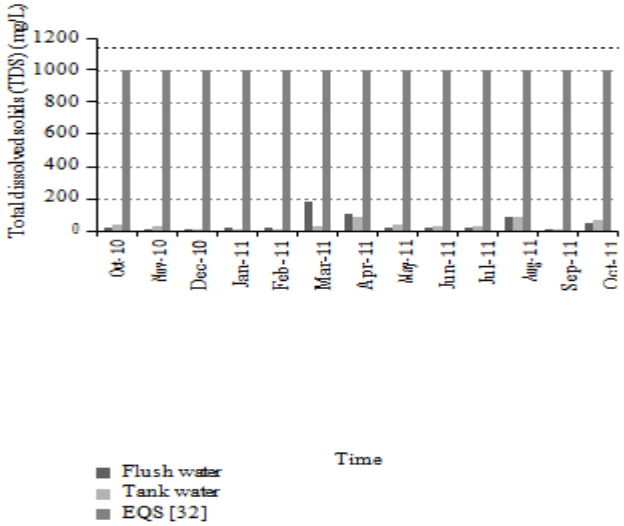

FIgURe 12: Variation of total dissolved solids over time.

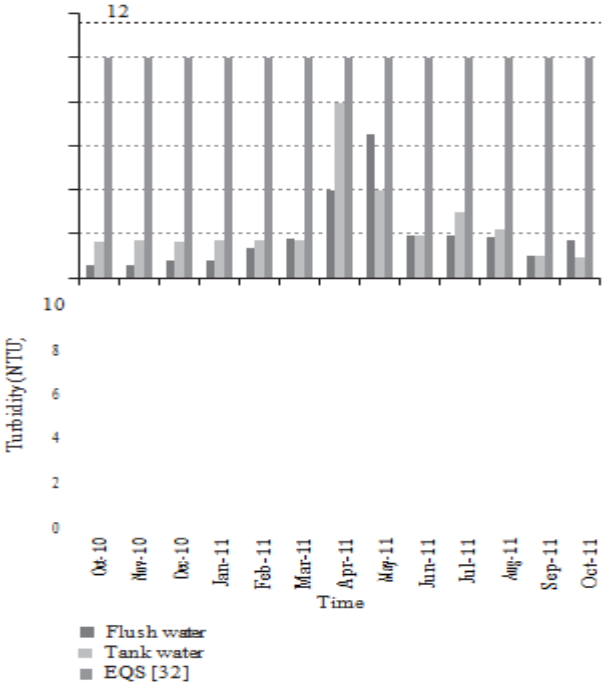

FIgURe 13: Variation of turbidity over time.

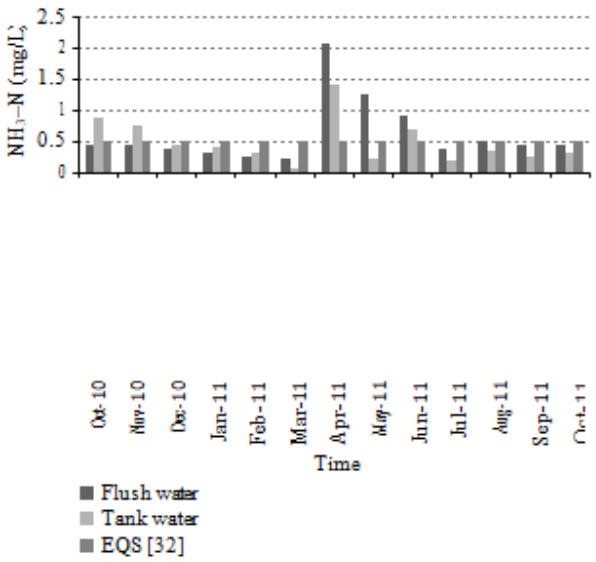

FIgURe 14: Variation of NH3–N over time.

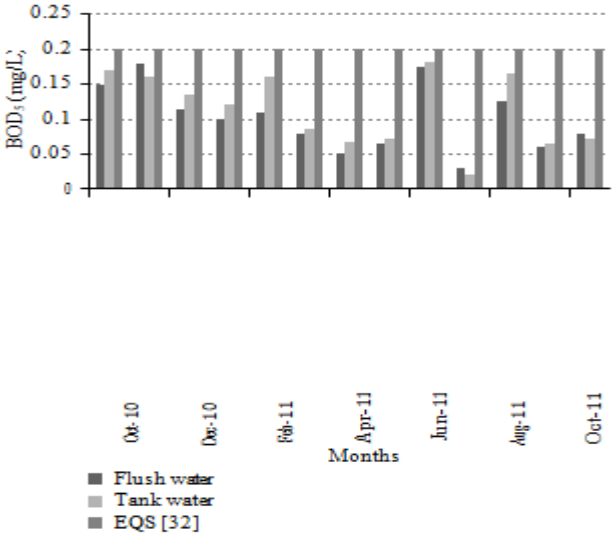

FIgURe 15: Variation of BOD5 over time.

Figure 15 shows the variation of BOD5 in the collected flash and tank water. In all of the selected time period, BOD5 is less than the Bangladesh standard for drinking water [32]. Another thing, BOD5 became less in flash water than in tank water. Due to the lack of proper maintenance, BOD5 from all kinds of coliforms, proper maintenance of tank and catchment areas could minimize coliform level and make rainwater safe for household purposes.

Figure 12 shows the variation of total dissolved solids over time. The allowable limit for total dissolved solids (TDS) in drinking water is about 1000 (mg/L) according to Bangladesh standards for drinking water [32]. For all the selected periods, the total dissolved solids in collected water were quite lower than the standard limit. Therefore total dissolved solids did not pose any threat to water used for drinking purposes. Fig- ure 13 shows the variation of turbidity over time. The standard limit for turbidity is 10 NTU. The measured turbidity level in collected water was below this standard limit. Therefore rain- water could be considered satisfactory from an aesthetic point of view. In a similar way, the NH3–N level was quite below the standard limit (0.5 mg/L) during the collection period (Figure 14). increased in the tank water. Further treatment may make water more usable for household work. In order to analyze the water quality in terms of lead concentration in collected water, tests were performed, which found that lead concen- tration always remained below the allowable limit according to the Bangladesh standards for drinking water [32]. Figure 16 shows the variations of lead concentrations with time.

IX. COST EFFECTIVENESS ANALYSIS

Thefinancial benefit associated with a rainwater harvesting system is solely connected with cost. The associated costs of a rainwater harvesting system are for installation, oper- ation, and maintenance. Of the costs for installation, the storage tank represents the largest investment, which can vary between 30% and 45% of the total cost of the system depen- dent on system size. A pump, pressure controller, and fittings in addition to the plumber's labor represent other major costs of the investment. A practical survey showed that (in Dhaka) the total cost related to construction and yearly maintenance of a rainwater harvesting system for 20 years' economic life

TABLe 1: Energy consumption in conventional water resources system [34].

Activity	Energy consumption
(kWh/MG)Supply and conveyance	150
Water treatment	100
Distribution	1,200
Total	1,450

X. WATER SAVINGS STRATEGY

Rainwater harvesting system plays an important role in developing sustainable urban future [24]. Availability of water of serviceable quality from conservative sources is becoming

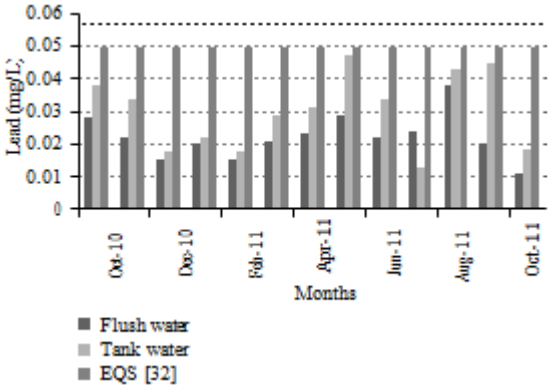

FIgURe 16: Variation of lead over time.

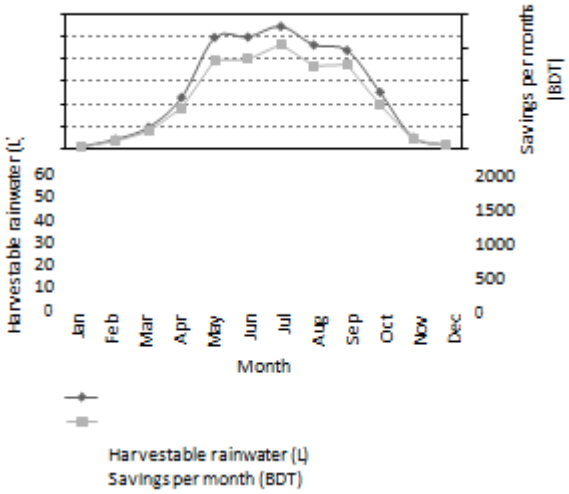

FIgURe 17: Month-wise harvestable amount of rainwater and the associated cost savings.

limited day by day due to huge demand. Rainwater provides sufficient quantity of water with small cost. Hence, the system can promote significant water saving in residential buildings in many countries. Herrmann and Schmida [35] studied that potential saving of roof captures water was about 30–60% of potable water demand in a house depending on the demand and catchment area. Coombes et al. [36] analyzed 27 houses in Australia with rainwater harvesting system and found that about 60% of potable water could be saved. Ghisi et al. [37] performed investigation on collected rainwater in Brazil and found that about 12–79% of potable water could be saved depending on the size of roof tank. Most of the researches on rainwater harvesting systems (RWHS) revealed that water conservation achieved through RWHS is quite significant is about 30000 BDT. This cost includes construction cost of tanks, gutters, and flushing devices and labor cost [33]. In the present case study, about 313.80 thousands liter water can be harvested from rain over one year. This amount of water could be collected within 1850 sq. ftcatchment area and considering monthly rainfall data. The yearly consumption of this selected building stands at 2916 thousands liters. Therefore utilizing harvested rainwater for this building can save up to 11% of the public water supply annually. This volume of rainwater can serve a building with 60 members for about 1.5 months in a year without the help of traditional water supply. Figure 17 shows the month-wise harvestable amount of rainwater and the associated amount of cost savings. Furthermore, consid- ering DWASA current water bill, about 8359.70 BDT can be saved per year, and about 125395.30 BDT can be saved in 15 years if rainwater is used for daily consumption. So, within three to four years, the installation cost of a rainwater har- vesting system can be easily returned. Moreover, the building owner would be exempted from paying large amount of water bill as well as additional taxes and fees charged by the city authority with the water bill if rainwater is utilized for daily consumption. Cost comparison and associated benefit between a rainwater harvesting system and traditional water supply system encountered and revealed a rainwater harvesting system as a cost-effective technology. especially in places where water is not easily available to consumers.

XI. ENERGY AND CLIMATE

Conventional use of water imparts critical impacts on nat- ural resources. Water collection from ground and surface sources, treatment, and distribution are closely associated with energy consumption, however, being related to climate consequences. The extraction of water from the sources, the treatment of raw water up to the drinking standards and the delivery of water to the consumers require high energy. More- over, there should be some energy losses during performing extracting, treating, and delivering of water. Therefore, the water sector consumes a huge amount of electricity from local and national grid. Approximately 300 billion kilowatt hours of energy could be saved if potable water demand could be reduced by 10% [38]. Adoption of RWHS is one of the most potential solutions that could save energy directly by reducing potable water demand. Table 1 represents the esti- mated energy required to deliver potable water to consumers. Reduction of water demand by 1 million gallons can result in savings of electricity use by 1,500 kWh. In the present case study, with an 1850 sq. ft. catchment area, about 69,026 gallons (313.8 thousands liters) could be harvested over one year. However, this amount could reduce potable water demand and approximately 100 kWh electricity could be saved in the selected residential building by introducing rainwater cap- turing system. Integrating rainwater harvesting system with the conventional water collection and distribution approach in residential as well as large scale, nonresidential applications suggest a potential method of reducing energy use. However, limiting energy demand has critical impact on carbon dioxide emissions, as release of carbon dioxide is closely associated with electricity generation. There should have sufficient reduction in carbon dioxide emissions when fossil fuel is used for power generation. Hence, limited contribution is to be expected from lower carbon release in climate change con- cept. Table 2 showed the carbon dioxide emissions from ele- ctric power generation.

However, water use should be critically judged from availability, safety, and sustainability of natural resources. Energy conservation is a critical component in sustainabil- ity concern. Decreased use of conventional potable water reduces energy demand that in turn reduces emission of carbon dioxide. Integrated water management approach with rainwater harvesting along with gray water and reclaimed water reuse could limit contributions to climate change and conserve limited water and energy resources.

TABLe 2: Carbon dioxide emission from water treatment and distribution system [39].

Fuel type	CO_2 output rate pounds (CO_2/kWh)	Drinking water energy demand (kWh/MG)	CO_2 output rate per MG water delivered (CO_2/kWh)
Coal	2.117		2,906
Petroleum	1.915	1,406	2,680
Natural gas	1.314		1,840

XII. FUTURE ACTION PLAN

Rainwater is one of the advantageous methods of using natural water in a sustainable manner. Rain is a blessing of nature. Densely populated cities with a water crisis and ade- quate rainfall should adopt this technology. Cities like Dhaka, where water is a major concern during dry periods, should introduce this system along with its traditional water supply system. Pressure on groundwater tables thus could be pre- vented, and natural recharging would also be proceeded through this system. Regular maintenance of harvested water might make it suitable for daily consumption. Water short- ages will become the most concerned issue all around the world in the future. Therefore city planners should rethink of the possibilities, outcome, and benefits of a rainwater har- vesting system and should create policies to make the system easily available to everyone. The following research could be made in future.

(i) This study focused only on rainwater harvesting system on a small scale basis. Further research could be performed on large scale residential, commercial or industrial sector.

(ii) Comparisons could be made with rainwater harvest- ing systems to conventional ground water system on the basis of quality, quantity, environmental impacts,

(iii) Case studies could be investigated to evaluate energy consumption in rainwater system with ground water system in a large scale. In a more applied setting, energy efficiencies of large scale rainwater harvesting systems should be analyzed to help determine the future of rainwater harvesting as a valuable technology for providing water, a crucial resource that is becoming more depleted with the ever increasing population and water demand.

(iv) A comprehensive cost-benefit analysis should be per- formed on different climate regions to get essential insight on the economic viability of rainwater harvest- ing system (RWHS).

(v) More detailed and advanced research on impacts on climate factors, human health risk, and potential ecological aspects should be performed in a large scale.

(vi) More comprehensive studies for better quantification of energy and climate factors should be made for proper development of the system.

(vii) Rainwater could be highly polluted by pesticides in any agricultural region. Hence, biological and chemi- cal analysis should be done before adopting harvested rainwater as a source of daily water.

XIII. CONCLUSION

Water shortage is one of the critical problems in Dhaka City. This problem is not new one, and it cannot be solved overnight. As DWASA relies on groundwater abstraction through deep tube wells to overcome the excessive demand, the water table is lowering day by day, and the recharge of groundwater table is facing difficulties. Rainwater harvesting is an effective option not only to recharge the groundwater aquifer but also to provide adequate storage of water for future use. This paper tried to focus on the sustainability and effectiveness of a rainwater harvesting system in terms of quality. Water was collected in a well maintained catchment system from rain events over one year and chemical analysis was performed regularly to observe the quality of collected water. The overall quality of rainwater was quite satisfactory and implies that the system could be sustained during critical periods as well as normal periods. Additionally, the system is cost effective as large amounts of money can be saved per year. Energy conservation and related reduced emissions are crucial parts of this system. Moreover, increased awareness on water crisis has led rainwater harvesting to be proposed as a community facility. The small and medium residential and commercial construction can adopt this system as sustainable option of providing water. It is almost the only way to upgrade one's household water supply without waiting for the devel- opment of community system. The system could become a good alternative source of water supply in Dhaka City to cope up with the ever-increasing demand and should be accepted and utilized by the respective authorities as well as by the city dwellers.

XIV. CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this paper.

XV. ACKNOWLEDGMENTS

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Real Time Tracking and Detection of Enemy Through Machine Gun Technique

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ABSTRACT

Border's restricted areas are dangerous for our soldiers. We have heard a lot about increasing rate of ceasefire violation at our border from Pakistan side causes death of our soldier. It provoked us with a feeling of being forced to think about our soldiers . So our study aims to find out the solution of a question that how it looks like to be , if our border is protected by a third eye instead of our soldier which save our soldier from being killed by enemy instantly.

We came up with a solution , friend of our soldier and quietus to our enemy ," VAJRA" an autonomous enemy detection camouflage gun and kill them which detects enemy and kill them in few minute under defined range.

I. INTRODUCTION

1.1 Overview:

We have many valuable possessions that needs protection but can't be everywhere at once. Luckily, by using image recognition and motion detection software, we can built automatic gun turrets to protect our border as well as most prized possessions even in our absence. Object Detection is very challenging and practically useful technology in the field of Computer Vision. Object detection deals with identifying the object present in Source image. Considerable amount of research is being done in the territory of object detection in the last decades. Incredible achievement had been accomplished in this area. **Autonomous Camouflage** gun are the best example of this at instance. Sometimes certain incidents arose at As per the data cited in the annual report (2017-18) of **Ministry of Home affairs , government of India ,**The ongoing militancy in the State of Jammu and Kashmir is intrinsically linked with infiltration of terrorists from across the border both from the **"International border"** as well as the **"Line of Control" in J&K.** The reported infiltration attempts and net infiltration in J&K since 2013 is indicated in the table below:

Year	2013	2014	2015	2016	2017
Infiltration attempts	277	222	121	371	406
Net Estimated infiltration	97	65	33	119	123

Table-1: soldiers killed data from 2013 to 2017

Presently at Indo-Pak border, 656 BOPs are held by BSF along the IPB. A proposal for construction of 96 Composite BOPs along the Indo-Pakistan border has been sanctioned. Construction of these Composite BOPs will provide necessary infrastructure for accommodation, logistic support and the combat functions of the BSF troops deployed on the Indo-Pakistan borders. The project is targeted for completion by July, 2018. Construction activities

in 84 BOPs have been completed and work is in progress in remaining 9 BOPs. So we required a framework that can detect enemies precisely and can work in real time and we find out the solution of a question that how it looks like to be if our border is detected by a third eye instead of our soldiers which saves our soldier from being killed by enemy instantly. If this incident happen in the night time it will also be able to detect the enemy where object detection is very challenging. In planning this framework, several challenges are confronted .Some of the challenges are detecting enemy and then differentiating it from our soldiers. Other than that it should be applicable for the night vision. In this project we made a motion detection airsoft turret with Raspberry Pi . The gun turret is autonomous so it moves and fires the gun when it detects motion. There is also an interactive mode so that you can control it manually from your keyboard. We used an airsoft gun for thus project but you can easily modify this build to use a nerf instead. This project is small, lightweight and entirely battery operated.

1.2 COMPONENTS:

1.2.1 HARDWARE COMPONENTS:

1. **Electric or Airsoft nurf gun**
2. **Raspberry Pi 3 B+ :**The raspberry pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse . It is a capable little device that enables people of all ages to explore computing. This model is a latest product in the Raspberry Pi 3 range , boasting an update 64 bit quad core processor running at 1.4 GHz with build in metal heat sink ,dual band 2.4 GHz and 5GHz wireless LAN , faster (300 mbps) Ethernet , and PoE capacity via a separate PoE HAT.
3. **Logitech C210 Webcam:** for motion detection and image processing
4. **Adafruit TB6612 Motion Motor Control Shield board(Hat):** The sense hat is powerful, multifunctional add on for the Raspberry pi. As well as an 8*8 matrix of 64 red, green and blue (RGB) programmable LEDs which can be control to produce any colour from a range of millions , a sense HAT includes a 5-way joystick controller and 6 on-board sensors.
5. **Stepper motor**
6. **Single Relay board 12V:** This module is a convenient board which can be used to control high voltage, high current load as well as it is designed to interface with microcontroller. The board works on 12V but the input signal can come directly from microcontroller output working at 5V to control relays. Each relay can switch variety of AC or DC high voltage, high current loads working at 110V or 220V AC mains like lights, fans, motors and such. The status of relay is indicated by individual LEDs.
7. **Portable cell phone charger:** used for power supply of 5V to Raspberry Pi.
8. **Jumper wires:** A jumper wire is an electric wire or group of them in a cable, with a connector or pin at each end , which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.
9. **Metal bracket (90 degree):** Metal brackets are used to support the turret legs on the base on an angle of 90 degree.
10. **Screws:** #8 1/2”Countersink screws are used.
11. **Washers:** It is a thin plate with the hole that is normally used to distribute the load of a threaded fastener, such as bolt or nut.
12. **MDF Sheet:** The medium-density fibre board is used for building the turret.
13. collar with a notched 5mm hole for attaching a 5mm motor shaft to a flat surface.
14. **Flanged shaft:** It is used for controlling the motion of gun in upward and downward side. A shaft with a flange allowing it to be mounted onto a flat surface. The gun will be attached to a

flange, while the shaft will allow it to rotate about a hole.

15. **SD Card:** It is used in raspberry pi for the storage purpose like storing the operating system and other data.

1.2.2 SOFTWARE COMPONENTS:

1. **NOOBS:** NOOBS ("New Out Of the Box Software") is a operating system for the raspberry pi and is a unique installation image. SD Card having NOOBS can install a wonderful range of operating systems for your Raspberry Pi. This makes Raspberry Pi easy to use by simplifying the installation of an operating system. Instead of using specific software to prepare an SD card, a file is unzipped and the contents copied over to a FAT formatted (up to 16 GB) SD card. That card can then be booted on the Raspberry Pi and a choice of six operating systems is presented for installation on the card. The system also contains a recovery partition that allows for the quick restoration of the installed OS, tools to modify the config.txt and an online help button and web browser which directs to the Raspberry Pi Forums.

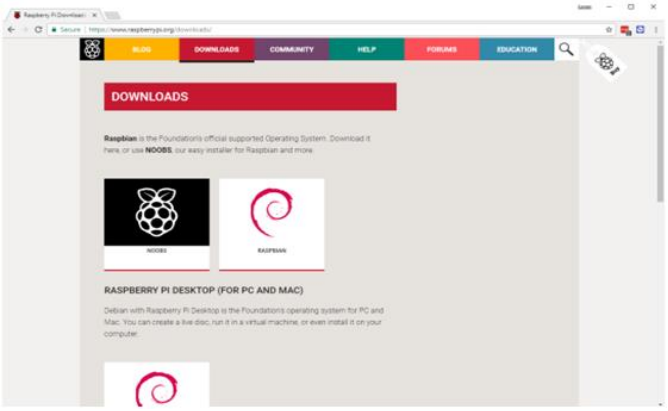

Fig: 1 Installation of NOOBS

(Ref:https://www.google.com/url?sa=i&source=images&cd=&cad=rja&uact=8&ved)

2. **OPEN CV INSTALLATION:** Open cv stands for Open Source Computer Vision Library. It is an open source computer vision and machine learning software library. The library has more than 2500 optimized algorithms which can be used to detect and recognizes faces, identify objects, classify human actions in videos, track camera movements track moving objects. Open cv is widely used all over worldwide ranging from stitching streetview images together, detecting intrusions in surveillance video in Israel, monitoring mine equipment in China, helping robots navigate and pick up objects at Willow Garage, detection of swimming pool drowning accidents in Europe, running interactive art in Spain and New york, checking runways for debris in Turkey, inspecting labels on products in factories around the on to rapid face detection in Japan. After installing NOOBS, we are ready with our operating system. After that installation of open cv for motion detection and image processing can be done for our project.

Fig: 2 Detection of object using open cv

(Ref: https://www.google.com/url?sa=i&source=images&cd=&cad=rja&uact=8&ved)

II. LITERATURE REVIEW

This chapter is a survey of research related to object detection using automatic gun, till date. The main aim behind this survey is to understand the method techniques developed to improve our product for getting very high accuracy as compared to development till date. We will study our survey by interpreting the work done by year so that we have a

beautiful glance of development till date. As we have done a lot of research ,and we found that there is no product available in the market till now .Automatic guns are available in the market but there automatic refers to the machine guns which are fired automatically for few minutes according to the specifications but they are controlled by the soldiers i.e., directions get defined by the soldiers.

2.1 Contribution in History:

Automatic gun is always a point of interest for engineers and developers from a long time. Developer had starting working on it since 18th century and the first fully automatic weapon was developed by **Hiram Stevens Maxim** in 1884, his Maxim machine gun used a recoil system to fire up to 500 rounds per minute [sources: LSU Civil War Centre, Spartacus Educational].

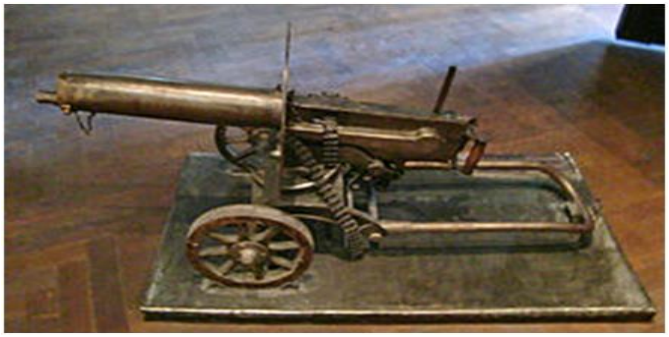

Fig: 3 PM M1910, Russian Maxim gun

(Ref: https://en.wikipedia.org/wiki/Maxim_gun#/media)

The first widely seen semi-automatic pistol, meanwhile, was created by John M. Browning in 1910 and originally used by U.S. soldiers the following year. Browning and company produced nearly 2 million of its Long Colt pistols during World War II and the .45-caliber weapon was the official sidearm for U.S. Army soldiers for nearly 75 years. In 1914, Browning also introduced the first semi-automatic rifle, a .22-caliber weapon that saw heavy action in World War II

[sources: Browning, Johnston, Smithsonian].

Fig; 4 A .50 caliber M2 machine gun John Browning's design

(Ref: https://en.wikipedia.org/wiki/Machine_gun#/media)

With the advance of gun technology came the dawn of gun control. Fully automatic machine gun-type weapons have been tightly regulated since Congress passed the National Firearms Act of 1934, largely in response to the growing prevalence of weapons like the Thompson submachine gun ("Tommy gun"), a machine gun with the cartridge of a pistol. Originally developed for use in World War I, the Tommy gun later became popular among Prohibition-era bootleggers and gangsters before the ban [source: Higginbotham].

Fig:5 A group of U.S. Army soldiers using a machine gun

(Ref: JACOM STEPHENS/VETTA/GETTY IMAGES**)**

III. METHADOLOGY

In this chapter, we are going to discuss about the experimental work which consists of experimental setup, Selection Raspberry pi 3 model B+, Selection of webcam, Selection Adafruit TB6612 motion motor control shield board (HAT) and our main operation

carried out using virtual environment created using OpenCV enable python by implementing image detection technique to the input for getting output real time.

Construction of Hardware

1. Building the base

First we take medium-density fiber board (MDF) and trace out two 9-inch diameter circles with a pencil and cut them out using a electric jigsaw. A motor will be mounted to the center of one circle, and 3D-printed flanged collar will be mounted to the center of the circle. For motor mounting , drill the four holes and one on the center of the MDF sheet. Usingfour M3 machine screws and four washers, mount one of the stepper motors to the MDF circle. With the other MDF circle, center a 3D -printed collared flanged onto the center of the board and use a pencil to mark the drilling location for each of the three mounting screws holes. Using a hand drill attach the flanged collarto the board.

Figure:6

2. Wire the gun

Before moving onto the next step, first we prepared our gun so it is ready to be mounted onto the turret. Now first we find out the switch that gets closed when trigger is pulled. We remove the wire from the switch and solder them directly to the longer power and ground wires and feed them out of the gun. Then we reassemble the gun. The physical switch actuated by the trigger that we just disconnected and later be replaced by an electric relay controlled by raspberry pi.

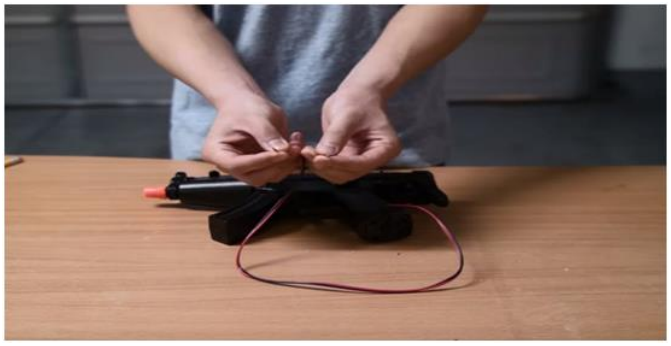

Figure:7

(https://hackster.imgix.net/uploads/attachments/340974/13_ms?auto=compress =740&h=555&fit=max)

3. Building the turret legs

Next we are ready to make the legs of the turret that will hold the gun. We used an 7.9 inch tall leg with a 6.3 inch wide base s about 2 inches wide at the top. Draw the leg shape onto a piece of paper, and cut it out with a pair of scissors. Then we use this paper, and cut it out. Use this paper to trace on MDF sheet to cut the legs out of MDF board. On one of the legs, drill a hole for the shaft of the motor to go through and on the other leg drill a hole for supporting the 3D-printed flanged shaft to rotate in. Now mount the second motor to the leg and insert the motor to the flanged collar. Take the 90-degree angled brackets and screw them into the bottom eachleg.

Figure:8

(https://hackster.imgix.net/uploads/attachments/340967/12_EL0gCdnrrY.PNG?auto=compress%2Cformat&w=740&h=555&fit=max)

4. Assembling the turret :

Now we have to figure out how far apart to space the legs from each other. Measure the width of our gun at our desired attachment point. Put the 3D-printed

flanged shaft into the hole of the other leg, and stand the legs up ,spacing them apart so the width of the gun is between the two flanged parts. After marking the circular MDF board. Screw the leg with the motor on it to one side. We use 3M double-sided tape and place it on the face of both flanged shaft and flanged collar. Placed the gun between the flanges to fix the gun.

ELECTRONICS

Raspberry Pi 3B+ model is used which have different components , just above the center point the system-on-chip(SoC) ,four USB ports which let us connect any USB-compatible peripheral, Ethernet port, Headphone jack can be used for audio video sound, Camera module, HDMI port use to connect the Raspberry pi to our display device, USB power port use to connect the Pi to a power source, camera connector use to connect the camera to Pi, 20 pins GPIO headers, microSD card contain all the file we save and all the software we install.

Figure-10
(https://www.raspberrypi.org/magpiissues/Beginners_Guide_v1.pdf)

Insert the stepper motor hat onto the Raspberry pi. Fix the hat with the Raspberry pi by solder. There are two stepper motor terminal on hat. Wire the motor on the base of the turret to right side of terminal shown in fig.5.Wire the gun pivot motor to the other terminal B. We use micro-USB cables to connect the raspberry pi. Connect the relay to the stepper motor and hat by connecting the power and ground(yellow and green) rail of motor hat and connect signal wire to GPIO pin 22(blue wire) on the Pi. Connect the output of relay to the wire of the gun. Plug in webcam to the pi using USB cables for detection. Insta

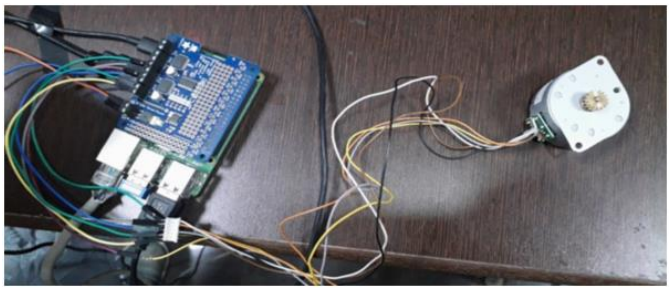

Figure-11

SOFTWARE

1. **NOOBS** :SD card having NOOBS can install a wonderful range of operating system for Raspberry pi. So we install NOOBS in our Raspberry pi.
2. **OpenCV:** It is an open source computer vision and machine learning software library. So we install OpenCV for motion detection and image processing for our project.

For communicating with stepper motor hat, we will have to configure our Raspberry Pi for I2C communication .Then we install the library for controlling the stepper motor hat. There are also a few libraries we need to install for image processing and recognition.

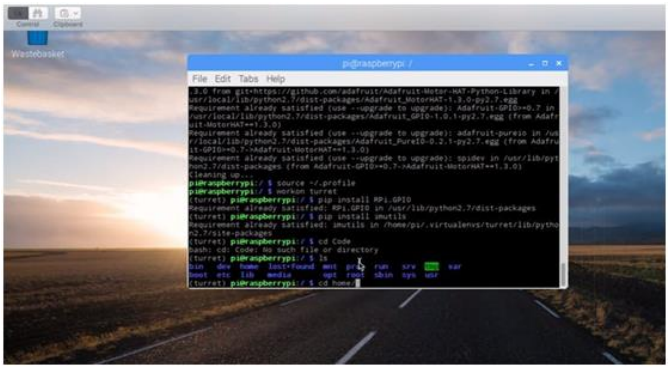

Figure-12

(https://hackster.imgix.net/uploads/attachments/340984/27_swwHAmA2Sc.PNG?auto=compress%2Cformat&w=740&h=555&fit=max)

Motion tracking mode calibration

The software does not know the position of the gun on startup, we will need to calibrate the turret when it is turned on. Python program will prompt to use the keyboard to adjust angle of turret. The software will then calibrated the exposure level of camera and pick a reference image for motion detection. Motion detection works by comparing subsequent images to initial reference image for change so we have to make sure that there is nothing move in front of the camera during image calibration.

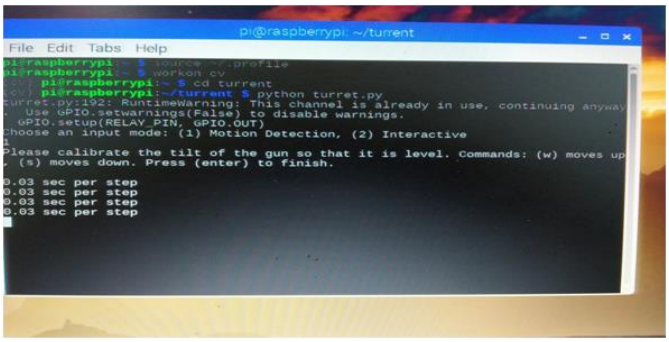

Figure-13

Interactive mode

Place the camera in line with the gun barrel and use keyboard to move and fire our turret. Use “a” and “d” keys left and right, “w” and “s” keys up and down. Enter to fire.

IV. RESULT AND DISCUSSION

As per the study we have done till now on our project, we will get a wide range of results. With the help of our algorithm, we can able to detect almost all the moving object.

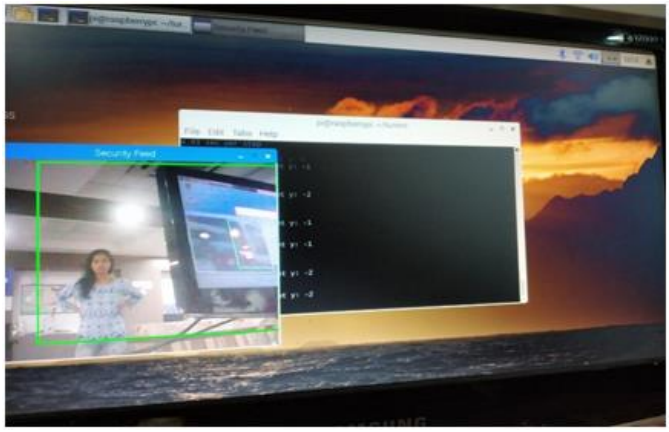

Fig: 14 (enemy detection)

4.1.1 HEIGHT OF THE SYSTEM:

Our turret lies at the height of approximately 25-30cm from the ground level.

4.1.2 RANGE OF THE SYSTEM:

The system will cover an area in range of approx. 60-80m for normal range and 80-100m for ceasefire for the detection of enemy.

4.1.3 VISION

The system will also be able to detect enemy in night.

4.1.4 FIRE PER ROUND

The system will be able to fire 500-1000 shots per round.

4.1.5 GUN BULLET:

It has high penetrating power hence enemy will die in 2-3 bullet.

4.1.6 RECOIL VELOCITY:

Minimum or very less recoil velocity, due to which vibration will not occur.

4.1.7 DETECTION SENSOR:

We will give a heat tag to our soldier in which individual barcodes are given which distinguishes enemy and soldier. The barcodes consist of all the essential information required for the identification of a soldier (e.g., aadharno. ,photo, eyesight vision). There are 13,00,000(approx..) Indian soldiers which includes Dogra regiments, Rajputana regiments, Cobra regiments etc. have their personal identification.

4.1.8 METAMATERIAL CLOAKING:

The system will become invisible from everyone by the metamaterial cloaking.

Fig: 15 (Prototype)

V. APPLICATION

5.1 FOR BORDER SECURITY:

Now a days we see lots of cease fire violation from our neighbouring country Pakistan and china due to which our soldiers got injured or died. By introducing **VAJRA** "an autonomous enemy detection camouflage gun" we can reduce the death rate of our soldier. The gun have motion tracking infrared camera fitted on it . If our enemy is doing any movement near border area this gun will automatic detect the enemy and start shooting until enemy dies. The gun haveheat sensor which will detect the heat radiated by the enemy body. If the enemy is dead heat will not radiate from the body and gun will identify that enemy is dead and stop firing. Now how it will differentiate between enemy and friend. We are going to fit heat tag on the Indian army soldiers in which there are bar code attached. The bar code consist of identification of soldiers like post, aadhar card, their images and vision of eye sight. The gun will detect that bar code and will not shoot the soldiers.

Figure – 16

(https://www.deccanherald.com/sites/dh/files/styles/article_detail/public/article_images/2018/05/30/file6yv890xq2xwcf8h8mqp.jpg?itok=QTAesScq)

5.2 For bank locker room:

Bank locker room(RBI) have so many precious atom like golds diamonds and so many cash. So, it needs high level security. By introducing **VAJRA** "an autonomous enemy detection camouflage gun" in the locker room we can easily secure the room. We will keep VAJRA inside the locker room .We are going to give the batch sensor to the selected staff of the bank who have the permission to enter in the locker room. Except those staffs if any other one who will enter in the room the gun will detect and start firing.

Figure – 17

VI. CONCLUSION AND SCOPE FOR FUTURE WORK

6.1 Conclusion:

The main aim of this thesis work is to detect the person and automatically fire the gun. We have run our algorithm on the detection of different person and accumulate our gun to fire. When motion is detected then bullet is fire out of the gun. Our system can effectively detect the person and fire the gun till the person is not alive. The person is alive or dead is detected by the radiation of heat ejected from the body of the person. If heat radiation is zero then the person is dead. The bullet is fired from the gun unless and until the death of person. The range of the gun is (80-100) m, and there is no any type of recoil velocity. Our aim is to develop a system which offers low cost solution and save the life of our soldier. Hence the death ratio of soldier at our border line minimizes. It also saves the man effort and money power of the government.

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FEM Based Pavement Performance Evaluation for Potholes

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ABSTRACT

In an effort to give a global view of this field of research, in this paper we highlight the performance of pavement under various pothole conditions. Pavement condition assessment is essential to develop the maintenance and rehabilitation programs. One of the major failures on flexible pavement is potholes. Pothole repairs continue to be a major maintenance problem for many highway agencies. There is a critical need for finding long-lasting, cost-effective materials and construction technologies for repairing potholes.

The main objective of this research effort is to investigate the effect of potholes of different geometry on the performance of flexible pavements. The primary objective is to perform a stress-strain analysis on the potholes using Finite element modeling to individualize the most effective shape for the pothole patchwork. Young modulus is evaluated for the filler materials and the existing material of the pavement to determine their compatibility in different loading scenarios. The behavior of potholes is determined at different depths under a standard static wheel load. The structure is modeled using COMSOL, a finite element analysis software. The analysis results can provide several reasonable and economic suggestions for road design and maintenance to meet the present road maintenance of maintenance requirements.

Keywords: Finite element analysis; Pothole; Pavement performance

I. INTRODUCTION

Flexible pavement consists of many layers but in general, it comprises of Sub-Grade, Sub-Base course, Base course and Surface Course. Any change in these layers results in the failure of the pavement structure and eventually affect its serviceability. It is of utmost importance to construct these layers with high degree of accuracy. Even then, there are different types of failures arises on the pavement structure during its design life. The reasons for these failures are mostly related to ageing, vehicle loads, moisture, temperature variation, as well as their combination. Out of these, the combined effect of moisture with the penetration of water into the layers has the ability to affect the layers and the pavement as a whole. These layers enable the pavement structure to bend, which therefore helps in damage reduction. The distress occurs on the pavement is divided into two groups viz., environmental distress and structural distress. Environmental distress in flexible pavements includes the outside influence that affects the performance of the pavement whereas the structural distress is classified as the physical failures that are found on the pavement surface and the sub-base layer. The reasons for these failures are overloading, frost action, wet sub-grade, etc. Various failures that arise on flexible pavement due to structural distress are Alligator

cracking, depressions, corrugations, shoving, potholes and rutting.

Out of these, potholes are the most common and widely occurring failure. Potholes are developed on the road surface when a part of original pavement gets broken away which then causes a disruption on the surface. Pavement fatigue is the main reason behind this. The interlocking of fatigue cracking leads to the formation of alligator cracks and the loosening and removal of the materials between those cracks due to the continuous action of loads and stresses develops a pothole. The combination of water and traffic loading together leads to the development of a pothole. The freezing and thawing cycles also damage the pavement and creates the openings for the water to penetrate into the layers. Potholes can grow to several feet in width but they are usually shallow in depth. There are various risks associated with the potholes. Vehicle damage due to unexpected jolt is the foremost risk that arises due to the development of the pothole on the pavement surface. This damage in turn can lead to a cascade of mechanical problems and catastrophic human injuries. If the pavement sections are not properly maintained, the environmental and structural factors results in shortening of the design life. Various studies have been carried out to point out the importance of pothole patching. If the size of the pothole is considerably large, then it does not actually affect the vehicle and its performance when compared to smaller potholes. Various patching technique can be used to repair a pothole, but the most common material used is cold mix asphalt or hot mix asphalt. Asphalt binder has its own viscoelastic properties which are a combination of elastic solid and a viscous fluid. This viscoelastic property of the binder is transferred to the mix, resulting in a viscoelastic mix which can be represented by mathematical models. Various studies have focused on the effects of viscoelastic properties of cold mix on pavement repairs. Regardless of the type of material used, concentration of stress at the boundary between the new and the existing material is a major concern. Very few studies are conducted using a 3-dimensional finite element simulation which shows the effects of various pothole geometry on the pavement. The stress reduction based on different geometry of the pothole is also studied. Few other studies have also focused on modeling of pavement materials as well as pavement structure as a whole under various vehicular loads. FEM has been used to simulate variety of conditions and it has also been used to simulate vehicle load interaction with the pavement surface.

In this study, simulations were performed to determine the effect of geometric shapes of pothole patch on the pavement structure. Comparative studies based on different model configurations were carried out to determine the behavior of flexible pavement and its layers. Further research has to be carried out to overcome this gap and to develop a general solution for the pothole patching technique as well.

II. METHODOLOGY

In this study, a 3-Dimensional Finite Element Model is developed using COMSOL Multi physics to check the response of the pothole under direct traffic loads. This study focuses on the influence of different pothole geometry on the stress concentration of the pavement structure.

This research shows the variation of stress and displacement along the pavement layers. It focuses to describe how the different pavement layers are behaving under direct wheel loads. Pothole was generated at the geometric center of the pavement structure and the overall geometry was considered symmetric to X, Y and Z axis so that the developed stress and the pavement response should also be symmetric to reduce the computational time. Finally, the behavior of the pavement is evaluated by measuring the vertical compressive stress and the displacement in the loading direction.

III. RESULTS AND DISCUSSION

The model is analyzed using COMSOL for various geometry of potholes. The stress-strain results are compared to determine the behavior of pavement layers under the traffic loading. In Fig. 1 contour lines are plot to evaluate the intensity of displacement and stress from the loading point and pothole location. Table 1 show the relation between depth of pothole and its displacement when the vehicle loading is directly over the pothole patch.

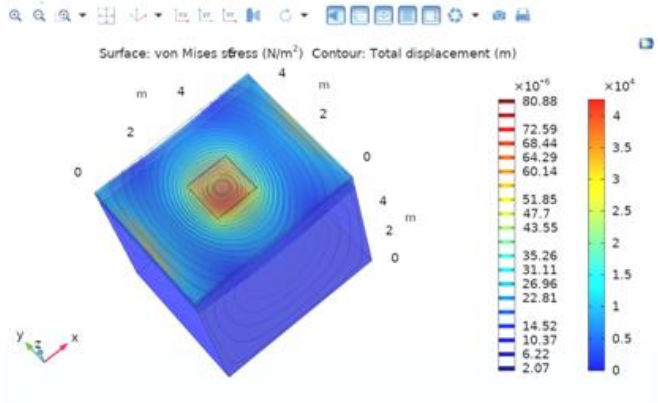

Fig. 1 Stress-Displacement diagram

Table 1 Depth vs. Displacement

Depth (mm)	Displacement (mm)
50 mm	0.081
100 mm	0.083
150 mm	0.087
200 mm	0.091

IV. CONCLUSION

There has been considerable discussion on the topic of stress distribution through various materials in flexible pavement. Studies show that in a layered system the degree of reduction of vertical stresses below the surface is a function of the relative strengths of the two materials.

The Displacement-Depth relation shows that for different geometric shapes, the displacement varies with respect to depth. In this case, the area of the pothole patch was kept constant. Simulations were carried out for different models with varying depth. The behavior of the pavement and its layers is explained in this study using FEM. It was observed that the displacement is directly proportional to the depth of pothole. The patching of pothole is necessary to eliminate the risk of pavement failures due to the presence of moisture and temperature.

Further studies have to be carried out to determine the most favorable shape of potholes to be adopted during patching and repairing process.

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Fatigue Strength Experimental Testing of a Cast Aluminium Alloy

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ABSTRACT

Fatigue strength of a type A319 cast aluminum alloy was studied by means of fully reversible tension–compression tests conducted at room temperature and at 130 °C; the specimens used in this study came from samples cut from the bulkheads of V-8 type engine blocks. Testing was carried out in a servo-hydraulic machine. The specimens were tested to fracture or up to 107 cycles. Analyses of the fatigue tests yield to a strength of 99.4 and 90.3 MPa at 107 cycles for the tests at room temperature and at 130 °C. The size and nature of the defects that originated the failure were determined by scanning electron microscopy. It was found that fatigue cracks originated in pores; single cracks were observed to occur in samples tested below a nominal reversible stress of 120 MPa; multiple cracks were observed in samples stressed above this value.

Keywords: Fatigue Strength, Failure, Electron Microscopy, Fatigue Cracks.

I. INTRODUCTION

keep The resistance to fatigue of cast aluminium alloys is affected by defects that are related directly to casting; among the defects that exert the higher influence in fatigue are pores, either due to shrink- age or gas evolution, intermetallic inclusions and precipitated par- ticles, as cracks nucleate on the most prominent defects and grow following paths in which smaller defects are concentrated [1–16]. The distribution of these defects is modified by the rate at which the casting solidifies; as smaller sizes and finer distribution are enhanced when the time available for growing is reduced [17,18]. It is normal practice to assess microstructural refining by means of the secondary dendrite arm spacing, DAS, which is related to the heat transfer rate occurring during solidification [19–23]. Most studies on fatigue of cast aluminium alloys have been carried out on Al–Si–Mg alloys, due to their wide use in automotive industry [1–6] and such studies can be used as a basis to under- stand the behavior of Al–Si–Cu alloys. It is suggested that cracks nucleated on large defects propagate through the material along sites that contain a high concentration of smaller defects [1,9,12,13].

Silicon is added to aluminium alloys to enhance fluidity and in- crease their strength, so it is expected to also enhance the resistance to high cycle fatigue, but, as the amount of silicon approaches the eutectic composition, this effect can be reversed as silicon platelets act as nucleation sites for fatigue cracks [9,10]. Cu and Mg are added to Al–Si alloys to increase the mechanical properties by heat treating and they affect fatigue due to the tendency for the

cracks to propagate along the interface of the precipitates [1,9,12,13]. Pieces such as engine blocks and cylinder heads are subjected to thermal fatigue due to the changes in temperature caused by turning on and off the engine and by their operation at high temperatures [2,7]. The aim of this work is to present the results of the studies carried out to evaluate the fatigue life of a cast aluminium alloy used in the manufacture of engine blocks. Thework was conducted on samples heat-treated to T7 condition that were cut from the bulk-heads of engine blocks.

II. EXPERIMANTAL PROCEDURE

A series of samples were cut from the bulkheads of V-8 engine blocks that were cast by low pressure [17,18]. The microstructure of this portion of the engine block is refined by a grey iron insert, which enhances the solidification rate, and allows for the mechanical properties required to withstand the stresses caused by the rotating crankshaft. Fig. 1 shows the position of the bulkhead within a V-8 engine block. The reduction of the secondary dendrite arm spacing, as measured on several bulkheads, that is promoted by the use of the grey iron insert. The position from which the specimens subjected to fatigue were machined isshown in the diagram. The DAS ranges in this region within the 20–30 lm interval.

The engine blocks from which the samples were obtained were cast from two different melts. Samples from the first one, identified as A, were tested at room temperature (22 °C), the samples from the second batch, B, were tested at 130 °C. The chemical composition of both melts is shown in Table 1. The samples were heat-trea- ted to a T7 condition (solubilization at 495 °C for 7 h, immersion in water at 90 °C and aging at 240 °C for 4 h). The specimens were machined to an hour-glass shape with a reduced diameter of 6.0 ± 0.05 mm at their centre, following a radius of curvature of 48.0 ± 0.25 mm from cylindrical bars of 15.0 ± 0.02 mm. Tensile test were carried out at room temperature following the ASTM standards B-557 [26] and E-8 [27] in samples cut and machined from additional bulkheads; these specimens were of 12.7 mm in diameter by 62.7 mm in gauge length. Fatigue tests were fully reversible.

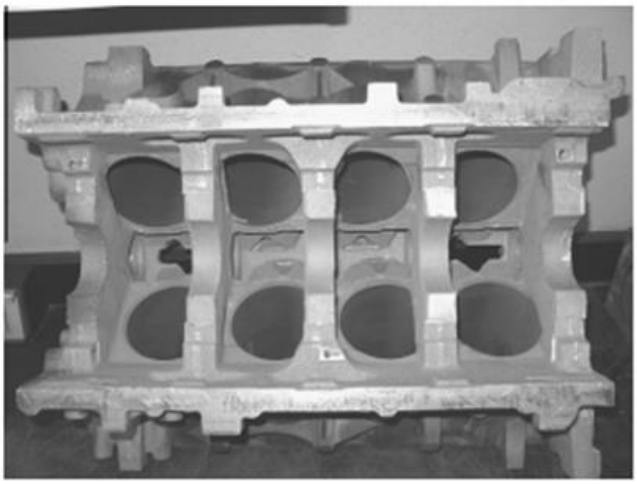


Figure -1,Position of the bulkhead within a V-8 engine block

The value of stress used along the text will be that of rmx.2.The frequency used in all tests was of 75 kHz an all were con- ducted either at room temperature (22 °C) or at 130 °C, the latter was accomplished with the aid of a small heating chamber; tensile tests were carried out only at room temperature. Fatigue testing followed a reduced staircase schedule [28]. The specimens were tested up to failure or until a number of 107 cycles was achieved; the reversible stress was computed from the original cross-section of the specimen. The trials at room temperature started with a stress (Dr/2) of 160 MPa, the stress level was then reduced by 10 MPa in the following test upon failure; this procedure was modified to the reduction or increase in stress in 5 MPa steps once the first sample withstand 107 cycles. The trials at 130 °C started with reversible stress amplitude of 90 MPa and were followed by reducing or increasing the stress in 5 MPa steps. The samples that resisted 107 cycles were then subjected to fatigue with an increase in stress of 10% to promote their failure and measure the size of the defect that caused it.Failure and metallographic analyses were conducted on fractured specimens

byscanning electron microscopy (SEM) and optical microscopy (OM). The size and type of defect that originated the fatigue crack was recorded, as well as the length and area of propagation of the crack. The samples were then cut along their axis to measure DAS and porosity close to the reduced section.

III. RESULT

The microstructure of the as-cast specimens is shown in Fig. 2a, which is typical of a modified hipoeutectic Al–Si alloy. Proeutectic aluminium dendrites are nucleated and grow at a speed that de- pends on the heat transfer rate; the separation between the secondary dendrite arms is used to rate solidification [19–23]. Fig. 2b and c shows the microstructures of samples treated to the T7 condition thatwere subjected to fatigue either at room temperature, Fig. 2b, or at 130 °C, Fig. 2c. It can be seen that heat treating contributes to rounding of the silicon platelets of the eutectic aggregate [19].

The results from the tension tests carried out at room temperature on samples in the ascast the quality index (Q) is calculated by [20,21].

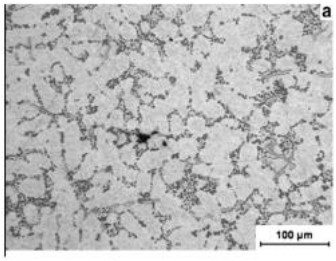
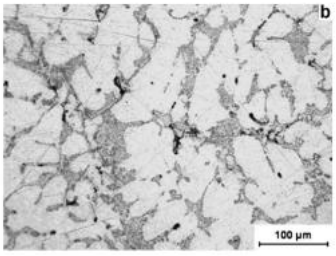


Figure-2 (a)



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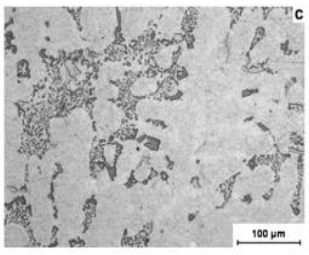

Figure-2 (c)

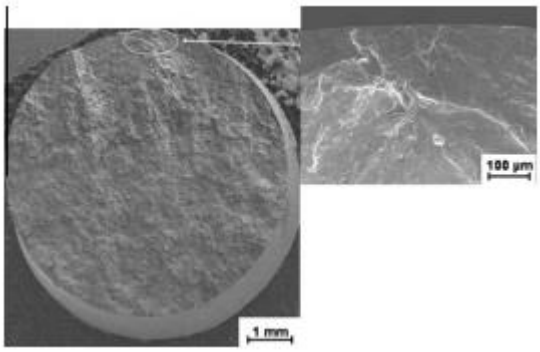

Figure-3 (a)

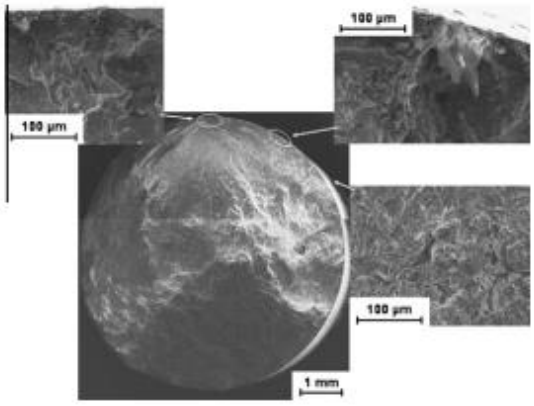

Figure-3 (b)

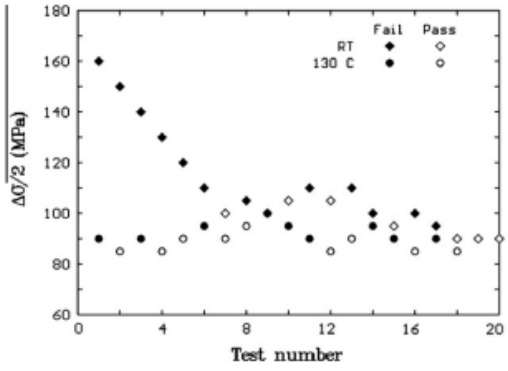

Figure -4 (a)

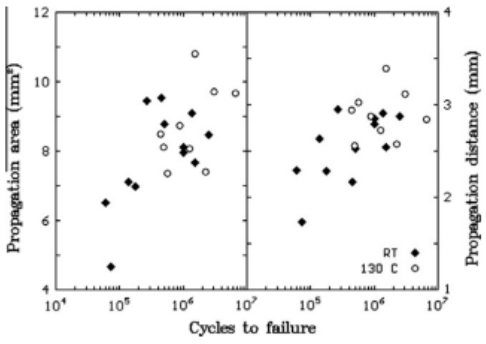

Figure -4(b)

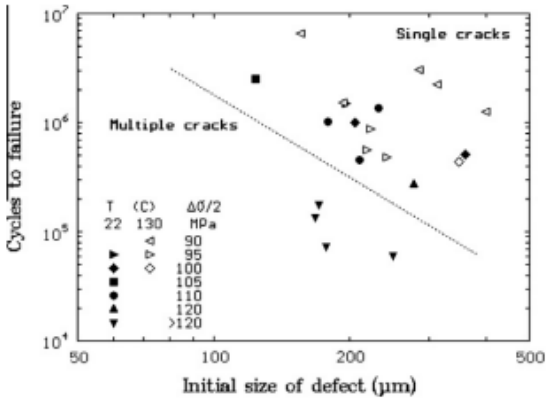

Figure-4 (c)

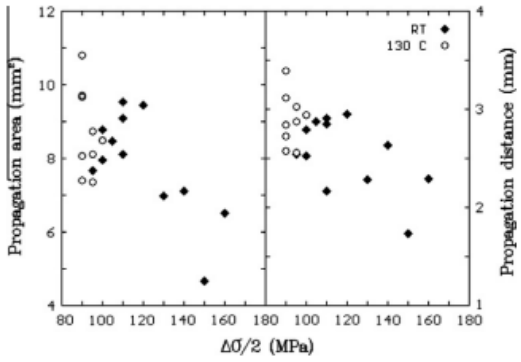

Figure-4 (d)

where ru and Dl are the ultimate tensile strength and the elongation to fracture.Fig. 4 shows the staircase schedules for the tests conducted at both temperatures, the specimens that failed before reaching the 107 cycles, or that resisted this number are identified by either full or empty symbols; the staircases started at a stress of 160 and 90 MPa respectively for 22 and 130 °C; the stress for the following.

sample was either reduced or increased depending on the failure or survival of the specimen.

The fracture surface of the samples was observed by SEM to detect the origin of the failure. It was found that some specimens developed a single crack, Fig. 5, which was able to propagate and cause the failure of the specimen, whereas failure in other specimens occurred by the propagation of multiple cracks, Fig. 6. It was found that the specimens that failed by the propagation of single cracks were stressed below ±120 MPa. SEM was used to identify the defects that originated the cracks and measure the propagation distance and the area covered by the cracks. Fig. 7 shows the fracture area of a sample tested at room temperature with ±105 MPa.

Fig. 8 shows the number of cycles to failure of the specimens as a function of the size of the defect that originated the crack. Figs. 9 and 10 show that the distance and area that the cracks were able toto the stress to which the samples were subjected, Fig. 10. Figs. 9 and 10 can be interpreted in terms of the toughness of the material, as shorter cracks will be able to promote failure at higher stresses.

IV. DISCUSSION

Fig. 8 plots the number of cycles that the specimens resisted as a function of the size of the defect that caused the failure (pores in all cases). The tendency of the data is for a reduction in the number of cycles to failure as either the stress or the size of the pore increase; a line is drawn to discriminate between the samples stressed above or below ±120 MPa, as the samples tested above this value, showed multiple crack propagation, see Fig. 6. Previous research [6,8] have shown a correlation between the size of the biggest pore with the number of cycles to failure in Al–Si–Mg alloys; the difference between the previous works and the present is that in the former ones the size of the pore was varied by changing the solidification rate, whereas in this work the solidification rate was kept within a narrow range, as can be verified by the similarity in DAS in all specimens tested. Of more importance will be the distance and area of the crack that propagate in fatigue, as will be discussed later on.

Fig. 11 shows the S–N curves of the experimental alloy at both testing temperatures. The fatigue limits of 99.4 and 90.3 MParespectively for 22 and 130 °C were calculated from the reduced staircases. Data points from a similar alloy with 23lm DAS tested at lower frequency (20 and 40 kHz) [21] are added for comparison.

V. CONCLUSIONS

Results from the fatigue tests indicate that the fatigue limit in the material is of 99.4 and 90.3 MPa when testing at 22 or 130 °C, which represent a 10% decrease in the fatigue limit at the higher temperature. Measurement of the distance and area that the cracks propagate before failure allowed for computing the threshold for the stress intensity factor these values werethen used to compute the average critical stress (rcr) that resultedin 99 and 90 MPa respectively for the material tested at 22 and 130 °C.

Fractographic analyses carried out on the samples show that the cracks nucleate on existing pores, which were in all cases close to the surface of the specimen. It was found that failure occurred by the propagation of single cracks when the samples were strained below 120 MPa; propagation of multiple cracks were found to occur when testing at higher stresses.

It was found a tendency for a reduction in the number of cycles to failure with the increase in the size of the defect on which the fatigue crack was nucleated.

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The Impact of Metallic Nanoparticles in Biodiesel Fuel Blends: A Comprehensive Review Physiochemical Properties and Emission Characteristics

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ABSTRACT

Biodiesel has been emerged as promised alternative fuel source intended to compensate the rapid depletion of fossil fuels.biofuel reduces the harmful emissions due to its inherent oxygen content in molecular structure. The copious benefits of biodiesel are overwhelmed by couple of disadvantages like the expansion in the nitrogen oxide outflow, its contrariness with chilly climate conditions. There is a further degree for upgrade in fuel properties and to beat the disadvantages by expansion of nano-particles as fuel added substances. Nanoparticle addition is an advanced approach to improve engine performance and emissions. The outcomes accomplished exhibited an improvement in the physio-compound properties, upgrade in the heat intensity rate, and increase calorific value. Likewise, there was an expansion in the motor execution boundaries and decrease in the exhaust emanations relying upon the dose of nanofluid added substances. The various writing surveyed had a few levels of unclear and conflicting results. The trial results from the different specialists were not summed up to arrive at a general accord with respect to this inventive methodology of fuel debasement. The current work summarizes the writing from latest articles on nano-particles as a fluid fuel added substance. The impact of scattering of a few nanoparticles on the upgrade in the presentation qualities and decrease in emanation of a CI engine fuelled with diesel-biodiesel mixes are examined.

Key Words: Diesel Biodiesel,Nanoparticles ,Engine Performance, Emissions

Nomenclature

B20	20% Biofuel+80% Diesel	D100	100% diesel
Al_2O_3	Aluminum oxide	GHG	Green house gases
B20+100 Al_2O_3	20% Biofuel+80% Diesel+100 ppm Al_2O_3 nanoparticle	HC	Hydro carbon
B20+50 CeO_2	20% Biofuel+80% Diesel+50ppm CeO_2 nanoparticle	IC	Internal combustion engine
B20+100CeO_2	20% Biofuel+80% Diesel+100 ppm CeO_2 nanoparticle	NO_X	Oxide of Nitrogen
BHA	Butylated hydroxyanisole	PM	Particulate matter

BHT	Butylated hydroxytoluene	SFC	Specific fuel consumption
BSFC	Brake specific fuel consumption	TBHQ	Tert-butylhydroquinone
BTE	Brake thermal efficiency	TDC	Top dead centre
CO	Carbon mono oxide	UBHC	Unburned hydro carbon
CO_2	Carbon dioxide	XRD	X-Ray Diffraction
CNT	Carbon nano tubes	WCO	Waste cooking oil
CRDI	Common rail direct injection	WPOME	Waste palm oil methyl ester

I. INTRODUCTION

Diesel engines play a significant role in transportation, trains, water system areas, and modern areas due to their the effortlessness of activity, unwavering high quality, sturdiness, and deep-rooted plan. Then again, diesel motors are considered one of the essential wellsprings of numerous poisonous emanations, particularly, particulate matter (PM), and nitrogen oxides (NOx) which have dangerous ecological influences. These harmful mixtures cause the development of acidic downpours, the exhaustion of the ozone layer, the increment of nursery peculiarities, the arrangement of brown haze, and unwanted climatic changes [1-3]. Diesel engines are broadly used to drive vehicles, trains, ships, planes, water system siphons, and furthermore stretched out to create electric power. The outflows created by the burning of petroleum derivatives seriously affect the biological system and human well-being. To conquer these downsides, it has turned into a worldwide plan to foster clean substitute fills that are effectively accessible, internationally satisfactory, and technically plausible. Attributable awareness of energy concerns and environmental misfires related to the consuming of petrol-based powers has strengthened various specialists to look at the chance of using non-traditional energy sources, as an other fuel source for petroleum products and their subordinates [4,5]. Sustainable power sources have an extremely high potential and huge accessibility, which makes them meet various times the world's energy interests. Biodiesel has arisen as the most well-known elective fuel source for diesel [6]. Biodiesel is a non-regular fuel source and can be made straightforwardly from consumable and non-eatable oils, squander cooked oils, and creature fats like fat and grease [7]. The utilization of biodiesel in CI motor has some limitations like a minor decrease in efficiency on an energy premise (around 10%), possibly higher thickness, unfortunate fuel atomization, lower cloud and pour focuses, cylinder ring staying, high NOX discharge and cold beginning issues [7-10]. These detriments can be overwhelmed by applying not many generally new methodologies like the expansion of fuel promotion dives and utilizes a mixture of fuel, which brings about the upgrade of engine execution and a decrease in exhaust emissions. There are numerous ways of updating the presentation of the engine utilizing diesel and controlling its natural outflow, one of which is to utilize an added substance. The choice of included substances in the biodiesel fuel mix ought to have financial plausibility, high dissolvability, non-poisonousness, thickness and glimmer point, the solvency of water, and sharing the added substance by water. Biodiesel is a non-customary fuel source and can be made straightforwardly from eatable and non-consumable oils, squander cooked oils, and creature fats[11]. Among the newly added substances utilized in diesel and biodiesel powers, the nanoparticles have arisen as a novel and promising added substance that brings about the decrease of fumes outflows and improvement in engine

execution. Numerous scientists certainly stand out in fuel adjustment techniques by utilizing the nano-added substances for accomplishing further developed execution and emanation attributes . A severe discharge guideline has been internationally implemented on the emanations re-rented from CI engines. The utilization of fuel-added substances in the fuel can alter various fuel properties, for example, the thickness, sulfur content, and volatility, which influences the fuel emanations. The capability of adding the the nanoparticle-added substance with fluid energizes as an optional energy transporter has further developed burning qualities, the examiners have attempted to track down the possibility of these changed fills with diesel engines. [12-18]. Ganesh and Gowrishankar concentrated on the impacts of the expansion of Magnalium and Cobalt Oxide nanoparticles on diesel motor execution filled by Jatropha biodiesel. They tracked down that the expansion of nanoparticles brought about a critical improvement in the brake warm proficiency and a decrease in the bsfc by 2%. Likewise, the discharges have a noteworthy decrease where UHC was diminished by 60%, CO by half, and NOx by 45%[19] Skillas et al. [20] concentrated on the size dissemination impact and organization of PM involving cerium as nano-added substances, and revealed an expansion in ultrafine yet decrease in the collection mode. An expansion in effectiveness resulted from the impact of nano-added substances, moreover, it influences the physicochemical properties and discharge of the fuel. Mehta et al. [21] concentrated on the motor execution and emanation qualities of a diesel motor worked with diesel fuel with the expansion of Aluminum and Iron nanoparticles. They found that the pinnacle chamber pressures and the brake warm proficiency were expanded by 4% and 9%, separately while the bsfc was diminished by 7%. Motor outflows of CO and UHC were diminished by 40% and 8% individually.

II. EFFECT OF NANO METALLIC ADDITIVE ON FUEL'S PHYSIO-CHEMICAL PROPERTIES

Biofuel blend with diesel engine impact the physiochemical properties of fuel. Calorific value of diesel oil decreased with blend of biofuel. Less calorific of fuel decreased the combustion characteristics and emissions of diesel engine. Instead of it biofuel has the higher viscosity than petroleum oil. Blending of biodiesel with petroleum fuel increased the higher viscosity. Higher viscous fuel decreased the quality of proper atomization of fuel by which homogenous spray of fuel does not occur inside the engine which endures the poor combustion. Poor combustion directly correlated to engine performance and emissions. Ultimately engine performance decreased. It was seen that oil physiochemical properties are directly proportional to engine performance and emissions characteristics. To improve the engine performance physiochemical properties are necessary to increased. To modify the physiochemical properties addition of nanoparticles is a good approach. Many researches investigate the impact of addition of nanoparticles on physiochemical properties of biofuel. Various specialists concentrated on the properties of nano-added substance fuel mix and its impact on different properties like calorific worth, streak point, thickness, consistency, cetane number, and so forth. The rationale behind the expansion of metal based nano-added substances to the diesel/biodiesel is to work on the presentation of the motor by upgrading the properties of fuel. The expansion of NPs to diesel/biodiesel mixes worked on the calorific worth and cetane number and it decreased the sulfur content in the fuel. properties of nanofluids utilized in the CI motor by latest examinations. The incorporation of Al2O3, CNT, CeO2, Al, Ag and graphene NPs with flawless biodiesel brought down the glimmer point values while they expanded the thickness and thickness values [22,23,].

Attia et al. [24] researched the impact of B20-Jojoba methyl ester with expansion of aluminum oxide nano molecule on properties of fuel, execution and discharge qualities of the diesel motor. The outcome showed that there was an extensive change in fuel properties. It was likewise seen that the expansion of Al2O3 decreased the kinematic consistency of the fuel alongside an expansion in thickness and Cetane number. Balaji and Cheralathan [25], referenced that the expansion of CNT with biodiesel brought about expanded streak point, thickness, calorific worth and Cetane number. The qualities were viewed as expanding with expansion in measure of CNT focus. Expansion of CuO and Al2O3 nanoparticles with slick diesel expanded the glimmer point and Cetane number though, ZnO and CeO2 decreased the upsides of blaze point [26, 27].

III. EFFECT OF NANO METALLIC ADDITIVE ON DIESEL ENGINE'S PERFORMANCE AND EMISSION CHARACTERISTICS

Biofuels are viable with diesel motors and require no change. The analysts directed a few examinations on diesel motors in view of discharges and execution qualities to show their predominance over fossil fuels.[28] Nano added substances are found to be helpful in further developing the fuel attributes and execution and emanations qualities of the diesel motor [29].The created nanoparticle fuel tests were assigned as (B20 + 50 Al2O3, B20 + 100 Al2O3, B20 + 50 CeO2, B20 + 100 CeO2). The CRDI motor was run at a consistent speed with four distinct motor burdens: 3 kg, 6 kg, 9 kg, and 12 kg. The outcome showed that the presence of Al2O3 in the mixed fuel worked on the BTE by 11.39%, diminished the SFC by 13.74%, and expanded the chamber strain and intensity discharge rate (HRR) by 16.77% and 21.48% separately contrasted with B20 fuel at top burden condition. With respect to emanations, CO discharges diminished by 15.06% for B20 + 50 Al2O3 than B20 and HC outflows diminished by half for B20 + 50 CeO2 than diesel at top burden. Further, NOx is diminished by 18.29% for B20 + 50 CeO2 than B20 at top loads[30].The examination test was led on a Typical Rail Direct Infusion (CRDI) motor filled by diesel, B20, B20 + 25Al2O3, B20 + 50Al2O3, and B20 + 100Al2O3 examples at a consistent speed of 1500 rpm under dierent motor burdens to assess the exhibition, ignition, and emanation qualities of the referenced motor. The experimental outcomes uncovered that Brake Warm Eciency (BTE) was broadly worked on by 13.53% and Speci c Fuel Utilization (SFC) was diminished by 20.93% for B20 + 100Al2O3 instead of B20 at the full burden. The discharge qualities, for example, CO and HC were through and through decreased by blending the nanoparticles in the relationship of B20 and D100; be that as it may, a slight addition was seen in NOx outflows, contrasted with B20 and D100 cases. Higher pinnacle focuses in both CPmax and HRRmax arrived at B20 +100Al2O3 essentially because of the decreased start delay contrasted with those in B20 and D100 [31]. The connection between the genuine BP produced by the motor and the energy moved to the motor is known as brake warm proficiency (BTE). The impacts of a few fills and fuel mixes on the motor execution can be researched by utilizing BTE. The expansion of nanoparticles with diesel-biodiesel fuel emulsions, energizes quick and complete burning cycle attributable to better radiative and heatmass transport properties, which prompts a significant improvement in ignition productivity. Nanthagopal et al. researched the variety of BTE with BMEP for perfect CIME, CIME emulsions with ZnO andTiO2 at measurements levels of 50 and 100ppm and diesel. The BTE expanded with motor burden, the improvement was expected to higher BP with an expansion in fuel rate. A greatest BTE for diesel was 3%, 31% for CIMET100, 30% for CIME-T50, 27% for CIME-Z100, 28% for CIME-Z50 and 26% for CIME biodiesel at the most extreme BMEP.[32]

IV. CONCLUSION

The expansion of metallic nanoparticles to the biodiesel mix influences the thickness, thickness, and glimmer point, however, the oxygen content of the biodiesel mix is expanded. Albeit, few metallic nanoparticles upgraded the cetane number and the blaze point. In the majority of the new examinations, metallic nano-added substances are utilized because of their minimal expense and the availability of blend gadgets. At higher motor burdens, the expansion of nanoparticles diminished the CO, NOX, and HC outflow because of the climb in temperature of the ignition chamber. there is a positive effect on the motor execution boundaries (BTE is expanded, BSFC is decreased). This study uncovers that the expansion of nanoparticles to biodiesel works on the physiochemical properties and motor execution.

V. FUTURE RECOMMENDATION

There is a need for a thorough concentration on the strength, warm conductivity, solidness tests, unpredictable models, and time span of usability of NPs for fluid fills. The autos ought to be planned and altered concerning the boundaries like the whirl proportion, pilot infusion, and spout math adjustment (improves the shower designs and diminishes the drop size). Ad libbing the motor similarity with nano-added substances and diesel/biodiesel energizes and makes it plausible for commercialization

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Health Prediction Using Data Mining

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ABSTRACT

The paper presents an overview of the data mining techniques with its applications, medical and educational aspects of Clinical Predictions. In medical and health care areas, due to regulations and due to the availability of computers a large amount of data is becoming available. Such a large amount of data cannot be processed by humans in a short time to make diagnosis, and treatment schedules. A major objective is to evaluate data mining techniques in clinical and health care applications to develop accurate decisions. It also gives a detailed discussion of medical data techniques which can improve various aspects of clinical predictions. It is a new powerful technology which is of high interest in computer world. It is a sub field of computer science that uses already existing data in different databases to transform it into new research and results. It makes use of machine learning and database management to extract new patterns from large data sets and the knowledge associated with these patterns. The actual task is to extract data by automatic or semi-automatic means. The different parameters included in data mining include clustering, forecasting, path analysis and predictive analysis. The objective of this work entitled "Health prediction using data mining" is to provide a user friendly and easily understandable GUI to users to easily get instant guidance on their health issues through an intelligent health care system online. The main objective of the system is to predict disease according to symptoms and suggest list of doctors and medicines.

Keywords: Predict Disease, Health, Data mining, GUI

I. INTRODUCTION

It might have happened so many times that you or someone yours need doctors help immediately, but they are not available due to some reason.The Health Prediction system is an end user support and online consultation project. Here we propose a system that allows users to get instant guidance on their health issues through an intelligent health care system online. The system is fed with various symptoms and the disease/illness associated with those systems. The system allows user to share their symptoms and issues. It then processes user's symptoms to check for various illnesses that could be associated with it. Here we use some intelligent data mining techniques to guess the most accurate illness that could be associated with patient's symptoms.

"Health prediction system " is the computerization of medical information to support and optimize

(1) Administration of health services
(2) Clinical care
(3) Medical research
(4) Training

It is the application of computing and communication technologies to optimize health information processing by collection, storage , effective retrieval. The proposed system is mainly used by all the people where confidentially and integrity of the data has utmost importance.

In doctor module when doctor login to the system doctor can view his patient details and the report of that patient. Doctor can view details about the patient search what patient searched for according to their prediction. Doctor can view his personal details. Admin can add new disease details by specifying the type and symptoms of the disease into the database. Based on the name of the disease and symptom the data mining algorithm works. Admin can view various disease and symptoms stored in database. This system will provide proper guidance when the user specifies the symptoms of his illness.

This project is basically based on data analysis using data mining which is a trend in todays time. Data mining is a process used by companies to turn raw data into useful information. By using software to look for patterns in large batches of data, businesses can learn more about their customers to develop more effective marketing strategies, increase sales and decrease costs. The health prediction system is an end user support and online consultation project. Here we propose a system that allows users to get instant guidance on their health issues through an intelligent health care system.

II. BACKGROUND

The core idea behind this work is to propose a system that allows users to get instant guidance on their health issues. This system is fed with various symptoms and the disease/illness associated with those systems. This system allows user to share their symptoms and issues. It then processes user's symptoms to check for various illness that could be associated with it. If the system is not able to provide suitable results, it informs the user about the type of disease or disorder it feels user's symptoms are associated with and suggest the doctor to whom he or she can contact.

To beat the downside of existing framework we have created health prediction system. We have built up a specialist framework called health prediction framework, which is utilized for improving initial level and proposes the possible diseases. It begins with getting some information about manifestations to the patient, in the event that the framework can distinguish the fitting sickness, at that point it proposes a specialist accessible to the patient in the closest conceivable territory.

On the off chance that the framework isn't sufficiently sure, it asks few questions to the patients, still on the off chance that the framework isn't sure; at that point it will show a few tests to the patient. In light of accessible total data, the framework will demonstrate the result. Here we utilize some intelligent methods to figure the most precise disorder that could be associated with patient's appearances and dependent on the database of a couple of patients restorative record, calculation (Naïve Bayes) is connected for mapping the side effects with conceivable diseases. This framework improves undertaking of the specialists as well as helps the patients by giving vital help at soonest organize conceivable.

III. SIGNIFICANCE OF THE STUDY

There is always a need of a system that will provide the disease information according to symptoms shared by user. This system will help the user to find good doctors and medicines. Data mining used in the field of medical application can exploit the hidden patterns in voluminous medical data which otherwise is left undiscovered.

The main goals of this work are:

- User friendly interface to provide ease.
- To get instant guidance on health issues.
- To get online medical facilities.

- Avoid problems while unavailability of doctors.
- User can search for doctor's help at any point of time.
- User can talk about their illness and get instant diagnosis.
- Informs the user about the type of disease or disorder it feels.
- Doctors get more clients online.

The project work has a wide scope, as it is not intended to a particular organization. This project is going to develop generic software, which can be applied by any business's organization. Moreover, it provides facility to its users. Also the software is going to provide a huge amount of summary data.

Hypothesis

Everyone is a patient at some time or another, and we all want good medical care. We assume that doctors are all medical experts and that there is good research behind all their decisions. However, that cannot always be the case. Nevertheless, they cannot possibly commit to memory all the knowledge they need for every situation, and they probably do not have it readily available. Disadvantage of an existing system would be that the patients have to visit the doctor in person and still does not get proper treatment, as the doctors are unable to predict exact disease.

- To overcome the drawback of existing system we have developed health prediction system. This system not only simplifies task of the doctors but also helps the patients by providing necessary help at an earliest stage possible.

IV. METHODS AND MATERIAL

- Existing system- Everyone is a patient at some time or another, and we all want good medical care. We assume that doctors are all medical experts and that there is good research behind all their decisions. However , that cannot always be the case. Nevertheless, they cannot possibly commit to memory all the knowledge they need for every situation, and they probably do noy have it readily available.

Even if they did have access to the massive amounts of data needed to compare treatment outcomes for all the disease they encounter, they would still need time and expertise to analyse that information and integrate it with the patient's own medical profile. But this kind of in-depth research and statistical analysis is beyond the scope of a physician's work. They want a doctor who will talk to them, listen to what they say and give them advice about how to get better and protect their health in the future. In many cases, the wish for a prescription is secondary to the wish of being cared for.

Disadvantage of an existing system would be that the patients have to visit the doctor in person and still does not get proper treatment, as the doctors are unable to predict the exact disease. Human error can be avoided with the help of computer assisted quality decision making. It is poor when there are huge amounts of data to be classified. In addition, efficiency and accuracy of decisions will decrease when humans are put into stress and immense work. Imagine a doctor who has to examine five patient records; he or she will go through them with ease. However if the number of records increases with a time constraint, it is almost certain that the accuracy with which the doctor delivers the results will not be as high as the ones obtained when he had only five records to be analysed.

V. RESEARCH METHODOLOGY

We have studied disease of many areas such as:

LUNGS:

DISEASES	SYMPTOMS
Idiopathic Pulmonary fibrosis (a disease in which tissues in your lungs	Shortness of breath, A dry, hacking cough,Rapid breathing,Gradual,

becomes thick and stiff or scarred overtime).	unintended weight loss,Tiredness, Clubbing, which is the widening and rounding of thetips of the fingers or toes.
Influenza(flu)	Fever, Dry persistent, Cough, Fatigue and weakness, Nasal congestion, Sore throat
Lung cancer	A cough that does not go away or gets worse, Fever. Chest pain, Hoarseness, Weight loss and loss of pressure, Coughing up blood or rust-coloured spit
Pertussis(whooping cough)	Runny nose, Nasal congestion, Red, watery eyes, Fever Cough

CHEST:

DISEASES	SYMPTOMS
Heart attack	Chest pain, Sweating, Pressure Fullness or tightness in your chest, Crushing or searing pain radiating to your back, neck, jaws, shoulders and arms particularly left arms. Shortness of breath, Dizziness or weakness, Nausea or vomiting

LIVER:

DISEASE	SYMPTOMS
Acute liver failure	Yellowish of your skin and eye balls(jaundice), Pain in your upper right abdomen, Abdominal swelling, Nausea,Vomiting, A general sense of felling unwell (malaise), Disorientation and confusion. Sleepiness.
Cirrhosis	Loss of appetite, Lack of energy which may be debilitating, Weight loss or sudden weight gain. Bruises, Yellowing of skin or the whites of eyes (jaundice), Itchy skin, Fluid retention (edema) and swelling in the ankles,legs and abdomen, A brownish and orange tint of the wine light coloredstools, Confusion disorientation, personality changes. Blood in the stool, Fever.
Non-alcoholic fatty disease	Fatique. Pain in upper right abdomen. Weight loss.
Alagille syndrome	Jaundice

VI. SAMPLING TECHNIQUE

1. Naïve Bayes algorithm

Naïve bayes algorithm is a classification algorithm based on Bayes' theorems use in predictive modelling and this algorithm uses Bayesian techniques. This algorithm is less computationally intense then other and therefore is useful for quickly generating mining models to discover relationships between input columns and predictable columns.

Data required for naïve bayes models

Requirements for a Native Bayes model

1. A single key column – Each model must contain one numeric or text column that uniquely identifies each record. Compound keys are not allowed.
2. Input columns – In a Naive Bayes model, all columns must be either discrete or discretized columns it is also important to ensure that the input attributes are independent of each other.
3. At least one predictable column- The predictable attribute must contain discrete or discretized values. The values of the predictable column can be treated as inputs.
4. Viewing the model- To explore the model we can use the Microsoft Naïve Bayes Viewer. The viewer shows you how the input attributes related.
5. Making predictions- After the model has been trained, the results are stored as a set of patterns, which we use to make predictions.

We can create queries to return predictions about how new data relates to the predictable attribute.

VII. RESULT AND DISCUSSION

- Patient Registration – If Patient is a new user, he will enter his personal details, he will get a user Id, and password through which he can login to the system.
- Patient Login – Patient Login to the system using his ID and Password.
- Disease Prediction – Patient will specify the symptoms caused due to his illness. The system will ask certain symptoms regarding his illness and then predict the disease based on the symptoms specified by patient
- Search Doctor – Patient can search for doctor when the disease is predicted by the system which will provide him with the address of any nearby doctor.
- Get Appointment – Patient will choose an appointment date for the selected doctor.

VIII. FUTURE SCOPE

Concealed learning will be extracted from the verifiable information in the proposed framework, by getting ready datasets by applying apriori calculation. Anticipating savvy wellbeing should be possible just if framework reacts that way. These datasets will be contrasted and the approaching questions and the last report will be produced utilizing Association Rue Mining. Since this proposed system will chip away at genuine chronicled information, it will give exact and productive outcomes, which will enable patients, to get the conclusion in a split second. More work should be possible later on by utilizing more informational index identified with heart sickness and by utilizing diverse information decrease techniques to improve the characterization.

For better precision and expectation of heart sicknesses the datasets that will be used must be quality organized and free from special cases, inconsistencies, and missing characteristics. This web application can be additionally upgraded in an Android application. This will be accessible to clients on versatile premise and its utilization can be additionally expanded. Likewise, highlight like getting the specialist online on a visit with the goal that patients can straightforwardly converse with the concerned specialists. The modules doing malignant growth examination can be coordinated to discover how close the individual related with disease is. This will make this web application unsurprising in obvious sense.

This web application can be further enhanced in an android app. This will be available to users on mobile basis and its use can be further increased. Also, feature like getting the doctor online on chat so that patients can directly talk to the concerned doctors. The modules doing cancer analysis can be integrated to find how close the person associated with cancer is.

IX. CONCLUSIONS

- Data mining can be beneficial in the field of medical domain. However privacy, security and unable to log into account are the big problems if they are not addressed and resolved properly. It describes about the proposal of hybrid data mining model to extract classification knowledge for aid of various disease in clinical decision system and presents a framework of the tool various tools used for analysis.
- Sometimes the situation occurs when you need the doctor's help immediately, but they are not available due to some reason. In our project , we have designed a health prediction system, which is an online system and various patients from any location can view it. Our system comprises of main components such as patient login, enter symptoms in the system, and prescribe medicines, suggested nearby doctor. The application takes the input of various symptoms from the patient, does the analysis of the entered symptoms, and gives appropriate disease prediction. Our system allows the users to get analysis on the symptoms they give for predicting the disease they are suffering from. Sometimes the situation occurs when you need the doctor's help immediately, but they are not available due to some reason. Thus , it allows the users to get analysis on the symptoms they give for predicting the disease they are suffering from.
- Data mining can be helpful in the field of restorative space. Anyway protection , security and unfit to sign into the record are the hugs issues on the off chance that they are not tended to and settled appropriately. It portrays the proposition of a crossover information mining model to separate arrangements learning for the guide of different maladies in the clinical choice framework and presents a structure of the apparatus different devices utilized for investigation. Now and again the circumstance happens when you need the specialist's assistance promptly, however they are not accessible because of some reason. In our venture, we have planned another wellbeing forecast framework, which is an online framework and different patients from any areas can see it.
- Our framework involves fundamental parts , for example, patient login, enter side effects in the system and recommend medications, proposes an adjacent specialist. The application takes the contribution of different manifestations from the patient, does the examination of the entered side effects and gives fitting sickness expectation. Out framework enables the clients to get an examination of the indications they give for anticipating the malady they are experiencing. Some of the time the circumstance happens when you need the specialist's assistance quickly, yet they are not accessible because of some reason. Along these lines, it enables the clients to get an examination of the side effects they give for anticipating the infection they are experiencing.

X. LIMITATIONS OF THE STUDY

- Supports the use of predictive model markup language(PMML) to create mining models.
- Supports drill through.
- Does not support the creation of data mining dimensions.
- Supports the use of OLAP mining models.

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Critical Analysis on Algorithm Visualization

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ABSTRACT

Over the years we've observed that algorithms even tough being acomplex subject are the foundation of computational thinking andprogrammingskillsofastudent.So to ease up the hardships of students this idea of the project wasformed. Our application Algorithm Visualizer is both interactive andalluringtostudents.Itgivesthestudentshandsonexperienceofthealgorithms' implementation. It feeds into their imagination to helpthem get a better understanding while also helping teachers to helpmaketheirstudents understandbetter.Through this project every student can learn at their own pace withour three speeds of learning: slow, average and fast. This interface isdesignedtomakeonefeelfullyengagedandconcentrated.Theconcept of Time Complexity has also been introduced to the userthroughaninteractivegame.Wehavemade useofReact.jsasframeworkandJavaScriptasprimarylanguageforourproject.Thepurposeofthisprojectistomakelearning less of a burden and more of an incredible experience whichleavesstudy.

Keywords: different searching, sorting algorithms, visualizations, algorithm's operations.

I. INTRODUCTION

keep When we talk about complex subject topics like Algorithms, itbecome necessary for students to have a strong grip over the topic asit would form the foundation of their computational thinking andprogrammingskills. We have observed that through conventional methods of teaching itbecomes a little difficult for students to understand the concept and for teachers to explain their thoughts. Motivated by the age-oldsaying,"apicturespeaksmorethanthousandwords",manyresearchersandeducatorsassumethatstudentswould learnanalgorithm faster and more thoroughly using algorithm visualizationtechniques. So, we developed a method of learning through visualization andhand-on experience over different searching and sorting algorithmswhich is bound to help the students and teachers. Good visualizationsbringalgorithmstolifebygraphicallyrepresentingtheirvariousstatesandanimatingthetransitionsbetweenthosestates,especiallydynamic algorithm visualization which shows a continuous, movielikepresentation of an algorithm's operations. Visualization allows thehumanvisualsystemtoextendhumanintellect;wecan useittobetterunderstand these important conceptual processes, other things, too.Also,weknowthemorewedothingsourselves and engage the more we tend to learn about a particulartopic.

Thus,engaginginvariousgamelikeactivitiescansurelyhelptheusers get aholdonthetopics.

II. METHODOLOGY

Architectural Design Our project comprises of 3 pages

1. Welcomepage
2. Path finding Algorithm
3. SortingAlgorithm

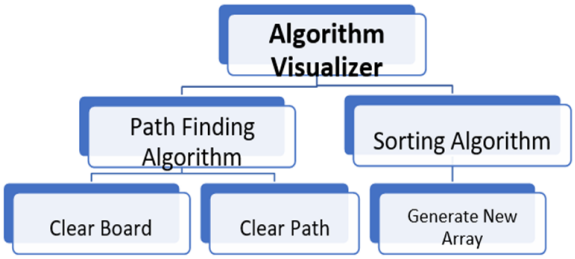


Figure:1 flowchartrepresentstheoverallarchitectureofourapplication

welcomepage:

1. Path-finding Algorithm
2. SortingAlgorithm

Path-findingAlgorithm

Thenavbarofpath-findingalgorithmconsistsofthefollowingoptions:-

Algorithms Wehaveincluded:

a) Dijkstra'sAlgorithmA*SearchGreedyBest-FirstSearchSwarmAlgorithmDepthFirstSearchBreadthFirstSearchThealgorithmspresent in the navbar are chosen on the basis of their popularity anddifficultylevel.Studentsfinditdifficulttounderstandthesealgorithmstheoretically. When they will see the visualization of these algorithmsthen they will be able to understand it better. User will be able todifferentiatebetweenthefunctionalitiesofdifferentalgorithmsonthebasis of timecomplexityafterthevisualizationisover.

b) Mazes and Patterns Maze and patterns are included to ensurebetter and clear understanding of algorithms. As there will be walls orobstruction between the starting node and the goal node, user canrelate the visualization with real world like situation. Also, user will beable to figure out which algorithm is better based on algorithm timecomplexity.Especiallyforuserslookingforaplayfuloptionforunderstanding these complex topicsthese fun filled options can turnouttobetheappropriateway.

c) Speed The project contains speed bar for maintaining the speed ofvisualization, this feature is included because everyone has a differentlearning rate so the user can vary the speed of visualization accordingto his/her choice. Designing Grid structure will be used to representeach node. Computer generated starting and ending node willbedisplayedinitially.Usercanchangethepositionsofstartandendnodeaccording to his/her will. Structure of Mazes & pattern can also bechangedaccordingtouser'swill(i.e.,patternofaddditionofnewwalls).

1) SortingAlgorithm

The navbar of sorting algorithm consists of the following options:-

a) Generate new array It will generate a new random array. Everytimeweclickonthis tabit will generate newrandom array.Arrayelementswillbe displayedinthe formof barswiththe height ofeachbar proportional to the numerical value it is representing. Whilesorting different coloured bars would be used to represent thesorted, unsorted and currently sorting numerical values from thearrayofinputnumbers.

b) Change array size and sorting speed A slider will be provided sothat user can change the size of array and accordingly the speed ofsorting will vary. Size of array will be directly proportional to thesorting speed i.e. (larger the

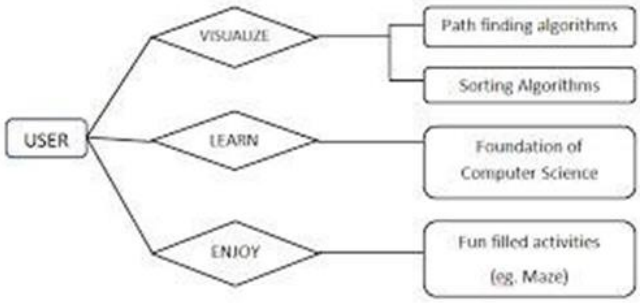
speed of array greater will be the speedof sorting). As, mentioned earlier this feature has been implementedto ensureusersare abletolearnattheirownpacewithout anyhaste.

c) Algorithms Merge SortQuickSort Heap SortBubbleSort

Usercanpickanyalgorithmfromtheabovelistofavailable algorithms. Algorithms are chosen on the basis of their popularity andimportanceaccordingtotheexistingcurriculum.DesigningForpropervisualization we have used different colours to differentiate betweenthesortedbarsandunsortedbarsandevenforbars whicharecurrently in the process of comparison and sorting. After sorting thecoloursofbarswillchangetosamecolourwhichwillbe differentfrominitialcoloursofarrayandarrayelementswillbearrangeinascendingorder.

III. MODELING AND ANALYSIS

OurimplementationoftheprojectisbasedonthebelowER (entityrelationship)modelAs we are able to see from the above model that the centre of attraction of ourapplicationistheuserthus,weneedtoensuregreatuser experience(UX)whichwould enhance the overall impact of our application. Since we did not havemuchcomplexrelationshipstomanageinourapplication wedecidedtoimplementourappusingsomelightweight frameworksandscriptinglanguages.Thus,JavaScript as hebaselanguagewasanobviouschoiceowingtoitslightweightnatureandwidevarietyoframeworkoptions.Wethenwentthroughmostofthepopular JavaScriptframeworks.Wetestedeachofthemby trying to implement a sample page and came to a unanimous decision thatReact.js was the best choice due to its features like reusability, easy testing anddebugging, and component based approach. Now, the only thing left was todecide how to structure our application to maximize its effectiveness. For thiswe analysed a few existing designs over the internet and we finally decided onanarchitecture whichhasalreadybeenexplainedinthemethodologysection.



As we are able to see from the above model that the centre of attraction of ourapplicationistheuserthus,weneedtoensuregreatuser experience(UX)whichwould enhance the overall impact of our application. Since we did not havemuchcomplexrelationshipstomanageinourapplication wedecidedtoimplementourappusingsomelightweight frameworksandscriptinglanguages.Thus, Java as the base language was an obvious choice owing to its lightweightnature and wide variety of framework options. We then went through most ofthepopularJavaframeworks.Wetestedeachofthem bytryingtoimplementasamplepageandcametoaunanimousdecisionthatForthisweanalysedafewexisting designs over the internet and we finally decided on an architecturewhichhas alreadybeenexplainedin themethodologysection.

IV. RESULTS AND DISCUSSION

Throughasurveyconductedbyusweinferredthat60%ofthestudentsresponded better to understanding concepts through visualization rather thantheir own imagination or the regular teaching methods. It's been proved timeand again through different experiments and research on masses that any kindof visual aid such as an image, a video or even an animation clip tends to beremeberedmorebyhumans.

Not only will the visualization help but due to features of mazes and patterns inourapplication,thestudentscanrelatetheworkingofthealgorithmstoreallifeexamples (like obstructions in

the form of walls). Often, we see teachersstruggling to make students understand concepts such as algorithms without itgettingmonotonous,that'swhereourprojectcomesinto playasagreatteaching aid. Because of our user-friendly and engaging interface, the problemofdistractionorlosinginteresttendstodecrease, makingitveryefficient.
Ourworkcaneasilybeincorporatedalongsideoureducati onsystembypromotingdifferentwaysoflearningrathert hantheage-
oldblackboardmethodaswejustneedtoaccessawebsiteh ostedontheinternettousetheapplication.Andwithuncer taintimeslikenowadays,wecannotonlyaffordtobedepen dentonly on our teachers and one to one offline teaching to understand differentconcepts. E-learning is a new age learning technique, and our project is a steptowardsreinforcingthismethodoflearning.

V. CONCLUSION

In a nutshell, we identifies some issues by experiencing them ourselves in thepresent learning strategies in use and we tried to help better the scenario foraspiringstudents inthis domainthroughorprogressivewebapplication.When we ourselves were learning the subject of algorithms in our curriculum,wefounditabitdifficulttorelateandunderstand thepracticalimplementationofthealgorithmsowingto thedifficultyincommunicationoftheconceptsfromthet eacherstothestudents.Wefoundthattherewerenoproper meansthat the teachers could adopt to portray their ideas in a better and easy manner infrontofthestudents.So, we built an application which could help in the following ways:- It has beenfound that it becomes easier for humans to retain the concepts when learntthroughvisualsthanjusttextualorspeechexplanati ons.Applicationisextremely user friendly so people of any age can engage and start learning newthings rightaway.The application would also include various fun filled activities like visualizationthrough mazes and patterns. This application will also include a parameter oftime complexity which will be displayed after the particular sorting algorithmhas completedits executionforbettercomparison.Almostallthefamousan dimportantalgorithmswillbepresentintheapplicationfo rvisualizationwithbothpath-
findingandsortingalgorithmspresent in same application, thus making it a one stop destination for thestudents ofthisdomain.

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Firewall Protection from Third Party Application

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ABSTRACT

Few businesses would choose to operate without a series of locks, alarms and security cameras to protect their premises and inventory from intrusions and theft. Protecting your computer systems is equally important, to prevent malicious users from disrupting your operations or -- even worse -- stealing your private data or intellectual property. One of the key tools used for computer security is a firewall, and few companies can afford to operate without one.A firewall is a vital piece of your business's defence against electronic threats. Serving as a gatekeeper between your company's servers and the outside world, a properly maintained firewall will not only keep external threats out, but it can also alert you to more subtle problems by intercepting outgoing data as well. Paired with a well-maintained anti-malware suite, a firewall can save your business from spending time and money dealing with virus infections or hacker attacks. A firewall is a piece of software that stands between a computer or network and the Internet. Connecting a computer directly to the global network is like leaving your front door open, allowing outsiders free access to your system. Any request will pass through to vulnerable systems, allowing unscrupulous third parties to exploit your computers for their own gain. A firewall serves to block these unauthorized requests, passing through only designated traffic.

Keywords: Firewall, alarms and security, electronics threats, global network

I. INTRODUCTION

Basically, a firewall is a barrier to keep destructive forces away from your property. In fact, that's why it's called a firewall. Its job is similar to a physical firewall that keeps a fire from spreading from one area to the next. Firewall technology emerged in the late 1980s when the Internet was a fairly new technology in terms of its global use and connectivity. A network's firewall builds a bridge between an internal network that is assumed to be secure and trusted, and another network, usually an external network, such as the Internet, that is not assumed to be secure and trusted.A firewall can either be software-based (ex: AVG-Zone Alert- ISA –TMG) orhardware-based (ex: Cisco-JUNIPER) and is used to help keep a networksecure. Its primary objective is to control the incoming and outgoing networktraffic by analyzing the data packets and determining whether it should beallowed through or not, based on a predetermined rule set. Many personal computer operating systems include software-based firewalls toprotect against threats from the public Internet.

Today's networks change and develop on a regular basis to adapt to new businesssituations, such as re-organisations, acquisitions, outsourcing, mergers, joint ventures, and strategic partnerships, and the increasing degree to which internal networks

areconnected to the Internet. The increased complexity and openness of the networkthus caused makes the question of security more complicated than hitherto, andnecessitates the development of sophisticated security technologies at the interfacebetween networks of different security domains, such as between Intranet andInternet or Extranet. The best way of ensuring interface security is the use of afirewall.

A Firewall is a computer, router or other communication device that filters access tothe protected network.Cheswick and Bellovin define a firewall as acollection of components or a system that is placed between two networks andpossesses the following properties.

1 All traffic from inside to outside, and vice-versa, must pass through it.
2 Only authorized traffic, as defined by the local security policy, is allowed to passthrough it.
3 The firewall itself is immune to penetration.

Figure:1 Inside and outside filter Demilitarized

Such traditional network firewalls prevent unauthorised access and attacks byprotecting the points of entry into the network. As Figure 1 shows, a firewall mayconsist of a variety of components including host (called bastion host), router filters(or screens), and services. A gateway is a machine or set of machines that providesrelay services complementing the filters. Another term illustrated in the figure is"demilitarised zone or DMZ". This is an area or sub-network between the insideand outside networks that is partially protected. One or more gateway machines maybe located in the DMZ. Exemplifying a traditional security concept, defence-in-depth, the outside filter protects the gateway from attack, while the inside gatewayguards against the consequences of a compromised gateway. Depending onthe situation of the network concerned, there may be multiple firewalls, multipleinternal networks, VPNs, Extranets and perimeter networks. There may also be avariety of connection types, such as TCP and UDP, audio or video streaming, anddownloading of applets. Different types of firewall configuration with extensivepractical guides can be found in. There are also many firewall products on themarket from different vendors. See for an updated list of products and vendors.

II. BACKGROUND

Firewall technology emerged in the late 1980s when the Internet was a fairlynew technology in terms of its global use and connectivity. A network's firewallbuilds a bridge between an internal network that is assumed to be secure andtrusted, and another network, usually an external network, such as the Internet,that is not assumed to be secure andtrusted.

Significance of the study

A firewall is a security device — computer hardware or software — that can help protect your network by filtering traffic and blocking outsiders from gaining unauthorized access to the private data on your computer. Not only does a firewall block unwanted traffic, it can also help block malicious software from infecting your computer. Firewalls can provide different levels of protection. The key is determining how much protection you need.

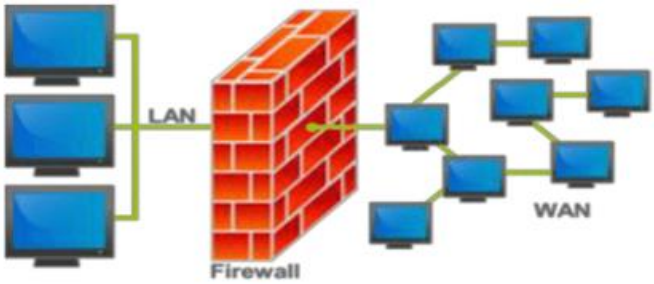


Figure:2 Firewall security network

The topics below can help you learn what firewalls do and determine the level of protection that will help keep your computer and the data on it safe and secure.A firewall acts as a gatekeeper. It monitors attempts to gain access to your operating system and blocks unwanted traffic or unrecognized sources.How does it do this? A firewall acts as a barrier or filter between your computer and another network such as the internet. You could think of a firewall as a traffic controller. It helps to protect your network and information by managing your network traffic. This includes blocking unsolicited incoming network traffic and validating access by assessing network traffic for anything malicious like hackers and malware.

Your operating system and your security software usually come with a pre-installed firewall. It's a good idea to make sure those features are turned on. Also, check your security settings to be sure they are configured to run updates automatically.

Research Methodology

There are certain methods through which firewalls can be implemented. These are as follows:

Static packet filtering – Packet filtering is a firewall technique used to control access on the basis of source IP address, destination IP address, source port number, and destination port number. It works on layers 3 and 4 of the OSI model. Also, an ACL doesn't maintain the state of the session. A router with ACL applied to it is an example of static packet filtering.

Advantages :

1. If the administrator has a good knowledge of the network, it is easy to implement.
2. It can be configured on almost all routers.
3. It has minimal effect on network performance.
4. The large amount of ACLs is difficult to maintain.
5. ACLs use the IP address for filtering. If someone spoofs the same source IP address then that will be allowed by ACL.

Stateful packet filtering

In stateful packet filtering, the state of the sessions is maintained i.e. when a session is initiated within a trusted network, it's the source and destination IP address, source, and destination ports, and other layer information are recorded. By default, all the traffic from an untrusted network is denied.

The replies of this session will be allowed only when the IP addresses (source and destination IP address) and port numbers (source and destination) are swapped.

Advantages

1. Dynamic in nature as compared to static packet filtering.
2. Not susceptible to IP spoofing.
3. Can be implemented on routers.
4. Might not be able to prevent application-layer attacks.
5. Some applications open dynamic ports on the server-side, if the firewall is analyzing this, it can cause application failure. This is where application inspection comes into use.

Proxy firewalls

These are also known as application-layer firewalls. A proxy firewall acts as an intermediary between the original client and the server. No direct connection takes place between the original client and the server.

The client, who has to establish a connection directly to the server to communicate with it, now has to establish a connection with the proxy server. The proxy server then establishes a connection with the server on the behalf of the client. Now, the client sends the data to the proxy server and the proxy server forwards it to the server. A proxy server can operate up to layer 7 (application layer).

Advantage

- Difficult to attack a server as a proxy server is an intermediate between the client and the server.

- Can provide detailed logging.
- Can be implemented on common hardware.
- Processor intensive
- Memory and disk intensive
- Single point of failure in network security

Application inspection –

These can analyze the packet up to layer 7 (deep inspection) but can't act as a proxy server. These can deeply analyze conversations between a client and server even when the server is assigning a dynamic port to the client therefore it doesn't fail in these cases (which can occur in a stateful firewall).

Advantages

- Can analyze deeper into the conversation between the server and the client.
- If there is a protocol anomaly happening from standard then it can deny the packets.

Transparent firewall

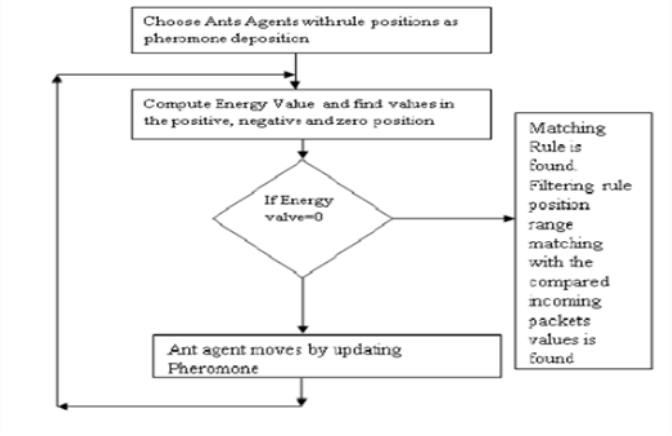
By default, the firewall operates at layer 3 but the benefit of using a transparent firewall is that it can operate at layer 2. It has 2 interfaces that will act as a bridge so can be configured through a single management IP address. Also, users accessing the network will not even know that a firewall exists.

The main advantage of using a transparent firewall is that we don't need to re-address our networks while putting up a firewall in our network. Also, while operating at layer 2, it can still perform functions like building a stateful database, application inspection, etc.

III. SAMPLING TECHNIQUE

Ant Colony Optimization (APO) technique for filtering theincoming packets in a network by matching the rules inrule set. The matching rule picked up from the rule set isdetermined by the ant agent. The attractiveness of the antagent is denoted by its energy value.

The following figureshows the model of the Ant system



The fields in the IP header of the incoming packet arecompared for match with the filtering rules in detectionunit. Initial sets of ants have pheromone depositionrepresenting the positions of filtering rule in the rule set.The comparison field of the rule denoted by thepheromone deposition of the ant agent is compared withthe corresponding field of the incoming packet. This antsystem with the help of pheromone deposition and tabu-listbrings in a solution.

Ant Colony Optimization PacketFiltering Algorithm (ACO-PF) filters the packet accordingto filtering rules in the rule set. The ant agent deposits thepheromone and searches for a rule in the rule set. Thepheromone deposition is a number denoting the position ofthe filtering rule in the rule set to be compared withincoming packet field value. The strength of attractivenessof the ant agent towards the solution is denoted by itsenergy value.

If the comparison field value of the filteringrule in the rule set is less than the value of the incomingpacket field, +1 is assigned as the energy value of the antagent and pheromone deposition of the ant agent is storedin the positive position of the tabu-list. The energy value is-1 if the comparison field value is greater than theincoming packet value and the pheromone deposition ofthe ant agent is stored in the negative position of the tabulist . The energy value is zero if both the fields are equaland pheromone deposition of the ant agent is stored in thezero

position of the tabu-list. Below shows themathematical equation in finding the energy values:If Ai is the ant agent and C(Fij) be the comparison fieldvalue of the jth filtering rule in the rule set of the ith antagent.

i=1, 2 ,…… no of ant agents.

j=1, 2, …… total no. of filtering rules

C(P) denotes the incoming packet value

The energy value is computed as follows:-Energy (Ai) = +1, C(P) > C(Fij) Positive position = j ,Energy (Ai) = 0, C(P) = C(Fij) Zero position = j

Energy (Ai) = -1, C(P) < C(Fij) Negative position = j

The paper has discussed two case studies. Case study 1 isdiscussed for real example where rules are defined in arule set for a network address detection unit. The numericequivalent of the network address is stored in the rule set.

Filtering rules in the rule set behaves in such a way that theincoming packets from the network address and thedestination port is only accepted. Case study 2 is discussedfor multidimensional filters where the packets from agiven source address and source port is rejected except foronly one destination address and destination port.

No	Source Port	Destination Port	Status
1	20	1052	Drop
2	20	1104	Drop
3	20	1106	Drop
4	1028	80	Drop
5	1050	25	Drop
6	1098	12345	Drop

Table 1 above shows the filtering rules in the rule set in asource port detection unit to either accept or drop theincoming packets based on source port of destination port.

The computational complexity of the system is derived asin n where n is the number of filtering rule in the rule set.

IV. TOOLS AND TECHNIQUES

Now we have chosen the building blocks of our firewall system. Now the time has come to configure the security rules onto a network system.Command-line interface (CLI) and graphic user interface (GUI) are used to configure firewall software. **For Example**, Cisco products support both kinds of configuration methods. Nowadays in most networks, the Security device manager (SDM) which is also a product of Cisco is used to configure routers, Firewalls, and VPN attributes. To implement a firewall system an efficient administration is very essential to run the process smoothly. The people managing the security system must be masters in their work as there is no scope for human error.

Any type of configuration errors should be avoided. Whenever configuration updates will be done, the administrator must examine and double-check the whole process so that leaving no scope for loopholes and hackers to attack it. The administrator should use a software tool to examine the alterations done.

Any major configuration changes in firewall systems can't be directly applied to the ongoing big networks as if failed can lead to a big loss to the network and directly allowing unwanted traffic to enter the system. Thus firstly it should be performed in the lab and examine the outcomes if the results are found ok then we can implement the changes in the live network.

V. CONCLUSION

A firewall is a crucial component of securing your network and is designed to address the issues of data integrity or traffic authentication (via stateful packet inspection) and confidentiality of your internal network (via NAT). Your network gains these benefits from a firewall by receiving all transmitted traffic through the firewall. Your network gains these benefits from a firewall by receiving all transmitted traffic through the firewall. The importance of

including a firewall in your security strategy is apparent; however, firewalls do have the few limitations like wise A firewall cannot prevent users or attackers with modems from dialing in to or out of the internal network, thus bypassing the firewall and its protection completely. Firewalls cannot enforce your password policy or prevent misuse of passwords. Your password policy is crucial in this area because it outlines acceptable conduct and sets the ramifications of noncompliance.

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Healthcare Monitoring System Using Li-Fi Technology

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ABSTRACT

Consistent checking of patient's ailment in emergency clinic is either manual or Wi- Fi based framework. Wi-Fibased framework is became slow in speed because of dramatically expanded adaptability. In this situation, Li-Fi finds theplaces wherever Wi-Fi is relevant with extra elements of high velocity information organization. Aside from the speed factor,Li-Fi is more reasonable in clinic application for checking the licenses'conditions without recurrence impedance with humanbody. This paper proposes a use of Li-Fi network in medical clinic for checking thepatients' circumstances, for example,temperature,pressure,heartbeat,glucoselevelandrespiratorycircumstancesbyutilizingseparatesensors.Thegatheredinformationfromthesensorsiscommunicatedtothesinkandfurther theseinformationarehandledutilizingmicrocontroller and shipped off show unit as diagrams or charts.Based on the idea of noticeable light correspondence, a modelis worked with the PIC microcontroller and essential sensorsas peripherals and tried it's working. Hence the use of Li-Fi as awellbeingobserving framework showed tentatively.

Keywords—Medicalserviceschecking,Drovelight,clinicalgear,patientcondition,NoticeableLightCorrespondences

I. INTRODUCTION

Li-Fi, called Light Devotion, is a progressive answer for rapid information organization, proposed by a German physicistHarold Haas. Li-Finetworks support the transmission of information through enlightenment of Driven bulb, consequentlyit is likewise named as noticeable light correspondences (VLC).In theepoch of web, there is a nonstop desire for quicker,secure and solid wire- remote availability in all fields, while remote organizations are morepreferable in all homegrownapplication overall and medical care application specifically. The justification for depending over remote organizationinhospital is the links which are running over the patient's body interconnecting the gadgets might cause pollution.Reliance on wirelessinternet expands the weight on Wi-Fi innovation which, thusly, encourages a tremendous interest fordatatransmissionandradiorange[1].Todecreasethelo adonWi-Fi,asubstitutemeanofremotewebisLi-Fifindswhichfinds its applications in pretty much everyfield, even in vehicle innovation TableIshowstheexaminationofWi-FiandLi-Fiinviewofdifferentparameters.Forquiteawhile,clinical innovationhasfalledbehindtherest.Theextensionforremotecorrespondenceintheclinicalfieldissetontherise,therearenumerousgadgetswhichworkonWi-

Fi,forexample,implantationsiphons,defibrillators,lung ventilatorsandsedationmachine.Atthepointwhenaspecialistissupposedtoutilize X-rayscannersalongsideimbuementsiphons,whichworkonWi-Fithereresultsarecurrencecoveringissue.Withmoreandmorenumberofremoteclinicalgadgetscomingup,usingtheRFrangeincrementswhichdrivesanelectromagneticimpedancethatresultsinpossiblyperilousoccasionsconnected with clinical hardware activities . Aside from the impedance with clinical hardware, an electromagneticimpedanceinfluenceshumanbodylikewiseasillnesses,invulnerablebrokenness,EMtouchinessandsoonandinmostpessimisticscenario,itmightleadtocancer.OnemoreimpedimentofWi-Fiinclinicframeworkisitssecurityissue.Patient data should be private and get yet stay open toauthorized people. Clinics are spots where both EMI awareness andsecurityof clinical subtleties areissues with the purposesofWi-Fi.TocombattheaboveimpedimentsofWi-Fiinwellbeingcheckingframework,Li-Fiisutilized,whichisacleverinnovation forhighthickness remoteinformationcoveragerelieving radioobstructionsinbound regions

VLC has distinct extension in numerous areas like Savvy Stores, Customer Hardware, Safeguard and Security, Vehicleand Transportation, Flying,Emergency clinic, Submerged Correspondence and Unsafe Climate and it has spread acrossthelocales ofAmerica, EuropeandAsia-pacific.The VLCmarketissupposedtodevelopfromUSD327.8Millionoutof2015toUSD8,502.1Millionby2020,ataCAGRof91.8%among2015and2020.TheworldwideLi-Fimarketissupposedtoshowdevelopmentatavigoroussp eed somewhere in the range of 2016 and 2023. Monstrous data transmission attributable to the developing RFrange crunch,along with a serious level of safety and energy productivity are supposed to support the worldwide Li-Fi market. Sincetheinnovation includes apparent light frequency and not radio waves, it is doubtful to affect human wellbeing. Specialistsfrequently think aboutLi-Fi to Free Space Optics (FSO) as it additionally uses light to move data[3] however it can't beutilizedin theplaceswhereit is challenging to lay theoptical fiber like medical clinics. Equal working with different EMI gadgets is possible with Li-Fi and is additionally gainful formechanicalmedicalproceduresandcomputerizedstrategies.Duringmedicalprocedure,Li-Fiframeworkalongsidedifferentsensors, is expectedto get quickdirection fromexperts in thetreatmentby sharing information, recordings/live insights concerning the patient for the best outcomes [4].Consequently a Li-Fi based medicalservices observing emergency clinic framework secure patients body from assault of many kinds of sickness, as theopposition force of patientsare extremely low. Not just further developing the patients' wellbeing conditionsbut likewiseinterchanges among the doctors and clinicians. Remoteinnovation with Li-Fi framework empowers clinicians to screenpatients from a distance and give them opportune wellbeing data, updates, and backing [5]. framework secure patientsbodyfromassault of many kinds of sickness, as theopposition force of patientsare extremely low. Not just further developing the patients' wellbeing conditionsbut likewise interchangesamong the doctors and clinicians. Remoteinnovation with Li-Fi framework empowers clinicians to screen patients from adistanceand givethem opportunewellbeing data, updates, andbacking [5].

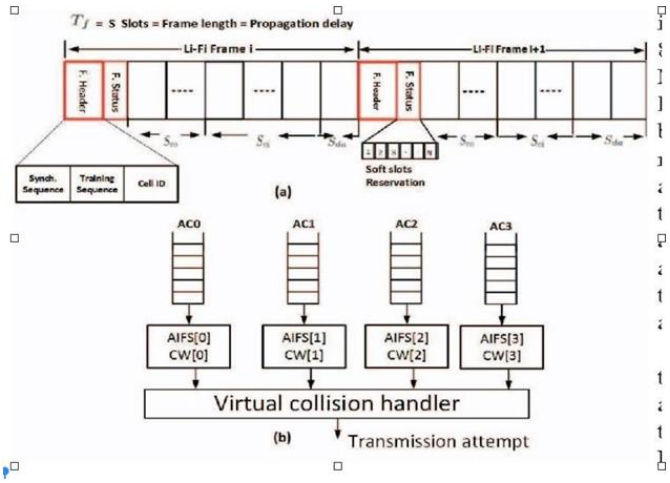
Li-Fiinnovationimprovesclinicalfieldtoahigherlevelandhasplentyofbenefitswhenintroducedandutilizedvaluably. Associationofthispaperisasperthefollowing.Thefundamentaldesignof Li-Fibasedobservingframeworkis introduced in segment II. A short conversationabout the proposed model is introduced in area III which is trailed by theportrayalofdifferentsensorsinsegmentIV.Programmingpartisoutofextentofthispaper.Anywaythedifficultiesaboutthe programming language is presented in area

V. Related use of PMS ismade sense of in area VI and finished up insegment VII followed by the references. Li-Fi innovation improves clinical field to a higher level and has plenty ofbenefits when introduced and utilized valuably. Association of this paper is as per the following. The fundamental designof Li-Fi based observing framework is introduced in segment II. A short conversationabout the proposed model isintroduced in area III which is trailed by the portrayal of different sensors in segment IV. Programming partis out ofextent of this paper. Anyway the difficulties about the programming language is presented in area V. Related use of PMSismadesense of in areaVI and finishedup in segmentVII followed by thereferences.

VLC has distinct extension in numerous areas like Savvy Stores, Customer Hardware, Safeguard and Security, Vehicleand Transportation, Flying,Emergency clinic, Submerged Correspondence and Unsafe Climate and it has spread acrossthelocales ofAmerica, EuropeandAsia-pacific.The VLCmarketissupposedtodevelopfromUSD327.8Millionoutof2015toUSD8,502.1Millionby2020,ataCAGRof 91.8% among 2015 and2020.The worldwide Li-Fi market is supposed to show development at a vigorous speedsomewhere in the range of 2016 and 2023. Monstrous data transmission attributable to the developing RFrange crunch,along with a serious level of safety and energy productivity are supposed to support the worldwide Li-Fi market. Sincetheinnovation includes apparent light frequency and not radio waves, it is doubtful to affect human wellbeing. Specialistsfrequently think aboutLi-Fi to Free Space Optics (FSO) as it additionally uses light to move data[3] however it can't beutilizedin theplaceswhereit is challenging to lay theoptical fiber like medical clinics. Equal working with different EMI gadgets is possible with Li-Fi and is additionally gainful formechanicalmedicalproceduresandcomputerizedstrategies.Duringmedicalprocedure,Li-Fiframeworkalongsidedifferentsensors, is expectedto get quickdirection fromexperts in thetreatmentby sharing information, recordings/live insights concerning the patient for the best outcomes [4].Consequently a Li-Fi basedmedicalservices observing emergency clinic

II. LI-FI FRAMEWORK

The design of a Li-Fi based medical care checking framework is portrayed in Fig. 1. The proposed framework isprofoundly advantageous yet it requirean underlying framework i.e., an implicit lightning foundations in hospitals.All thecurrent bulbsare to be supplanted by Li-Fi viable bulbs andthe wires to move information, in the spine LAN should beadded inside the roof as well as wall. Most recent PDAs are viable for thisinnovation use. I-telephone has high goalcamera worked in with outside streak light. Additionally a Li-Fi legitimate operating system is tracked down in IOS (I-telephoneWorking Framework) 9.1 firmware by Apple Inc. Consequently an I-telephone can be remembered for essentialframework for Li-Fi networks [6].Li- Fi organizations can be utilized as completely computerized framework. TypicallySpecialists and attendants ought to intermittently watch out for patient's wellbeingcondition by taking estimations ofpulse, pulse, mild, breath rate and so on. In this proposed strategy the estimations are made with no human mediation anddifferent patient measurements are likewise recorded (constant wellbeing checking system).Each patient is givenwith atagfortheirrecognizableproofandtoconcentrateontheirpastprescriptionswhichcanbehelpfulontheoffchancethat theyaremovedtoonemoreemergencyclinicorsedatedbyafewdifferentprofessionals[7].Basedontheproposeddesigna model is worked to test theidea of Li-Fi in clinical field.

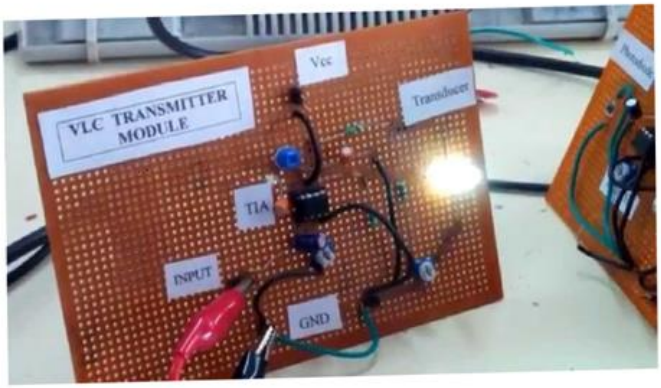


(d) (e)

Fig.1(a)and(b)Frontandbackview(c)Singleantennaevolutionsteps(d)Thevariationsin|S11|associatedwithallsteps(e) Notch Currentdistribution at 3.725GHz frequency of theproposed antenna.

III. DESIGN AND ANALYSIS OF FOUR-ELEMENT ANTENNA

ThefoursingleThemodelcomprisingoftransmitter,beneficiaryanddifferentsensorsiscreated.Theequipmentarrangementof interactingbiomedical sensors withLi-Fi board isdisplayed in Fig.2 and theresult inFig. 3.



IV. APPLICATIONS

- Hospitalsandinstitutions.
- Defence&security.
- Underwatercommunication.
- Servicesprovidedbasedonlocation.
- Patientismonitoredinremoteareasor whiletraviling.
- Mobileconnectivity.
- Smartlighting.
- WiFispectrumrelief.

V. ADVANTAGE

- Itisn'tdestructiveforhumanbody.
- Energyutilizationisexceptionallyless.
- Expansioninsecurity.
- Patientcan beconstantly checkedwithout
- humanconnectionpoint.
- Thisisexceptionallysuccessfulwayforcommunicatingdatatomedicalservicesstaffandmedicalcaresuppliers.
- Nodestructivebeamsthatimpacthumanexistence.
- Minimalexpense.
- Efficient

VI. CONCLUSION

In this paper the primary reason for utilizing this venture is to help a specialistto treat a patient when he is in crisis,through thisproject we can screen a patient for (24*7) that a typicalindividual can't do in the event that a patient is instrange conditionThat's what regulator distinguishes and show message on LCD to thespecialist regardless of whether heis away from patient. So he canpromptly answer for treatment as this innovation isn'tperilous to human wellbeing this isthebenefit of thisproject.

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Rain Water Detector

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ABSTRACT

Peopletodaywastetoomuchwater,andthemajorityofthewaterusedfordrinking comes from agriculture, which results in a significant loss of freshwater. Therefore, it is important to stop this practise or at least reduce it inorder to conserve water. We are building a rain water detector that will enableus to recognise when it is going to rain so that we can get ready to collect therainwater and use it for household purposes. We can utilise rain waterdetectors in a variety of locations, including malls and public spaces, and wecan usethewatertheystoreforcleaning tasks.

Keywords: Reuse, Domesticwork, Agriculture

I. INTRODUCTION

A switching device actuated by rainfall is a rainwater detector. The rain waterdetector'stwo mostcrucialfeaturesare.Thefirstisawater-savinggadgetthat isconnected to a computerised irrigation system and is programmed to cut offwhen it starts to rain. The 2d is a device intended to protect a car's interior fromrain and other elements. When a rain detector detects it, windscreen wipers canbe operated automatically. Rain caused the alarm to go off. An environmentallybeneficial technique to stop irrigation whenever it rains is with a rain detectionalarm. Additionally, customers utilise it in household automation to reclaimtheir possessions and cover windows. In some circumstances, we can collectsomerainwater.

II. REVIEW OF LITERATURE

Arainal arm is a device that will undoubtedly function in accordance with your wishes. The sign will be produced by a machine when it starts to rain. When itrains heavily, the frequency increases, and when it rains lightly, the frequency decreases significantly. The frequency will entirely depend on the amount ofrain. Every moment it starts to rain, the circuit will produce a musical tone.

III. RAIN WATER SENSOR

A rain sensor is a rain switch device that is turned on by a downpour. The rainsensor has two primary purposes. The first is a water-saving device connectedto an automatic irrigation device that causes the device to shut off in the event of rain. These cond device helps the automatic wind display wiper modean disintended to protect a vehicle's interior

from rain. The ability to activate a rainblower on the antenna feed aperture to clear away water droplets is another useful feature of professional satellite TV for computer communications antennas.

IRRAGATIONS ENSOR

Both wireless and hard-wired rain sensors for irrigation systems are available;most use hygroscopic discs, which inflate in the presence of rain and shrinkback down when they dry up. In particular, they may be connected to theirrigation controller's sensor terminals or are set up in collection with thesolenoid value common circuit so that they prevent the opening of any valveswhenrainhasbeendetected.Wi-fiandwiredversionsusesimilarmechanismstotemporaril y droop wateringby usingtheirrigationcontroller.

IV. OBJECTIVE

Theprimarypurpose orpurposeofthemissionare-

1. Waterconservation

Theusageofarainsensorcanhelpyouconservealotofwate r.Yourlawnirrigation system can be set to switch off automatically whenever it rains,savingwaterthatcanbeusedforothercrucialthingsl ikeputtingoutfires.

2. TosaveyoudiseasedamageandNutrientLoss

By preventing your plants' roots from growing deeply into the soil,overwatering makes them more susceptible to disease. As excessive wateringwashesawaythesoil'svitamins, leavingyourfloravulnerableanddangerous,overwaterin gisalsoamajorcause ofnutrientlossin flowers.

3. TosavecashonFertilizer

Youarepreventedfromoverwateringyourlawnandplant sbyarainsensor.The nutrients from the turf wash away into the drainage system when a plant isoverwatered. You must make up for this by fertilising your plants and grassmorefrequently.Thissuggestspurchasingfertilisers atahighercost.Theturfinyour garden will continue to be a truly ideal environment for your plant life inaccordance with the fertiliser that you are using if you have a rain sensor thateffectively stops your garden irrigation machine from overwatering your lawnandvegetation.

4. Togrowththelife-spanofyour IrrigationSystem

Because a rain sensor reduces the amount of time your lawn irrigation isrunning, it protects your lawn irrigation system from needless wear and tear.Thisis especiallyhelpfulduringtherainyseasonwhentherainca ncomeandgo suddenly. 4. To protect you Pollution of Groundwater and WaterwaysInsecticides, motor oil, fertiliser, dog excrement, and sediment runoff are allreducedtoaminimumbyagardenirrigationsystemwit ha rainsensor.

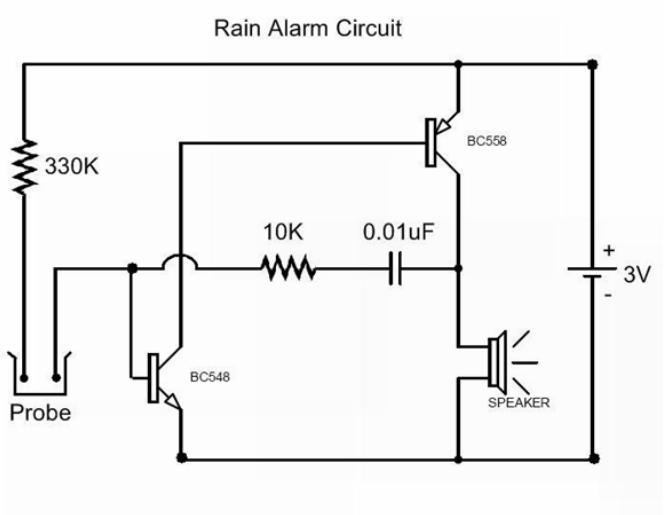
Additionally, itreducestheamountofpesticidesandfertilisersfromyour gardenthat enteryourgroundwatermachine.

V. METHODOLOGY

Because we are becoming increasingly motivated to complete the activity, wewill use any additional means necessary to achieve our goal or produce a result.The first stage of our work, which is typically the theoretical component, can becompleted using the department computer lab. In this case, we have access tothe internet and can obtain the project plan as well as all the pertinent statistics.The branch laboratories will be used to represent our project's second phaseusingthetoolsfromthepaperpaintings.Additionall y,wecould makeuseofthedigitalandelectronicslabs.

VI. EQUIPMENTREQUIRED

This project can be made with high-quality, easily accessible materials that canbe purchased for a reasonable price. Do not overlook the circuit schematic fortherainalarmshownbelow.

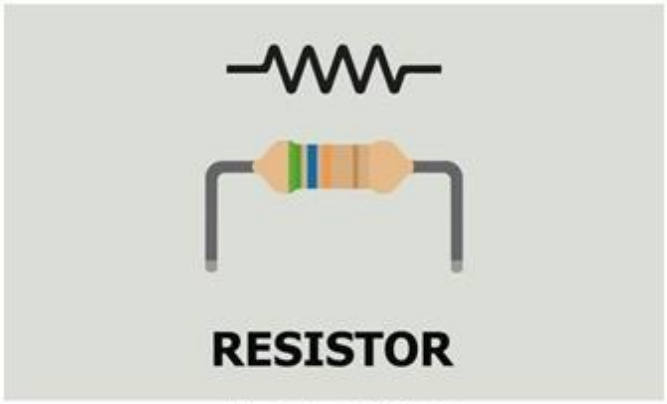


Thematerialsortoolsthatmaybeneededareasshownabov einthecircuitschematicfortherainalarm:1.Resistor:- tworesistorof330kand10k

1. Transistor:- NPNandPNPtransistors,whichhavelowworking voltagesforgreater protection and the lowest cost, are the two types of transistors employedinthistask.

TransistorsoftheBC548and BC558kindsareemployed.

2. capacitor (zero.01mf):-The net charge either plate of the capacitor is equalandoppositetothenetchargestoredina capacitor=zero.
3. Speaker:- ThistoolisusedtomaketouchwiththeprobeandobtainamusicalsoundduringrainBattery(3v):- 3V batteries are small batteries that are capable of providing 3volts of power to a wide variety of small household electronic devices. Theycome in two general form factors, button cell, also called coin cell, and CR2.Theyare generallypoweredbylithiumtechnologyortraditionalalkalinebatterytechnology.
5. Probe:- Ithaslongbeenusedtopredictwhenitwillrain.Itwillcreateavalidonceit switchesthesignto thespeaker.
6. Electricpoweredwires:- Itisfrequentlyusedtoaffixthehardware'scircuitry components.



Resistor

Capacitor

Transistor

Buzzer

VII. CONCLUSION

In general, there was unwavering belief that water is crucial to our survival. Wemay conclude that the project will provide significant benefits for home,commercial,and industrialappliancefteritiscompleted.

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Water –Quality-Analysis of River Mohand-Rao Flowing In the Doon Valley in Lower Hills of Himalayas

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ABSTRACT

The people who rely on the river water needs water quality monitoring for their day to day usages.Herewe take ,a stretch of 15Km from Dat- Mandir to Ganeshpur of the Mohand-Rao river (Doon-Valley) was studied during the year 2019-2020.The impact of seasonal variation on water quality of Doon – Valley is the main concern of study here in this paper. The different water samples were collected during 2019 (Summer and Monsoon) and 2020(Winter). Mohand- Rao river flow through Mohand Anticline in the lower parts of the Shivalik hills in the Doon Valley. In Doon valley ,though the urbanization are fast but low industrial effluent around the study areas as there is less harmful industries are present . The main requirement to analyze the water quality of the stream Mohand-Rao is to check the pollution status, as water quality gives the information about the catchment characteristics such as topography,geology,soil and vegetation. Changes in flow regime an d habitat type, loss of riparian vegetation ,causing major effects on riparian and in – stream habitat and processes are the some of the direct effect ,also increase in sediment transport from the catchments leading to change in water quality .

Keywords: Water-Quality-Monitoring,Mohand-Anticline,Topography

I. INTRODUCTION

The whole human race or living being depends upon the environment for the survivor. Nature and mankind's forms an inseparable part of the life support system. This system has five element air, water , land flora and fauna which are interconnected, inter-related and inter-dependent and have co-evolved and are co-adopted.

Deteriorations in one inevitably affect the other four elements. If the deterioration is for a short term and the life support system had enough resilience, it repairs itself and reverts to the original states.

However if the deteriorations continues, the whole systems including all lives are thrown out of gear. This disturbance of system is called the pollutions; it may be in air, water and land causing air, water and land pollution. The importance of understanding the relationship between man and environment has never been so great as it is realized at present.

In whole world industrial and technological advancement creating the depletion of environmental resources and increasing pollution. Therefore ,the sustainable development is globally recognized as the need of today for not only restoring environmental resources but also sustain life on our planet.

Pollution may be defined as any undesirable changes in physical, chemical or biological characteristics of air, water and soil. The dispersion and movement of pollutant in the biosphere is a complex process and it accumulates within organisms and causing toxic effects.

On our planet 80% of earth surface is water one of the precious natural resource which we humans use in various forms. On our planet earth water is essential for life. Owing to increasing industrialization on one hand and exploding population on the other, the demand of water supply have been increasing tremendously. Moreover considerable part of this limit of water is polluted by sewage,

Assessment of aquatic body involving three main component as, hydrology,physic-chemical and biology. These components are monitored for the accurate assessment of the water quality of an aquatic body.The analysis of water quality of aquatic body on physical,chemical and biological aspects is needed not only for human health but also for the living creaters in the aquatic body.

Due to different human activities such as urbanization and industrialization there is increase in water pollution in ground and surface both.Thence there is the requirement of safe potable drinking water. Various treatment methods are use for the purification of water and to raise the quality of drinking water. Water should be free from various contaminants viz Organic and Inorganic Pollutants,heavy metals,Pesticides and other synthetic chemicals and also all its parameter such as Electrical conductivity, Turbidity, Calcium,Magnesium,Total hardness,pH, Carbonates and bicarbonates,Chloride, alkalinity,Sodium ,Potassium ,Nitrates and Dissolved Oxygen should be within a permissiable limit.

II. DESCRIPTION OF THE STUDY AREA

A. Geology of the study area :

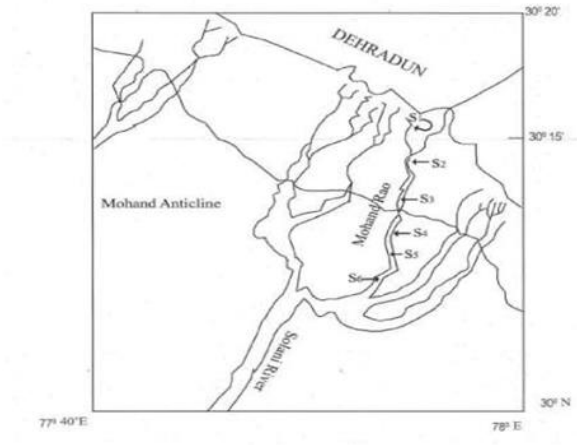
Doon Valley are formed by the tectonic activity that goes on within earth crust in the Himalayan region.The Doon Valley is situated between latitude 30° and 30°32' and longitude 77°43' and 78°24'. It is nearly 75 Km long from North-West to South-West. Region of Dun Valley involves two distinct styles and amplitudes of folding . In the Northern part, the overturned Santaurgarh-anticline with both limbs dipping steep to moderate was developed as fault propagated fold over the Santuargarh-Thrust (ST).

B. Drainage System :

River Yamuna and river Ramganga demarcated the western and Eastern boundaries of the Garhwal Region. Holy Ganga and its tributaries are mainly covered the region of Garhwal and the region western Uttar-Pradesh attached to it also there flow not only develops the gorges of certain length also made Himalaya get demarceted.From Shivalik many river flows through the district Saharanpur ,among these are the river Mohand-Rao .District Saharanpur is situated on the northern part of Uttar-Pradesh the state of India.

Mohand Rao river originated near a temple known as Dat-Mandir.It is about 18 Km in length and flow from Dat-Mandir passing through various villages from Mohand to Amanatgarh village where the river Mohand Rao joined river Solani

Which then via Khedi,Hasanpur,Madanpur,Khubbanpur,Bhagwanpur, Landhora it join Ganga near Luxor. The length of the river is 20Km with a width varying between 5m and 100m . The mean depth of the river is only 0.3m.



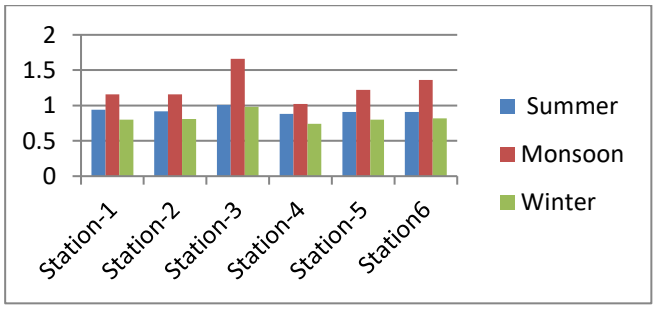
III. METHODOLOGY

Surface water quality analysis :

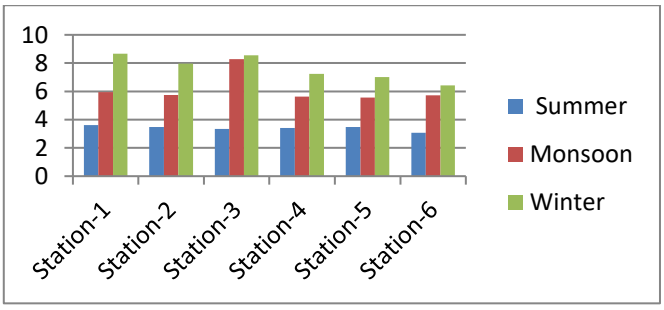
Six surface water samples were collected from selected locations. In the present study Dissolved Oxygen, Chemical Oxygen Demand, and Biochemical Oxygen Demand were determined by using standard methods

Station		Summer			Monsoon			Winter		
		B.O.D	C.O.D	D.O	B.O.D	C.O.D	D.O	B.O.D	C.O.D	D.O
1-	Mean	0.94	3.11	3.62	1.16	4.37	5.95	0.8	2.93	8.67
	SD	0.02	0.07	0.17	0.07	1.01	0.19	0.0	0.06	0.17
2-	Mean	0.92	3.11	3.49	1.16	4.7	5.75	0.81	2.87	7.97
	SD	0.03	0.11	0.18	0.11	0.15	0.19	0.03	0.07	0.37
3-	Mean	1.01	3.76	3.34	1.16	5.22	8.28	0.98	2.88	8.56
	SD	0.05	0.14	0.13	0.13	0.21	0.27	0.03	0.16	0.15
4-	Mean	0.88	2.88	3.4	1.02	4.23	5.64	0.74	1.99	7.23
	SD	0.02	0.07	0.16	0.02	0.11	0.14	0.03	0.05	0.16
5-	Mean	0.91	3.02	3.47	1.22	4.55	5.56	0.8	2.1	7.01
	SD	0.03	0.13	0.1	0.11	0.19	0.11	0.07	0.15	0.26
6-	Mean	0.91	3.02	3.06	1.36	4.65	5.71	0.82	2.02	6.42
	SD	0.03	0.13	0.11	0.12	0.18	0.16	0.07	0.1	0.4
Total-	Mean	0.93	3.15	3.4	1.26	4.62	6.15	0.83	2.47	7.64
	SD	0.05	0.3	0.23	0.23	0.18	0.98	0.09	0.44	0.87

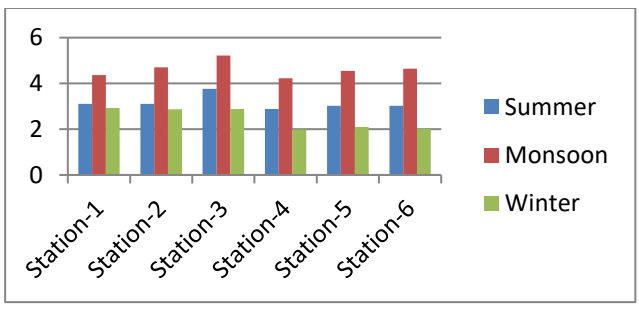
1-B.O.D. (BIOCHEMICAL-OXYGEN-DEMAND)



3- D.O. (DISSOLVED OXYGEN)



2-C.O.D.(CHEMICAL-OXYGEN-DEMAND)



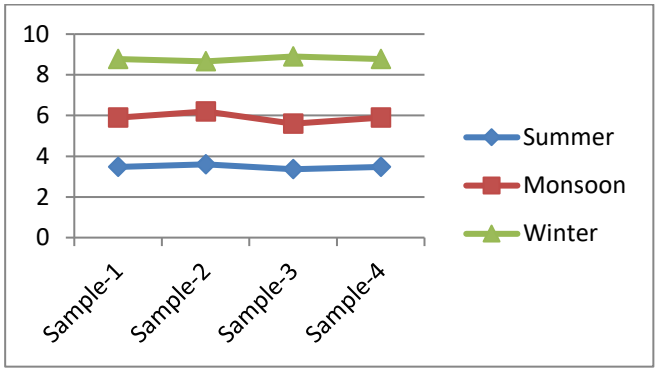
IV. RESULT AND DISCUSSION

Assessment of water quality today in global terms implies the need for a reference point against which the result of monitoring can be measured and weighted. An attempt is made to define and describe natural water quality to the extent possible and scientifically justified. Aquatic ecosystem as a part of

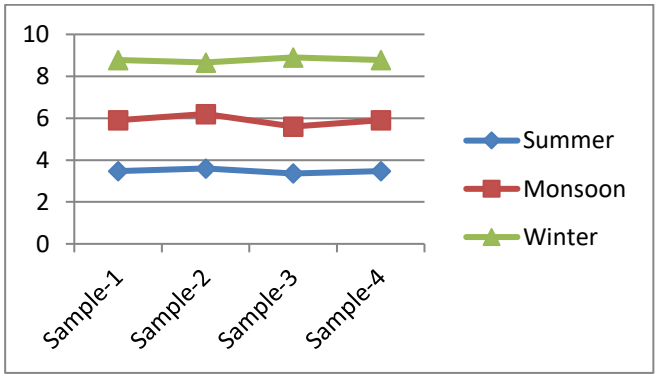
the natural environment are balanced both within themselves and other environmental compartments and this equilibrium is subject to natural variations and evolutions as well as variation caused by human interventions.

A- Analysis of dissolved-oxygen of the river MOHAND –RAO flowing in the lower hills of Himalayas in Doon Valley

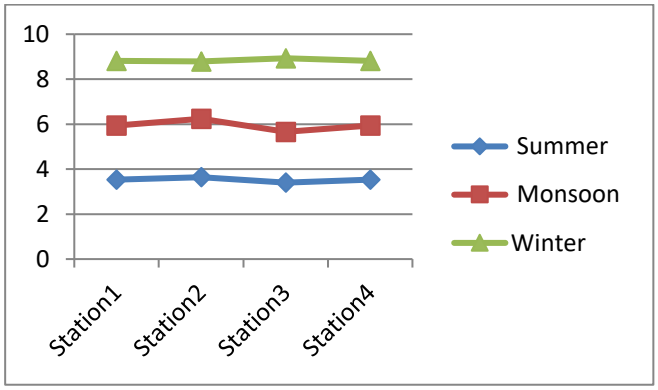
Station-1: having dissolved oxygen in the year 2016-2017



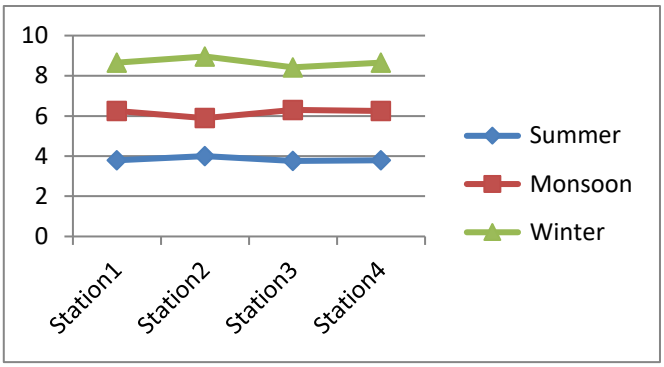
Station-1 :having dissolved oxygen in the year 2017-2018



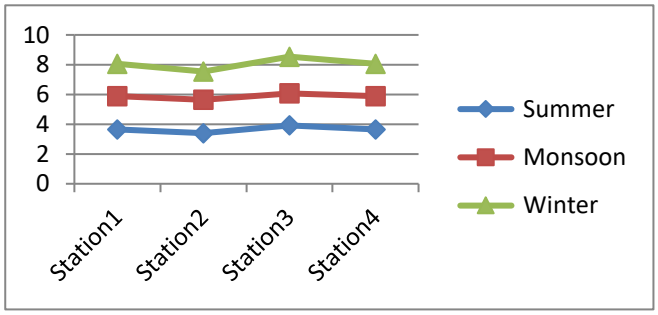
Station-1:having dissolved oxygen in the year 2018-2019

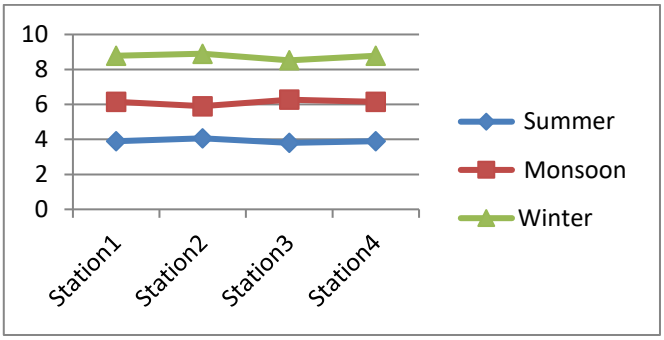


Station1: dissolved oxygen of the Station1 in 2019-2020

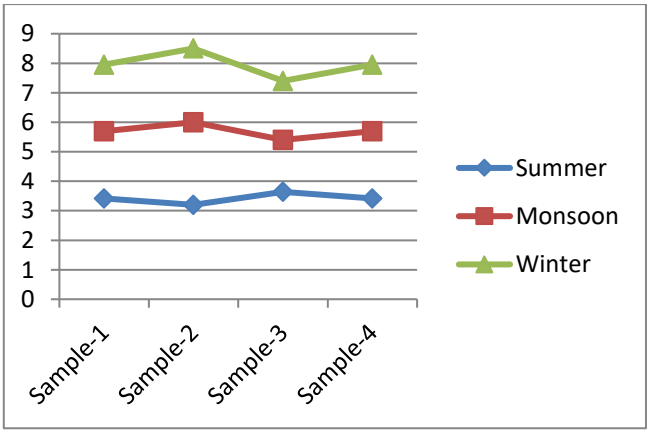


Station1: dissolved oxygen of the Station1 in 2020-2021

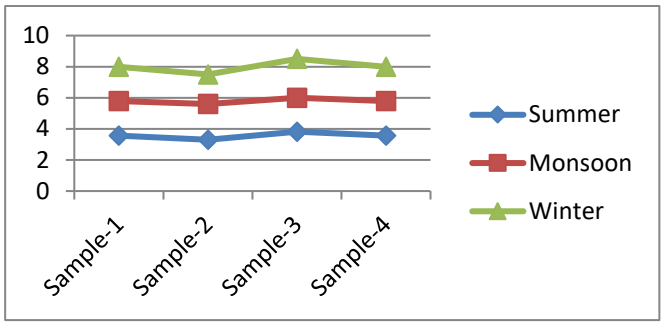




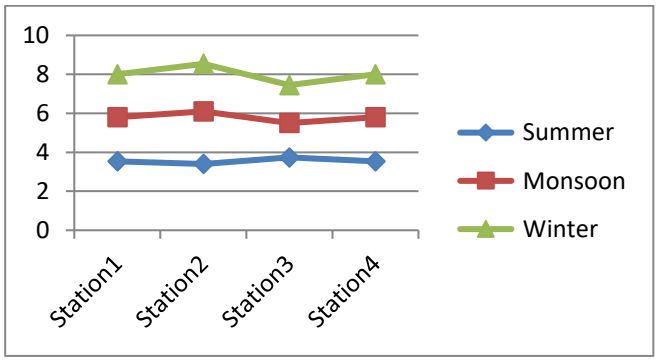
Station-2 having dissolved oxygen in the year 2016-2017



Station-2 having dissolved oxygen in the year 2017-2018

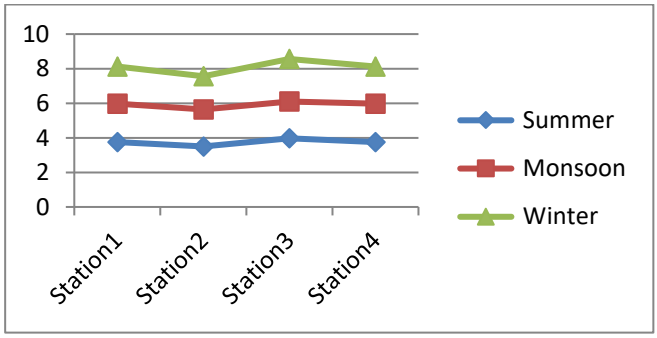


Station-2 having dissolved oxygen in the year 2018-2019

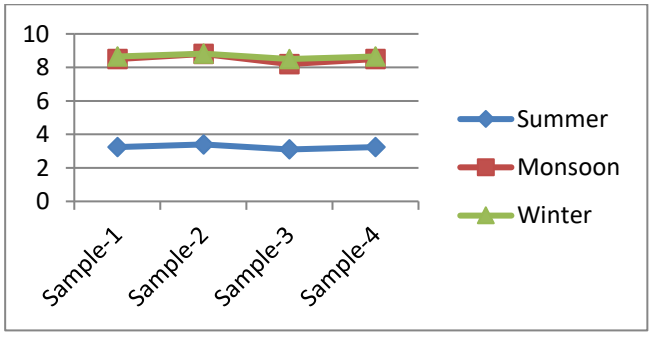


Station-2 having dissolved oxygen in the year 2019-2020

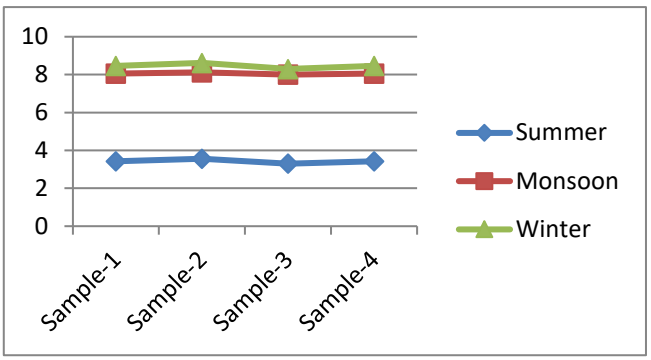
Station-2 having dissolved oxygen in the year 2020-2021



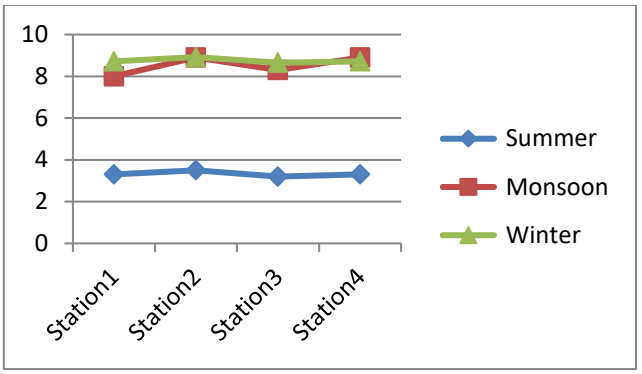
Station-3 having dissolved oxygen in the year 2016-2017



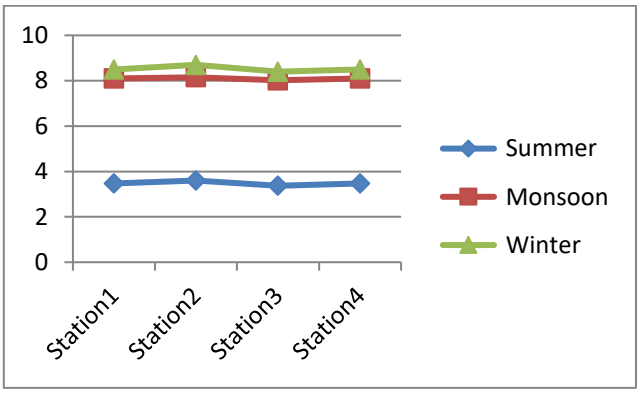
Station-3 having dissolve-oxygen of the year 2017-2018



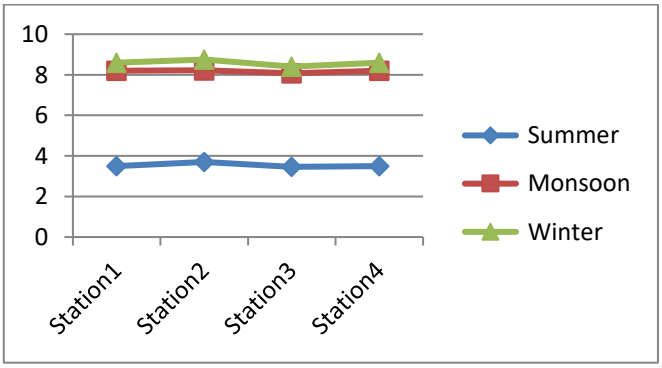
Station3 having dissolve oxygen of the year 2018-2019



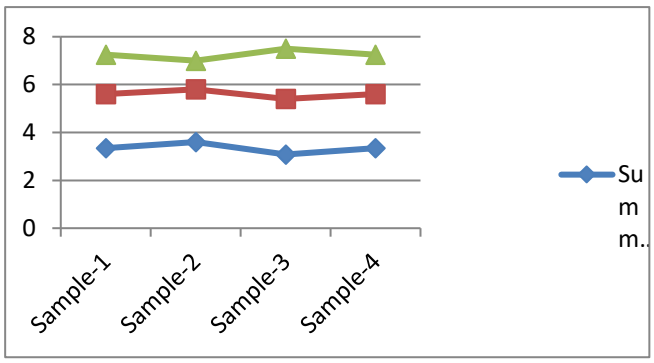
Station3 having dissolve oxygen of the year 2019-2020



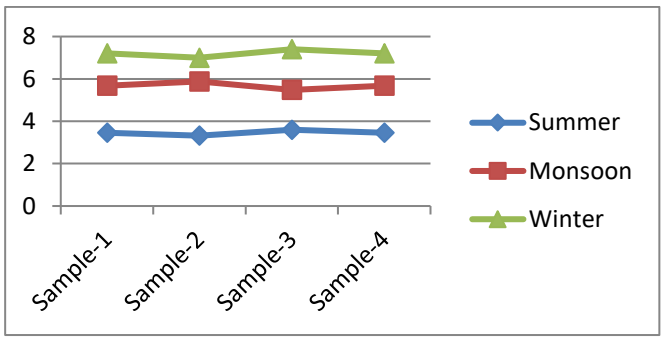
Station3 having dissolve oxygen of the year 2020-2021



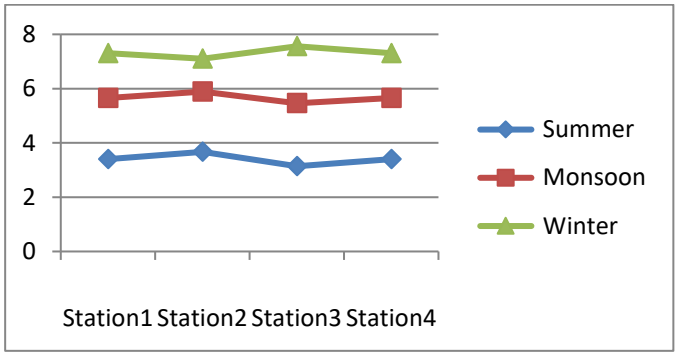
Station-4having dissolve oxygen of the year 2016-2017



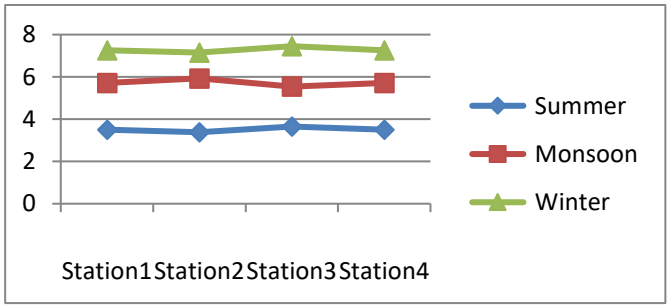
Station-4 having dissolve-oxygen of the year 2017-2018



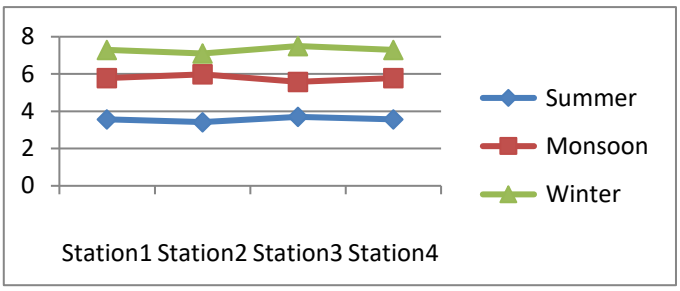
Station-4 having dissolve oxygen of the year 2018-2019



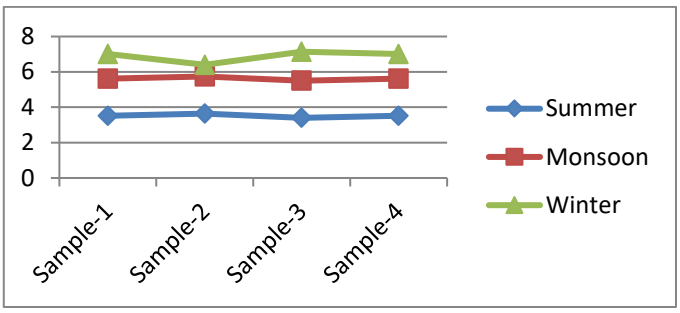
Station-4 having dissolve oxygen of the year 2019-2020



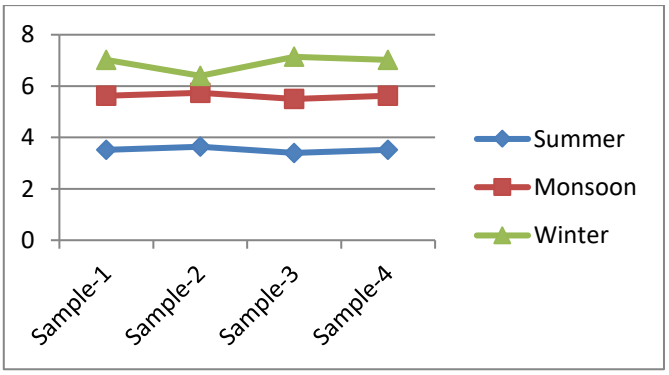
Station -4 having dissolve-oxygen of the year 2020-2021



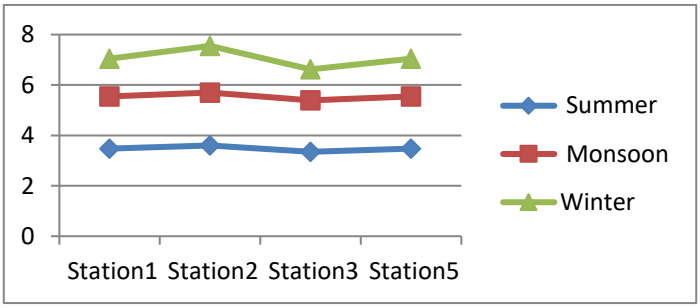
Station-5 having dissolve-oxygen of the year 2016-2017



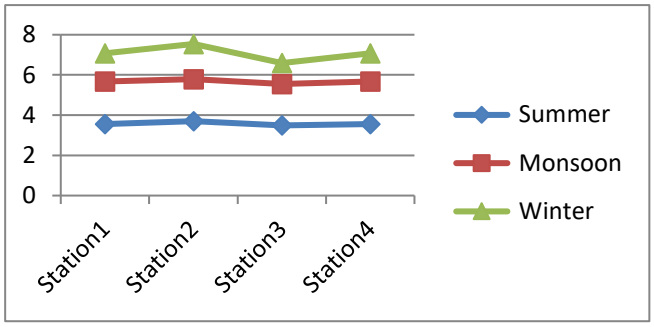
Station-5 having dissolve-oxygen of the year 2017-2018



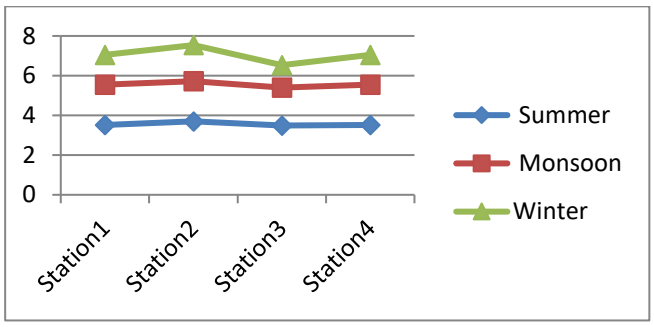
Station-5 having dissolve-oxygen of the year 2018-2019



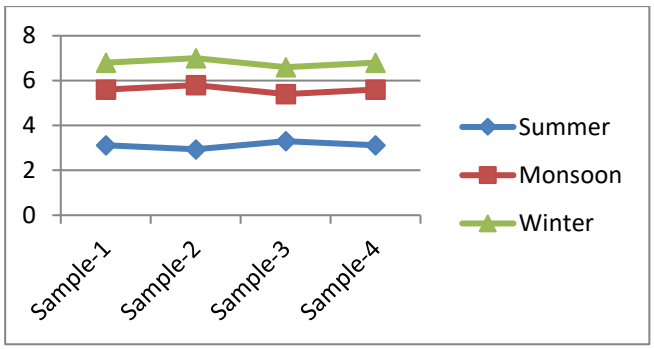
Station-5 having dissolve-oxygen of the year 2019-2020



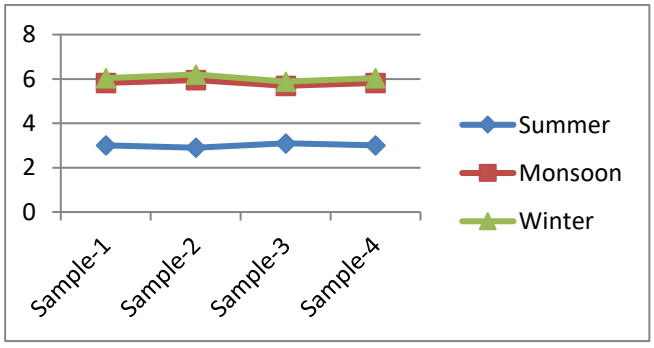
Station-5 having dissolve-oxygen of the year 2020-2021



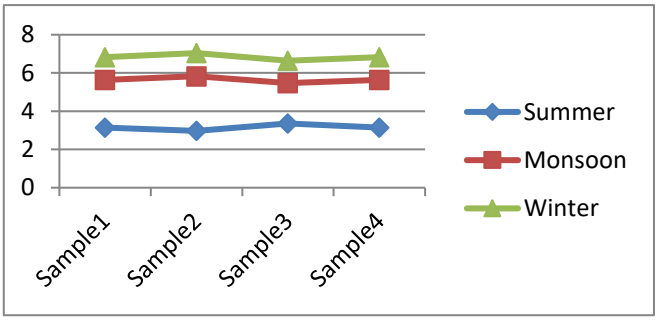
Station-6 having dissolve oxygen of the year 2016-2017



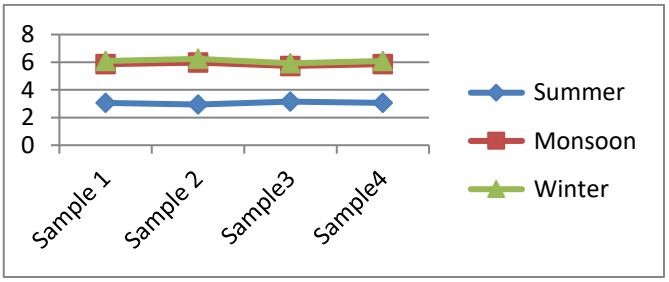
Station-6 having the dissolve-oxygen of year 2017-2018



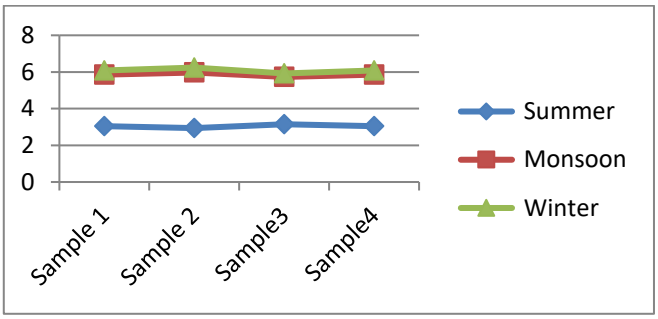
Station-6 having the dissolve-oxygen of year 2018-2019



Station-6 having the dissolve-oxygen of year 2019-2020

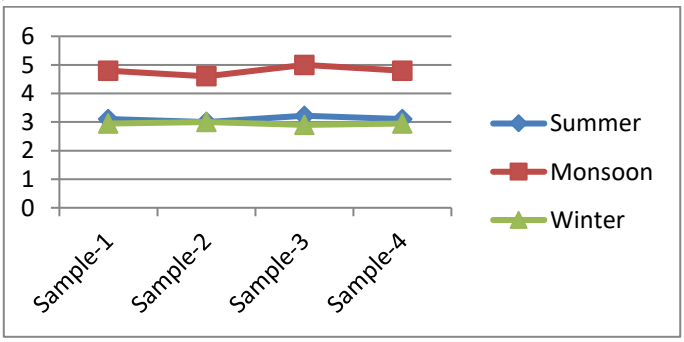


Station-6 having the dissolve-oxygen of year 2020-2021

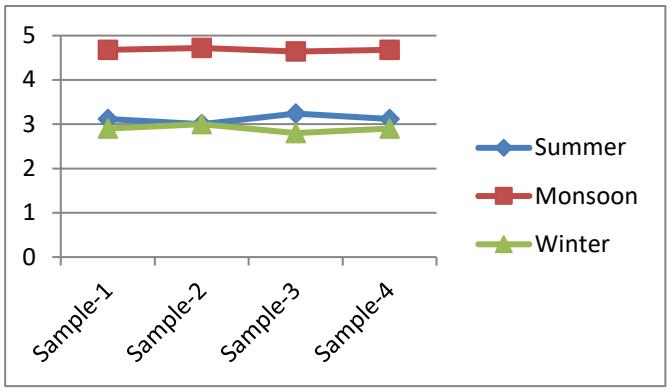


B- Analysis of Chemical Oxygen Demand of the river MOHAND-RAO flowing in the lower hills of Himalayas in Doon Valley.

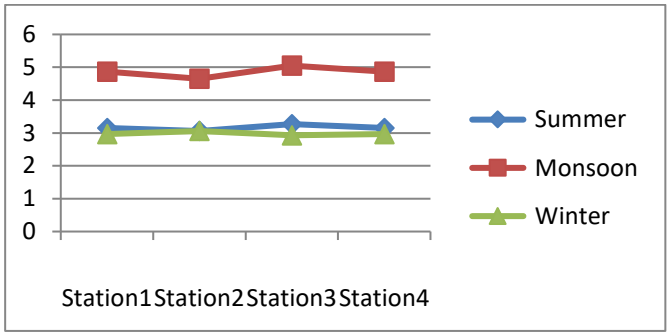
Station-1: having Chemical-Oxygen-Demand of the year 2016-2017



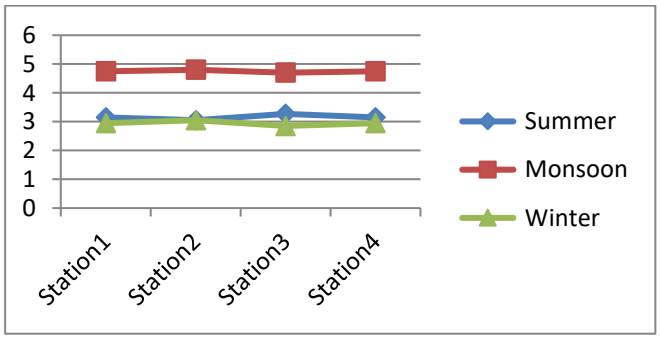
Station-1: having Chemical-Oxygen-Demand of the year 2017-2018



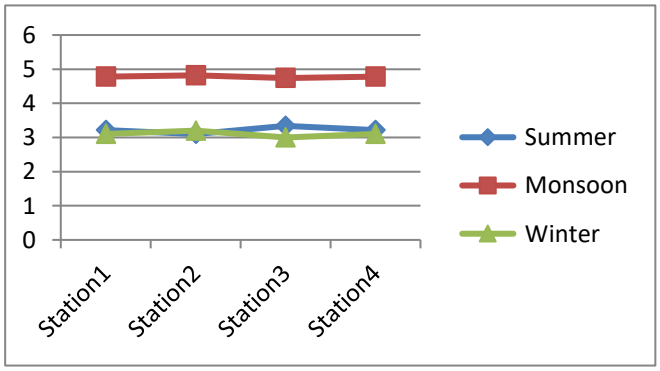
Station-1 Having the Chemical-Oxygen-Demand of the year 2018-2019



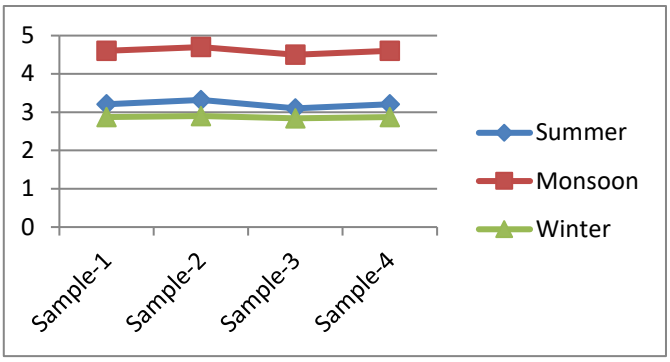
Station-1 Having the Chemical-Oxygen-Demand of the year 2019-2020



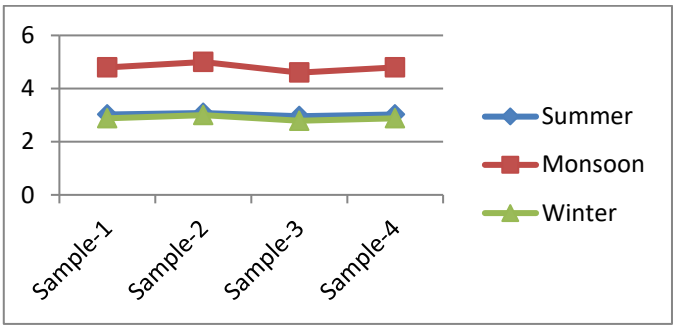
Station-1 Having the Chemical-Oxygen-Demand of the year 2020-2021



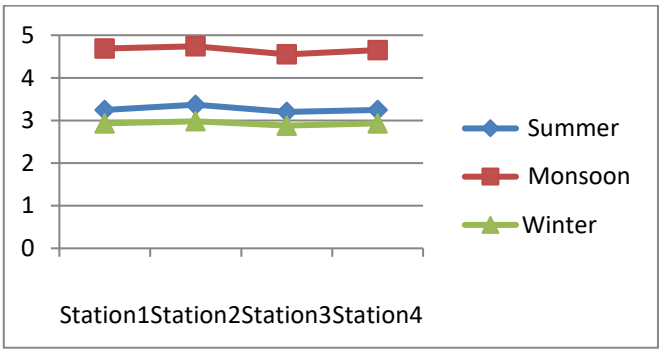
Station-2: having Chemical-Oxygen-Demand of the year 2016-2017



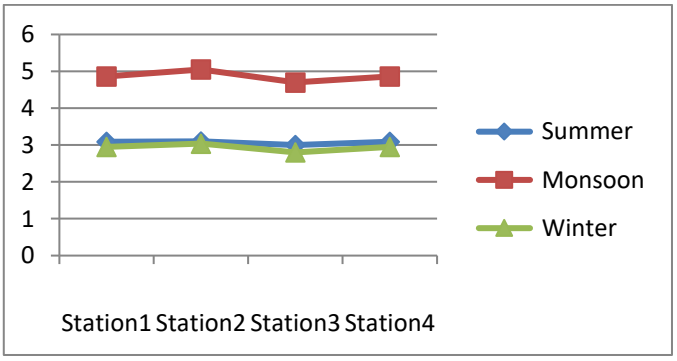
Station-2: having Chemical-Oxygen-Demand of the year 2017-2018



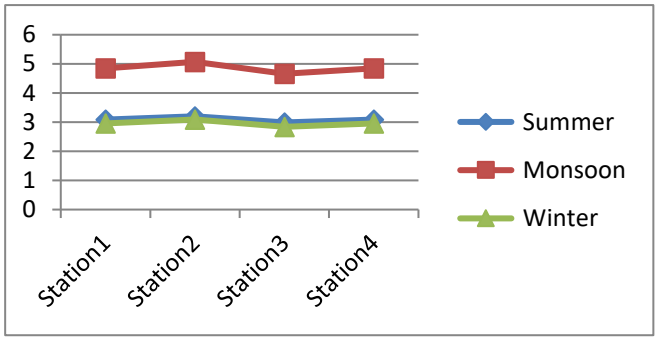
Station-2: having Chemical-Oxygen-Demand of the year 2018-2019



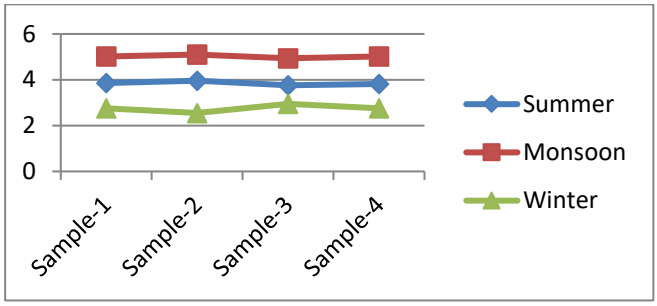
Station-2 : having Chemical-Oxygen-Demand of the year 2019-2020



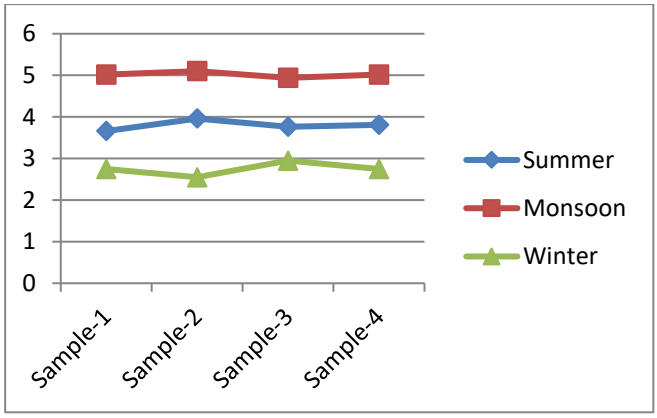
Station-2: having Chemical-Oxygen-Demand of the year 2020-2021



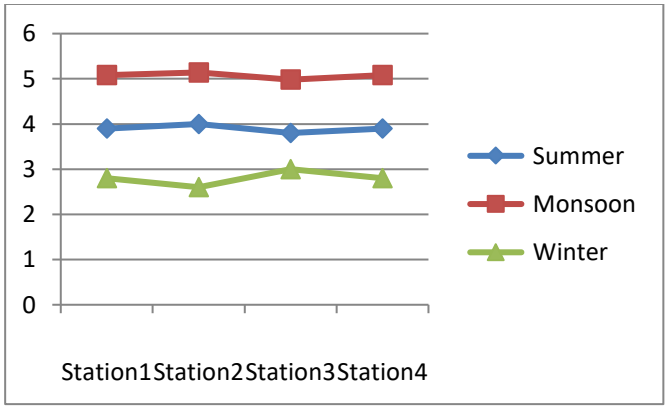
Station-3: having Chemical-Oxygen - Demand of the year 2016-2017



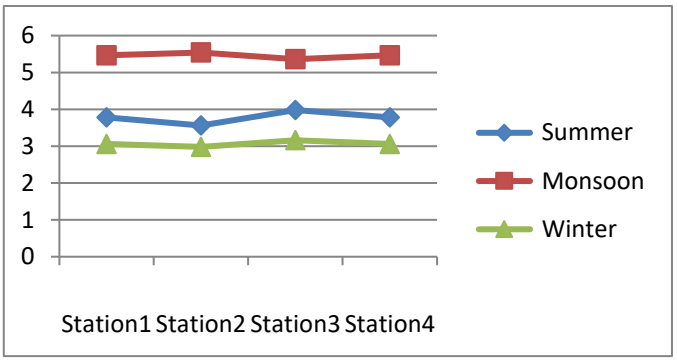
Station-3: having Chemical-Oxygen-Demand of the year 2017-2018



Station-3: having Chemical-Oxygen-Demand of the year 2018-2019



Station-3 : having Chemical-Oxygen-Demand of the year 2019-2020



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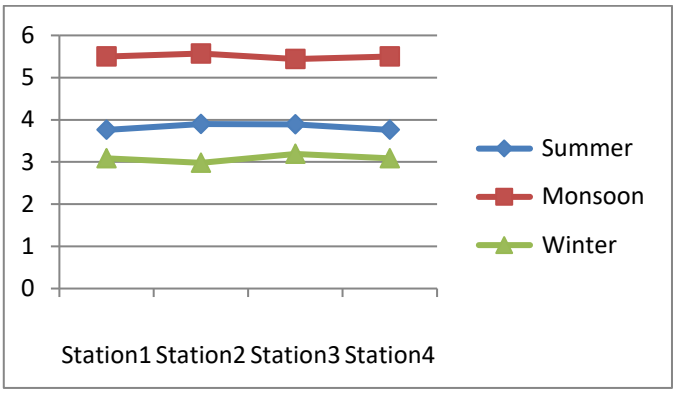

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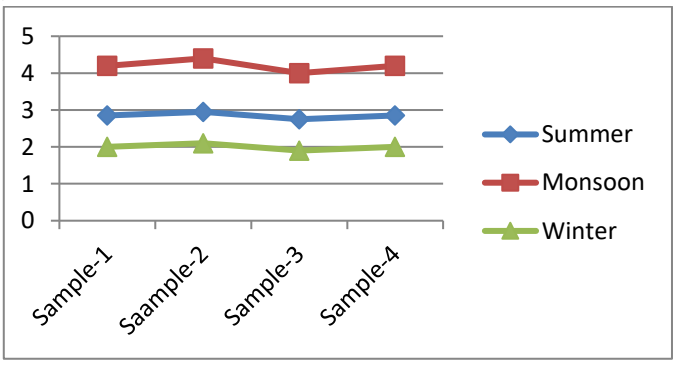

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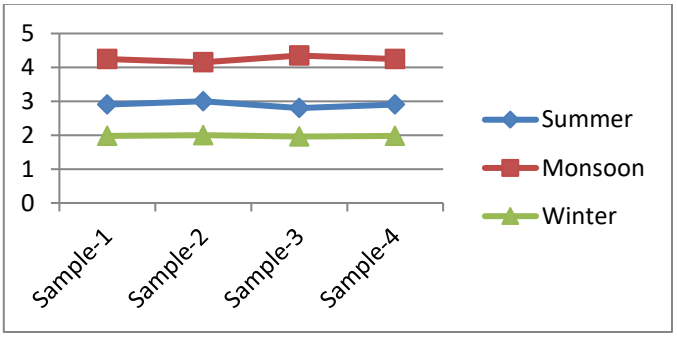

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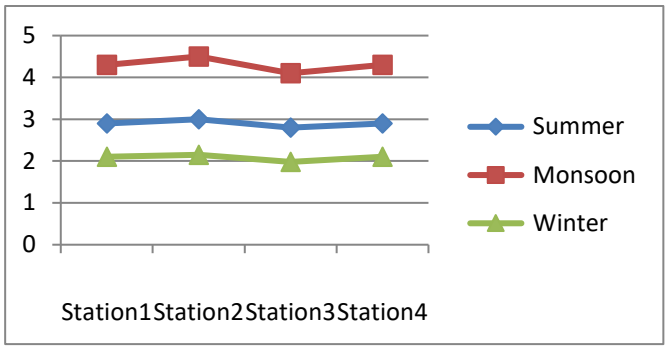

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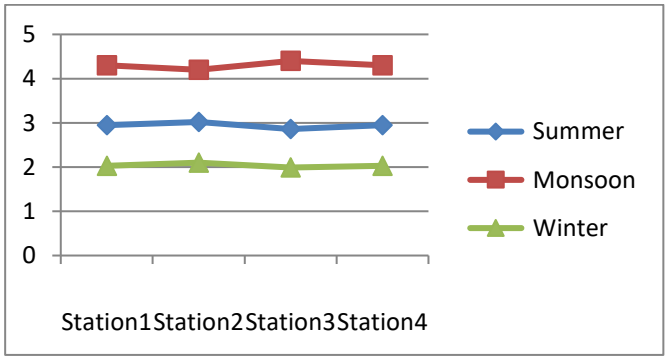

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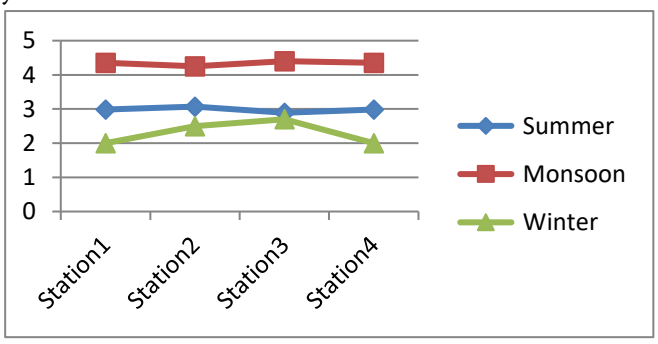

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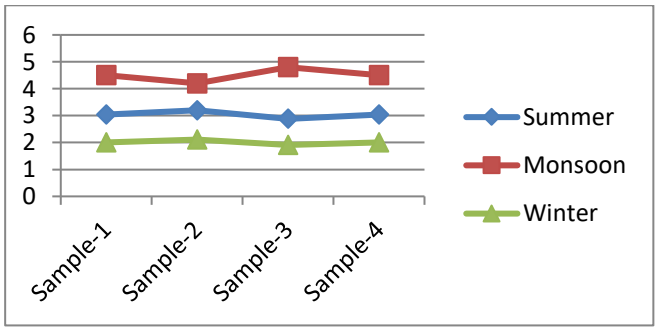

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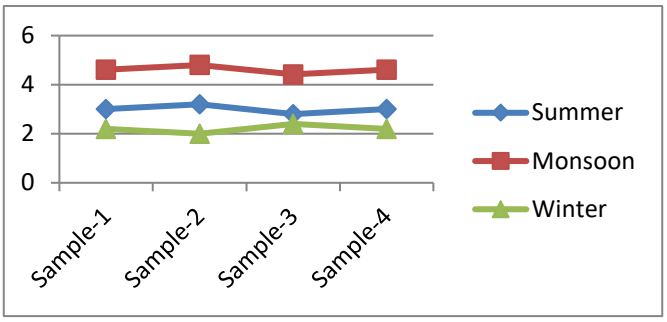
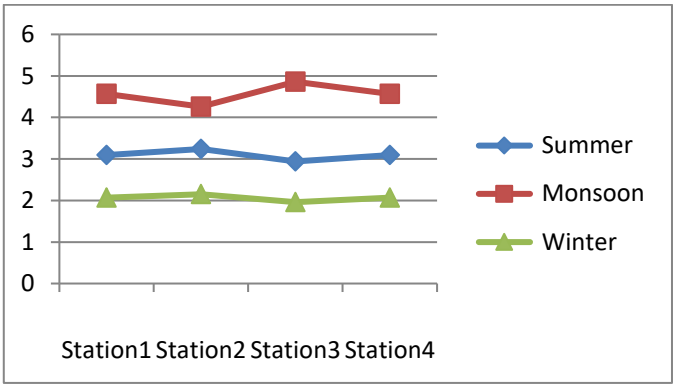
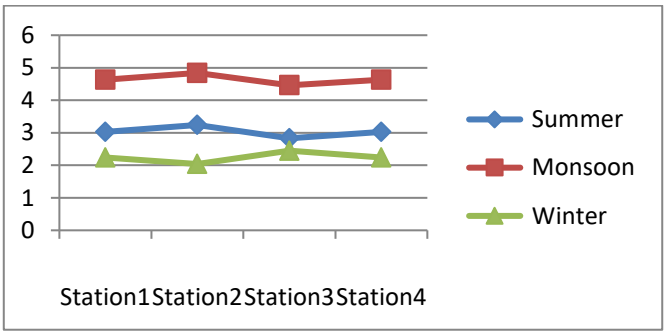


Station-5: having Chemical Oxygen Demand of the year 2018-2019



Station-5: having Chemical-Oxygen-Demand of the Year 2019-2020



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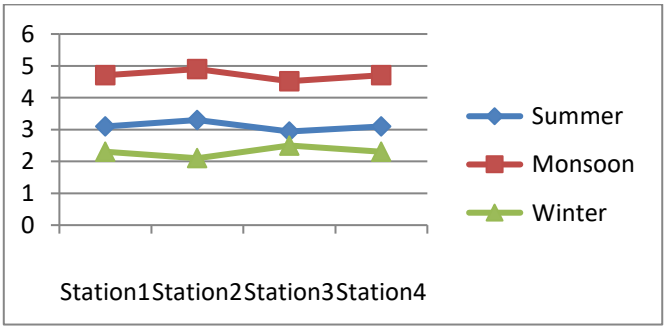

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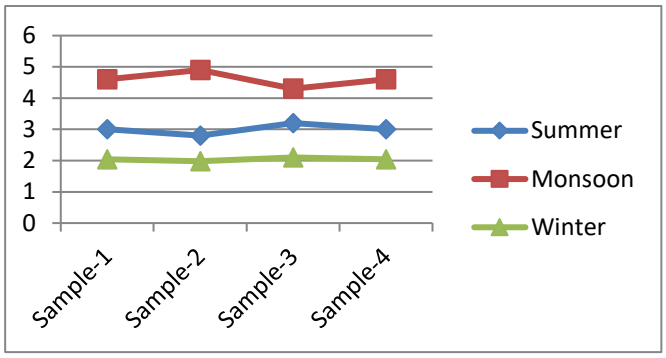

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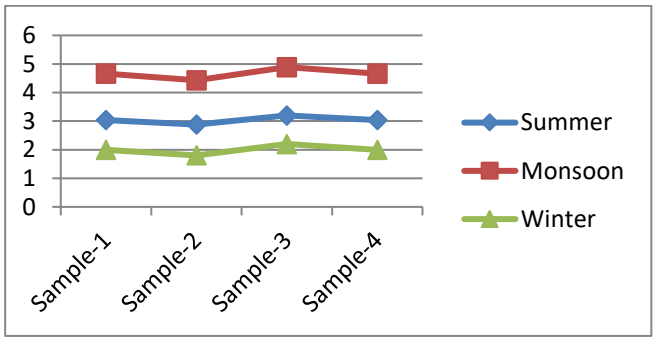

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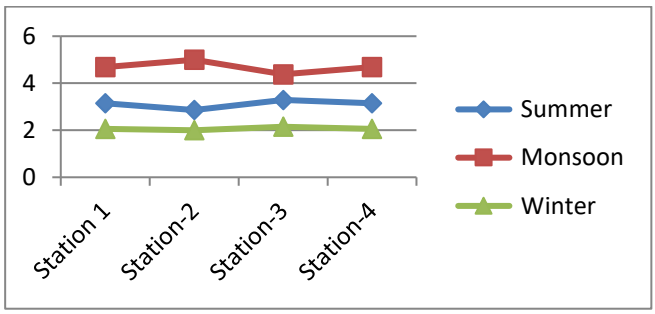

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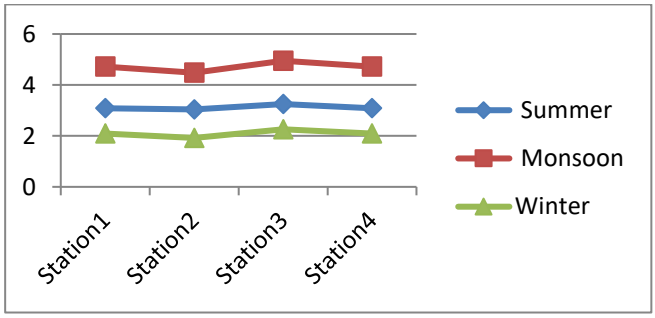

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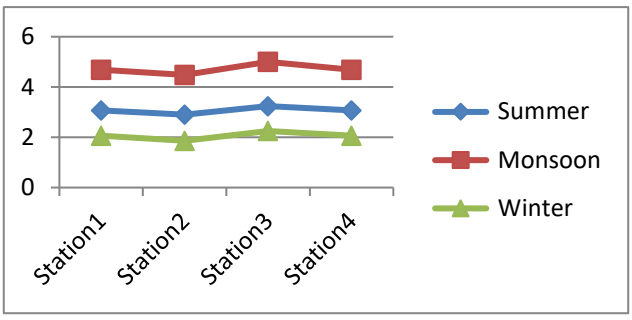
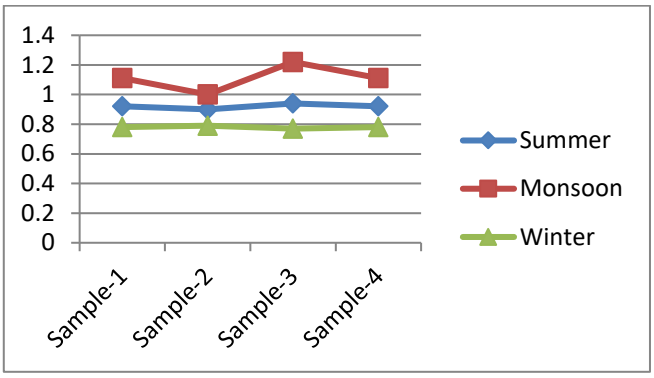
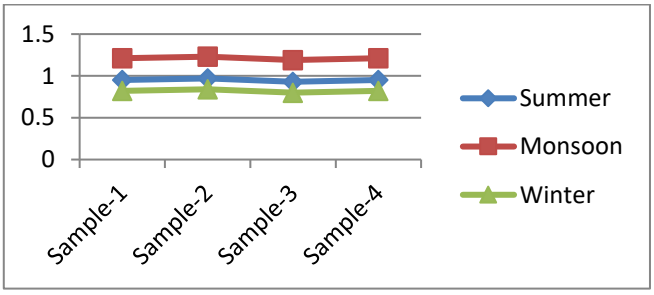


C- Analysis of Bio- Chemical Oxygen Demand of the river MOHAND-RAO flowing in the lower hills of Himalayas in Doon Valley.

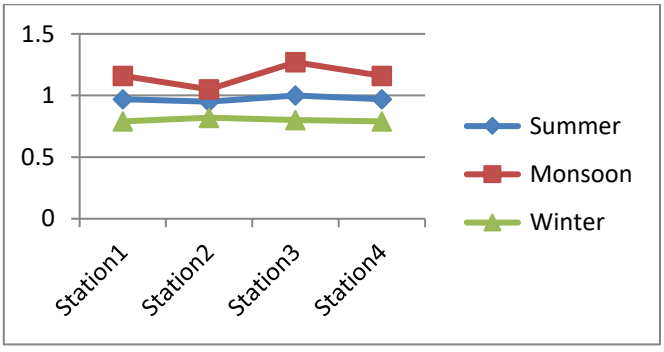
Station-1: having Biochemical-Oxygen-Demand of the year 2016-2017



Station-1: having Biochemical-Oxygen-Demand of the year 2017-2018



Station1 having Bio-Chemical Oxygen Demand of the year 2018-2019



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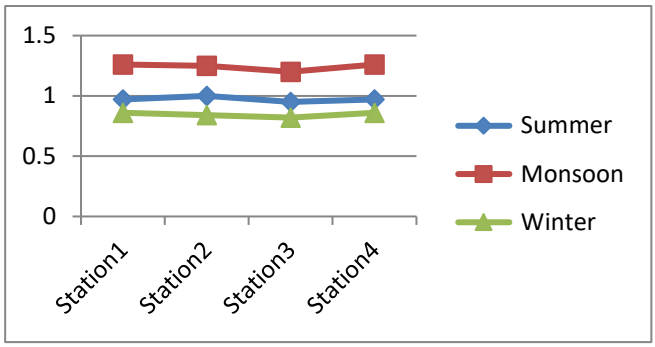

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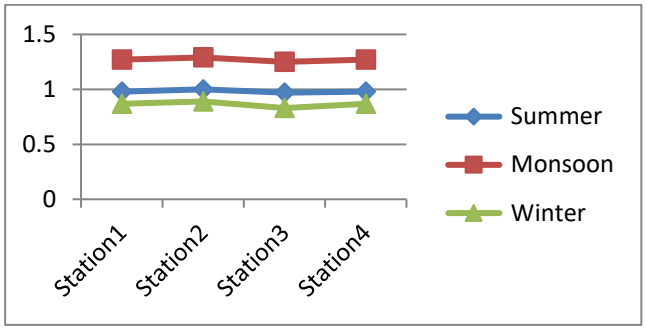
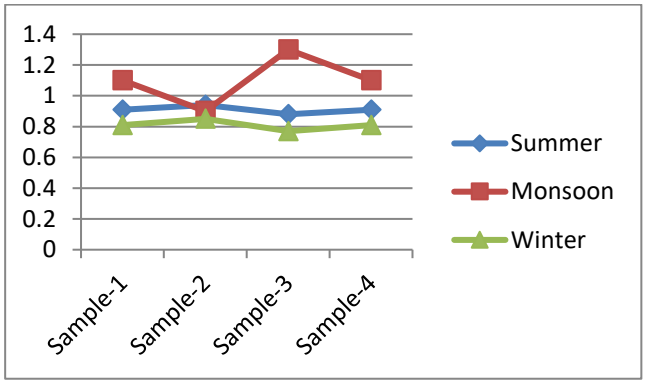


Station-2: having Biochemical-Oxygen-Demand of the year 2016-2017



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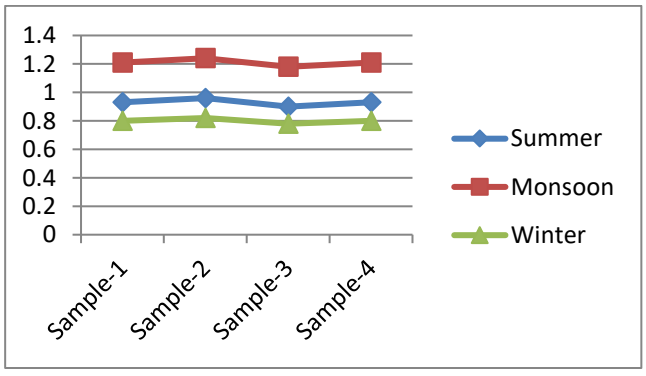

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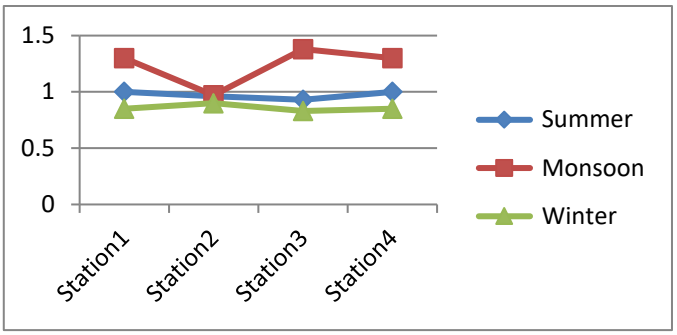
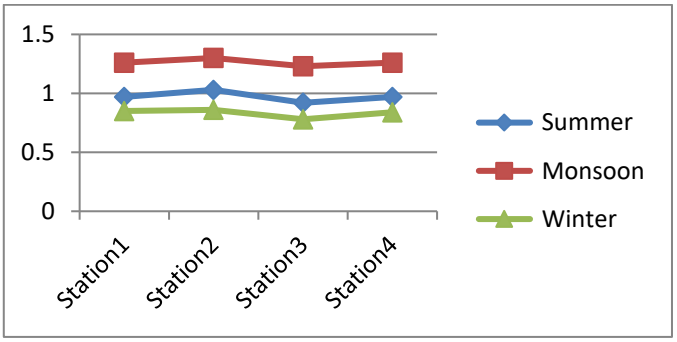


Station-2 : having Bio-chemical Oxygen Demand of the year 2019-2020



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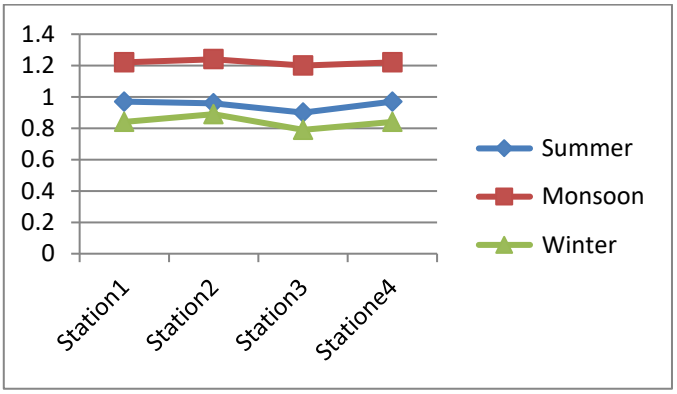

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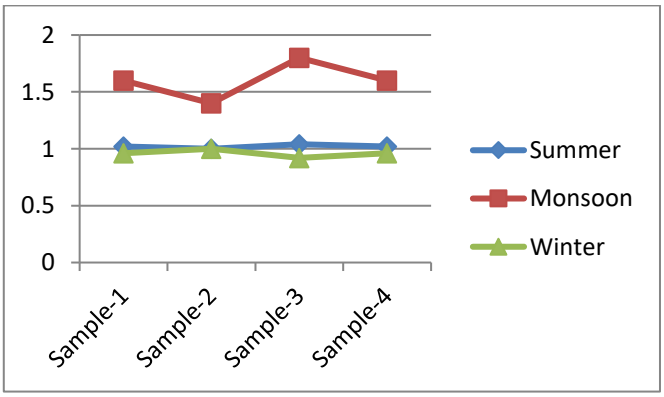

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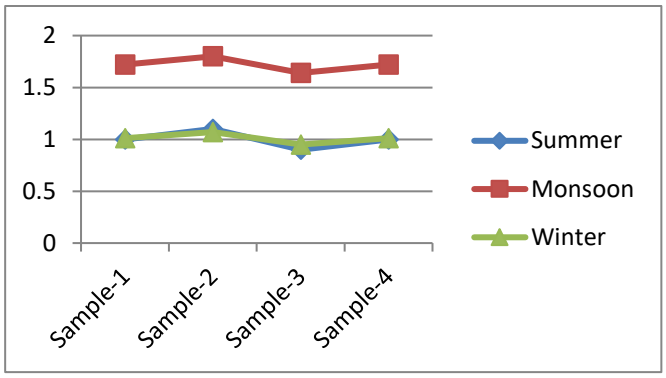

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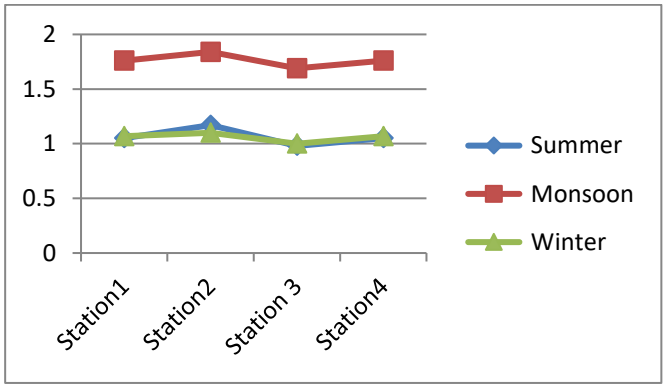

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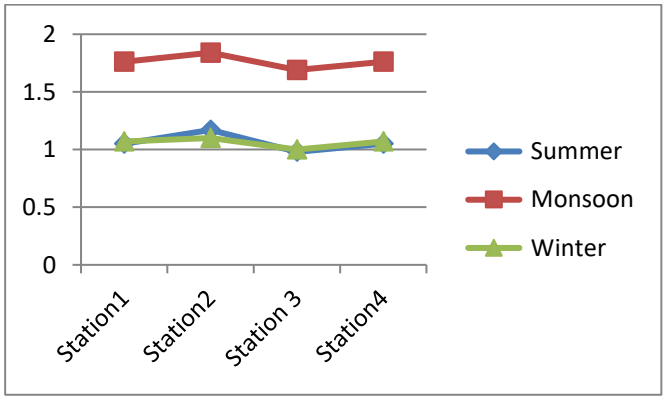

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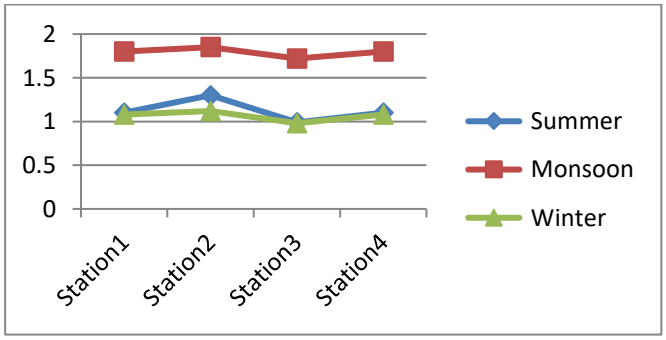
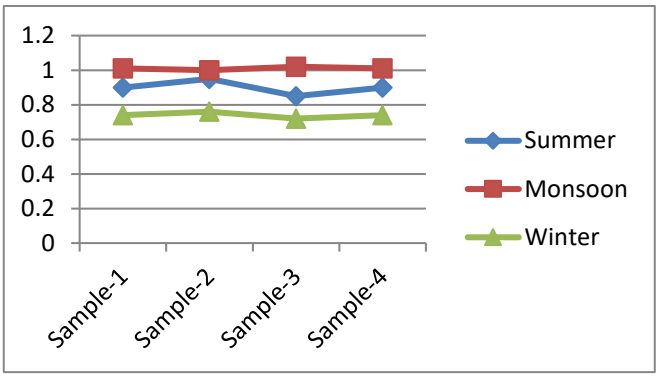


Station-4: having Biochemical-Oxygen-Demand of the year 2016-2017



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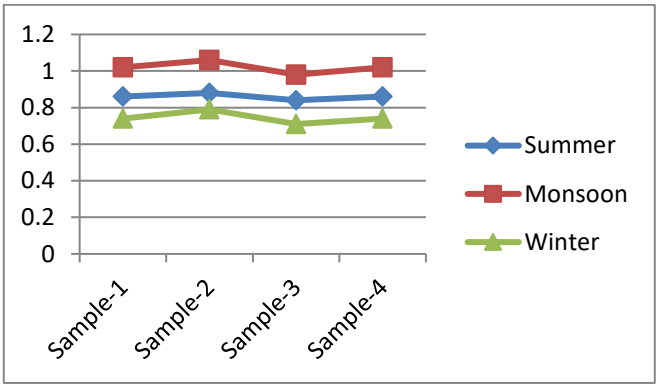

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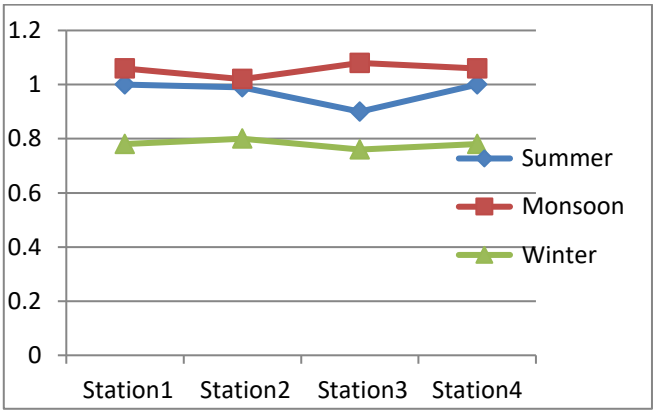

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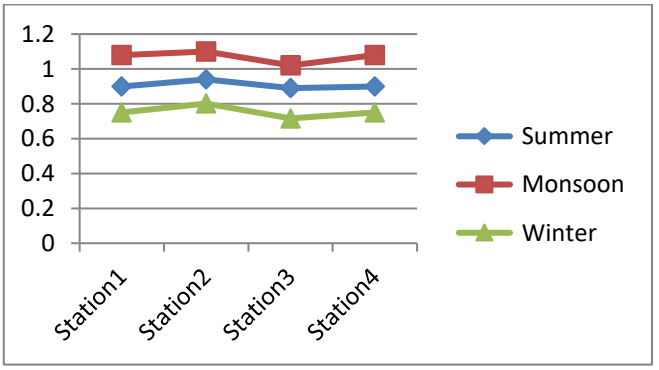

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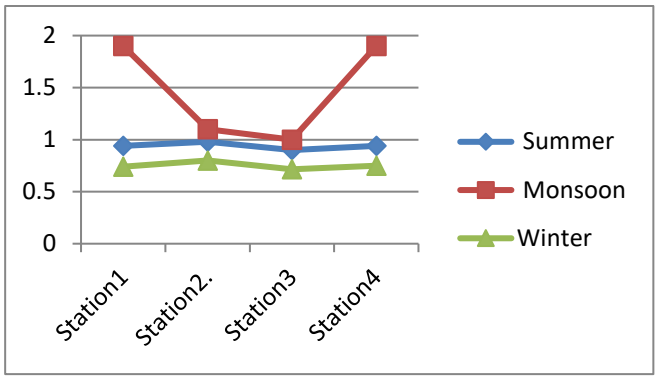

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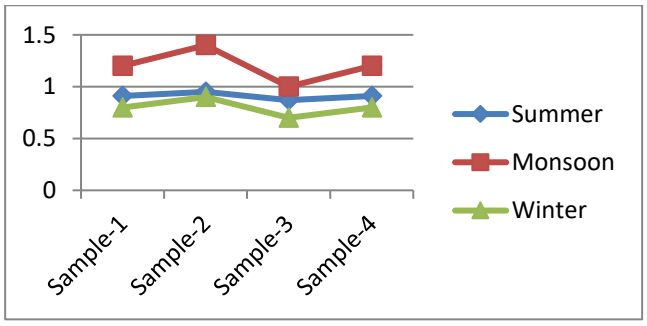

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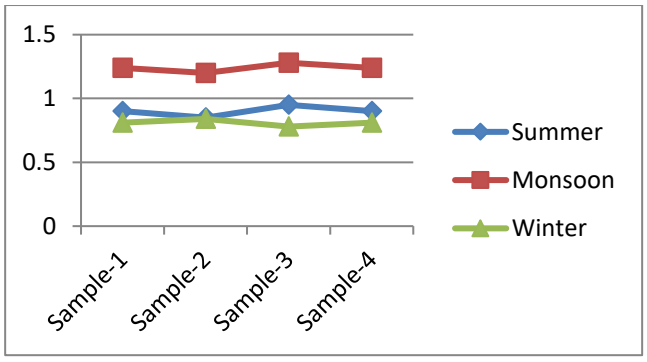

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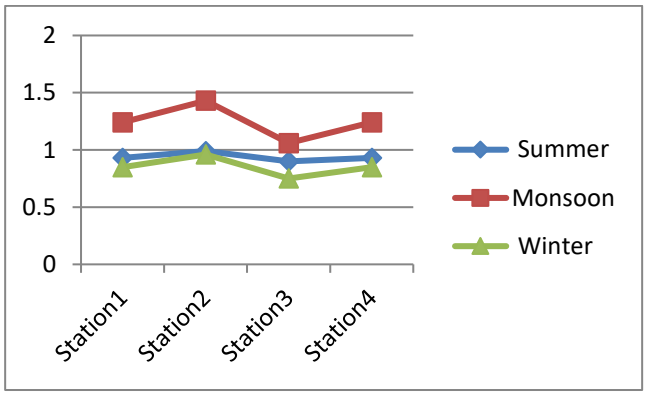

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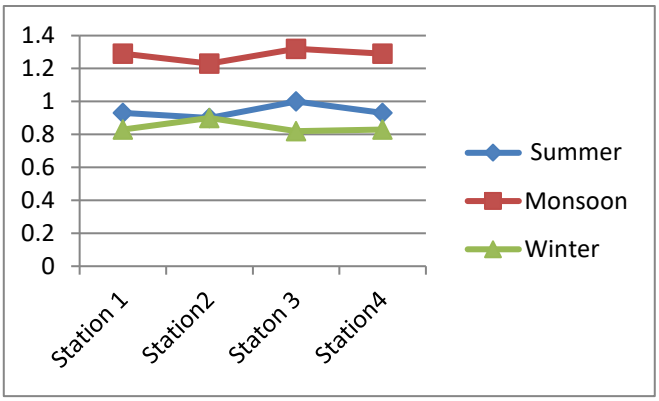

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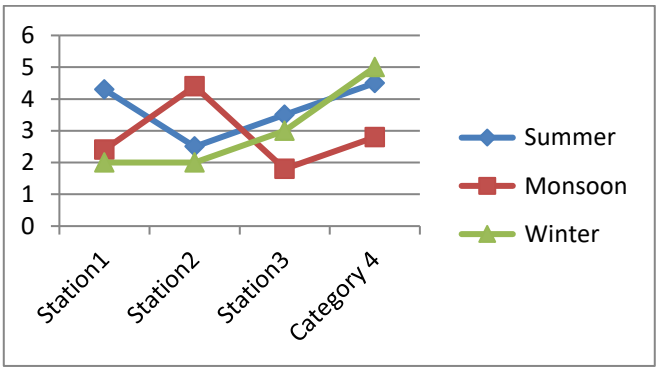
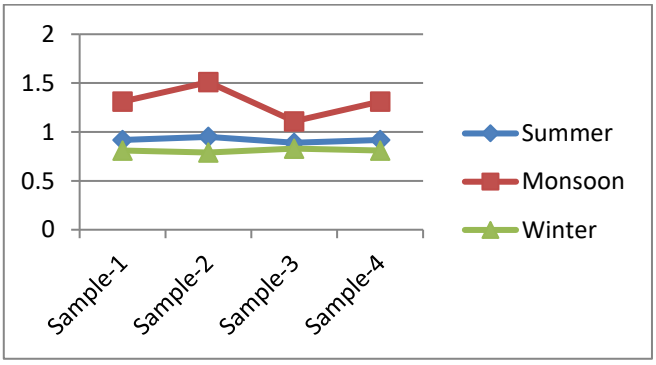
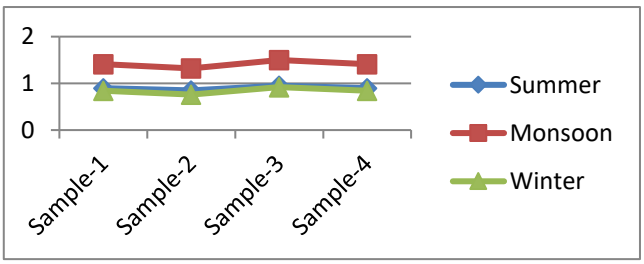


Station-6: having biochemical-oxygen-demand of the year 2016-2017

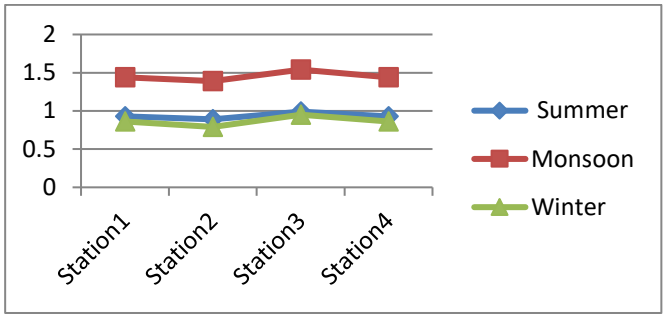




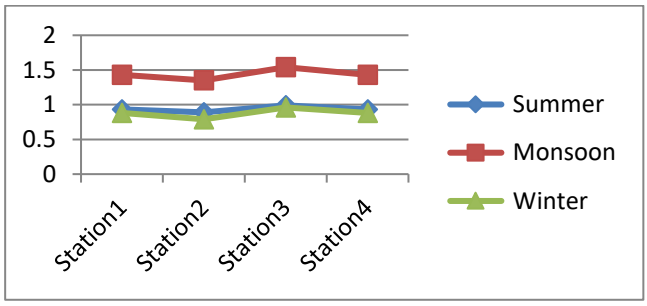
Station-6: having the biochemical-oxygen-demand of the year 2017-2018..

Station-6: having the bio-chemical-oxygen demand of the year 2018-2019

Station-6: having the bio-chemical-oxygen demand of the year 2019-2020



Station-6 : having the bio-chemical-oxygen demand of the year 2020-2021



All the graphical analysis of the different sample at different station on the flowing river water of MOHAND-RAO river in the foothills of Himalayas in Uttarakhand and Uttar-Pradesh of INDIA.

In these analysis of river water quality explain that the water of the river is suitable to support the ECO-SYSTEM around the river.

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India's Ambitious 'Net Zero Emission' Plan and the Way Forward

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ABSTRACT

The environmental degradation has been, by far, the most challenging issue faced by the mankind ever since the nuclear holocaust. The dimension and the menace it imposes on the universe is frightening. United Nations, therefore, took upon itself to address the issue comprehensively. A lack of consensus among the members of the World Forum, however, failed to achieve any significant outcome, thus far. Suffice to say, achievement in controlling the climate change has been left much to be desired.

Recently, a United Nations Climate Change Conference was held from 06 Nov to 20 Nov 2022 at Sharm El Sheikh, Egypt. The twenty seventh meeting of the Conference of Parties, acronymed as COP 27, held at Sharm El Sheikh, was slated to be a pioneering event that would trigger a significant scale-up in the initiatives towards reduction in global warming. The COP is the apex decision making authority that comes under the United Nations Framework Convention on Climate Change (UNFCCC) which was formed in 1994. The UNFCC has the aim of stabilizing greenhouse gas generations in the atmosphere. The UNFCC has 198 parties. Ever since 1994, the COP members meet annually to review the progress achieved. The presidency of the COP normally rotates among the five United Nations regional groups.

Aim of this research paper is to map the voluntary commitments made by India at this prestigious world forum with reference to its own debilitating economy and enormous clean energy-needs in the decades ahead.

Keywords: United Nations Framework Convention on Climate Change (UNFCCC), Conference of Parties (COP 27), Clean Energy, Sustainable Energy.

I. INTRODUCTION

According to World Meteorological Organization (2021)[1] meteorological disasters in the world in the last 50 years account for human tragedy in terms of 1,341,668 deaths and the destruction of assets worth 636 US $ billion due to climate and weather changes. The miseries inflicted by draught, storm, extreme temperature and flood have not distinguished between the rich and poor nations. Sufferers included the countries like Bangla Desh, Ethiopia, Sudan, Mozambique, Venezuela, Myanmar, Russian Federation, United States and the latest sufferer being Pakistan which suffered damage and losses of 30 US $ billion due to floods during 2022. Its impact was felt across the globe. No wonder, it was a warning signal that continued becoming louder with potential to threaten the very existence of some nations. The world came together to address the issue albeit too late.

II. BACKGROUND

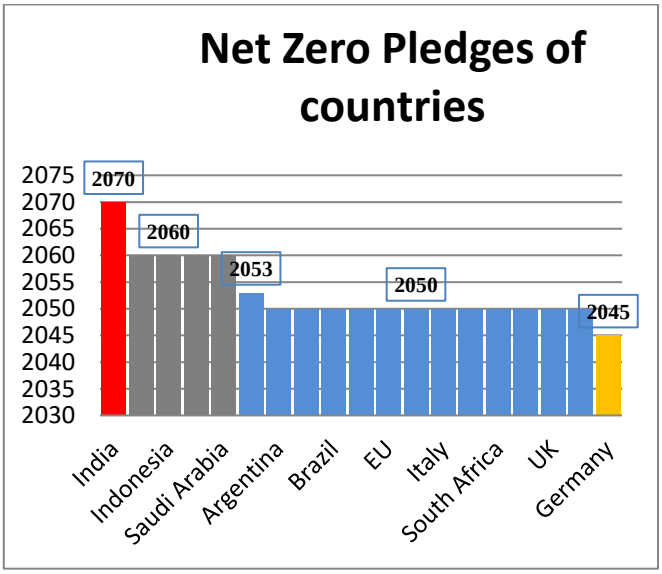
2.1 The Paris Agreement[2]: A comprehensive, and first time a legally binding Framework, was prepared by 196 parties at COP 21. The Framework included three nodal areas of support – financial, technological and capacity building, keeping in view the need and responsibility of under developing, developing and developed nations. The objective set forth was to keep global warming below 2 degree Celsius, preferably under 1.5 degree Celsius, compared to pre-industrial levels. To achieve this goal, countries needed to strive for limiting green house gas emissions to net zero level by mid-century.

2.2 The Period from COP 21 to COP 27. The intervening period of COP 21 to COP 27 witnessed a dithering United States, Administration, from its solemn commitments to climate control; to a determined India well poised to establish a new world order in the Global Climate Control regime, echoing from the rich cultural heritage of India- "Vasudhaiv Kutumbkam".

2.3 Sharm El Sheikh, Summit of 2022 The 2022 United Nation Climate Change Conference, also known as COP27, held in Sharm El Sheikh, Egypt was attended by over 92 heads of state and 35000 representatives from 190 countries and was the first climate submit in Africa since 2016. The conference aimed to limit global temperature rises and address issues related to climate change, led to the creation of the first loss and damage fund. The conference was sponsored by Coca-cola ,which faced criticism from environmental activists for its role in plastic pollution.

Africa was the most vulnerable continent to the effects of climate change and there were hopes that the conference would improve the visibility of the priority demands of African states and civil society. The Conference was focused on topics such as Climate finance, Decarbonization, Adaptation and Agricultural. During the summit, United States proposed a system of Carbon credits for low-income countries to deal with climate change impacts. Germany and United States announced over $250 million in resources to support Egypt's clean energy economy. Negotiations over loss and damage were also expected to continue.

2.4 Glasgow Summit of 2021: At the United Nations Climate Change Conference held from 31st October to 12th November 2021 at Glasgow, Scotland, United Kingdom, the Indian Prime Minister Shri Narendra Modi had unilaterally announced India's national goal to achieve net zero emission of greenhouse gases by 2070. The target was slated to be achieved through a major reform already underway in power sector by discarding coal-based thermal power plants and increasing installed capacity of renewable-energy-based power plants. Considering the enormous cost involved in reducing greenhouse gas emissions, technological constraints, and its energy needs, a realistic view seems to have been taken by India in resetting the desired timelines of limiting greenhouse gas emissions to net zero level, from mid-century to 2070, at COP 26.



Ambitious Goals[3]

III. INDIA'S CHALLENGES

India's primary challenge remains in achieving balance between economic growth and environment, while negotiating through global politico-environment milieu without compromising on its developmental needs.

3.1 Greenhouse Gas Emissions

"Greenhouse gas emissions by India are the third largest in the world and the main source is coal. India emits about 3 gigatonnes (Gt) CO_{2eq} of greenhouse gases each year; about two tons per person, which is half the world average. The country emits 7% of global emissions."[4]

Keeping in view, the India's constraints in terms of its access to cutting edge technology, financial resource allocation, energy needs, its commitment to reduce greenhouse gas emission to net zero level by the year 2070 seams to be realistic.

3.2 Resource Limitations

India's "total installed capacity at the end of November 2021 was 392 GWe, of which nuclear accounted for 6.78 GWe (1.7%),. The government's 12th five-year plan for 2012-17 targeted the addition of 94 GWe over the period, costing $247 billion. The OECD's International Energy Agency predicts that India will need some $1.6 trillion investment in power generation, transmission and distribution to 2035.[5]

3.3 Technological Challenges

4.1 Transport Sector

Electric vehicles will pave the way for clean environment, however an exhaustive ecosystem needs to be put in place for a meaningful outcome. The much needed initiatives would include domestic manufacturing of Li-Ion batteries, ubiquitous availability of High Power Electric Vehicle Charging Stations for modern passenger carrying vehicles (PCVs) and Load carrying Vehicles (LCVs), chips manufacturing infrastructure, and disposal of used batteries. Thus, it may be seen that India is still way behind in decarbonising the emission intensive surface transport sector.

4.2 Semiconductors

There is an urgent need to reduce India's dependence on import of semiconductor chips from China and Vietnam. An accelerated growth of ecosystem for manufacturing of semiconductors under 'Make in India' programme, by extending production linked bonuses to the manufactures, is an imperative, India can least afford to brush aside. It will provide an impetus to the India's ambitious programme of rolling out electric vehicles on Indian roads in a big way and phasing out of fossil fuel vehicles as "modern car can use between 1,500 and 3,000 semiconductorss"[6].

4.3 Political Constraints

Recently, India witnessed a major supply chain disruption with China due to Ladakh standoff. Geo-strategic consideration will therefore continue to play a major role in the industrial production of any country. Importance of supply of critical components to various industries therefore assumes greater significance than ever before. This is in addition to the embargo imposed by various power blocks, treaties, frameworks, agreements, and conventions in a dynamic, complex and uncertain inter-governmental geo-political relationship.

IV. INDIA'S GREEN ENERGY INITIATIVES

India has, thus far, taken numerous initiatives to focus on carbon neutral regime, however, keeping in view its huge clean energy needs, India has to keep both the options- an incremental one and transformational open to achieve its goal.

4.1 Productivity Linked Incentives (PLI). Budgetary provisions for Productivity Linked Incentives will address the manufacturing of

high efficiency modules, and battery storage projects, for solar energy as well as semiconductors chips for electric vehicles leading to clean energy and reduced emissions of green house gases.

4.2 Sovereign Green Bonds. Issue of Sovereign Green Bonds has been designed to help mobilising resources for green infrastructure. The proceeds of Sovereign Green Bond framework is set to be deployed in public sectors projects with a view to reduce emissions.

4.3 National Green Hydrogen Mission. The ambitious goal set forth is likely to catapult India as a leading global market leader in the realm of clean energy as India can leverage Green Hydrogen to move from Low Carbon to No Carbon Framework across the sectors.

4.4 Green Credit Programme. Introduction of Green Credit Programme under Environment (Protection Act), 1986 is meant to incentivise corporate who adopt environment friendly and responsive measures. The step seeks to introduce behavioural shift amongst various stakeholders towards environment protection.

V. THE WAY FORWARD: REDUCING GREENHOUSE GAS EMISSIONS

5.1 Phasing Out the Coal-fired Power Plants

India needs to reduce its current dependency on coal-based power plants from current 65% to complete cessation of operation of these power plants in the near future. Discarding the coal-based power plants will also reduce its dependency on imported coal needed currently to reduce the emission.

5.2 Establishing New Solar Power Plants

In future, India needs to establish solar power plants to harness clean, affordable and sustainable energy. This calls for need to manufacture indigenous solar panels at competitive rates prevalent in the global market.

5.3 Nuclear Power Plants

Nuclear power plants need nuclear fuel for which India is dependent on nod from countries of Nuclear Supply Group who often raise the issue of India's non-signing of Nuclear Non Proliferation Treaty which has direct bearing on its national security needs. Notwithstanding obstacles in supply of uranium, India's civil liability law, impact of radioactive waste on environmental degradation, embargo on provision of advanced technology due to international conventions, treaties, and high cost of construction prohibits the country to go for a cheap, affordable and sustained source of electric power. Nevertheless, as the operational cost of nuclear plant is very low, it remains a viable option of clean energy provided indigenous technology is developed to avert disruption of supply chain of nuclear fuel.

5.4 International Solar Alliance (ISA)

On 30 Nov 2015, India and France launched this initiative. Currently, it has 121 countries mostly located between Tropic of Cancer and Tropic of Capricorn. The object of the alliance is to harness solar energy and reduce dependence on use of fossil fuel, a conventional source of energy. Under its ambitious programme of **'One Sun One World One Grid'** it proposes to establish common grid among the member countries to transfer the solar power to the member countries in need of clean, affordable and sustainable energy.

5.5 Public Awareness

More public awareness is needed to avert future environmental disasters in the world. This could be achieved by trendy taglines and **'moment marketing'** by the countries across the globe.

VI. CONCLUSION

Reducing the emission of greenhouse gases and reaching to net-zero emission stage is not only an obligatory but an inescapable need for all the countries in the world. Reducing air pollution in India alone, would have far reaching impact on its health infrastructure bringing down the cost on health services, considerably. Impact of climate control on agricultural sector, in terms of crop yield alone has the prospect of alleviation of hunger and poverty from the planet. Its positive impact on pharmaceutical, fertilizers and transport sectors, including irrigation, drought and flood control will have the potential to save the countries across the globe from eminent catastrophe.

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Analysis of Wormhole Attack in Wireless Sensor Networks: A Review

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ABSTRACT

Wireless Sensor Networks are a collection of minor sensor nodes. The sensors devices gather the information from the open environment for the use of intended purpose. The WSNs are contaminated from various types of attacks like wormhole attack, blackhole attack, sybil attack, and sinkhole attack. But the wormhole attack is one of most severe attack in WSNs. It creates a tunnel in the network and mislead the data packets. To prevent the sensor network from these attacks a various technique has defined such as watchdog technique, Wormhole Attack Detection Protocol using Hound Packet (WHOP), and Delay Per Hop Indication (DELPHI).

Keywords: WSN, Wormhole Attack, Watchdog, WHOP, DELPHI

I. INTRODUCTION

Wireless sensor networks are the combination of very small tiny devices known as sensors and the main objective of these sensor devices to measure the activities of a particular region where the sensors have deployed. The wireless sensor network is used in various fields like military, hospitals, agriculture, health, and to measure the number of environmental conditions like moisture, temperature, and humidity [1].

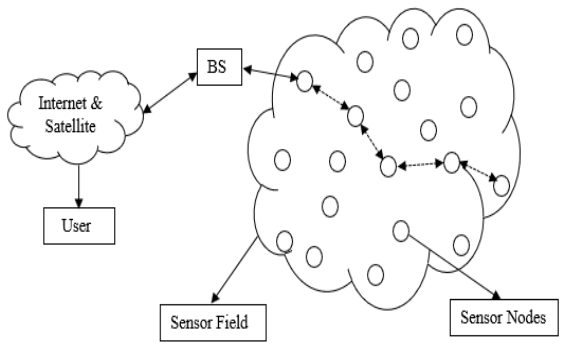

Fig. 1 WSN Architecture

WSN attacks

The Wireless Sensor Networks attacks viewed on security, protocols. It can base on the principle of communication. In Wireless Sensor Network, we can categorize it into two main types.

A. **Active Attack**: The active wants to make changes in the transmitted messages or try to modify it. The attacker can also try to inject its information in the traffic or to disturb the transmission [2].

B. **Passive Attack**: The passive attacks are difficult to trace-out because they only listen to the information. Neither they modify the information nor to exchange it. These attacks are basically supported for the active attack after gaining the information [3].

Security Goals in WSN

The wireless sensor network is not untouched from the various types of attacks. The primary requisites to

supreme the security checks are Availability, Confidentiality, Integrity, and Authenticity. Except these, some other secondary conditions are source localization, self-organization and data freshness [4].

Availability: Availability designates the data should be always on site all time even in case of a contamination. So for this, it is important that the network should be more and more secure.

Confidentiality: Confidentiality should be compulsory from both the sides sender and receiver. There is an important term Secrecy at both the endpoints. The secrecy is of two types, one is forward secrecy and another backward secrecy. In forwarding secrecy, the sender may not be able to retrieve the information after denying the network while in backward secrecy the receiver member node may not be able to access the precedent information afore joining the network. So, secrecy is a consequential thing to maintain between sender and receiver.

Integrity: The data sent by the sender should be modified at the receiver end. The can be modified by the intruder or by an intruder. If the received information is modified then the network should be able to detect the modifications.

Authenticity: Inauthenticity the verification of the sender node is an important thing for the receiver so that any trait node cannot impose any data in the network.

Wormhole Attack

In the wormhole attack, the malicious node has more energy in comparison than the other nodes at the initial level, so it works as a cluster head for the first round. After being a cluster head, it receives the data from all neighbor nodes, then it aggregates the whole data and does not transfer to the base station so the total amount of transmitted data is reduced [5].

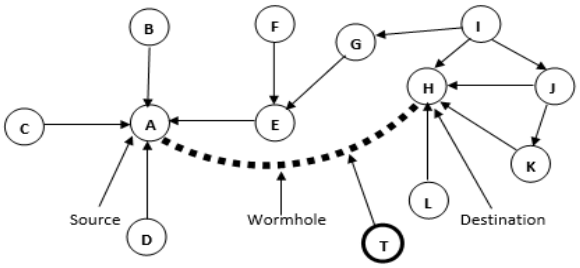

Fig. 2 Representation of Wormhole Attack

WORMHOLE ATTACK MODEL

A. Open Wormhole

In open wormhole attack the malicious node M1, M2 and source and destination nodes are visible while nodes A and B kept hidden. The attackers involved in packet header following the route discovery procedure. The nodes in the network are sensible about the about the beingness of malicious nodes on the path but they would copy that the malicious nodes are direct neighbors [6].

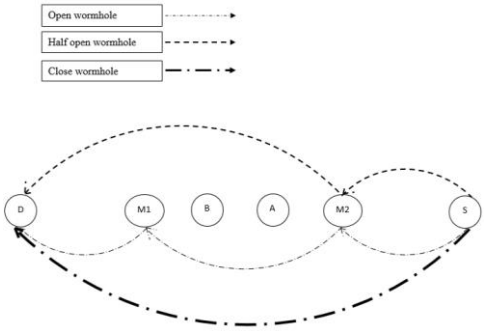

Fig. 3 Representation of Open, Half Open, and Close Wormhole

B. Half-Open Wormhole

The malicious node M1 is near to source node is open while the malicious node M2 node is invisible. The path traversed in this is S-M1-D for transferring the data by source to destination. The malicious does not alter the data of the packet. Alternatively, they normally tunnel the data from one side to another side and it retransmits packets [7].

C. Close Wormhole:

The IDs of all intermediate nodes are hidden between Source and Destination. So, in this way, the Source

node and Destination node feel that they are just one-hop off from each other. Thus, bogus nodes are created [8].

Types of Wormhole Attack

The wormhole attack can be classified on the basis of performance and the number of nodes involved in the simulation.

A. Wormhole using packet encapsulation:

In this scenario, an intruder node hears at one end to RREQ packets and transmits the information to the second end node. After that, the second party node rebroadcasts the RREQ and drops the packets. So, the resultant is that the collaboration of these nodes establishes a packet encapsulation wormhole [9].

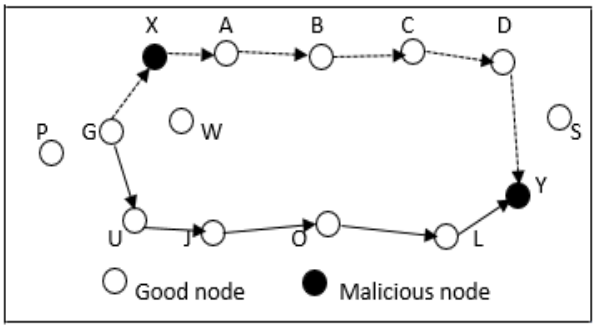

Fig. 4 Wormhole Using Packet Encapsulation

B. Wormhole Using Out-of-band Attack: This takes place due to the high bandwidth energy between the assailed nodes. This link is achieved via long-range direct wireless or wired link. Such type of attack is not easy because it needs some specialized hardware capability [10].

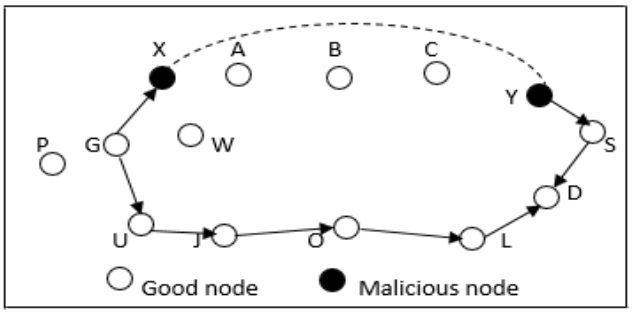

Fig. 5 Wormhole Using Out-of-band

C. Wormhole Using Packet Relay: In Wireless Sensor Networks, such type of attacks can be launched with the help of one or more than nodes. The assailed node transmits the data packets of two faraway sensor nodes to agree them that they are neighbors [11].

D. Wormhole Using High Power Transmission: This type of attack can be done only a single assailed node with a high-power transmission. The assailed node communicates faraway nodes. As the assailed accepts an RREQ, it transmits the request a ta high power level. The receiving node rebroadcasts the RREQ to the destination. Due to this, the assailed have a great chance to initiate a route between the source and sink without the participation of any other assailed node. The chance of occurrence is to be reduced if every sensor node has the ability to measure the received signal strength (RSS) [12].

Schemes to detect the Wormhole Attacks

A. Watchdog technique: With the help of watchdog technique user can traits detect the assailed nodes in the network area. In this scenario, the source node transmits a message to the sink node via an intermediate node. If the intermediate does not transmit the received to sink node, then user declares a malicious node to the intermediate node [13] [18].

The main problem of watchdog approach in leach protocol afore the steady phase and withal used decentralized Intrusion detection method in setup and steady phase [14].

B. Wormhole Attack Detection Protocol using Hound Packet (WHOP): The WHOP protocol was suggested for the wormhole attack detection in AODV protocol. In this methodology, a hound message transmits after discovering the path. The hound packet traverses all the nodes except the nodes are

involved in the path set-up. After receiving the packet by the sender, it launches a hound packet to digest it by its own private key and associate all the information with the hound packet.

But the main problem with the WHOP protocol, the processing of packets is too poor [15].

C. **Delay Per Hop Indication (DELPHI):** In DelPHI wormhole observation user gathers hop count as well as delay information to observe the wormhole detection. In the normal conditions, the delay of a should remain same along each path. But the path traversed via any assailed node should be higher than the normal traversal [16]. This method works only for the checking of wormhole attacks and a delay between the source and sink node [18].

The main restriction of DelPHI mechanism is that it can work for some of the paths tunnelled by wormhole attack, if most of the paths are tunnelled by wormhole attack then it will not work well [13].

D. **Location-Based Approaches:** The main moto behind the location-based approach is to use the geographical id to recognize the assailed nodes. Before transmitting the information, nodes fix a communication time and geographical id and the next receiving node calculate the transmission time to ensure the wormhole attack [17].

E. **Time Calculation Based Approaches:** In this scenario the is a True Link means a direct link among adjacent nodes. The Direct Link takes two steps to detect the wormhole named as rendezvous and validation. The first step is done with timing factor between the nodes but does not exchange any information while the second phase prove that both the nodes are validate to each other. The main downside of this technique is that it operates only on IEEE 802.11 gadgets. So, the True Link technique is planned only for secret attacks.

TABLE 1 Wormhole Attack Detection Techniques

Detection Technique	Necessity/ Analysis
Watchdog Technique	Wrong response, collaboration, incomplete drizzling
WHOP	Works with only private key, packet processing too poor
DelPHI	No need to readjustment, delay as well as hop count is measured
Location Based Approaches	Location of each node, unambiguous solution.
Time Calculation Based Approach	Validation mechanism, operates only with IEEE 802.11 hardware.

II. CONCLUSION

Here we have discussed different types of wormhole attack in wireless sensor networks and detection mechanism for wormhole attacks as well. Each and every detection mechanism has the ability to detect. The watchdog mechanism is a powerful tool for the detection of wormhole attacks in the network. The DelPHI mechanism the user collects the hop count and observe the delay entire network. The WHOP mechanism is used to detect the wormhole attack in AODV protocol but it has constraint of poor packet transmission.

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Automatic Bike Stand with Smart Helmet

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ABSTRACT

Two-wheelers are most prone to accidents due to their fragile nature. One of the issues of motorbike accidents is that people forget to slide their side stands back in place on starting the bike and people also forget to carry helmet.

So here we propose smart helmet with automatic side stand if the rider does not wear helmet, then bike would not start. when we wear the helmet switch press and send the signal to encoder which encode the signal then after it will transmit to RF transmitter and RF transmitter release the signal in air the RF receiver will catch the signal the and decode the signal then decode signal send to Arduino UNO then Arduino UNO send signal to the relay and relay will connect and disconnect the wire (the wire which coming from key slot) when it connected side stand will move and there is red switch which stop the side stand when it touches.

In modern developing world, automobile plays important role especially two-wheeler i.e. (motorcycles&bikes) plays a major role. Even though they are helpful there are some sad events like accidents due to careless of rider.

Some accidents occur due to forgetting of lifting side stand. To avoid such accidents, cause due to uplift the side stand, we may be producing the new advance in bike that as we press the gear lever to lift the side stand. So, we have made the project of "Automatic Side-Stand with smart helmet" is to be designed based on the working principle of bikes. This mechanism is operated manually means on the feet power of rider. After starting the bike immediately when the rider puts the first gear, the side stand lifts automatically.

Keywords: Two-wheeler, RF transmitter, RF receiver, Arduino UNO

I. INTRODUCTION

The thought of developing this project come to do so good thing towards the society day by day two-wheeler accident are increasing lead to losses of many life.

According to survey of India there are around more than 700 accident occurring due bike accident per year. The reason may be many such as no proper driving knowledge no fitness of the bike fast riding of the bike and drunk and drive etc.

sometimes the person injured the accident may not be directly responsible for accident it may be fault of rider but end of the day both drivers involve in the accident who is going to suffer if the accident are one issue lack of treatment of proper time is another reason for death.

In all over world everywhere motorcycle is used. The side stand plays major roll while the vehicle is in rest

position. But it has some disadvantages takes place as while the driver starting the motorcycle, there may be possibility of forget to release the side stand this will caused to unwanted troubles.

This is a new type of side stand which is automatically retracting the side stand through some mechanical and electronic arrangement. In this system microcontroller, , dc battery is used. sense the rotation of the wheel and sends the signal to the microcontroller which is actuate the dc motor which is caused the disengage the stand from the road.

A motorcycle side stand is nearly universal method of allowing a motorcycle rider to park his vehicle easily. If this stand is in the park position while the motorcycle is ridden through left turn a serious hazard exists.

A new type stand side stand which is automatically retracting side stand is invented to prevent such type of accidents. Side stand mounted behind bottom bracket and can be bolted on either clamping the chain stays, or welded in to place as an integral part of the frame.

A side stand is a device on a bicycle or motorcycle that allows the bike to be Kept upright without leaning against another object or the aid of a person. A side stand is usually a piece of metal that flips down from the frame and makes contact with the ground. It is generally located in the middle of the bike or towards the rear. Some touring bicycles have two: one at the rear, and a second in the front. . A side stand is usually a piece of metal that flips down from the frame and makes contact with the ground. It is generally located in the middle of the bike or towards the rear. We may have witnessed motorcycle accidents because of the surface hindrance of retracted positioned side stand. One of the most common problems that are encountered in using the side stand is negligence or carelessness to kick back the side stand The negligence may be due to absence of mind. The side stand lock link relates to the field of automobiles industry, especially for two wheeler vehicles using side stand apart from the aim center stand provided there in for the resting of the vehicle. The side stand lock link makes the contact with the gear lever there by indicating the person handling the vehicle about the unreleased side stand when the rider tries to apply the gear in unreleased state of stand and prevents him from being endanger or to have unsafe ride of motor cycle.

II. LITERATURE REVIEW

The first step in the invention of this glorious machine can be tracked down in 1791 at Parisian Park a toy-like machine named Hobby Horse as a plaything for rich. Improvement in it is seen in 1817, now front wheel can be turned by a handle. This was named as Draisienne after German Baron von Draise or a Velocify. The first treadle led true bicycle appeared in 1830 which was ridden with both feet‟s entirely off the ground by the earliest known side-stand was designed by Albert Berruyer in 1869, and since then side-stands have been independently reinvented many times. It was mounted below the handlebars so was much longer than more recent designs. A shorter model was patented by Eldon Henderson in 1926.In the 1930s, a "smaller, more convenient" side-stand was developed by Joseph Paul Treen. In 1891, Pardon W, tilling hast patented a design for a stand which was mounted on the pedal, but folded up flat under the pedal when not in use. Side-stands on bicycles fell out of fashion in the 1970s, as the bicycles became lighter, and many riders were concerned about extra weight.

According to the recent Research paper in 2016 titled ‘2 Helmet using for accident detection and reporting system’, The author specially developed this project to improve the safety of the bikers.

The objective of this project is to study and understand the concept of RF transmitter and RF receiver circuit. The major disadvantage of this project is they are not using any display device for showing the current status. Also, the cost of helmet is

still high since helmet is designed for only one purpose.

According to the Research paper in 2015 titled 'Microcontroller based smart wear for driver safety', In this paper author has discussed on the speed of the vehicle. The author has worked only on the phenomenon of accident.

Research paper in 2016 titled 'Smart Helmet', In this paper the main objective of author is to force the rider to wear the helmet. In this competitive world one of the surveys says that the death trolls due to motor bike accidents are increasing day by day out of which most of these casualties occurs because of the absence of helmet.

Traffic police cannot cover remote roads of city. That's why over primary objective is to make the usage of the helmet for two wheelers" compulsory ". Thus, no one other than the owner himself, who doesn't have "password" which would have been created by the owner, can use the bike. In this author has proposed the feature that the bike will not start unless the bike rider does not wear the helmet.

Arduino is also used in this project which is an open-source tool for making computer that can sense. According to the Research paper in 2015 titled 'Smart Helmet', In this project the author has proposed the smart helmet because of growing bike accident. People get injured or might be dead because of not wearing helmet. Continuously no one follows road rules. So, to overcome this problem this helmet is been designed. The middle-class families prefer to buy motor bike over four wheelers, because of the low prices, various variety available in the market.

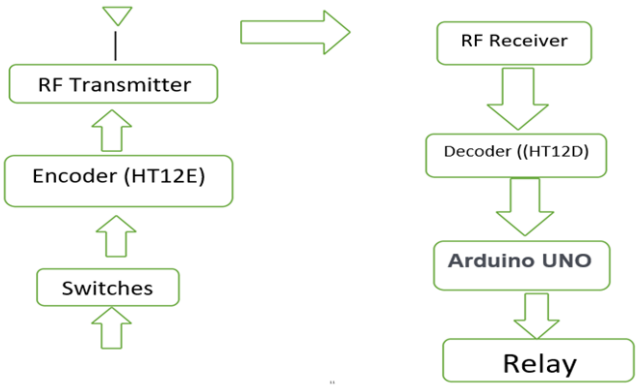
Author has also used encoder that receives parallel data in the form of address bits and control bits the other author has used smart system for helmet. But in this project author have not focused on the major issue that will occur in future regarding the alcohol and many other

III. EXPERIMENTAL SETUP

A. Working Principal

TheTwo-wheelers are most prone to accidents due to their fragile nature. One of the issues of motorbike accidents is that people forget to slide their side stands back in place on starting the bike and people also forget to carry helmet. So here we propose smart helmet with automatic side stand if the rider does not wear helmet, then bike would not start.

When we wear the helmet switch press and send the signal to encoder which encode the signal then after it will transmit to RF transmitter and RF transmitter release the signal in air the RF receiver will catch the signal the and decode the signal then decode signal send to Arduino UNO then Arduino UNO send signal to the relay and relay will connect and disconnect the wire (the wire which coming from key slot) when it connected side stand will move and there is red switch which stop the side stand when it touches



B. Defination of Components

I. Battery

It is used to supply 12volt power dc to motor

We could not use the battery more than 12 volt because it is hazards

II. DC Motor

Motor is used to convert electrical energy to mechanical energy

Here it used to lift the side stand

DC motor is designed for two-speed operation. It consists of three brushes namely: common, low speed,

high speed. Two of the brushes will be supplied for a different mode of operation. The DC motor does not oscillate back and forth, it rotates continuously in one direction like most others motors. The rotational motion is converted to the back-and-forth wiper motion by a series of mechanical linkage. This type of motor is called a gear head or motor end has the advantage of having lots of torque. The dc motor works on 12-volt D.C. battery

III. Pushbutton

A limit switch is configured to detect when a system's element has moved to a certain position. A system operation is triggered when a limit switch is tripped

It is a momentary or non-latching switch which causes a temporary change in the state of an electric circuit only while the switch is physically actuated. An automatic mechanism (i.e., a spring) returns the switch to its default position immediately afterwards, restoring the initial circuit condition. There are two types:

A 'push to make' switch allows electricity to flow between its two contacts when held in. When the button is released, the circuit is broken.

A 'push to break' switch does the opposite, i.e. when the button is not pressed, electricity can flow, but when it is pressed the circuit is broken. This type of switch is also known as a normally close. (Examples: Fridge Light Switch, Alarm Switches in Fail-Safe circuits).

Many Push switches are designed to function as both 'push to make' and 'push to break' switches. For these switches, the wiring of the switch determines whether the switch functions as a 'push to make' or as a 'push to break' switch.

IV. Relays

It is used to change the direction of the motor.

V. Arduino UNO

It is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

VI. RF Module

An RF module (short for radio-frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wireless

VII. Side Stand

A side stand is a device on a bicycle or motor cycle that allows the bike to be kept upright without leaning against another object or the aid of a person. Aside stand is usually a piece of metal that flips down from the frame and contacts the ground.

VIII. Micro Controller

A **microcontroller** (**MCU** for *microcontroller unit*) is a small computer on a single metal-oxide-semiconductor (MOS) VLSI integrated circuit (IC) chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

In modern terminology, a microcontroller is similar to, but less sophisticated than, a system on achip (SoC). An SoC may connect the external microcontroller chips as the motherboard components, but an SoC usually integrates the advanced peripherals like graphics processing unit (GPU) and Wi-Fi interface controller as its internal microcontroller unit circuits.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems. In the context of the internet of things, microcontrollers are an economical and popular means of datacollection, sensing and actuating the physical world as edge devices.

Some microcontrollers may use four-bit words and operate at frequencies as low as 4 kHz for low power consumption (single-digit milliwatts or microwatts). They generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

IV. CONCLUSION

During the time of riding a bike with side stand in its uplift may create problems and accident but with the help of our accessories we solved this problem. The objective of this project is to provide the rigid and safety mechanism without changing in any standard design of bike. It does not disturb the performance of the vehicle. And it is different than other mechanism. Other system requires battery power or chain power but it is not required any external power. Moreover, it should be economical for every class of society. it is new product it will promote employment and vast field development for new engineer in day period. By using this system, we avoid the accident which happened due to the side stand. Also, it's easy to installed in any gear bike and economical

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Automated Vending Machine : A Review

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ABSTRACT

Vending Machines are automated machines that dispense selling products such as snacks, beverages, lottery tickets, and etc. It is vital to save time and reduce human energy. These vending machines are developed in the way of Non IoT based and IoT based methods. These Non IoT based machines are not smart and are not operated in real-time data, which are functioned when giving cash or card and inputs (vending things) of the machine. It is controlled by a microcontroller and distributed the given inputs. IoT- based machines are computerized, which have cashless payment facilities, order facility before going to the vending machine to order things, and can be identified the location of machines by the customer. These IoT-based machines are assisted to suppliers to identify the availability of the stocks. Simulation software and prototype are used to validate the machines. In this review, it is found that most of the vending machines developed are capable of operating without IoT technology, and nowadays, vending machine systems are required to implement using IoT with machine learning, and artificial technologies to satisfy the customer preferences.

Keywords: Internet of Things; Vending machines; Automatic machine; Automation; Cashless payment; and smart vending.

I. INTRODUCTION

Nowadays, automated machines are in demand for making numerous activities not only easier, but also more efficient [1, 2]. These machines require minimal human intervention to carry out the work. The machine has numerous inputs and outputs to provide service to customers [3].Automatic vending machines are not that common in our country. Hence implementing such a machine in real-time will be of great use for people. The advantage of the machine is it requires no man power, consumes less power, occupies less space, maintenance free, simple in operation and portable. The objective is to develop a vending machine prototype model for vending the items by credit or transaction. The availability of the items is also checked. It finds its application by mainly students and common citizens in public places. Vending Machines: Candy machine is a coin worked machine for offering stock. Candy machine gives different item, for example, snacks, refreshments, water, tickets, and others item. Candy machine likewise does not require administrator or laborers for running it. Candy machines can be utilized both for offering an item (stationary, cool drinks, etc) or offering an administration (tickets, coupons, and so forth). After installment has been made the machine will administer the concerned item or administration (Ana Monga, 2012; Ankush, 2012; Shatrughan Modi, 2011; Biplab Roy, 2010). Around 215 B.C, the first

candy machine is accepted to have been developed in Alexandria, Egypt. The mathematician Hero presented machine that acknowledged a coin and afterward apportioned a settled measure of blessed water. After that, in A.D1076, candy machine was overhauled by Chinese designers who added to a coinworked pencil merchant (Subramoney, 2007; Kaushal, 2012; Karthik, 2013, Jasmin, 2015). Mid 1880s, the first present day coin-worked candy machines apportioning post card were presented in London, England. The primary candy machine in the U.S. was implicit 1888 by the Thomas Adams Gum Company. The candy machine administered a bit of tutti-frutti gum. In late 1920 and 1930, costlier items were presented. Sample being soda pop and nickel-confection. In 1946, espresso sellers were produced and took after by refrigerated sandwich merchants in 1950. These days, numerous things can be found in candy machine, for example, dress, milk, cigarettes, postage stamps, cologne, baseball cards, books, live draw, comic books, and some more. Some hey tech candy machine can apportion hot nourishments, for example, pizza, popcorn, French and burger. A couple of frameworks utilized an exploratory Java and an exceptional reason equipment interface to control a Pepsi B candy machine over the World Wide Web. This framework permits clients with prepaid records to distribute a pop from the Pepsi A machine (with no coins or bills) utilizing a web program, for example, Netscape or Internet Explorer. Anybody with a web program might see whether any of his or her most loved soft drinks are left in the machine. Indeed, even remote candy machines were planned and executed. In our proposed framework, the candy machine is intended to distribute vital things. The advantage of the framework is its reduced size and is anything but difficult to introduce. It has great surface shower to guarantee rust counteractive action in the machine. Primary component of it is innovative apportioning system by reversible upset of the belt. It can acknowledge one division of coin every time, except can acknowledge 1-6 pieces by setting. High volume rechargeable battery or 8pcs size D battery are utilized for force supply and along these lines help in decreasing the utilization of power (Philomina, 2014; Karthik, 2014; Gopalakrishnan, 2014)

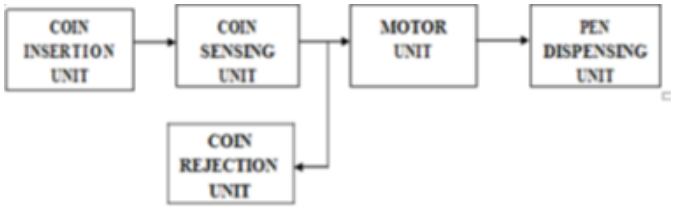

Figure:1 System block diagram

System Block Diagram:

Coin Insertion Unit: A provision for insertion of coin is made at the top of the machine. The coin slot is made in such a way that it can accept only a particular type of coin hence it will not accept any other denominations. Once a coin is inserted it is directed through a pathway of similar size (Saravanan, 2014; Vijayaragavan, 2014).

Coin Sensing Unit: As the coin moves through a path, it is made to pass through an Infra-red sensor. When the light ray emitted by the Infra-red sensor source is cut while the coin passes through the ir sensor, it generates an output that actuates a stepper motor.

Coin Rejection Unit: There are two specific cases when a coin rejection takes place. First case, a coin is rejected when no output is generated from the sensor which in turn rotates a stepper motor to 360° in anti-clockwise direction so that the coin is sent to coin rejection area. Second case, a coin is rejected when a pen is not dispensed or unavailable.

Motor Unit: The motor unit is dependent on the coin sensing unit. Motor unit works only if there is a valid output from the coin sensing unit is obtained. If a valid output is obtained from the coin sensing unit, the Stepper motor which is coupled to a gear system is made to rotated 180° which in turn rotates the gear to

15° in order to dispense the item (Karthik, 2013; Kanniga, 2011, 2014).

Dispensing Unit: Once all the above units work properly and efficiently, the item is dispensed and can be collected from the collection area

Working: The user can drop a coin through the slot provided and press the button of the required item. After the insertion and sensing of the coin, execution of the process starts. A sensed coin waits for the entire process to be completed before getting deposited into the collection box. An un-sensed condition ensures that the coin is given back. The process ends with one item being dispensed to the collection area, the rotation mechanism of the stepper motor and the associated load ensures that proper operation takes place and the item is vended properly. The item as it gets dispensed is made to pass through the infra-red sensor. As the object cuts the infrared rays, we can say that the process is complete. If the item is not dispensed out and if there is no obstruction sensed by the sensor, then it is assumed that there is some problem in the system. In that case, the control goes to the coin stepper motor and coin is sent to the rejection area.

Mechanical structure:

The prototype model is implemented by the help of the mechanical design setup. The various blocks present in the design are mentioned below.

Coin section: The coin section consists of three units – coin insertion unit, coin sensing unit and the coin rejection unit.

A coin slot slot is provided at the top of the box to insert the coin. This coin slot will accept only one type of coin. Subsequently the coin will be directed through a pathway of similar size. The machine will not accept other denomination coins. The coin would be rejected if the pen is not vended properly.

The purpose of the infrared sensors is to check if the coin is dropped into. Its structure consists of a flat plate to hold the inserted coin. So when a coin is dropped on the plate, then the infrared signal is cut and immediately an output will be generated and thus the sensing will be done.

The rejection unit consists of a stepper motor which is coupled to the flat plate. The stepper motor enables the plate to rotate either left or right 90^{o} and return back to its position. So when there is change in resistance, it checks for the range.

The coin section functions under

Two main conditions:

- If coin is valid Stepper motor rotates the COIN STEPPER MOTOR 360 degree RIGHT. And the coin gets collected in the drop box.
- If coin is invalid Rotate the COIN SENSOR MOTOR 360o LEFT, where the coin will be rejected through the rejection bay.

Dispensing Unit: The dispensing unit consists of conveyors for holding the items, a gear to rotate, stepper motor and infra-red sensors. 3 conveyors will be provided for 3 different items separately. Material used is rubber. Capacity provided for items are 50 items each.

Metal Box: This sheet metal box is used to hold all the mechanical and electronic components intact. A lock is kept for safety purpose. A control unit is provided separately at the bottom to hold all the electronic components which include 89c51 development board, stepper motor, drivers and transformers.

Conveyors: Conveyors are used to hold the items. They are made up of rubber material. A guide is provided along the sides of the conveyors such that item is held in position and not rolled. A opening is made at the bottom of the guides so that only one item is dropped out at a time.

Rollers: A Conveyor is mounted on top of rollers. A bearing system is used for rotating the conveyors as per the specified angle. Material used is nylon for light weight purpose.

Gears: Gear is made up of nylon. It is used to propel the load from the stepper motor to the rollers.

II. CONCLUSION AND FUTURE SCOPE

The proposed system is the design of prototype model for an automatic vending machine. The controller part was tested and it was found that automatic vending machine prototype was working according to the specifications for which it was designed. The prototype model was designed for the implementation of the mechanical structure of a vending machine which finally results in vending a item upon the insertion of the coin. Implementation of this machine in schools and colleges will help the students to take the items whenever they are in need of it. Coins were inserted and items were vended successfully. In future, vending machines of maximum accuracy and efficiency can be achieved with better design and faster control equipment's.

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Changing the Centre Stage for Effective Teaching and Learning : Flipped Classroom Approach

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ABSTRACT

An alternative to the traditional lecture mode of teaching which is actively being practised and has gained a tremendous amount of attention is the flipped classroom approach. In flipped classroom model the pre-learning materials like online audio, video and readings are shared in advanceStudents use these materials prior to coming to class which leads to freeing up the class for discussions, hands-onapplications, problem-solving, games and other engaging and collaborative activities. In this type of setup the role of the teacher/ instructor changes from deliverer of content to guiding students through a series of engaging and experiential-learning activities.During the course,students learn how to find answers together with the questions they prepared before the lesson i.e. group learning, problem-solving and analytical skills. The present research emphasizesunderstanding the student's perspective regarding flipped classrooms.Students being important stakeholders, this research considers their perspective as a crucial element to the present study.This study was conducted amongst students studying in management colleges located in the National Capital Region (NCR) with a sample size of 211 respondents.

Keywords: Flipped classroom, Learning material, Learning.

I. INTRODUCTION

In the 21st century, the traditional lecture style of teaching remains the most popular and commonly found in all kinds of college courses worldwide. Students and teachers both are familiar with the traditional lecture method and are generally comfortable in the conventional classroom. For many, it is a method that yields positive and better results. However, there are better approaches for everyone regarding learning style and flexibility. In our century, rapidly developed technologies affected education training fields as they do in all areas. Change in knowledge and technology is so fast that in education also, development with innovative learning approaches is rapidly changing. This change and transformation in the education training field take out a new strategy: flipped classroom system in education. The flipped classroom approach, accepted as the most popular and active-based approach, is a specific change in blended learning. The main aim of this new learning approach is to prepare students in the subject before the course and during the period by applying

activities that increase the quality of class participation and education.

A flipped classroom is "a pedagogical model in which the typical lecture and homework elements of a course are reversed". Video lectures, readings, and podcasts are just a few tools that allow students access to course materials and lectures outside of class time, mainly devoted to hands-on activities or discussion. This term has become widely adopted to mean any classroom that uses prerecorded material followed by a more active classroom setting. The nature of flipping a classroom is that the instructor of a course serves in many roles, including subject matter expert, instructional designer, and developer. The students in the flipped classroom use self-directed learning methods to review and critically consider materials outside of class and then actively apply what was learned in a collaborative class environment. While flipping holds promise for helping students achieve meaningful learning outcomes and for assisting instructors in making more efficient use of class time, it is but one of many instructional strategies.

The hands-on and interactive activities associated with the flipped classroom may better accommodate students of this millennium since the teacher, who acts like a facilitator, can guide the process and help students. At the same time, they are engaged in learning activities. In contrast, students in traditional lecture-style courses typically encounter difficulty learning in class and the most complex and frustrating outside of class, where they likely need access to such instructional help.

II. REVIEW OF LITERATURE

The flipped classroom is an approach that increases active learning activities and allows the student to use his knowledge in class with the guidance of a teacher. There are many definitions regarding flipped classrooms in literature. According to Bishop and Verleger (2013) flipped classroom is a student-centred learning method consisting of two parts interactive learning activities during the lesson and individual teaching based directly on the computer outside the class. Mull (2012) defined it as a model that provides students to prepare themselves for the lesson by watching videos, listening to podcasts and reading articles. According to Milman (2012), it is an approach aimed at the efficiency of classes by transferring knowledge to students via videos and vodcasts, as well as through discussions, group works, and applications during the course. Hamdan and others (2013) explained flipped classroom is not a defined model; instead, it is a model that teachers use to compensate for the demands of students by using different equipment. Since educators in other countries use flipped classrooms with various methods, this caused the changing of flipped classroom concept to flipped classroom approach. It is emphasized that this new approach can be used with different learning methods (Flipped Learning Network-FLN, 2014).

Lord and Camacho (2007), in their survey of engineering faculty, found that only 36 % of teachers think that the traditional lecture style is good, whereas 60 % of teachers teach in the lecture style. Most faculty members recognized the need for an active learning environment and its incorporation. In this regard, one obstacle is the coverage of the course syllabus. In contrast, another obstacle is the delivery of basic knowledge, which competes with the application part of that knowledge within specified class time. Today's millennium students need both active and passive learning opportunities within class time.

Frand (2000) mentioned in his research that students of the new millennium believe that doing is more important than knowing and that learning is a trial-and-error process. Lage, Platt, and Tregalia (2000) found that students in their economics courses felt they learned more in the flipped environment than in a lecture course. Students in their class enjoyed the hands-on as well as the group work experience and interaction with their classmates and felt easier asking questions in the less formal flipped classroom. Carlisle

(2010) mentioned in his study that he used the flipped classroom method in his introductory computer programming course. Interestingly, students indicated that the instructional videos he had developed for the system helped them learn the material, and they liked having more time to do hands-on programming work in class.

Deslauriers, Schelew, and Wieman (2011), in a large-enrolment physics course, compared learning achieved using a traditional lecture approach to that completed using a 'deliberate practice' approach with characteristics of the flipped methodology. The study found increased student attendance and higher engagement in the non-lecture section. Students in the non-lecture area also did more than twice as well on the given test compared to those in the lecture section. Day and Foley (2006) applied the flipped classroom approach in two human–computer interaction course sections. Using a small-scale quasi-experimental design, they taught one section using traditional lectures and one section using the flipped approach. They found that students in the flipped class section performed better on every course assignment.

Bette et al. (2014) found that students within a flipped classroom performed as well as their peers in a traditional classroom on the final exam performed well, representing conceptual understanding. They found this result necessary as the flipped classroom students learned the essential mathematical skills from their linear algebra coursework and enjoyed the classes more.

In a survey of university students on learning environment and activity, Strayer (2007) studied the comparison between a class that received traditional instruction and a class that was given flipped instruction. He found that students in the Flipped Classroom "preferred and experienced a higher level of innovation and cooperation in their classroom". Strayer (2007) also noted that students were less satisfied with the class structure, though they enjoyed the innovation and cooperation aspects of the flipped classroom. The unstructured model of the course brought unsettledness among students, which needed to be experienced in the traditional lecture classroom. Strayer suggested that students should have a choice regarding how they interact with the course content, the activities in class should be less open-ended and more step-by-step, and lastly, that students be given a significant opportunity to reflect on their learning.

III. OBJECTIVES OF THE STUDY

The primary purpose of this study was to provide insight towards Flipped classrooms with an emphasis on student perceptions. The following are the objectives of the study –To study the flipped classroom approach.

- To study the management students' perception of the flipped classroom approach.
- To know whether there exists a significant difference level of management students' perception based on various parameters like different age, gender, educational qualification and comfort level with Information Technology among management students under study.

IV. HYPOTHESIS OF THE STUDY

In order to know the significant difference between management students' perception of the flipped classroom approach with reference to three demographic variables and comfort level with Information Technology, following hypothesis have been tested:

$H_0$1: There is no significant difference in students' perception towards flipped classroom approach between students of different age group.

$H_0$2: There is no significant difference in students' perception towards flipped classroom approach between male and female students.

$H_0$3: There is no significant difference in students' perception towards flipped classroom approach between students of different qualifications.

H_04: There is no significant difference in students' perception towards flipped classroom approach among the students having different comfort level with Information Technology.

V. RESEARCH METHODOLOGY

This study is based on the survey results of 211 respondents. The self-administered questionnaire was circulated to 400 respondents, out of which 216 were received, but due to some missing values in five responses, only 211 of them were considered for the study. The respondents were students pursuing various undergraduate and postgraduate management courses in universities and colleges located in Delhi NCR. These students had the experience of attending flipped classes and are aware about the lecture based "Sage on Stage" and Flipped based " Guide on Side" classroom conduct.

The data were analyzed with the help of SPSS 19. First demographic data was tabulated as frequency and percentage distribution. Cross-tabulation of data was done where there was a need to know the joint distribution of two or more variables. To test the various hypotheses given in the study, independent sample t-test and multivariate analysis ANOVA were used.

VI. RESULTS AND ANALYSIS

6.1. Analysis of Demographic Distribution of Respondents

6.1.1. Age wise distribution of respondents

The age of the respondents varies between 20 years to 30 years. There were 2% responded between the age of 20 to 21 years and 4% of the respondents were having the age more than 25 years, whereas 71% of the respondents were in the age group of 21 to 23 years (Table 1)

Table 1: Age wise distribution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Age Group	20-21	4	1.9	1.9	1.9
	21-23	150	71.2	71.2	73.1
	23-25	48	23.1	23.1	96.2
	Above 25	8	3.8	3.8	100.0
	Total	210	100.0	100.0	

6.1.2. Gender-wise distribution of respondents

There were 61% male and 39% female students who shared their opinion on the flipped classrooms (Table 2).

Table 2:Gender wise distribution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Female	82	39.2	39.2	39.2
	Male	129	60.8	60.8	100.0
	Total	211	100.0	100.0	

6.1.3. Qualification wise distribution of respondents

Out of the total number of respondents, 172 i.e. around 81 % of the respondents were perusing a post graduation course in management (MBA/ PGDM) and around 19 % of them were doing under graduation course in management (BBA/BBM)(Table 3).

Table 3: Qualification wise distribution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Qualification	PG	172	81.1	81.1	81.1
	UG	30	18.9	18.9	100.0
	Total	211	100.0	100.0	

6.1.4. Distribution of respondents with respect to comfort level with information technology

Table 4: Comfort level of various age group with technology

		Comfortable	Highly comfortable	Moderately comfortable	Not at all comfortable	Total
Age	20-21	3	1	0	0	4
	21-23	88	25	37	1	151
	23-25	26	12	9	1	48
	Above 25	5	1	2	0	8
Total		122	39	48	2	211

Table 5 Comfort level of various age group with technology

		Comfort level with technology Among Different Genders				Total
		Comfortable	Highly comfortable	Moderately comfortable	Not at all comfortable	
Gender	Female	47	11	24	1	83
	Male	75	28	24	1	128
Total		122	39	48	2	211

Most of the students rated themselves comfortable with the use of technology (Table 4 and 5). They also stated that on an average they spent 1 to 2 hours every day watching online videos related to classroom content. (Table6 and 7)

Table 6: Time Spent on Watching Video by Different Age Group

Age		Time Spent on Watching Video by Different Age Group			Total
		1-2 Hour	Less Than an Hour	More Than 2 Hour	
Age	21	2	2	0	4
	21-23	73	38	40	151
	23-25	24	8	16	48
	25	3	3	2	8
Total		102	51	58	211

Table 7: Time Spent on Watching Video by Different Genders

		Time Spent on Watching Video by Different Genders			Total
		1-2 Hour	Less Than an Hour	More Than 2 Hour	
Gender	Female	40	22	21	83
	Male	62	29	37	128
Total		102	51	58	211

But when the question was asked whether these videos and readings were discussed or they are supplemented with lecture in the classroom, more than 75% of the respondents were of the opinion that classes are still held in lecture mode. (Table 8 and 9)

Table 8: Opinion of different age group on Lecture Mode Teaching

		Lecture Mode		Total
		Yes	No	
Age	21	3	1	4
	21-23	115	35	150
	23-25	39	10	49
	25	5	3	8
Total		162	49	210

Table 9: Opinion of different Gender on Lecture Mode Teaching

	Lecture Mode		Total
	Yes	No	

Gender	Female	59	24	83
	Male	102	26	128
Total		161	50	211

When respondents were asked about, whether they have done any self paced course or not more than 50% of male students and 25% female students have done a few self paced courses and hence are motivated to learn by themselves (Table 10 and 11). The research also says that students in the age group of 23 to 25 are more motivated to do self paced course, as almost 50% of the students in the age group of 23 to 25 have done some self paced course as compared to 33% students in the age group of 21-23.

Table 10: Gender Vs Done Self Paced Courses

		Done Self paced Course		Total
		Yes	No	
Gender	Female	23	59	82
	Male	64	65	129
Total		87	124	211

Table 11: Age Groups Vs Done Self Paced Courses

		Done Self Paced Course		Total
		Yes	No	
Age	21	1	3	4
	21-23	54	96	150
	23-25	26	23	49
	25	5	3	8
Total		86	125	211

6.2. Students' perception level of flipped classroom approach

The questions in the questionnaire were so worded that each one of them indicated students' positive perceptions. The mean weighted score of all responses was calculated and used to indicate students' perception levels.Students' perception level towards flipped classroom approach was 3.62 out of 5 which is above average or on the higher side. This result indicates that management students under study have shown a positive attitude towards flipped classroom approach. They are keen to learn in interactive and technology-orientedenvironments. Students liked this innovative approach to learning than the traditional lecture style.

6.3. Hypothesis and Evaluation:

In order to know the significant difference between management students' perception of the flipped classroom approach with reference to three demographic variables and comfort level with Information Technology, following hypothesis have been tested:

Ho1: There is no significant difference in students' perception towards flipped classroom approach between students of different age groups.

In order to understand whether there was any significant difference in the perception of the students between different age groups, one-way ANOVA test was conducted. The p-value obtained at the 95% level of confidence was 0.024, which is less than 0.05, hence null hypothesis is rejected. This indicates that students have a positive perception towards the flipped classroom, but the opinion across different age groups is not the same (Table 12). Studentsof the youngest age group (< 21 years) under study were having the highest positive perception (mean score = 3.9 out of 5) towards flipped classroom approach than the older age group (> 25 years with mean score =3.56 out of 5). This gives a clear indication that the upcoming younger generation is more adaptive towards adopting new ways of technology-oriented learning

Table 12: ANOVA: Age and Students' Perception towards Flipped Classroom

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.474	3	.491	3.220	.024
Within Groups	31.730	208	.153		

Total	33.204	211			

H02: There is no significant difference in students' perception towards flipped classroom approach between male and female students.

In order to test the above hypothesis, an independent sample t-test was applied and it was found that the perception of both male and female students is not significantly different (p > 0.05). Both male and female students have almost the same high positive perception towards flipped classroom approach and believe that it is more supporting and engaging and results in better learning.

Table 13: Descriptive Statistics – Gender and Students' perception towards flipped classroom approach

Group Statistics					
	Gender	N	Mean	Std. Deviation	Std. Error Mean
Perception towards Flipped Classroom	1	129	3.6322	.35806	.03153
	2	83	3.5954	.45162	.04957

Table 17: One sample t test – Gender and Students' perception towards flipped classroom approach

Independent Samples Test										
	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Perception towards Flipped Classroom	Equal variances assumed	.644	.423	.658	210	.511	.03680	.05589	-.07339	.14699
	Equal variances not assumed			.626	146.402	.532	.03680	.05875	-.07930	.15290

H03: There is no significant difference in students' perception towards flipped classroom approach between students of different qualifications.

In order to test this hypothesis, an independent sample t-test was conducted and the results of the test indicate that there is no significant difference in students' perception towards the flipped classroom approach across different qualifications (table 15) as the p-value is greater than 0.05. Respondents under study were undergraduate and post-graduate management students. The average perception of students undergoing both undergraduate and postgraduate courses towards flipped classroom approach is strongly positive (table 14) and students believe that it is useful in retaining learning and motivating them to participate in group work and class participation.

Table 14:Descriptive Statistics– Educational Qualifications and Students' perception towards flipped classroom approach.

Group Statistics					
	Educational Qualification	N	Mean	Std. Deviation	Std. Error Mean
Perception towards Flipped Classroom	1	172	3.6288	.34357	.02620
	2	40	3.5703	.57530	.09096

Table 15: One sample t test - Educational qualifications and Students' perception towards flipped classroom approach.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Perception towards Flipped Classroom	Equal variances assumed	5.374	.021	.839	210	.402	.05850	.06968	-.07887	.19587
	Equal variances not assumed			.618	45.666	.540	.05850	.09466	-.13208	.24908

Ho4: There is no significant difference in students' perception towards flipped classroom approach among the students having a different comfort level with Information Technology.

In order to test the above hypothesis, one-way ANOVA test was carried out to know that whether there exists any significant difference in students' perception towards flipped classroom approach among the students having four different comfort levels with Information Technology.The comfort level of the students varies between highly comfortable to not at all comfortable. The hypothesis testing indicates that the null hypothesis is not rejected and hence the difference in the perception is not significant (p-value> 0.05). Students of all categories of comfort levels with Information Technology were having highly positive perceptions towards flipped classroom approach. This result shows that the new generation of young students was keen towards this new learning approach irrespective of their comfort level with Information Technology.

Table 16: ANOVA- Students' perception towards flipped classroom approach among the students having a different comfort levels with Information Technology

Perception towards Flipped Classroom					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.397	2	.198	1.263	.285
Within Groups	32.807	209	.157		
Total	33.204	211			

VII. CONCLUSION

The study aimed to study and compare management students' flipped classroom approach with different demographic variables i.e. age, gender and educational qualification and also their comfort level with Information Technology.On the basis of analysis

of results, it was concluded that overall students' perception towards this innovative approachwas very high whichis a very good sign for the development of new generation business leaders as they are keen to adopt new methods of learning. The study brings out some startling revelations in the context of demographic variables that with age there is a significant difference in students' perceptiontowards this innovative approach. The youngest category of students was having highest positive perception. The same is not seen apparent in the case of gender, educational qualification and comfort level with Information Technology.

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New Challenges in Metaverse with Respect to Augmented Reality and Virtual Reality

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ABSTRACT

The Metaverse is a concept of an online, 3D, virtual space connecting users in all aspects of their lives. It would connect multiple platforms, similar to the internet containing different websites accessible through a single browser. The concept was developed in the science-fiction novel Snow Crash by Neal Stephenson. However, while the idea of a Metaverse was once fiction, it now looks like it could be a reality in the future. Crypto cloud economies are the next emerging market investment frontier and the Metaverse is at the forefront of this Web 3.0 internet evolution. The Metaverse is a set of interconnected, experiential, 3D virtual worlds where people located anywhere can socialize in real-time to form a persistent, user-owned, internet economy spanning the digital and physical worlds. The internet has always been about connecting people. Over the past three decades, internet technology has evolved, and the way we all interact with the web has evolved with it. Much has changed, but three key eras of online-based communities could be thought of as: • Web 1.0 - Netscape connected us online • Web 2.0 - Facebook connected us into online communities • Web 3.0 - Decentraland connected us into a community-owned virtual world.

Keywords— Metaverse, Web 3.0, Web 2.0, Netscape

I. INTRODUCTION

The Metaverse is a concept of an online, 3D, virtual space connecting users in all aspects of their lives. It would connect multiple platforms, similar to the internet containing different websites accessible through a single browser. The concept was developed in the science-fiction novel Snow Crash by Neal Stephenson. However, while the idea of a Metaverse was once fiction, it now looks like it could be a reality in the future. The Metaverse will be driven by augmented reality, with each user controlling a character or avatar. For example, you might take a mixed reality meeting with an Oculus.

The internet has always been about connecting people. Over the past three decades, internet technology has evolved, and the way we all interact with the web has evolved with it. Much has changed, but three key eras of online-based communities could be thought of as:

Web 1.0 - Netscape connected us online

Web 2.0 - Facebook connected us into online communities

Web 3.0 - decentral and connected us into a community-owned virtual world.

A. Metaverse in Gaming

Because of the emphasis on 3D virtual reality, video games offer the closest Metaverse experience

currently. This point isn't just because they are 3D, though. Video games now offer services and features that cross over into other aspects of our lives. The video game Roblox even hosts virtual events like concerts and meetups. Players don't just play the game anymore; they also use it for other activities and parts of their lives in "cyberspace". For example, in the multiplayer game Fortnite , 12.3 million players took part in Travis Scott's virtual in-game music tour.

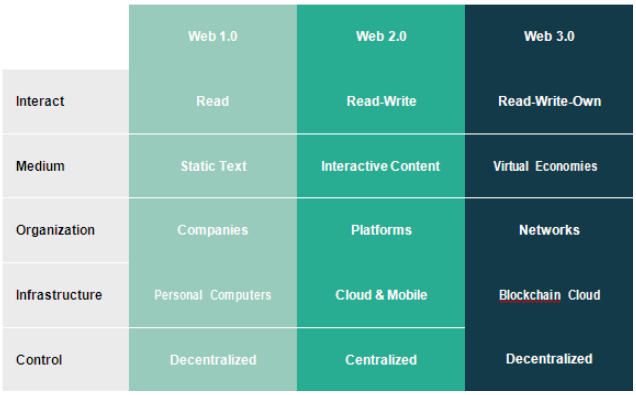

Figure-1: Key Features of Web-1.0, Web 2.0 and Web 3.0

B. Crypto File and Metaverse

Gaming provides the 3D aspect of the Metaverse but doesn't cover everything needed in a virtual world that can cover all aspects of life. Crypto can offer the other key parts required, such as digital proof of ownership, transfer of value, governance, and accessibility.

1. **Digital Proof of Ownership:** By owning a wallet with access to your private keys, you can instantly prove ownership of activity or an asset on the blockchain. For example, you could show an exact transcript of your transactions on the blockchain while at work to show accountability. A wallet is one of the most secure and robust methods for establishing a digital identity and proof of ownership.
2. **Digital Collectability:** Just as we can establish who owns something, we can also show that an item is original and unique. For a Metaverse looking to incorporate more real-life activities, this is important. Through NFTs, we can create objects that are 100% unique and can never be copied exactly or forged. A block chain can also represent ownership of physical items.
3. **Transfer of Value:** A Metaverse will need a way to transfer value securely that users trust. In-game currencies in multiplayer games are less secure than crypto on a block chain. If users spend large amounts of time in the Metaverse and even earn money there, they will need a reliable currency.
4. **Governence:** The ability to control the rules of your interaction with the Metaverse should also be important for users. In real life, we can have voting rights in companies and elect leaders and governments. The Metaverse will also need ways to implement fair governance, and blockchain is already a proven way of doing this.
5. **Accessibility:** Creating a wallet is open to anyone around the world on public block chains. Unlike a bank account, you don't need to pay any money or provide any details. This makes it one of the most accessible ways to manage finances and an online, digital identity.
6. **Interoperability:** Block chain technology is continuously improving compatibility between different platforms. Projects like Polkadot (DOT) and Avalanche (AVAX) allow for creating custom block chains that can interact with each other. A single Metaverse will need to connect multiple projects, and block chain technology already has solutions for this.

C. Future of Metaverse

Facebook is one of the loudest voices for the creation of a unified Metaverse. This is particularly interesting for a crypto-powered Metaverse due to Facebook's Diem stable coin project. Mark Zuckerberg has explicitly mentioned his plans to use a Metaverse project to support remote work and improve financial opportunities for people in developing countries.

Facebook's ownership of social media, communication, and crypto platforms give it a good start combining all these worlds into one. Other large tech companies are also targeting the creation of a Metaverse, including Microsoft, Apple, and Google

Figure-2: Exponential Evolution of Web Communities

D. The Meta Market Opportunity

A greater and greater portion of our attention is going towards digital activities, especially for younger generations. Today, ~1/3rd of our lives (~8 hours/day) is already spent watching TV, playing games, or on social media.

As we spend more of our time in these digital world experiences, we also spend more of our money within these digital realms to build our social status within these online communities.

E. The Meta Web 3.0 Economy

Web 3.0 crypto Metaverses are emerging market virtual world economies with a continually developing complex mix of digital goods, services, and assets that generates real-world value for users.

Early Web 3.0 Metaverse worlds have been typically built on top of blockchain computing platforms (layer one) with a host of parties contributing to the development of the games and in-games items that can be freely traded on the blockchain.

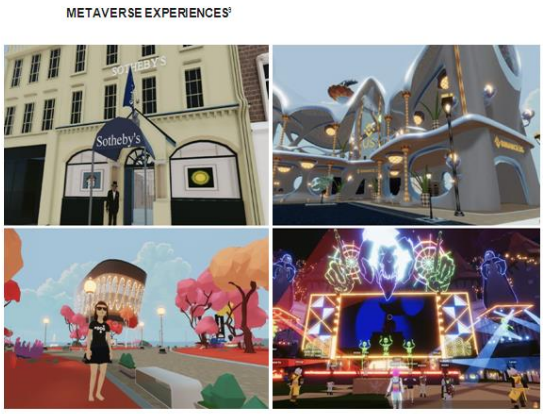

Figure-3: Web 3.0 Metaverse worlds are part of a larger interconnected crypto cloud economy

F. Challenges

Here are some of its potential limitations:

- **Identity verification:** In the Metaverse, you could face challenges related to identity authentication or verification. In the Metaverse, people will use their avatars. Thus, it could be challenging to identify people in the virtual world. Users will be verified through their avatar features, voice, and facial expressions.
- **Damaging Reputation** :Scammers can try to damage someone's reputation by mimicking e someone else's avatar.
- **Data Privacy** :This technology will depend highly on VR and AR devices with camera capabilities and unique identifiers. This can result in the leaking of the personal data of users.
- **Laws & Regulations** : Another challenge we could face in the Metaverse is related to laws, regulations, legislation, and jurisdiction. This technology will bring a huge number of people together. The absence of laws that regulate the boundaries in such virtual worlds could be a challenge.

G. PROTOCALS USED

These decentralized protocols interoperate with and provide the technical infrastructure to support Metaverse virtual economies.

- **Payment Networks:** Web 3.0 Metaverse economies can use their own digital currency, like MANA, or the currency of the layer one base crypto cloud economy platform they're built on, such as Ethereum (ETH) or Solana (SOL).
- **Decentralized Finance:** Decentralized exchanges allow users to trade in- game items while lending platforms allow users to take out loans on their virtual land.
- **NFT Sovereign Goods:** Players can purchase NFTs from other creators and bring them into other virtual worlds to be put on display or sold.
- **Decentralized Governance:** Legal frameworks take back control of the digital economies from centralized corporations and allow a global network of Web 3.0 Metaverse users to decide the rules of their collectively owned virtual space.
- **Decentralized Cloud:** File storage solutions such as Filecoin give Web 3.0 Metaverse worlds a decentralized infrastructure solution to store data while services like Livepeer give virtual worlds decentralized video transcoding infrastructure.
- **Self-Sovereign Identity:** Internet-native social reputation coin ("creator coins") data from other platforms may be transferred **into the Metaverse** and used for identity or credit scoring.

H. Metanomics

When you think about the economics of the Metaverse—or metanomics—there are opportunities in almost every market area. Imagine you have an online avatar and you want to change what it/you are wearing, you will be able to buy limited-edition, digitally branded clothing that you pick after browsing a virtual showroom. Or you may start your own small business, such as an art gallery where you display your latest and greatest collections, or a virtual private club.

II. AUGMENTED REALITY

The word "Augmented" means to add. It is created by using the technology by adding digital information to an image or something. Augmented reality is an important concept and impacts our lives deeply. It provides an improved version of reality as it uses different tools to make the environment existing and real. Augmented reality gives you an interactive experience of the real-world environment. It keeps you in your place and superimposes the technology in the form of text, sounds, and images.

Augmented Reality(AR) is a way by which technology can change how we perceive the world around us. It's also very useful in various fields, but first, we need to know what is augmented reality and how it is different from virtual reality.

A. Advantages of Augmented Reality

The advantages of Augmented Reality are listed as follows -

- It increases accuracy.
- It offers innovation, continuous improvement, and individualized learning.
- It helps developers to build games that offer real experiences.
- It enhances the knowledge and information of the user.

B. Disadvantages of Augmented Reality

The limitations of Augmented Reality are listed as follows –

- Projects based on AR technology are expensive to implement and develop.
- Excessive use of augmented reality technology can lead to eye problems, obesity, etc.
- It can cause mental health issues

III. VIRTUAL REALITY

It is a very important and interesting term. The terms 'Virtual' refers to something conceptual that does not have its physical existence, and the word 'reality

refers to the state of being real. So, virtual reality means something that is almost real. It is defined as the creation of a simulated environment by using computer technology. Viewing virtual reality means viewing a completely different reality than the one in front of you. It can be artificial, like an animated scene or a place which is photographed and integrated in a virtual reality app. It enables us to move around and look in every direction - up, down, sideways, and behind, as we are present there actually.

A. Advantages of Virtual Reality

The benefits of virtual reality are listed as follows -

- It creates an interactive environment.
- It helps us to explore the world by creating a realistic world using computer technology.
- It makes education comfortable and easy.
- It allows users to do an experiment in an artificial environment.
- It increases the work capabilities.
- Virtual reality is helpful for medical students to do practice well. It will be helpful for patients, too, as it offers a safe environment to them by which a patient can come into contact with the things they fear.
- Virtual reality helps to measure the performance of sportsperson and analyze their techniques.

B. Disadvantages of Virtual Reality

The limitations of virtual reality are listed as follows -

- Using VR, people start ignoring the real world. They started living in the virtual world instead of dealing with the issues of the real world.
- Training in the virtual environment does not have the same result as training in the actual world.
- It is not guaranteed that a person has done a task well in the real world if he/she has performed that task well in the virtual world.

C. The Reality-Virtuality Continuum

The **reality-virtuality continuum** is a scale that was given by Paul Milgram. It is a scale which has two extremes one part depicts the 'virtuality' or an environment which is completely virtual and, the other part describes a real environment or 'reality' and the middle part is termed as "mixed reality", thus this scale contains all possibilities for one object or plane being completely digital or completely real.

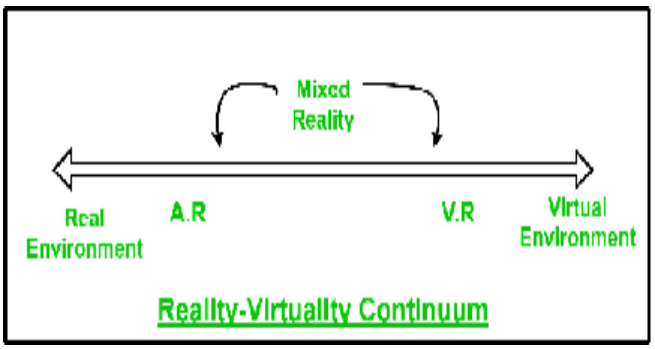

Figure-3: Reality-Virtual Continuum

Examples: One of the best examples of augmented reality is the app "**Pokemon GO**".so what that game does is that it imposes the images of pokemon which are digitally created and puts them into our real-world view which we can see through our phone's camera. the newest development in augmented reality technology is done by Google through their **ARcore** app.

ARcore is a platform for developers to design and run AR apps on their devices. Google also created an app called "**just a line**" which lets users draw virtually in the real world. There are tons of apps on google play store that uses AR technologies like "**houzz**" or apple store like "**amikasa**" which helps you style your room and helps you design a room layout by implementing the furniture in your room using your phone's camera.

A few Examples of MR apps are:

- An app that allows users to place notes around their environment.

- A television app placed in comfortable spots for viewing.
- A cooking app placed on the kitchen wall.
- Microsoft's Hololens is also a famous example of MR.

One common thing between all the above forms of technology is that they change the way we perceive real-world objects.

IV. AUGMENTED REALITY V/S VIRTUAL REALITY

Table-1: Comparison Between Augmented Reality and Virtual Reality

Features	Augmented Reality	Virtual Reality
Involvement	In AR user is partially immersed with the real world, i.e. user is immersed with mix of real-world and virtual world.	In VR, the user is completely immersed in a virtual world.
Distinction	In augmented reality, it is easy to distinguish between both real-world and virtual world.	In Virtual reality, it is hard to distinguish between the virtual world and real world.
Devices used	In AR, there is a use of tablet, smartphones, or another mobile device.	In VR, there is a use of head-mounted display or glasses.
Reality and virtuality	Augmented reality is 75% real and 25% virtual.	Virtual reality is 75% virtual and 25% real.
Network data	Augmented reality requires upwards of 100Mbps bandwidth.	A virtual reality video with 720p requires a connection of atleast 50Mbps.
Revenue	The projected revenue share for augmented reality in 2020 is $120 million.	The projected revenue share for virtual reality in 2020 is $30 million.
Visual senses	In Augmented reality, a user always has a sense of presence in the real world.	Whereas, in virtual reality, the visual senses are under control of the system.

V. IMPORTANCE OF AUGMENTED REALITY

The development of AR technology is set to revolutionize industries from retail to military to education to tourism and transform the way we interact with the digital world every day. Augmented reality has many uses in different fields like archaeology, architecture. visual arts, commerce, education, video games, and military training, etc. some applications of AR are

- AR is being used to aid research in archaeology. AR can be used to recreate different structures and overlay them in the real environment so that researchers can study them correctly.
- AR applications in smartphones include Global Positioning System (GPS) to locate the person's location and its phone's inbuilt compass to find device orientation.
- Augmented reality can be used in the field of tourism to enrich visitor's experience during visits like the Eiffel tower has an AR app that can show you it looked throughout history when it was being built.

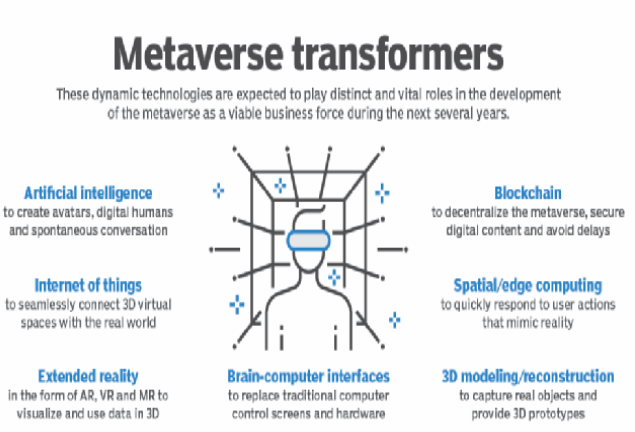

Figure-4: Metaverse Transformers

The consensus among Shein's expert sources was that these seven technologies will have the biggest impact on Metaverse development over the next decade:

- artificial intelligence
- internet of things
- extended reality
- brain-computer interfaces
- 3D modeling and reconstruction
- spatial and edge computing
- blockchain

A. Metaverse Usage in Modern Aspects

The online gaming industry has decades-long experience in creating immersive virtual worlds. And to the extent a proto-Metaverse has a mainstream use, the massive audiences that flock -- albeit not synchronously -- to the likes of Roblox, Epic Games and Decentraland suggest that playing games, building virtual worlds and investing in real estate might be it.

Enterprises are experimenting with Metaverse applications in the workplace that build on the virtual applications companies deployed during the pandemic to support remote work. An early application of Metaverse technologies involves workplace training. Some hospitals are already using VR and AR to train for common medical procedures, reported TechTarget news writer Esther Ajao. One technology recently approved by the FDA is Medivis, an AR surgical system that lets surgeons quickly sync with a hospital's digital imaging system. Other Metaverse-type applications she wrote about in her article, "Enterprise applications of the Metaverse slow but coming," include the following:

- **Digital twin avatars**

These twins will not only exist on computer screens but will be rendered as AI-powered holograms or holographic images that are assigned tasks, Ajao reported. A CEO, for example, could activate an AI-powered hologram of himself to engage with multiple stakeholder groups at once.

- **Metaverse for work collaboration.**

Enterprises are starting to use the Metaverse to add "an element of realism" to remote work experiences, said Forrester analyst J.P. Gownder. This includes setting up 3D rooms where employees can collaborate spaces. Accenture hires more than 100,000 people every year and uses Microsoft Mesh to help onboard new employees. New hires meet on Teams to receive instructions on how to create a digital avatar and access One Accenture Park, a shared virtual space that's part of the onboarding process. The futuristic amusement park-like space includes a central conference room, a virtual boardroom and digital monorails that new hires use to travel to different exhibits.

B. Metaverse Ecosystem

The Metaverse ecosystem is basically a self imaginary experience for the users which allows them to interact with two people using the Metaverse technology. The Metaverse ecosystem basically deals with the creation of online virtual reality rooms where the users will share their thoughts and ideas and communicate with each other on the Metaverse in virtual reality. For example – Roblox allows its users to create online rooms while playing games for interaction with the users within the Roblox ecosystem of the game. This creates an immersive ecosystem for the users to pursue and create the

characters and stories for the interaction between the users and their avatars.

VI. TECHNOLOGIES USED IN METAVERSE

Basically, the types of technologies used in Metaverse are as follows:

Hardware: The type of hardware used in the Metaverse will be a pair of glasses that will be used to create a 3D virtual reality image in front of the eye of the users. These pair of glasses form a three-dimensional image on the screen on the hardware of the Metaverse. It may be a pair of AR spectacles or a virtual reality headset like the Oculus Quest 2. These hardware devices play an important role by giving an immersive experience to the users about them so that the users feel that he is really in person next to what is happening on these pair of virtual reality glasses.

Software: Popular game development engines like Unity, Amazon Sumerian, and Unreal Engine 4 (UE4) are someone of the most powerful sets of VR development tools. They allow the real-time rendering of visuals in the graphics used to display virtual reality to the users. These software tools have the capability to initiate high-fidelity real-time graphics, and artistic tools and graphics. They have the compatibility with all popular VR platforms like Oculus, Sony, etc.

VII. APPLICATIONS OF METAVERSE

Virtual Reality: Virtual Reality is the main backbone of the Metaverse. Metaverse enables the users to interact, socialize and collaborate with each other using 3D virtual reality. The users can interact and play with each in the digital world by attending music concerts and conferences, playing football virtually, and even more. Anything that we can do in real life is possible in the Metaverse using virtual reality.

Video Games: Multiplayer battle royale games like Call of Duty, Roblox, Minecraft, and Fortnite have brought new features into the gameplay that make it more immersive than ever before. Users can customize their avatars by making virtual items and then fight with other people in the game in the 3D surroundings using the Metaverse.

Events: Due to Covid, people have now chosen to attend music and launch events virtually instead of risking their health. Music events, cultural events, and other technical events can be conducted on the Metaverse just like what happens in the real life. People can socialize and interact within the 3D space of the event.

Buy and Sell: Metaverse enables users to buy and sell interactive virtual things online. People can now buy and sell virtual fungible tokens like NFTs and also try new items. We can try new clothes on our avatars using Metaverse just like what happens in the real life.

Enhanced Social Media Experience: Now social media platforms like Instagram, Facebook, and Twitter will become more and more immersive as the Metaverse arrives because the users will have the ability to enjoy the content now in virtual reality using 3D images.

Online Education: Now the students can create their own customized avatars in online classes and now they can understand the topics taught in the online classes using the immersive learning experience with the help of the use of virtual reality in teaching the students.

VIII. REAL-WORLD EXAMPLES

Fortnite Concerts: Users can now enjoy concerts with their friends online through the use of Metaverse technology. Fortnite allows its users to hold and attend the various music and culture concerts and events in its game so that the paid users can now

attend them with their community of people online to ensure the virtual reality connection through the use of the Metaverse technology.

Virtual Real Estate: We can now use the Metaverse technology in order to enable the purchase and sale of virtual real estate through the use of cryptocurrencies. Virtual real estate is an important source of investments for an upcoming investor because more and more people are getting interested in the Metaverse and NFTs.

Ready Player One: This film uses Metaverse technology to showcase to the users the true capacity of the Metaverse technology. The touch-sensitive gloves and virtual reality headset used in the film give us a slight glimpse into what the future of the Metaverse looks like.

Second Life: Second Life is one of the examples of a gaming Metaverse, where the users have the ability to create their own digital avatars and characters to host their online open gaming world with the help of Metaverse technology.

The Sandbox: The Sandbox is basically a virtual reality Metaverse that allows users to experience, explore and play in a three-dimensional world. It also allows players to create their own digital avatars and characters to host their online open gaming world with the help of Metaverse technology. Users can also buy some NFTs for the in-game purchases for customizing their characters.

Decentraland: A piece of virtual real estate property on Decentraland was auctioned off for a price of $2.4 million. Decentraland is one of the best Metaverse examples to acknowledge the true potential of Metaverse technology.

Illuvium: It is an open-world role-based game that uses the Ethereum cryptocurrency-based Blockchain network and it is expected to be released in 2022. Here, the users search for the collecting NFTs, which represent each Illuvial.

IX. CONCLUSION

While a single, united Metaverse is likely a long way off, we already can see developments that may lead to its creation. It looks to be yet another sci-fi use case for blockchain technology and cryptocurrencies. If we will ever really reach the point of a Metaverse is unsure. But in the meantime, we can already experience Metaverse-like projects and continue to integrate blockchain more into our daily live .some significant distinctions between Augmented Reality and Virtual Reality, despite the fact that both have their own individual advantages. Augmented Reality provides its users the ability to interact with digital content that is superimposed over the real world, whereas Virtual Reality produces an experience that is wholly immersive. Augmented Reality has a wide range of potential uses in a variety of disciplines, including education, healthcare, and even business. Virtual Reality, on the other hand, is mostly utilized for gaming and entertainment purposes.

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Noise Generated by Single Cylinder Petrol Engine

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ABSTRACT

At present, rapidly expanding environment one of the developingproblems is that of "Noise". The purpose of this Paper is to the study the harmfuleffects of noise on human beings. In India, the transportation sector is growing rapidlyand number of vehicles on Indian roads is increasing at very fast rate. This has lead toovercrowded roads and noise pollution. Engine noise is one of the major sources ofnoiseinvehicles. So, it is necessary to study noise generated by two stroke petrol engines atdifferent speeds and loads. First the sound pressure level is measure in dB (A) near theengine at four different locations at distance of 0.5m from centre of each side of anengine to find out that location where sound pressure level is maximum. Sound poweriscalculated using rectangularparallelepipedatdifferentspeedsandloads. Vibration analysis has been carried out to measure acceleration and velocity atthat location where sound pressure level is maximum. Frequency spectrum analysis isdone tomeasure soundpressurelevelin1-1octaveband. The study of noise generated by two stroke petrol engine is carried out with orwithout mufflers to check the effectiveness of the muffler. There are three differenttypes of mufflers used in this study out of which two are reflective type of muffler andoneishybridtypeofmuffler.It isfoundthat thebestmufflerisofhybridtype.

Keywords: Research Paper, Technical Writing, Science, Engineering and Technology

I. INTRODUCTION

1.1. Introduction to Noise

In our modern world, rapidly expanding environment one of the developingproblemsis thatof noise.Apart from the pure annoyance factorof noise,exposure toanintensesoundfieldoveralongperiodoftimepresentstheriskofpermanentdamageofhearing. This particularproblem isbecoming asource ofseriousconcerntoindustrialcorporations,tradeunions andcompanies.

The object of this part is to discuss the concept of noise,problemsof noise and itseffectonmanandenvironmentbothasannoyanceandasadangertohealth.

Themajorsourcesofnoiseare:

i) Industrialnoise
ii) Trafficnoise
iii) communitynoise

Noise: Noiseisconveniently andconciselydefinedas "unwanted sound".Sound: Soundwavesare pressure variationsproducedas a resultofmechanicaldisturbanceinamaterialmedium

1.2. SoundSources

Adistinctionismadebetweenthreedifferenttypesofsoundsources:

a) Pointsource
b) Linesource
c) Planesource

Point source: Asoundsourcecanbeconsideredasapointsource,ifitsdimensionsare smallin relationto thedistance to the receiverand it radiatesanequalamountofenergyinalldirections.Typicalpointsourcesareindustrial plants,aircraft and individual road vehicles.

Line source: A line source may be continuous radiation, such as from a pipecarrying a turbulent fluid,ormay be composed of a large numberof pointsourcessocloselyspacedthattheiremissionmaybeconsideredasemanatingfromanationallineconnectingthem.The soundpressure leveldecreases3dB,whenteverthedistancetoalinesourceisdoubled.

Planesource: Aplanesourcecanbedescribedasfollows.Ifapistonsourceisconstrainedbyhardwallstoradiateallitspowerintoanelementaltubetoproducea planewave, the tube will contain aquantity ofenergynumericallyequal to thepower output of the source. In the ideal situation there will be no attenuation along thetube.Planesourcesareveryrareandonlyfoundine.g.,ductsystems.

Whentwosourcesradiatesoundenergy,theywillbothcontributetothesoundpressure level a distance away from the sources. If they radiate the same amount ofenergy and the distance from the point of measurement to the sources is the same, thelevelwillincreaseby3dBcomparedwiththelevelcreatedbyonesourcealone

1.3. UsefulApplications ofNoise

Noiseisnotonlyhavingharmfuleffectsbutsometimesitisveryuseful.Someoftheexampleswhennoiseisuseful:

Study of heart beats: Noiseproducedby theheart beatsisvery useful todiagnosetheperson'shealthaccordingly.

Maskingeffects: Sometimes,itisnecessarythatnobodyshouldheartheconversation betweenthe twopersons. For this,maskingeffectisused.

Fore.g.,inthedoctor'schamber,doctorwantsthatnobody shouldhearhisconversationwith the patientsoDr.usesmaskingeffectbyputtinganoisierexhaustfanwhichmakenoiseoutsidetheroom.

1.4. NoiseMeasuringInstrument

Noisemeasuringdevicestypically use a sensorto receive the noise signalsemanating from a source. The sensor, however, not only detects the noise from thesource,butalso anyambientbackgroundnoise.Thus,measuringthevalue ofthedetected noise is inaccurate, as it includes the ambient background noise. There are somany different types of instruments available to measure sound levels and the mostwidelyusedaresoundlevelmeters.

1.5. Elementsofsoundlevelmeter

Microphone: Mostmeasurementmicrophonesgeneratea voltagethatisproportional to the sound pressure at themicrophone and isthe electrical analog ofsound waves impinging on the microphone'sdiaphragm.The particularmechanismthatconvertsthepressurevariation intosoundwavessignal.Differenttypesofmicrophonesare:

a) Capacitor(Condenser)Microphone
b) Pre-polarizedMicrophone
c) PiezoelectricMicrophone

Amplifier: Itamplifiesthesignalfrommicrophonesufficientlytopermitmeasurementoflow SPL.Itamplifiessoundoverawidefrequencyrange.Itmaintainstheamplification constant.

Rectifier: Itrectifiesthesignalfromanalogsignaltodigitalsignal.

1.6. IntroductionofS.IEngine

Sparkignitionengines(S.IEngine)arethosetypesofengin esinwhichcombustion of fuel takes place inside the engine cylinder. In S.I engine, the fuel isignited by the spark produced by spark plug. Since the

combustion of fuel takes placeinside the engine cylinder, so these engines are very noisy. S.I engine is also known aspetrolengine.According to the numberof strokespercycle,itis divided into twotypes:

a) Twostrokeengines
b) Fourstroke engines

1.7. EngineNoise

An engine is a mechanical device that produces some form of output from agiven input. An engine whose purpose is to produce kinetic energy output from a fuelsource iscalled a primemover, alternatively, amotoris adevicewhich produceskineticenergyfrom apreprocessed"fuel"(such aselectricity, aflowofhydraulicfluidorcompressedair).

1.8. CombustionNoise

Combustionnoise is produced because ofunsteady combustion offluid and isoftwo types:turbulentcombustion noise and periodiccombustion oscillationregion.Themechanism issuchthat the pressure waves generated are so phased to the velocity fluctuations. The noisespectrum involvesonespecificfrequencyanditsharmonicsand thatfrequencyisrelated to the resonant modes of the combustion chamber. Some of the possible curesare:

1. Modificationofcombustionchambergeometry
2. Changeofair-fuelratio,burnertypeetc.
3. Changeofburningrate

1.9. MechanicalNoise

Mechanical noise is the noise which is generated by variousimpactsbetweenthe engine parts. This noise source ismore important in the higher frequency rangerather than in lowerfrequency range where combustion noise is important. There arelots of moving parts, for example, gear, valves, and rocker arms, piston and cylinderliner.Someareasfollows:

Engine clicking noise: A clicking or tapping noise that gets louderwhen yourev the engine is probably "tappet" or upper valve-train noise caused by one ofseveralthings:lowoil pressure,excessivevalvelash,orwornordamagedparts.

Collapsed lifter noise: Worn, leaky or dirty lifters can also cause valve-trainnoise.Ifoildeliveryisrestrictedtothelifters(plugged oilgalleyorlowoil pressure), thelifterswon't"pumpup"totakeupthenormalslackinthe valve-train.A"collapsed"lifterwillthenallowexcessivevalvelas handnoise.

Valve lash noise: Toomuch space between the tipsof the rockerarmsandvalve stemscanmake the valve-train noisy, and possibly causeacceleratedwearofbothparts.

Damaged engine parts noise: Excessive wear on the ends of the rocker arms,cam followers(overheadcam engines) and/orvalve stemscan open up thevalvelashandcausenoise.

Rapping or deep knocking engine noise:A deeprappingnoise fromtheengine isusually"rodsknock"aconditionbroughtonbyextreme bearingwear or damage. If the rod bearings are worn or loose enough to make a dull,hammeringnoise.

1.10. PistonSlapNoise

Pistonslapnoiseisgeneratedbythesuddenimpactofthepi stontothecylinderwall is considered to be predominantdue to the higher amountof energyreleased.In the compression stroke, the connecting rod pushesthe piston upwardsovercomingthe gas force. The force actingon the pistonhas alateral componentandthe piston slides upwards on the minor thrust side of the cylinderwall. Thus, as thecrank pinpassesthrough the cylindercenterlinebefore the powerstroke. These simple models do not take into accountothers factors whichmay affectthepistonmotionsuchas:

1. Pistonpinoffset.
2. Rockingmotionofpiston.
3. Frictionsatpistonpinaswellaspiston’soutersurface
4. Pistonconfiguration,especiallyunderoperation.

5. Pressuredistributionaroundpistonduetothesqueezingmotionofoilfilm.
6. Complianceofcylinderlinerwall.

1.11. BearingNoise

Crankshaftbearingsare alwaysreplacedwhen rebuilding anengine becausethey are awearcomponent.Heat,pressure,chemical attack,abrasion andlossoflubrication can all contribute to deterioration of the bearings. The above features giverisetothenoise.Someofthefactorsthatcausebearingnoiseareasfollows:

Dirt: Dirt contamination often causes premature bearing failure. When dirt orother abrasivesfind theirway between the crankshaftjournal and bearing, itcanbecomeembeddedinthesoftbearingmaterial.Thesofterthebearingmaterial,thegreatertheembed ability,whichmayormaynotbe agoodthing depending on the size of the abrasive particles and the thickness of thebearingmaterial.

Heat: Heat is another factor that acceleratesbearingwear andmay lead tofailure if the bearingsgethotenough.Bearingsare primarilycooledbyoilflowbetween the bearing and journal.Anything that disrupts or reduces theflow of oil not only raises bearing temperatures but also increases the risk ofscoringorwipingthebearing.

Misalignment: Misalignment is another condition that can accelerate bearingwear. If the centermain bearings are wornmore than the ones towards eitherendof the crankshaft, the crankshaft may be bent or the main bores may be outofalignment.

Corrosion: Corrosion can also play a role in bearing failure. Corrosion resultswhenacidsaccumulateinthecrankcaseandattackthebearingscausingpittingin thebearingsurface.Thisismoreofaproblemwithheavy-dutydieselenginesthat use high sulfurfuel ratherthangasolineengines,but itcanalsohappeningasolineenginesiftheoilisnotchanged oftenenough andacidsareallowedtoaccumulateinthecrankcase.

1.12. SparkKnock(Detonation)

Sparkknock isa knocking, rattlingor pingingnoise thatmay be heardwhenthe engine is accelerating or is working hard under load (driving up a hill, towing atrailer, passingon the highway, etc.). Spark knockmeans the fuel isdetonating. Someofthefactorsthatcausesparkknockareasfollows:

EGRvalvenot working: TheEGRvalveissupposedtoopenwhentheengine is accelerating orlugging underaload. This allows intakevacuum tosuck someexhaustin through the EGRvalve to dilute the air/fuelmixtureslightly.Thislowerscombustiontemperaturesandpreventsknock.

Compression ratio too high: If an engine has been rebuilt and the cylindershave been bored to oversize,it will increase the engine's static compressionratio.Engines that are supercharged or turbochargedare also atmuch higherriskofdetonationbecausetheforcedairinductionsystemincreasescompression.

Engineoverheating: Iftheengineisrunningtoohotbecauseoflowcoolant,a cooling fan that isn't working, a plugged radiator, bad water pump, stickingthermostat,etc.,itmaycausethefueltodetonate.

ExhaustNoise

The engine exhaust noiseoriginatesat theexhaust tailpipe openings and istransmitted through the cabinwalls,firewall, andnose gearbay. Thisis the loudestandmostobjectionablenoiseheard.

Relationbetweennoise, enginedesignandparameters

Despite the numerous exciting forces which almost simultaneously excite theenginestructure.Sincethegasforceresultingfromcombustiontendstobethepredominantforceinmostoftheengines

Thethreebasicparametersofanengineare

1. Speed
2. Size
3. Load

1.13. Enginespeed

The engine structure characteristics can be defined by use of electro-dynamicvibration generators, and the broad response readily established as shown by the solidenvelopline.Itwillbeseenthatwhenthestructureiss ubjectedtoaconstantsinusoidal force itexhibitsmaximum response in the high– frequency range from800-2000Hz.

1.14. Enginesize

Measurement carried out on alarge numberofengineswith engine size isconsiderably less. An increase of size to ten times gives an increase of noise of 17.5dB(A). The detailed investigationsnow indicate that vibration levelsof the enginesurfaces are about the same irrespectiveof theirsize, thus the increaseofnoisewithsizeissimplyduetolargerradiatings urfacearea.

1.15. Engineload

Engine load hasno effect onnoise,which is in agreementwith the findingsthat noise is simply due to the initial ignition the fuel. Thisoccurs at the sameintensitywhethertheengineisrunningatnoloadatal lorfullload.Itcanbeconcludedthat:

a) Thegasforcedeterminestherateofincreaseofnoisew ithenginespeed.
b) Athighenginespeedsthegasforcehasalesssignifican teffectonnoise.
c) Enginenoiseisindependentofthehorsepowerprodu ced.

1.16. Mufflers

A muffler (silencer) is a device for reducing the amount of noise emitted by amachine. In internal combustion engines, the engine exhaust blows out through themuffler.

Typesofmufflers

Mufflerscanbeclassifiedinreflective,absorptiveandhybr idmufflersdependingontheworkingprinciple.

Reflective muffler: Reflective mufflers are those mufflers that uses for soundattenuationbychangingcrosssectionsintheduct.R eflectionmufflersattenuatethesoundbyreflectionandint erference.TheimportanttoolsofReflectivemufflers are analyticmodeling and evaluation ofnetwork theory.ThereflectivemufflerisshowninFig.

Fig.2.1ReflectiveMuffler

AbsorptiveMuffler: Absorptivemufflersarethosemuffle rsthatusesforsound attenuation by sound absorbingmaterials. Theydissipate the acousticenergy into heat energy through the use of porousmaterials asmineral fiber.TheimportanttoolsofAbsorptivemufflersareabsor bermodelingandnumericalcomputation.Theabsorptive mufflerisshowninFig.

Fig.2.2AbsorptiveMuffler

Hybrid Mufflers: Mufflers that combine the working principle of a reflectivemufflerandan absorptivemufflerare calledhybridmufflers.Thistypeofmuffleristhebestmuffl ertoreducethenoise.

In this study, three different types of mufflers are used out of which two areReflectivemufflersandoneisHybridmuffler.Silencer No.1isHybridtypeofmufflershowninfig.2.3andfig.2.4.

SilencerNo.1

Fig.2.3Hybridmufflerinclosedcondition

Fig.2.4Hybridmufflerincutcondition

SilencerNo.2

Fig.2.5Reflectivemufflerinclosedcondition

II. LITERATUREREVIEW

A lot of research work has been carried out throughout the world to investigateand analyze the noise generatedby two stroke petrolengines atdifferentloadsandspeeds and check the effectiveness of mufflers. A brief review of literature is beingpresentedhere.

2.1. Mills C.H.G. and Aspinall D.T. [1] discussed the various sources of the noise in I.C.enginecommercialvehicleandmethodsofnoise reductionbytheuseofhightransmission-lossenclosuresandsound-absorbentandpanel-dampingmaterialsaredescribed. Examples are given on the practical applications of acoustical treatments tothe reduction of the noise within and emitted by typical road haulage vehicles. Usefulreductionscan achieve by palliative treatmentsbut attention isdrawn to the practicalandeconomic difficulties associatedwith incorporation ofsound reducing treatmentsinproductionvehicles.

2.2. Wonacott E.J. [2] used the recommendations and established theory to analyze andbuild a series of efficient silencers for general vehicle and stationary engine use. Therecommendeddesignprocedurehasgenerallybeenfoundtobeflexibleinitsapplication and the silencers thusdesigned appear tohave distinct advantagesovertheir current counter parts in relation to design simplicity, ease of manufacture andconsistentattenuationperformance throughouttheir useful life.The resultsofthesetrials are described togetherwithdetailsofmanufacturing and testingproblemsthathasbeenexperiencedinbuildingsuchunits.

2.3. Bryce W. D. and Stevens R. C. K. [4]identifiedandunderstand thenoise sourcesthatcontributetotheexhaustnoiseofaircraft gasturbineengines,controlledexperimentshave been carried out to study the noise characteristics of amodel turbo-jetexhaustsystem.Thenoisedatahavebeenrelatedto measurementsoftheaerodynamic conditions in the model and, with the aid of specific diagnostic tests, thepredominantnoisemechanisms are considered to have been recognized.Thenoiseradiation, above thatof the jet,is attributed primarily to dipole sourcesgenerated bytheturbineoutletstruts,thetransmissionofthisnoisebeingmodifiedbyductpropagationandnozzleimpedanceeffects.

2.4. Jha S. K. [5] studied the characteristics of noise and vibration in a motor car. Thepredominant frequency regionsinwhich noise levels are high are established. It isshown that themajorpart of the sound energy lieswithin the frequency region below20Hz and iscausedmainlyby roadexcitationbeing transmitted through thewheeland suspension system. The predominant noise in the audible range lies within 30-300Hz frequency band and is

produced primarily by body resonances excited by variousengine harmonics. The vibrational and acoustical behavior of the car body at some ofthesecriticalfrequenciesisalsodiscussed.Finally,itisshownthatbystructuralmodificationasubstantialnoisereductioncanbeobtained.

2.5. Mugridge B. D. [6] concerned with the reduction of noise from automotive coolingsystems. A comparison is made between the use of axial flow and centrifugal fans andformulaepresentedforobtainingtheoctavesoundpowerforeachtypeoffan.The disadvantagesofcentrifugalfaninstallationsarehighlightedandaxialfandesignconfigurationsareexaminedwiththeobjectofprovidingoptimizedsystems.Experimental results are presentedfordifferent axial fansandcomparisonsmade ofthe noisemeasurementswith the ingested flowdistortionsmeasured bymeans of ahotwire anemometer.The resultsindicate thelimitsofmaximumnoise reductionwhichmanufacturersmayexpectusingexistingfandesignsandalsoindicatethemethodsforachievingmaximumnoisereductionfortheseconfigurations.

2.6. NakraB.C.,SaidW.K.andNassirA.[11]experimentedonreactivetypesofmufflers- and theircombinationswith absorption types,inordertodetermine theirnoiseattenuationcharacteristics.Testswerecarriedouton atest rig,with aloudspeaker as ainput source aswell as afourcylinderdieselengine.The frequencyspectraofattenuationlevels,obtainedexperimentally,werecomparedwithcorresponding theoreticalpredictions.

2.7. Lim M.K. and Low C.S. [15] designedanengine cylinderpressure dampingdeviceto reduce engine noise by controlling the sharp pressure rise excitation applied to theengine structure by the combustionprocess. The device isa small pistoncontrolledbya spring and dashpot system concerned to the engine cylinder by mounting it on top ofthe cylinderhead.Lab testsshow that therewas asignificant reductioninenginesurface vibrationandnoiseradiated,particularlyathighfrequenciesabove4000Hz.

2.8. Tandara V. [16] studied the radiator fan noise. The combustion engine is only one ofmany vehicle noise sources. Every combustion engine has inner and external noisesources. The coolingfanscanbe importantnoise sources. They are installed to coolthe engine,encasementand the inside of the car. The influence offans is greatin caseofhighambienttemperature,lowtravelingspeedandfrequentstoppages.

III. EXPERIMENTAL SET-UPANDMEASUREMENTS

3.1. ExperimentalSet-up

To study the noise generated by an engine, the parameters like sound pressurelevelarerequiredtostudyindifferentconditionslikespeedandload.Experimentalsetupofsingle-cylindertwo-strokepetrolengineisshowninfig.3.1.

Fig.3.1S. IEngine

3.2. Measurements

Measurement's procedure of different noise parameters contains calculation of soundpower, measurement of sound pressure level at different locations (A, B, C, D and E),measurement of acceleration and velocity for vibration analysis and measurement ofsoundpressurelevelforfrequencyspectrumin1-1octavebandarediscussedbelow:

3.2.1. Measurement of Sound Power: Calculation of sound power is done by twomethodsrectangularparallelopipedandhemisphereparallelopiped.Inthepresentwork,rectangularparallelepipedmethodisusedbecausemaximum dimension of an engine is greater than 1m. In this method, the first step is tomakeagridaccordingtothedimensionsofengine. Lengthbreadthandheight ofengine are 2.86m,2.84m and1.66m.Thegridismade byplacingan engine atcenter positionandwith the helpofwire at requiredpositionsmarkthedifferentpoints.Therea re17Gridpointsformedasshowninfigure 4.2. Sound pressure level can be measured for every grid point for differentspeedsand loads. Speed can be changed by rotating awheel and adjust thevalue of speed as 1100,1500,1900,2300 RPM. Similarly, load can be changedwiththehelpofspringbalancei.e.byrotating thewheelinclockwisedirection.Value of load ischangedin the stepofone i.e. from 0to 6kg.Value ofSound pressure level ismeasured in A-weighting at slow response.ThemeasuredataforSPLisgivenfrom

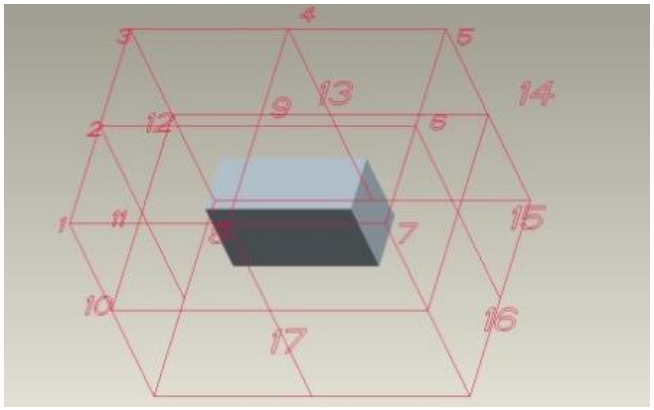

Fig.3.2.1Showing17gridpoints

3.2.2. Measurement ofSoundPressure Level at differentpointsnear Engine:Sound pressure level is measured at five different locations out of which fourlocations(A,B,Cand D)are at adistanceof0.5m from center ateach sideof an engine.The fifth location (E)istaken atexhaust.Thesemeasurementswillhelptofindout thatlocationwheremaximumSoundpressurelevel occurs.

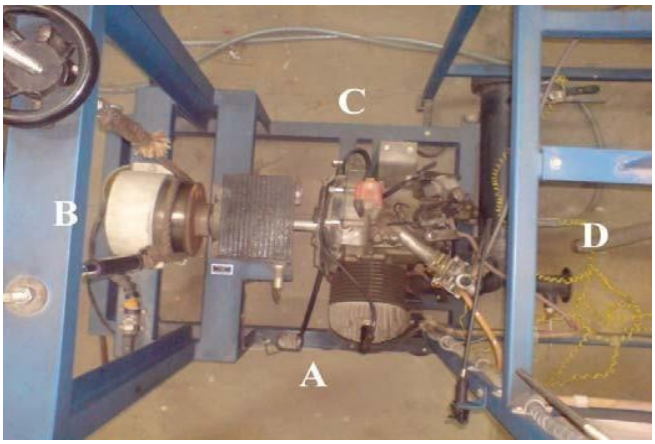

Fig.3.2.2 LocationofpointsA,B,CandD

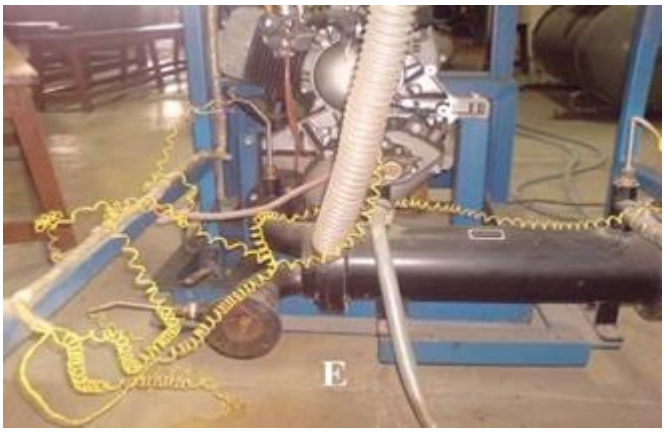

Fig.3.2.3LocationofExhaustpoint„E"

3.3. Measurement for Vibration analysis:One ofthemain causesofnoise isvibration. So, it is necessary to study the vibration analysis. Acceleration and velocityweremeasuredinvibrationanalysisbyavibrationmeasuringinstrument.Thisinstrumentgivestheresultsforaccelerationinm/s2andvelocityinmm/satanyfrequency between 20Hzto 20 kHz.Thisinstrumenthasfine scale for adjustingfrequency to a finer value. It also has a filtration device which gives reading for 1/1octave band and 1/3 octave band. It consists of a pick-up made up of magnet which isattachedtothemachinebody.

Fig.3.3VIBRATIONMEASURING INSTRUMENT

Acceleration and velocity were measured at that location where the value of soundpressure level is maximum i.e. at location B. The vibration pick-up is attached to thefoundationnearlocationB.

3.4. **MeasurementofSoundPressureLevelforFrequencySpectrumin 1-1Octave band:** The value of sound pressure level at 1-1 octave band gives themaximumandminimumvalueatparticularfrequency.

Fig.3.4Soundlevelmeter

IV. RESULTSANDDISCUSSIONS

After all the measurements, it is required to analyze the data by comparing thedifferentnoiseparametersatdifferentspeedsandloads withsilencerandwithoutsilencer.Analysisisdoneforacousticpower,soundpressurelevelatdifferentlocations(A, B,C,D and E),acceleration and velocity forvibration analysis andsoundpressurelevelforfrequencyspectrumin1/1octaveband.

Ananalysisofthecollecteddataindicatesthefollowingresults:

1). **AcousticPower:**Valueofacousticpowerwithoutsilencervariesfrom102.4dB(A) to 120 dB(A) for 0 to 6 kg load and for speed 1100 to 2300 RPM. It variesfrom 102.4 dB(A) to 115.9 dB(A) for load 0 kg when speedvaries from 1100 to2300RPM and102.4dB(A)to 107.7dB(A)forspeed1100RPMwhenloadvaries from 0 to 6 kg. Forsilencer1, it variesfrom 94.2 dB(A) to 106.8 dB(A)for0to6kgloadandforspeed1100to2300RPM. Itvariesfrom94.2dB(A)to 102.1 dB(A) for load 0 kgwhen speed variesfrom 1100 to 2300 RPM. It variesfrom94.2dB(A)to98.7dB(A)forload1100RPMwhenloadvariesfrom0to6kg. For silencer 2, It varies from 94.8 dB(A) to 109.2 dB(A) for 0 to 6 kg load andforspeed 1100 to 2300 RPM.It varies from 94.8 dB(A) to 104.3 dB(A)forload0kg when speed varies from 1100 to 2300 RPM. It varies from 94.8 dB(A) to 99.7dB(A)forload 1100RPMwhen loadvariesfrom 0 to 6kg. Forsilencer3, itvariesfrom 94.4 dB(A) to 107.1 dB(A) for0 to 6 kg load and for speed 1100 to2300 RPM. It varies from 94.4 dB(A) to 102.5 dB(A) for load 0 kg when speedvaries from 1100 to 2300 RPM. It varies from 94.4 dB(A) to 98.9 dB(A) for load1100 RPM when load varies from 0 to 6 kg. Acoustic power varies linearly byincreasingloadandspeed.

2). **Sound Pressure Level at Exhaust:**ValueofsoundpressurelevelatExhaustvaries from 98.8 dB(A) to 114.6 dB(A) for without silencerfor 0 to 6 kg load andforspeed 1100 to 2300 RPM.It varies from 98.8 dB(A) to 109.6 dB(A)forload 0kg when speed varies from 1100 to 2300 RPM. It varies from 98.8 dB(A) to 103.4dB(A)forload1100RPMwhenloadvariesfrom 0to6kg.Forsilencer1,it variesfrom 85.3 dB(A) to 97.5 dB(A) for 0 to 6kgload and for speed1100 to2300 RPM. It variesfrom 85.3 dB(A) to 92.9 dB(A) forload 0 kg when speedvaries from 1100

to 2300 RPM. It varies from 85.3 dB(A) to 89.8 dB(A) for load1100 RPMwhen load varies from 0 to 6 kg. For silencer 2, it varies from 86.9dB(A)to100.6dB(A)for0to6kgloadandforspee d1100to2300RPM.Itvariesfrom 86.9 dB(A) to 95.8dB(A) forload 0 kg whenspeed variesfrom 1100to 2300 RPM.

3). **Sound Pressure Level at location A:** Value of sound pressure level at location Avaries from 89.9 dB(A) to 106.5 dB(A) for without silencerfor 0 to 6 kg load andforspeed 1100 to 2300 RPM.It varies from 89.9 dB(A) to 102.3 dB(A)forload0kg when speed varies from 1100 to 2300 RPM. It varies from 89.9 dB(A) to 95.8dB(A)forload 1100RPMwhen loadvariesfrom 0 to 6kg. Forsilencer1, itvaries from 81 dB(A) to 93.6 dB(A) for 0 to 6 kg load and for speed 1100 to 2300RPM. It varies from 81 dB(A) to 89.1 dB(A) for load 0 kg when speed varies from1100 to 2300 RPM. It variesfrom 81dB(A) to 85.6 dB(A)forload 1100 RPMwhen load varies from 0 to 6 kg. For silencer 2, it varies from 81.5 dB(A) to 95.9dB(A) for0 to 6kg load and for speed 1100 to 2300RPM.Itvariesfrom 81.5dB(A) to 91.1 dB(A) for load 0 kg when speed varies from 1100 to 2300 RPM. Itvariesfrom81.5dB(A)to86.3dB(A)forload1100R PMwhenloadvariesfrom0 to 6 kg. Forsilencer3, it varies from 81.2 dB(A)to 93.8 dB(A)for0 to 6 kgloadandforspeed1100to2300RPM.Itvariesfrom 81.2dB(A)to89.3dB(A)for load 0kgwhen speedvariesfrom 1100to 2300 RPM.

4). **Sound Pressure Level at Location B:**Value ofsoundpressure levelatlocationBvaries from 90.3 dB(A) to 106.9 dB(A)forwithout silencerfor0to 6 kg loadandforspeed1100to2300RPM.Itvariesfrom90. 3dB(A)to102.7dB(A)forload0kgwhenspeedvariesf rom1100to2300RPM.Itvariesfrom90.3dB(A)to96. 2dB(A)forload1100RPMwhenloadvariesfrom0to6 kg.Forsilencer1,

5). **Sound Pressure Level at Location C:**Valueofsoundpressurelevel atlocationCvaries from 90.2 dB(A) to 106.8 dB(A)forwithout silencerfor0 to 6 kg loadandforspeed1100to2300RPM.Itvariesfrom90. 2dB(A)to102.6dB(A)forload0kgwhenspeedvariesf rom1100to2300RPM.Itvariesfrom90.2dB(A)to96. 1dB(A)forload1100RPMwhenloadvariesfrom0to6 kg.Forsilencer1,it varies from 81.3 dB(A) to 93.9 dB(A) for 0 to 6 kg load and for speed 1100 to2300 RPM. It variesfrom 81.3 dB(A) to 89.4 dB(A) forload 0 kgwhen speedvaries from 1100 to 2300 RPM. It varies from 81.3 dB(A) to 85.9 dB(A) for load1100 RPMwhen load varies from 0 to 6 kg. For silencer2,itvaries from 81.8dB(A) to 96.2 dB(A) for 0 to 6 kg load and for speed 1100 to 2300 RPM. It variesfrom 81.8dB(A) to 91.4dB(A) forload 0kgwhen speedvariesfrom1100to2300 RPM. Itvariesfrom 81.8 dB(A) to 86.6 dB(A) forload 1100 RPMwhenload varies from 0 to 6 kg. For silencer3, it variesfrom 81.5 dB(A) to 94.1 dB(A)for0to6kgloadandforspeed1100to2300RPM. Itvariesfrom81.5dB(A)to89.6dB(A)forload 0kgwhen speedvariesfrom 1100 to 2300RPM. Itvariesfrom81.5dB(A)to86.2dB(A)forload1100R PMwhenloadvariesfrom0to6kg.SPLatlocationCals ovarieslinearlybyloadandspeed.

V. CONCLUSION AND SCOPEFORFUTUREWORK

5.1. Conclusion

The object of the presentwork is to collect the data based on two parameters i.e. loadandspeed.Thepresentworkconcludesthefollowing points:

a) Available data concludes that the best silencer for this Engine is silencer1which isHybrid type of silenceras
b) discussed in chapter 3. The result showsthatthedifferencebetweenwithoutsilenceran dsilencer1isaround14dB

c) Datafromfrequencyspectrumconcludesthatthemaximumd Bisat63Hz.
d) ItisobservedfromresultsthatvalueofSoundPressure Levelvarylinearlywithrespecttoloadandspeed.
e) ThemaximumdBnearthe Engine is atlocation Bshowing in Fig.5.2. ShaftandBearingsarealignedatlocationB.
f) ValuesofAccelerationandVelocityaremaximumatfrequency500Hz.

5.2. Scopeforfuturework

The presented work can be extended byworking upon different points. Someof themarelistedbelow:

a) AproperSilencercanbedesignedtoreducemorenoise fromanEngine.
b) Itis concluded from results that the maximum dB isat Frequencyof 63Hz.By using an intensity probe, parts will be found where the maximum SoundPressureleveloccursatparticularfrequency.
c) Toreducemorenoise,foundationofanEnginewillbedesignedproperly.

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Comparative Study of Routing Protocols for Underwater Wireless Sensor Network

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ABSTRACT

Bandwidth restrictions, mobility of nodes, limitations on battery power, interference and a louder noise, area of shadow, detector or sensor node movements with a strong current of water, a high fault rate, debilitation, imersion, fauling and erosion, as well as a long and variable propagation delay are all factors that make the undersea environment is incredibly demanding and unpredictably unpredictable.This research examines a number of protocols for resolving node mobility difficulties, as well as determining which is the most efficient among them. Node mobility is a major issue that has arisen as a result of the mobile nature of nodes. During communication, the source and Environmental variables cause destination nodes to relocate from their initial places, resulting in a communication breakdown.

KEYWORDS- COMMUNICATION ISSUES, COMMUNICATION NETWORK, COMMUNICATION CARRIERS, UWSN, ROUTING PROTOCOLS

I. INTRODUCTION

Wireless sensor networks come in a variety of shapes and sizes. A subclass of wireless sensor networks is the UWSN. It enables communication via wireless between nodes of sensors and self-driving underwater vehicles (AUVs) positioned underwater to execute collaborative activities via an audio link across a defined area. The world's first wireless underwater sensor network was built in the United States at the end of WWII as a communication method for submarines. In the 8-11 kHz frequency, Analogue modulation was utilised in this communication system. Vehicle-to-vehicle communication is utilized for security and acquiring information about the maritime environment. In underwater circumstances, communication performance is solely dependent on an efficient and reliable routing mechanism. Routing protocols are the most important need for data routing in a network. Underwater wireless sensor nodes are used to store data gathering of the underwater world, locating an oil fields as well as underwater items, sampling of the ocean, environmental monitoring, and sensor nodes provide information when a disaster occurs. They are also used to avoid disasters. It is used to detect pollution in rivers and the sea. It's used to keep track of the weather and compile ocean statistics. Communication problems in the underwater acoustic network: Underwater, bandwidth is constrained, Bit error rates are high, and battery power is restricted. Because of consumption, energy efficiency is a concern and

dependability, as well as node mobility and the probability of sensor node failure is extremely high. With a variety of suggested geographical routes algorithms utilised in UWSN, solve the difficulties mobility of node, a long propagation time and a high error rate.

II. RELATED WORK

2010 (Dario and colleagues) For UWSNs, they've proposed a multimedia pass protocol. New submerged applications like as photograph and video acquisition, tactical and coast observation and classification, and catastrophe avoidance will be possible. For Location aid for underwater sensors, they propose a " Algorithm for Anchor-Free Localization " (Liute and al., 2012). UWSN's fixed and mobile nodes were utilised in this strategy. It creates an algorithm structure using data from neighbouring nodes. The wireless sensor nodes have a limited data transfer capacity (bandwidth) as well as a propagation delay. Sensor nodes require a lot of energy to keep all sorts of communications running due to their limited power of battery. (Dini and colleagues, 2011). They've got to cope with the issue of undersea vessel coordination in a secure manner. They created a secure communication suit that includes vehicle validation and privacy. All conversations are likewise protected by the suit's integrity and security. Walter et al. (2018) presented "Arc Moment" as a way to increase node mobility utilising a 2 - D based method in previous work. The Euclidian 2 to D distance formula was employed in this procedure. Using this Euclidian 2 D distance formula, we were able to keep communication running smoothly. Walter and colleagues (Walter and colleagues, 2018) "KRUSH-D," a three-dimensional approach, has been proposed. It increases network connectivity while also addressing node mobility difficulties. It selects pathways using the well-known Krushkal method and the Euclidian 3 D distance calculation. The UWSN KRUSHKAL algorithm provides a way to keep communication stable. Mangla et al. (2016) presented "Cluster Based Energy-Efficient Sensor Nodes," which are based on each sensor node's dependability, energy efficiency and throughput. It uses a two-stage method. First, it uses the Euclidian distance formula to compute the distance between the head node (or undersea sink). Second, it is used to identify the node inside a cluster that is known as the head node. The head node can sometimes deliver stable communication. The head node sends all data to the surface station and ensures that communication with other nodes is reliable. UWSN routing techniques have been proposed by Mangla et al. (2018). It is determined by a number of factors, including packet delivery rate, energy efficiency and end-to-end delay. All of below protocols can be combined to create different network scenarios. These criteria can be used to assess the effectiveness of routing protocols and aid in the selection of the optimum protocol.

UNDERWATER ROUTING PROTOCOLS

Reactive Proactive and Geographical Routing protocols

Routing is a way to create and choose a route to send information from one source node to another. The network layer includes routing algorithms. Different routing algorithms can be used to create ad-hoc networks. These are the protocols used for routing VANETs Proactive Routing Protocols*:*

These protocols use a table. Every node manages a table to store and transfer information. Each node also connects to the other via linked nodes. These protocols are also known as table driven protocols and proactive routing protocols. Among the table-driven routing protocols are OLSR, FSR, and DSDV.

DSDV (Destination Sequence Displace Vector Routing) DSDV is based upon the Bellman-Ford algorithm. DSDV protocol allows users to share data packets with other nodes. This packet stores information such as the IP address, sequence number, and hope count. Each node in the network changes its topology after a time, a fixed time, or immediately.

OLSR (Optimized link State Routing)

To collect information about the nearest node in OLSR, node used "hello" message.

Every node in a network sends "hello" signals to its neighbours as soon as an issue is detected. They also keep track of all nodes in a table. The classical link state algorithm is another name for this. This is a method of multipoint relay. This strategy lowers the cost of flooding to the sensor node, which is a time-consuming process.

Reactive Routing Protocols:

Reactive routing protocol allows you to create and choose a route to send information from one source node to another. This type of protocol is also known as on-demand routing protocols. Reactive routing protocol decreased network traffic. This protocol is used to discover routes and search for destinations in a network.

Types of reactive routing protocols:

1. AODV
2. DSR
3. TORA

We have used two UWSN reactive routing protocols in this paper. Nodes in UWSN have high mobility and move at high speeds. It is not suitable to use proactive based routing. Due to the large amount of table information and bandwidth consumed, proactive-based routing protocols could fail in UWSN TORA

AODV: This is a reactive routing protocol. It is used whenever a node wishes to send data to another node. The AODV extension of DSR (Dynamic source routing protocol) is the AODV. Many reasons AODV is called Reactive routing. It's a means of obtaining routes on demand, with routes being built on the fly. only when they are needed. This protocol is called on demand routing protocol. AODV is a broadcast routing discovery system that locates a route using RREQ (Route Request packet) broadcasting and establishes forward pathways using RREP (Route Reply Package). In AODV route tables entries establishment is dynamically, or nodes lies active path and maintain routing information.

If the routing table entry has expired, it is used to determine if it is still in use. To avoid routing loops, AODV employs a destination sequence number and avoid broken routes.

AODV manages ad-hoc networks and the results are very automated and efficient. Multi-hop routing is possible in this protocol, where nodes move through root. It allows nodes to quickly achieve their goal and does not require them to manage the path to destination.

DSR:

It is an efficient and routing protocol that is simple and was specifically developed for Wireless ad hoc networks with many hops. It allows the network's self-organization and configuration without any need for pre-established network infrastructure. Source routing is used to send packets between source nodes. Source routing requires that each source node knows the hop sequence to the destination.

III. PROTOCOL FOR GEOGRAPHICAL ROUTING

A. VBF

Vector Based Forwarding protocol is based on location. This protocol sends data packets from a source to a destination using a pipe. Each packet has complete information on the source, destination, and forwarder. If the receiving packet has arrived in the pipe, calculate its location. If not, toss the packet out.

B. Hop-by-hop vector-based forwarding (HH-VBF)

A location-based Protocol was also used in the development of VBF. A pipe was utilized to send a packet from source to destination in this protocol. This is because per hop forwarding pathways define forwarder nodes. For networks with a small number of nodes, VBF and HH provide better forwarding methods.

C. Depth - Based Routing (DBR)

It's a dynamic and dense network with excellent efficiency. It enables scalable and efficient routing without the need for localization. DBR only employed a depth sensor. DBR makes use of a depth sensor. The data is sent through a sink in the water's surface.

D. Topology - Control Vector Based Forwarding (TCVBF)

It makes optimum the use of energy resources, and also provides reliable data transmission to wireless sensor networks. It can be divided into network connectivity and network coverage. The first is network coverage. This is determined by how the objective land is verified by the sensor node. It works to consume less power and provide reliable sensing areas. System affinity refers to a proficient sensor relationship topology that uses UWSN architecture to regulate and operate power.

IV. THE ARCHITECTURE OF THE UWSN

A. UWSN architecture in one-dimension

Sensor nodes are positioned underwater in a one-dimensional layout. Each sensor node forms its own network. Collecting data and transmitting it to remote stations is a time-consuming process. A camera, CPU, battery, and storage device are all included in sensor nodes. A node can be an autonomous underwater vehicle (AUV) using this design. It is an autonomous underwater vehicle (AUV) that moves in the water without the need for direction from an administrator. A sensor node communicates to one another using a combination of radio frequency, optical, and acoustic communication careers.

B. UWSN architecture in two-dimension

Two-dimensional architecture, in which sensors nodes are placed underwater. A cluster is made up of several nodes. Each cluster builds its own network. The head node of a cluster is known as anchor node. They are located at the bottom of the ocean. Other sensors nodes gather information from the undersea and transmit it to the head node. The information was collected by the head node and sent to AUV. AUV connects directly to the surface sink via wired connection. Horizontal communication links every cluster communication node with the head node. The AUV surface sink receives data and is directly connected to it. For communication, the head node and the other nodes use wireless connections. Two-dimensional sensor nodes communicate with each other using the three communication careers acoustic (optical) and radio frequency communication career, depending on the nature of the underwater environment.

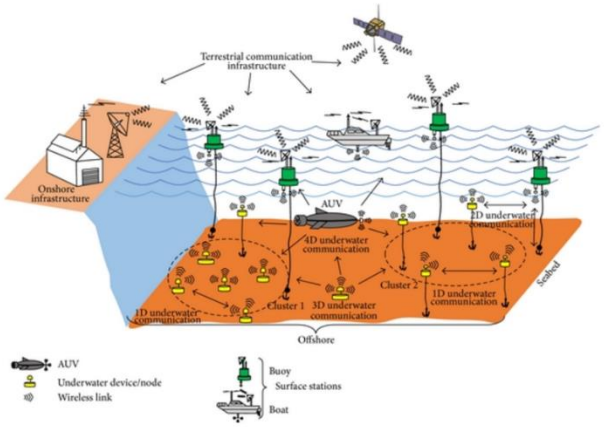

Fig.1 Architecture of UWSN

C. UWSN architecture in three-dimension

In 3D architecture, sensor nodes form a cluster and connect at the bottom underwater. This architecture will support three communication scenarios:

Inter cluster

Intra cluster

Communication via an anchor-floatable node. Communication scenarios will use optical, acoustic and radio frequency links.

D. UWSN architecture in four-dimension

The D UWSN is a combination three-dimensional underwater sensor network and mobile UWSNs. Remotely operated underwater vehicles (ROVs) will contain the mobile UWSN. ROVs gather

data from the head nodes, and transmit the data to the remote station. ROVs may be autonomous underwater vehicles, robotics, ships, or underwater vehicles. The sensors can all be autonomous underwater vehicles that will send the data directly to ROVs. This data is used to calculate the distance between a node and a ROV. The distance between the ROVs and underwater sensor nodes will determine which communication scenario is used. Acoustic or radio can also be used. Also, there may be a relationship of data between ROVs to sensor nodes. For transmitting data, the sensor node will use radio links. UWSNs research focuses mainly on communication, self-organization and processing capabilities.

E. Architecture of 3-D communication

3-D communication architecture, which can be observed in underwater monitoring. It will form clusters. It will form clusters. There will be one common gateway that connects two clusters and one selected cluster head. This architecture is used for underwater observation. This architecture uses communication between the cluster head and horizontal sensor nosdes (HN), vertical sensors nodes (VN), and surface station (SS), as well as between the cluster head (CH), gateway (GW), and between different types nodes.

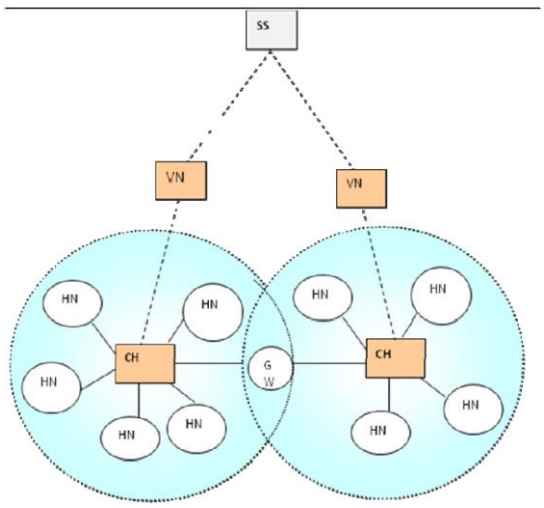

Fig2. Communication in 3D Architecture

Table1. Communication in 3D Architecture

Type	HN to CH	CH to Gateway	VN to SS
Communication	Acoustic Horizontal link	Acoustic Vertical Link	Acoustic Vertical Link

F. COMMUNICATION TYPE

UWSN offers two type of communication :

Underwater communication is intra-cluster between sensor nodes, cluster head, surface stations and horizontal sensors nodes.

The cluster head, gateway, surface station, cluster head, and horizontal sensor nodes communicate underwater. a cluster head, a surface station, a gateway, a neighbour cluster head, a neighbour cluster head, a neighbour cluster head, a neighbour cluster head, a neighbour cluster head.

G. DATA COMMUNICATION ISSUES IN UNDERWATER

Many factors that effects in UWSNs communications are given here:

a. Transmission Loss

Underwater medium is susceptible to attenuation transmission losses and geometric spreading loss. Spreading of the acoustic signal. Conversation of the energy of an acoustic wave can cure attenuation. Attenuation can be found in underwater communications due to loss spreading and loss absorption. This reduces the power of desired signals, but it is still very effective. It is crucial to delete the required data from the received signal at destination.

b. Bandwidth

Underwater wireless sensor networks have a very restricted bandwidth. At a low data rate, its range is close to 102 KHz. This isn't the case in terrestrial

networks, which have significantly more capacity than underwater wireless sensor networks. Information can only be moved at a limited frequency range underwater due to the incontinence of the environment. Acoustic systems are limited in their design and operation due to the limited bandwidth of the acoustic spectrum. To establish routes and send data packets to their destinations, routing protocols must take into account the limited frequency range.
The bandwidth of an underwater application's bandwidth is directly proportional to the convergence (transmission range).

Table2. Bandwidth relationships in UWSN

Convergence	Range in (km)	Bandwidth in (kHz)
Very long	More than 100	Less than 1
Long	More than 10–100	Almost 2–5
Medium	Almost 1–10	Almost 10
Short	Almost 0.1–1	20–50
Very short	Less than or equal to 0.11	Greater than 100

c. Noise

There are two types of underwater noise: man-made and natural. Natural noise will be caused by biological, seismic and hydrodynamic activities. Man-made noise will come from machinery and shipping noises. The ability to connect underwater noise to the data will improve the quality of communications. The best route must be chosen, as it is less affected by noise. This can improve underwater communication. There are four components to underwater noise: shipping noise, turbulence, wave and thermal. The The total of all four noise types equals the power spectral density (N) of ambient noise in decibels. N =Nsh + nwv + ntb+Nth is the formula for calculating it (1)
The power spectrum densities for shipping, wave, and turbulence are Nsh, Nwv, and Ntb, respectively.

d. Multipath

Multipath effect occurs in the underwater environment due to wave reflections from surfaces and bottom.

e. High Delay

UWSNs have a much higher propagation delay than terrestrial wireless sensor networks. This reduces the throughput in an underwater environment. The underwater environment is four times more time-consuming than terrestrial wireless sensor networks.

f. Doppler Spread

Doppler shift, receiver movement, and channel boundaries are all caused by receivers. Doppler spread is affected by all these parameters.

g. Short Network Lifetime

The network's life expectancy is greatly affected by the absence of solar energy. The underwater environment can only store a limited number of sensor nodes. It is possible to replace the battery after a while. Due to a limited supply of battery power, the sensor nodes begin to lose battery power. This creates energy holes. This is a problem with the battery and it means that the network fails, which can delay data delivery to the surface sink. The problem with battery power. This problem will be solved by making efficient and effective use of the electrical power available to sensor nodes in the underwater environment. The routing protocol underwater must select the best path that is suitable for the network. This will reduce the network's energy consumption. These nodes are called energy holes if they lose battery power in the early stages of network operation. They then become dead. Energy holes allow safe packet delivery to the destination. Underwater communications vary the

speed of an acoustic waves according to salt, temperature, and depth.

The speed of acoustic waves within water is:
C=1449 + 5.304 x 10-2-2 T +2.1744 x 10-4-5 T3 + 1.34 (S – 35) + +1.63x10-2D + 1.675x10-7 T+1.025x10-2T(S – 35) 7.139x10-3 T3 (2)
The sea depth in meters, water salinity factors per thousand, temperature and degree Celsius are the respective temperatures. C, S, D, T, and T refer to the speed of acoustic wave in meters per second

H. UNDERWATER COMMUNICATION CARRIER

There are many communication mediums that can be used underwater for data transmission. These include radio communication technique and optical communication technique. For data transfer, all acoustic communication carriers can be used underwater. Acoustic sound waves are medium for data transmission. The 'Table' table shows a comparison of communication techniques in an underwater environment.

Table3. Underwater Communication Carrier

Communication technique	Acoustic communication	Radio communication	Optical communication
Communication carrier	Sound waves	Radio frequency	Light waves
Propagation speed in (m/s)	1. 5 *10^3	3 * 10^8	2.1 to 3 * 10^8
Bandwidth	KHZ	MHZ	10-150MHZ
Frequency band	KHZ	MHZ	10^14-10^15HZ
Data rate	Up to 100kbps	Up to 10mbps	1gbps
Transmission range	50-5km	1m-100m	1m-100m

a. Radio communication

The electromagnetic wave is also known by radio communication carrier. Radio communication carrier has a limited communication range due to high frequency absorption and channel attenuation. It is also less than 1 meter in fresh water. Radio frequency waves propagate through conductive salty underwater over long distances at low frequencies (30-30 Hz), which is why it's so expensive to have a large antenna and high transmission power. For underwater communication, radio communication modems cannot be used.

b. Optical communication

Because optical communication carriers are only suitable for clean and fresh water, they are not suitable to be used in an underwater environment. This type of communication is intended for point-to-point underwater communication. Because of its limited range, this type of communication is not appropriate for the underwater environment. This type is only for short distances. Optic communication is not recommended for long distance and dirty communications.

c. Acoustic Communication

It is ideal for use in the underwater environment. It can be used for long distances. It can also be used in deep dirty water. The transmission range of acoustic can be set up in an underwater environment within this range. It propagates at a slower rate than other communication carriers. The frequency and bandwidth are in KHZ for acoustic communication careers.

d. Sonar Communication

Sonar communication is a subclass in acoustic communications. Like acoustic, it uses sound waves to transmit signals. It can be divided into active and passive modes. Both modes use hydrophones to receive or emit sonar waves. The transmission range of sonar communication and acoustic communications

is very similar. Communication frequency ranges are also very similar. Sonar communication carrier and radio communication carrier are physically and electrically different. Sonar communication is not used to trans-border condition in air water.

e. Magneto-Inductive Communication

The magneto inductive communication carrier can be used as an alternative communication method to radio communication and acoustic communication. It is free from any impairments. Magneto inductive communication carriers include dynamic channels, high propagation delays, multiple paths fading, and multiples paths. This communication uses induction coils. These magneto-inductive communication instruments can be deployed underwater. It can be equipped with elastic antenna structures that are low-cost and allow for the formation of underwater networks of magnet waves whipping path losses.

V. CONCLUSION

This paper discusses routing protocols and solution for improving communication issues in an underwater wireless sensor network environment. It includes transmission loss, propagation delay, noise, multipath, Doppler spread, and transmission loss. UWSNs will benefit from a comprehensive overview of 3-D-based communication architecture. This study focuses on the choice of a communication carrier. For underwater wireless sensor networks, acoustic communication is the most suitable communication medium. We have demonstrated that the propagation delay caused by acoustic signals is lower than radio frequency. Future work will be to develop efficient communication protocols for underwater sensor network considering performance metrics such as throughput, energy efficiency and delay. We also want to improve reliability of the network.

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Effect of Sesame oil Biodiesel Blends on the Performance and combustion of CI Engine

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ABSTRACT

Alternative fuels are the fuel for the future as it plays a vital role in mitigating pollution effect on the environment. Biodiesel prepared from sesame oil has comparable chemical properties to conventional diesel. Blending the sesamebiodiesel with mineral diesel for running a compression ignition engine is found to be economical and less polluting. This study investigated the performance analysis of sesame-based biodiesel blends. At high engine load and 1500 rpm, the peak cylinder pressure of biodiesel blends is 41.20 bar (B10), 40.21 bar (B20), 44.68 bar (B30), and 45.91 bar for diesel fuel. The maximum heat release rate of the diesel fuel exceeds 85 J / deg, with a maximum heat release rate of 80.62 J / deg (B20), 75.11 J / deg (B15), 40.63 J / deg (B10), and 20.63 J/deg (B5). The higher the fuel consumption in the system, the largest fuel is used. Quantitative heat release is better for B15 than D100, and the maximum value is about 7.7 % more than the value for D100. Brake meansadequate pressure is better for B10 as compared to D100. Indicated mean adequate pressure for B10 is 2.67% more than the value for B15. Thus, the higher the fuel consumption in the system, the largest the fuel used.

I. INTRODUCTION

Fossil fuels are depleting at a faster rate than expected them to be [1]. The combustion process in a diesel engine is mainly based on atomization characteristics and air-fuel mixing [2]. The present study examines sesamebiodiesel as an appropriate diesel replacement. The main emphasis of this research is on fuel characteristics and engine combustion issues. Finally, we analyze the performance, combustion, and emission characteristics of the sesame biodiesel blends with diesel.Sesame-basedbio-resourcesandcost-effectivewastes in the application of CI engines especially in earlier studies, it has been found that sesame is comparatively more abundantly available and cost-effectivebiofuel than mahua oil and other vegetable oils [3-5].

Piloto-Rodríguez, R et al. [6] investigated the effect of diesel engine performance when fueled with biodiesel from algae and microalgae and found the performance 66 percent effective with low emission of NOx. Naik M et al. [7] stated that unprocessed oil might also be used in diesel motors, albeit with the required motor driving habits modification. In contrast to diesel fuel,

vegetable oil mainly comprises high-free fatty acid Karanja oil saturated hydrocarbons, triglycerides, and glycerol esters.Archer,S et al.[8] have revealed a distinct chemical structure for the palm oil biodiesel life cycle. Up to three fatty acids are coupled with an ester-connected glycerin molecule. The length of the carbon chain and the amount of double bonds of the fatty acids varies. The typical chain length in vegetable oils ranges from 12 to 22 carbon atoms, with the physical-chemical characteristics of the oil as opposed to diesel being responsible for 0 to 3 double bonds Gautam, R et al. [9].

II. Materials and methods

For biodiesel production, Transesterification is the technique utilized within sight of the impetus, like sodium hydroxide or potassium hydroxide, for the synthetic separating of the crude oil particle into methyl or ethyl ester and glycerol [10]. Oil usually consists of 72% vegetable oil and 28% biodiesel catalyzed by CaO. Transesterification is known as the process of eliminating in the presence of a catalyst and glycerol and fatty acids from vegetable oil [11]. Vegetable oil catalyzes mono-hydro-alcoholic drinking, such as methanol/ethanol, interacting with the presence of sodium and potassium Kouzu, M., & Hidaka, J. S. [12].

The most promising method was transesterifying triglycerides with methanol, ethanol, propanol, and butanol. Methanol is the most frequently used alcohol owing to its cheap cost. The significant factors influencing ester output during the transesterification process are free fatty acid effects and humidity, type, and concentration of catalyst, molar alcohol-oil ratio and alcohol type, reaction time and temperature effect, and intensity mixing [13].

The free fatty acid and moisture content are the essential criteria for the feasibility of the process of vegetable oil transesterification. A free fatty acid (FFA) value lower than 3 percent is required to complete the catalytic base reaction. The more the acidity of the oil, the less the conversion efficiency (Dorado et al 2002). Methoxide and hydroxide from Na and K should be kept in anhydrous condition since extended air contacts decrease the efficacy of these catalysts via moisture and CO_2 interactions [14].Alkaline catalysts are preferable to industrial operations because they are less corrosive for industrial equipment. The concentration in the range of 0.5%-1.0% (weight/weight) showed that 94%-99% of vegetable oil is converted into esters. Further increase in catalyst concentration does not impact the conversion but increases additional costs [15].

With a molar ratio of alcohol to oil and type of alcohol the industrial process employs an ester yield of more than 98 percent with a molar ratio of 6:1 Acid, peroxide, iodine, and saponification have a minor influence on the molar proportion of methyl esters. In addition, the high molar alcohol/vegetable oil ratio interferes with glycerin separation.The highest production of esters occurs at the molar ratio of 6:1 at temperatures ranging from 60°C to 80°C [16].The transesterification process is vital because NaOH-MeOH solution is immiscible with oil and fat. It is no longer required to stir after the two phases are mixed. Methanolysis was conducted at 180, 360, and 600 rpm (rpm). As a result, Methanolysis was minimal at 180 rpm [17].

Fig.1 : Separation process of sesame biodiesel and glycerine in the funnel

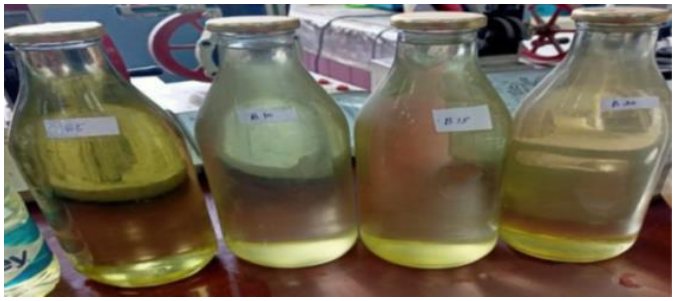

Fig. 2. Different blends of Pure Diesel and Sesame Biodiesel

III. Results and discussions

3.1. Net heat v/s crankshaft

As shown in Fig. 3, the motor's fusion rates of diesel and biodiesel vary at 5 %, 10%, 15%, and 20%. Initially, there is a negative heat output. Due to endothermic chemical and physical processes happening during the ignition delay period, and because the fuel accumulates, vaporization occurs, resulting in negative heat release. Both diesel and biodiesel burn in the same way. After the pre-muzzled combustion stage, the fuel-air combination burns quickly, and the heat release is positive when auto-ignition occurs. The fuel-air mixing velocity controls the burn rate at this step. It may be found that combustion for biodiesel mixes begins sooner, owing to a reduced ignition delay. Biodiesel is greater than 80,62J/deg (B20), 75,21J/deg (B15) and 40,63J/deg (B10), and 20,63J/deg (B20) (B5The maximum heat discharge of diesel fuel is somewhat greater when combined with biodiesel due to enhanced volatility and improved air contact. A longer ignition time for diesel fuel may also cause significant amounts of fuel to accumulate in the combustion chamber throughout the pre-measured burning duration, increasing the heat release rate. However, heat releases in biodiesel blends are only significantly less than in diesel after late combustion. This is because the more oxygen-intensive chemicals ensure that the remaining fuel is fully combusted from the primary combustion phase and burned in the later burning process.

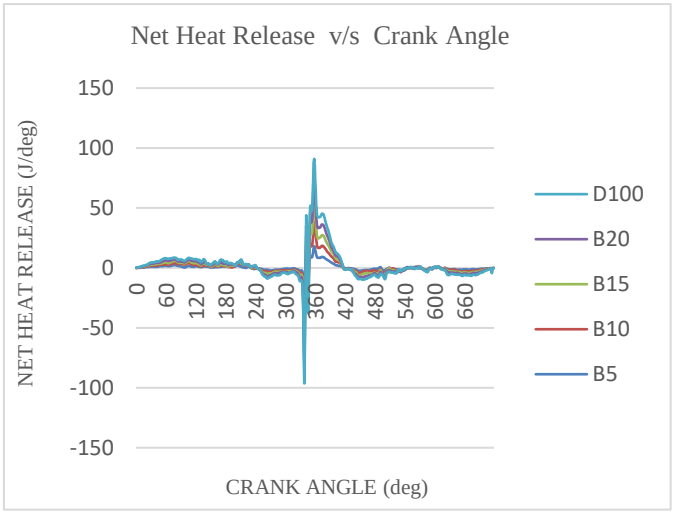

Fig. 3. Heat release graph v/s crank angle

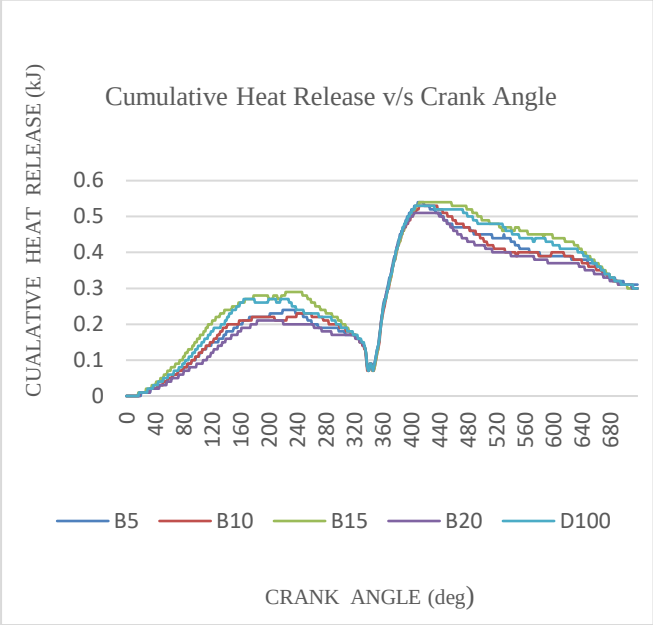

Fig. 4. Cumulative heat release v/s crank angle

Fig.4 shows the cumulative change in the heat release rate of diesel and biodiesel mixtures. The cumulative rate of heat emission of diesel fuel is 0.52 kJ, and biodiesel is 0.57 kJ (B15) (B20).

3.2. Mean gas temperature v/s crank angle

The extreme gas hotness for diesel fuel is 800.21 / daC, and the biodiesel combination is 831.21 / daC (B10), 825.5 / daC (B15), and 820.65 / daC for diesel fuels (B20). This shows 1%, 2%, and 4.4% differences in values for B5-, B10- and B20 biodiesel compared to diesel correspondingly. The air temperature at the

conclusion of the compression may be seen to be high enough to spray and ignite the droplet upon entering the cylinder. The gas temperature for the diesel fuel is greater during the combustion stage and thus increases the pressure during the combustion phase. Fig. 5 illustrates variations in average gas temperature for diesel and bio-diesel mixtures in crank angles.

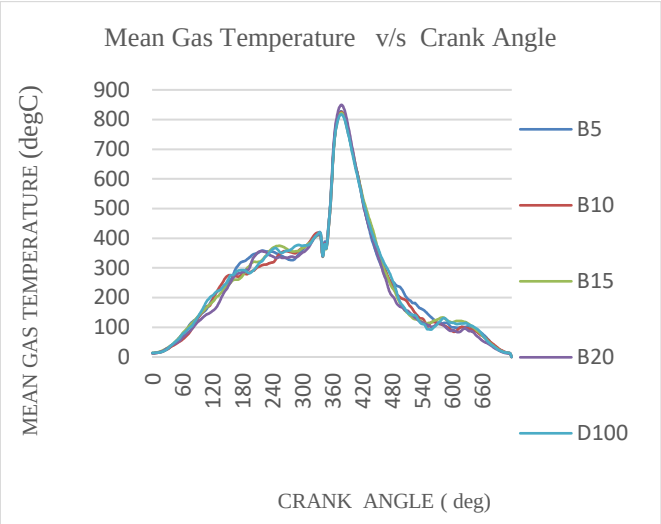

Fig. 5. Mean gas temperature v/s crank angle

3.3. Performance of biodiesel

3.3.1 Torque v/s load

Fig. 6 shows the torque vs. load graph, and it is clearly seen that when the load increases, the Torque of the blend changes. When the load 3 kg the highest Torque shown for B 10 followed by the D 100, then B 5, and lastly B 15. At the 6 kg load the highest torque shown for D 100 followed by the B 10 and B 5, B 20. At the 9 kg load the highest torque obtained for the D 100 followed by the B 10 and B 15 respectively. At 12 kg load the again highest torque obtained for the D 100 followed by the B 15 and B 5.

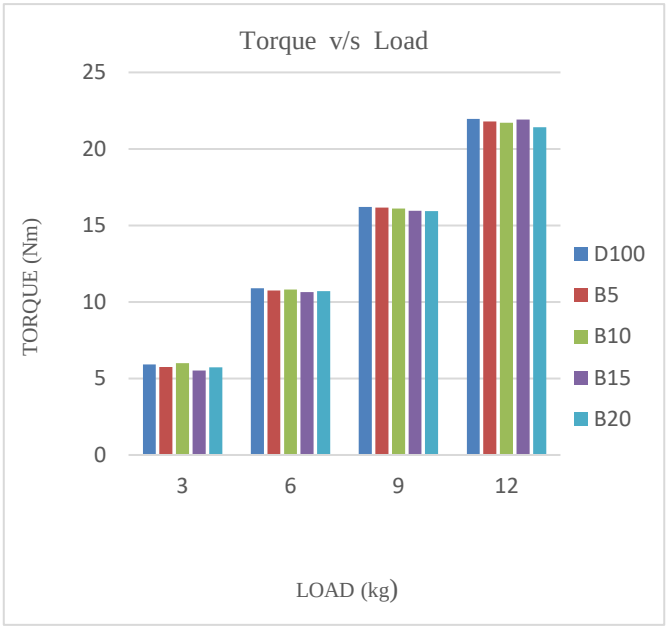

Fig. 6. Torque v/s load

3.3.2. Brake power v/s load

Fig. 7 shows the BP v/s load graph. At 3 kg load, the highest BP is shown for D 100, and in the second position, almost all blend shows the same BP. At the 6 kg load, the highest BP is shown for D 100, followed by B 5, B 10, B 15, and B 20; in the 6 kg load, the BP decreases gradually. At a 9 kg load, all materials show the same BP. At 12 kg load, the highest BP was shown for D 100, followed by the B5, B 10, B 15, and B 20, respectively.

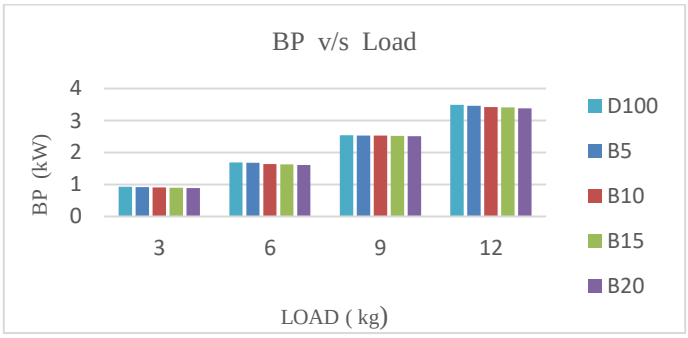

Fig. 7. Brake Power v/s load

3.3.3. Brake thermal efficiency v/s load

From Fig. 8,we can see that as the load increases, so is brake thermal efficiency. It can also be noted that the brake thermal efficiency is highest for B 10 i.e., 20.4% and lowest for D100 i.e., 19.42% at maximum load condition.

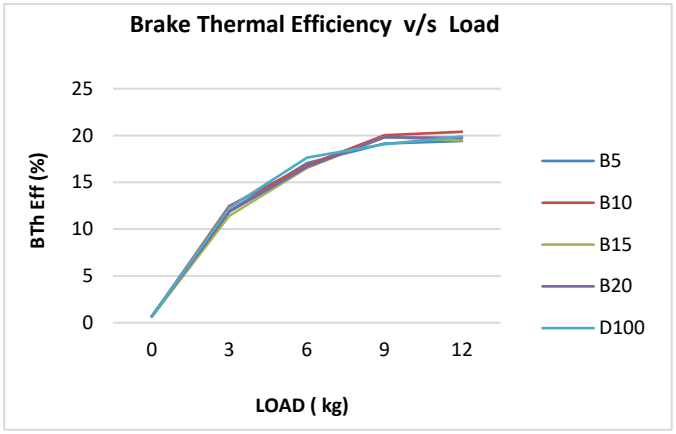

Fig. 8. Brake thermal efficiency v/s load

3.3.4.BMEP v/s load

From Fig 15, we can see that the BMEP of different sesame oil increases when the load increases. It can be noted that the highest values are seen for B 10, i.e., 4.2 bar whereas the lowest values are shown for B 20, i.e., 4.07 bar.

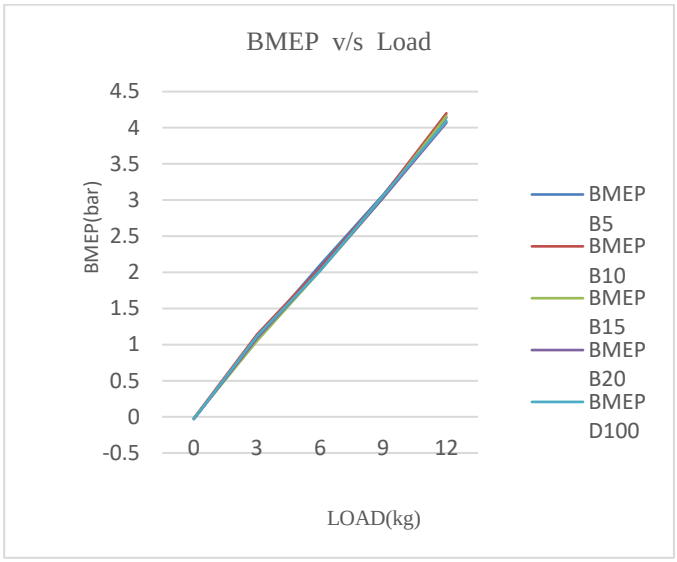

Fig. 9. Brake mean effective pressure v/s load

3.4. Fuel consumption v/s load

Fig. 10 shows the fuel intake of pure diesel and different biodiesel blends and it can be seen that as the load is increasing so is the fuel consumption. The highest fuel consumption is shown for the B 15 followed by the D 100 and others blend shows the lowest fuel consumption of the system.

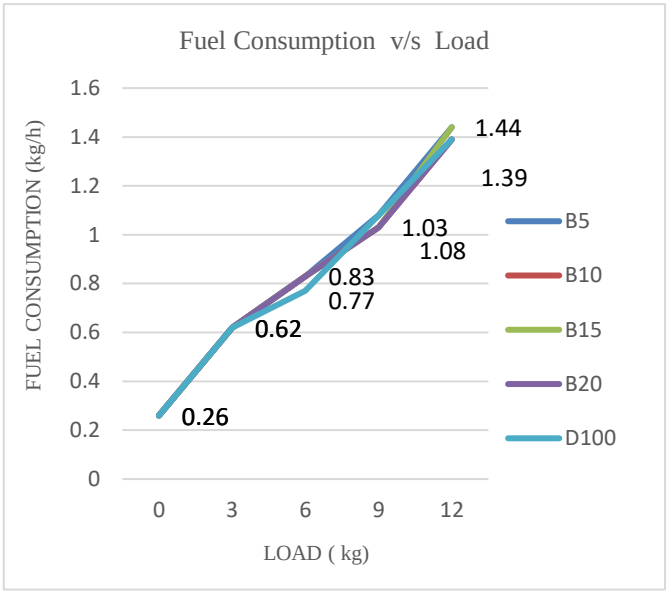

Fig. 10. Fuel consumption v/s load

IV. CONCLUSION

The maximum heat release rate of the diesel fuel exceeds 85 J / deg, with a maximum heat release rate of 80.62 J / deg (B20), 75.11 J / deg (B15), 40.63 J / deg (B10) and 20.63 J/deg (B10) (B5). The peak heat release rate for diesel fuel is somewhat higher than that in biodiesel mixtures, due to increased volatility and a better combination from diesel to air. Another factor might be a protracted ignition period in Diesel fuel, which results in a higher level of heat release during pre-feed burning phases, causing a considerable amount of fuel to build in the combustion chamber.

The highest fuel consumption is shown for the B 15 and followed by the D 100 and others blend shows the lowest fuel consumption of the system. Quantitative heat release is better for B15 as compared to D100 and maximum value is about 7.7 % better than D100 value. Mean gas temperature of B10 is more than the D100.Torque is better for D100. Fuel consumption is higher for B20 than other at all loads. Brake mean effective pressure is better for B10 as compared to D100.

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Latest Methods for Solving Engineering Problems Related to Pipes and Cisterns

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ABSTRACT

Plastic pipes are ubiquitous in both residential and non-residential building. They are hidden and hardly visible but offer a major contribution to your living comfort. They are essential for hot and cold water, surface heating (including floor heating) and cooling, ventilation, air conditioning, low noise soil and waste evacuation, sprinklers, gutters and, downpipes. In this paper we have focused on latest methods for solving engineering problems related to pipes and cisterns. These methods are very helpful for solving any competitive problem related to pipe and cistern in day to day life.

Keywords: Cistern, Pipe, Non-Residential Building, Ventilation; Gutters, Waste Evacuation.

I. INTRODUCTION

An increasing variety of heating and cooling installations allow people to live and work in a comfortable temperature, irrespective of weather and climate conditions. Plastic pipes play a central role in such heating and cooling applications as, among others, floor heating, radiator connections, central heating and ventilation systems [1]. Pipes are defined as circular tubular products used for conveying fluids (liquids, gases, and fluidized solids). Pipes are designed for a particular design pressure corresponding to the design temperature. Various parameters related to pipes are Pipe Size, Pipe Schedule or thickness, Pipe Material, Pressure withstanding capability, Temperature withstanding capability, etc. Different types of pipes are used in the industrial sector for different purposes. Common industries that find extensive use of pipes are oil and gas, process industries, chemical and petrochemical complexes, food and beverage industries, power sectors, steel industries, HVAC industries, plumbing industries, pipeline industries, refineries, etc. Today, the use of pipes is so wide that modern industrial plants cannot be thought of without pipes. Types of pipes are decided based on various factors. In this article, we will explore different types of pipes that are widely used in industries [2]. Pipes are normally classified based on the material which is used to produce the pipe during manufacturing. In general,

there are two types of pipes: Metallic Pipes and Non-metallic Pipes. The pipes made of metal are known as metallic pipes. They can be grouped into two categories: Pipes made from ferrous materials, and Pipes made from non-ferrous materials. Type of Pipes made from ferrous materials: These types of pipes are stronger and heavier. These pipes have iron as their main constituent element. Common examples of pipes made from ferrous materials are: Stainless steel pipes, Alloy steel pipes, DSS pipes and Carbon steel pipes. Carbon Steel Pipes (Temperature Range -29 degree centigrade(C) to 427 degrees C). This is the most common and cheapest material used in process plants. Carbon steels are used in most general refinery applications. It is routinely used for most organic chemicals and neutral or basic aqueous solutions at moderate temperatures. Carbon steels are extensively used in a temperature range of (-) 29 degrees centigrade to 4270 centigrade [3].

II. METHODS AND MATERIAL

A pipe is connected to a tank or cistern. It is used to fill or empty the tank; accordingly, it is called an inlet or an outlet. Problems on pipes and cisterns are similar to problems on time and work. In pipes and cistern problems, the amount of work done is the part of the tank of filled or emptied. And, the time taken to do a piece of work is the time take to fill or empty a tank completely or to a desired level.

Inlet: A pipe which is connected to fill a tank is known as an inlet.

Outlet: A pipe which is connected to empty a tank is known as an outlet.

III. RESULTS AND DISCUSSION

Steps to remember:

Step-1) If an inlet connected to a tank fills it in X hours, part of the tank filled in one hour is = 1/X

Step-2) If an outlet connected to a tank empties it in Y hours, part of the tank emptied in one hour is = 1/Y

Step-3) An inlet can fill a tank in X hours and an outlet can empty the same tank in Y hours. If both the pipes are opened at the same time and Y > X, the net part of the tank filled in one hour is given by;

$$= \left(\frac{1}{X} - \frac{1}{Y}\right)$$

Therefore, when both the pipes are open the time taken to fill the whole tank is given by;

$$= \left(\frac{XY}{Y-X}\right) \text{ hours}$$

If X is greater than Y, more water is flowing out of the tank than flowing into the tank. And, the net part of the tank emptied in one hour is given by;

$$= \left(\frac{1}{Y} - \frac{1}{X}\right)$$

Therefore, when both the pipes are open the time taken to empty the full tank is given by;

$$= \left(\frac{YX}{X-Y}\right) \text{ hours}$$

Step-4) An inlet can fill a tank in X hours and another inlet can fill the same tank in Y hours. If both the inlets are opened at the same time, the net part of the tank filled in one hour is given by;

$$= \left(\frac{1}{X} + \frac{1}{Y}\right)$$

Therefore, the time taken to fill the whole tank is given by;

$$= \left(\frac{XY}{Y+X}\right) \text{ hours}$$

In a similar way, If an outlet can empty a tank in X hours and another outlet can empty the same tank in Y hours, the part of the tank emptied in one hour when both the pipes start working together is given by;

$$= \left(\frac{1}{X} + \frac{1}{Y}\right)$$

Therefore, the time taken to empty the full tank is given by;

$$= \left(\frac{XY}{Y+X}\right) \text{ hours}$$

Step-5) Three inlets A, B, and C can fill a tank in X, Y and Z hours respectively. If all the inlets are opened together, the time taken to fill the tank is given by;

$= \left(\frac{X+Y+Z}{XY+YZ+ZX}\right)$ hours

Step-6) Two pipes can fill a tank in X and Y hours respectively and an outlet can empty the same tank in Z hours. If all the pipes are opened together, part of the tank filled in one hour is given by;

$= \frac{1}{X} + \frac{1}{Y} - \frac{1}{Z}$

∴ Time taken to fill the tank completely when all the pipes are working is given by;

$= \frac{XYZ}{YZ+XZ-XY}$

Step-7) A pipe can fill a tank in X hours but due to a leak in the bottom, it can be filled in Y hours. The time taken by the leak to empty the tank is given by;

$= \frac{XY}{Y-X}$

Step-8) An inlet A is X times faster than inlet B and takes Y minutes less than the inlet B, time taken to fill a tank when both the pipes are opened together is given by;

$= \frac{XY}{(X-1)^2}$

And, A alone will fill the tank in minutes

And, B alone will fill the tank in minutes

1) A pipe can fill a tank in 6 hours and another pipe can empty the tank in 12 hours. If both the pipes are opened at the same time, the tank can be filled in

A. 10 hours

B. 12 hours

C. 14 hours

D. 16 hours

Correct answer; option (B)

Answer with explanation:

Part of the tank filled in one hour = $\frac{1}{6}$

Part of the tank emptied in one hour = $\frac{1}{12}$

Net part of the tank filled in one hour;

$= \frac{1}{6} - \frac{1}{12}$

$= \frac{2-1}{12} = \frac{1}{12}$

Part of the tank can be filled in one hour.

∴ the tank will be filled completely in 12 hours.

Solution 2:

Apply formula; = $\frac{XY}{Y-X}$

X = 6 hours and Y = 12 hours

$\frac{6*12}{12-6}$

∴ = 12 hours

2) Three pipes A, B and C can fill a cistern in 8 minutes, 12 minutes and 16 minutes respectively. What is the time taken by three pipes to fill the cistern when they are opened together?

A. 3.7 minutes

B. 4 minutes

C. 4.5 minutes

D. 5 minutes

Correct answer; option (A)

Answer with explanation:

Part of the tank filled by A in one minute = $\frac{1}{8}$

Part of the tank filled by B in one minute = $\frac{1}{12}$

Part of the tank filled by C in one minute = $\frac{1}{16}$

Net part of the tank filled by A+B+C in one minute;

$= \frac{1}{8} + \frac{1}{12} + \frac{1}{16}$

$= \frac{6+4+3}{48} = \frac{13}{48}$

$\frac{13}{48}$ Part of the cistern is filled in one minute.

∴ The whole tank will be filled in $\frac{48}{13}$ = 3.7 minutes

3) Two pipes can fill a tank in 6 hours and 8 hours respectively. A third pipe can empty the same tank in 12 hours. If all the pipes start working together, how long it will take to fill the tank?

A. 4 hours
B. 4.5 hours
C. 4.8 hours
D. 5.2 hours

Correct Option (C)

Answer with explanation:

Part of the tank filled by two pipes in one hour = +

Part of the tank emptied by the third pipe in one hour =

∴ Net part of the tank filled in one hour = + -

=

Part of tank can be filled in one hour

∴ the whole tank will be filled in = 4.8 hours

4) A tank can be filled in 10 hours. After a leak in its bottom, it takes 12 hours to fill the tank. Find the time taken by the leak to empty the full tank?

A. 45 hours
B. 60 hours
C. 50 hours
D. 55 hours

Correct Option (B)

Answer with explanation:

Part of the tank filled in one hour before the leak =

Part of the tank filled in one hour after the leak =

Part of the tank emptied in one hour by the leak = -

Part of tank will be emptied in one hour by the leak

∴ the full tank will be emptied by the leak in 60 hours.

Solution 2:

Apply formula; =

X = 10 hours

Y = 12 hours

∴ = 60 hours

5) **Two pipes can fill a tank in 10 and 14 minutes respectively. A third pipe can empty the tank at the rate of10 liters/minute. If all the pipes working together can fill the empty tank in 8 minutes, what is the capacity of the tank?**

A. 210 liters
B. 215.4 liters
C. 220 liters
D. 225.4 liters

Correct answer; option (B)

Answer with explanation:

Let the capacity of the tank is X liters.

Part of the tank filled by two pipes in one minute = 1/10 + 1/14

10 liters is emptied in 1 minute

X liters will be emptied in X/10 minutes

In X/10 minutes the whole tank will be emptied.

In one minute 10/X part of the tank will be emptied.

As per question;

6) A cistern can be filled by an inlet in 6 hours and can be emptied by an outlet in 8 hours. If the inlet and outlet are opened together, in what time the cistern can be filled?

A. 24 hours
B. 26 hours
C. 20 hours
D. 18 hours

Correct Option (A)

Answer with explanation:

Part of the tank filled by the inlet in one hour =

Part of the tank emptied by the outlet in one hour =

Net part of the tank filled in one hour = -

Part of the tank is filled in one hour

∴ the whole tank will be filled in 24 hours.

Solution 2:

Apply formula; =

X = 6 hours

Y = 8 hours

∴ required time = = 24 hours

7) **20 buckets can fill a tank when the capacity of each bucket is 12 liters. If the capacity of each bucket is 10 liters, find the number of buckets required to fill the tank.**

A. 30 buckets
B. 34 buckets
C. 24 buckets
D. 27 buckets
Answer with explanation:
Capacity of each bucket = 12 liters
20 buckets can fill the tank. So, capacity of tank = 20 * 12= 240 liters
New capacity of bucket = 10 liters
So, 10 liters can be poured into the tank by one bucket

8) Two pipes working together can fill a fish tank in 12 minutes. If one pipe fills the fish tank 10 minutes faster than the second pipe, in what time the second pipe alone can fill the fish tank?

A. 20 minutes
B. 25 minutes
C. 30 minutes
D. 35 minutes
Correct answer; option (C)
Answer with explanation:
Let the first pipe fill the reservoir in X minutes
So, the second pipe will fill the reservoir in (X+10) minutes
As per question;
12X +120 + 12X = X2 + 10X
X2 +10X 24X -120 = 0
X2 14X -120 =0
X2 - 20X+6X 120=0
X(X-20) +6(X-20) =0
(X+6) (X-20) = 0
X = 20
∴Second pipe will fill the reservoir in 20 + 10= 30 minutes

9) 25 outlets working 6 hours a day, can empty a reservoir in 10 days. If only 15 outlets are operational and work for 4 hours a day, in how many days the reservoir can be emptied?

A. 20 days
B. 18 days
C. 22 days
D. 25 days
Correct answer; option (D)
Answer with explanation:
Apply formula used in work and time problems; M1D1T1W2 = M2D2T2W1
M1= 25 outlets, D1=10 days, T1= 6 hours/day, W2 = to fill the reservoir
M2= 15 outlets, D2=? T2 = 4 hours/day, W1= to fill the reservoir
W1=W2
So we have; M1D1T1= M2D2T2
25*10*6=15*D2*4
1500 = 60 * D2

10) Pipe A can fill a tank in 12 minutes whereas pipe A along with pipe B can fill the same tank in 8 minutes. In what time pipe B alone can fill the tank?

A. 24 minutes
B. 20 minutes
C. 25 minutes
D. 22 minutes
Correct answer; option (A)
Answer with explanation:
Part of the tank filled by pipe A in one minute=
Part of the tank filled by A+B in one minute =
Part of the tank filled by B alone =

∴ Pipe B will fill the whole tank in 24 minutes.
Solution 2:
X= 12 minutes
Y=?
As per question;
12Y= 8Y+96
4Y= 96
Y = 24 minutes

11) A can fill a tank in 8 hours, B can fill the same in 12 hours, and C can fill the tank in 24 hours. If they are open at 2 am, 3 am, and 4am respectively, then at what time the tank will be completely fill?

A. 5:00 am

B. 6:00 am
C. 6:40 am
D. 7:20 am

The correct answer is C.

Answer with explanation:

ATQ,

At 2am: A starts and fill the tank in 8 hours.
At 3am: B starts and fill the tank in 12 hours.
At 4am: C starts and fill the tank in 24 hours.
Let the capacity of the tank = LCM of (A's, B's, and C's time)
Now, LCM of 8, 12, and 24 is 24.
i.e., the capacity of the tank = 24 litre
Now, A's one hour work = capacity of the tank/ time taken by A.
A's one hour work = 24/ 8 = 3litre/hour.
B's one hour work = 24/12 = 2litre/hour.
C's one hour work = 24/24 = 1litre/hour.
ATQ, between 2am to 3am, only A works = 3 unit
Between 3am to 4am, A and B works = 3+2 = 5 unit
Total work done till 4 am is 5+3 = 8 unit
Then the remaining work after 4am = 24-8 = 16unit
Now,
Between 4am to 5am, A, B, and C works = 3+2+1 = 6unit/hr.
To complete the 16 unit work it requires 16/6 = 2[2/3], or 2:40min
That means the total work will complete at 4am+2hr+40min= 6:40 am

12) Two pipes A and B individually can fill a tank in 15 hours, and 12 hours respectively, and C can empty the full tank in 4 hour. If all three pipes are open at 8, 9, and 11 am respectively. At what time tank will be completely empty?

A. 2:40 pm
B. 1:00 pm
C. 12:00 pm
D. 1:35 pm

The correct answer is A.

Answer with explanation:

ATQ,

At 8am: A starts and fill the tank in 15 hours.
At 9am: B starts and fill the tank in 12 hours.
At 11am: C starts and empty the tank in 4 hours.
Let the capacity of the tank = LCM of (A's, B's, and C's time) Now, LCM of 15, 12, and 4 is 60.
i.e., the capacity of the tank = 60 liter
Now, A's one hour work = capacity of the tank/ time taken by A.
A's one hour work = 60/ 15 = 4litre/hour.
B's one hour work = 60/12 = 5litre/hour.
C's one hour work = 60/4 = 15litre/hour.
ATQ, between 8am to 9am, only A works = 4 units
Between 9am to 10am, A and B works = 4+5 = 9 units
Between 10am to 11am, A and B works = 4+5 = 9 units
Total work done till 11 am is 4+9+9 = 22 units
Now,
Between 11am to 12am, A, B, and C works = 4+5-15 = -6unit/hr
Here, -ve sign indicates C empty the tank.
That means after 11 am, every hour the tank will be empty by 6 units.
Now, we have to empty the 22 unit water that is stored till 11 am
So, the tank can be empty in 1 hour = 6 unit
Or, to empty 1unit water it requires 1/6 hour.
Or, 22 unit = (1/6) * 22 = 11/3
Or, 22 unit water can be empty in 3[2/3], or 3 hour + (2/3)*60 hour
Or, 3hour: 40min
That means the water that is stored till 11 am will be empty in 3hour: 40min
So, the time which requires to empty the tank is 11 hour+3 hour+40min = 2:40pm

13) A tank has two pipes. The first pipe can fill it in 45 minutes and the second can empty it in 1 hour. In what time will the empty tank be filled if the pipes be opened one at a time in alternate minutes?

A. 2 hrs 55 min
B. 3 hrs 40 min
C. 4 hrs 48 min

D. 5 hrs 53 min

The correct answer is (D)

Answer with explanation:

Let pipe A can fill a tank in 45 minutes

Pipe B can empty in 1 hour = 60 minutes.

Now, take LCM of A and B to find the capacity of the tank

LCM of A (45) and B (60) = 180

That means assume the capacity of tank is 180 liters

Now, 1 minute work of A = 180/45 = 4 units

Now, 1 minute work of B = 180/60 = - 3 units

Here've indicates empty tank per minute

But ATQ, the pipes are open alternatively, that means the net filling of tank in 2 minutes = 4-3 = 1 unit

Now, 176 units will be filled in 176*2 = 352 minutes.

Now, the remaining 4 liters will be filled in next 1 minute

i.e., 352 + 1 = 353 min = 60*5 = 300 + 53

Therefore, the time taken to fill the tank = 5 hrs. + 53 min.

14) A cylindrical tank of diameter 25 cm is full of water. If 11 liters of water is drawn off, the water level in the tank will drop by (use π =22/7).

23.7M

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Java Try Catch

A. 10 cm

B. 12 cm

C. 14 cm

D. 22 cm

The correct answer is D.

Answer with explanation:

Volume of cylinder = π r2 h

π r2 h = 11 liters = 11000 cm3

Or $\frac{22}{7} * \frac{25}{2} * \frac{25}{2}$ = 11000 cm^3

h = $\frac{11000 * 7 * 2 * 2}{22 * 25 * 25}$

h = $\frac{28*4}{5} = \frac{112}{5} = 22\frac{2}{5}$ cm

Therefore, the water level in the will be drop by $22\frac{2}{5}$ cm

15) Two pipes can separately fill a tank in 20 hrs. and 30 hrs. respectively. Both the pipes are opened to fill the tank but when the tank is full, a leak develops in the tank through which of the water supplied by both the pipes per hour leak out. What is the total time to fill the tank?

A. 12 hrs.

B. 14 hrs.

C. 18 hrs.

D. 16 hrs.

The correct answer is D.

Answer with explanation:

Let pipe A can fill a tank in 20 hours

Pipe B can empty in 1 hour = 30 hours

Now, take LCM of A and B to find the capacity of the tank

LCM of A (20) and B (30) = 60 liters

That means assume the capacity of tank is 60 liters

Now, A can fill the tank in one hour = 60/20 = 3 liters/hr.

B can fill the tank in one hour = 60/30 = 2 liters/hr.

If (A+B) both open together then the tank will be filled in 60/ (2+3) = 12 hours.

If both pipes open together then to fill 1/3 part of the tank they requires 12/3 = 4 hours

Or, in the 4 hours, A+B together will fill 4* 5 = 20 liters.

Now the remaining = 60-20 liters

ATQ, (A+B) can fill the tank per hour = 5 liters, but (1/3) of 5 flows out by leak That means 5/3 liters flow out per hour.

Now, total inlet per hour = 5- = 10/3 liters

Therefore, to fill the remaining 40 liters, both pipes take = 12 hours

Hence, total time to fill the tank = 12+4 = 16 hours

IV. CONCLUSION

Now eight latest method are found in this research to solve the day to day problems related to pipes and cisterns. All eight methods are describes in eight steps.

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Modelling of an Aquifer System in Greater Noida Region, U.P.

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I. INTRODUCTION

Gautam Buddha Nagar district with geographical area of 1442 Sq. Km with headquarters at industrial city of Greater Noida has three Tehsils and four developmental blocks viz. Bisrakh, Dadri, and Dankaur & Jewar. According to 2011 census, the total population of the district was 1105292 and average population density was 766 persons per sq. km. It comes under the purview of the National Capital Region of Delhi. The city was developed based on Greater Noida Master Plan 2001, 2021 plan report (2013). The notified area of Greater Noida comprising of 124 villages and about 40,000 hectare of area is broadly bounded by National Highway 24 in the north-west. Also River Hindon lies in the western side of the city. Due to nearness to Delhi, both these towns being are developed rapidly. Due to the pressure for development of Greater Noida, the number of industries during the last decade has grown more than ten times. Accordingly the problems related to environmental degradation have increased many folds. In summer i.e. from March to June the weather remains hot and average temperature ranges from minimum of 23^0 C in winter to maximum of 45^0 C in summer. Monsoon season prevails during mid-June to mid-September with an average rainfall of 93.2 cm (36.7 inches). Average temperature falls substantially down to as low as 3 to 4 C at the peak of winter. Total land use is 13,570 hectares with the total institutional area around 1,970 hectares along with 30 hectares of commercial area. The area is divided into different zones for water supply such as tube wells, overhead tanks and trunk and other supply lines. At present approximately 500 km length of water supply lines with approximately 460 km length of sewerage network and approximately 500 km length of drainage exists. The general slope of the ground water movement is from eastern side towards river Hindon in the west.

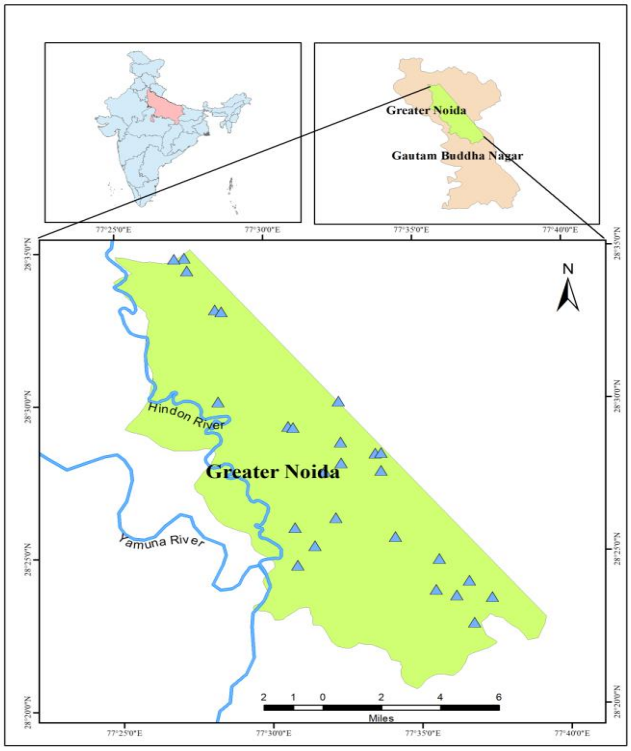

Fig 1. Study Area

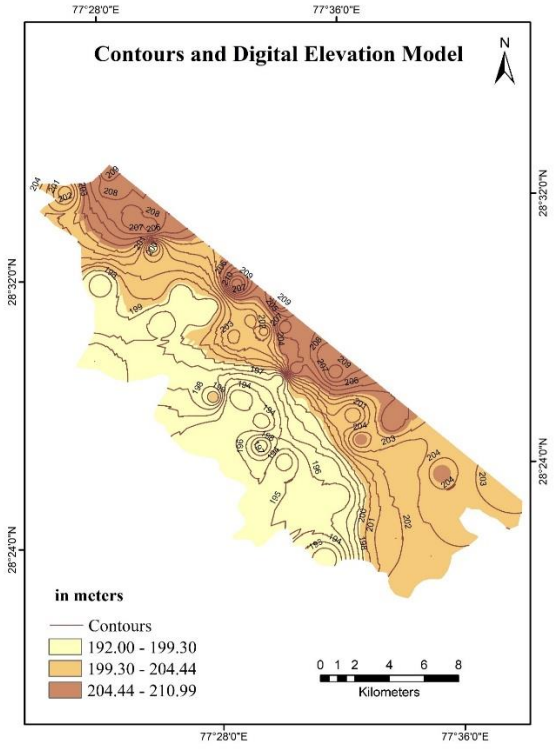

Fig 2. Contours and Digital Elevation Model

TABLE1: Locations and Elevations

S.NO.	Sampling Site	Latitude	Longitude	Elevation(m)
1.	Buland Khera	28.378239	77.613739	204
2.	Salempur Gurjar	28.413320	77.594895	202
3.	Bilaspur	28.395584	77.644306	202
4.	Gautam Buddha University	28.421663	77.525443	193
5.	Chi IV	28.431766	77.514645	199
6.	Omicron	28.471521	77.560365	209
7.	Swarn Nagari	28.462086	77.531846	196
8.	Omicron I	28.462131	77.563375	210
9.	Beta II	28.486314	77.514700	202
10.	Eta II	28.500340	77.535780	211
11.	Beta 2nd	28.487070	77.511868	204
12.	Ecotech II	28.501139	77.473065	197
13.	Sector 3	28.572869	77.457290	209
14.	Sector 2	28.578080	77.451630	211
15.	NIIT	28.411120	77.515698	195
16.	Kasna	28.436763	77.537579	198
17.	Sector MU I	28.471749	77.563615	208
18.	Khanpur	28.425747	77.570532	205
19.	Dalelgarh	28.393345	77.604249	204
20.	Rampur Majra	28.401183	77.611367	205
21.	Khera village	28.551346	77.472358	208
22.	Knowledge Park V	28.550212	77.475933	209
23.	Bagpur village	28.396619	77.592738	202
24.	Birondi	28.478029	77.541162	206
25.	Patwari	28.579910	77.455855	210
26.	Accher	28.466540	77.541162	207

Model Conceptualization and development

A conceptual model is used to understand the field problem and linked the associated field data so that the classification can be analyzed more eagerly. Conceptualization is a process of to synthesis and framing up of data relevant to hydrology, geology, hydrogeology and meteorology.

Fresh water resources are shrinking due to the continuously increasing the water demand for domestic, agricultural and industrial uses. Declining

ground water in the study area has led to harmful effect to the ground water resources and domestic, agricultural and industrial users. An average decline of 0.88m/year shows the trend of long term ground water level. In many aspects ground water is preferred over surface water irrigation such as operational costs and pumping are low,it is easily assessable and pumped due to shallow depth, sympathetic treatment to farmers in the form of free tube well installation providing subsidized electricity policy in early 60's. Various investigations of hydrogeological parameters were mainly carried out by Central Ground Water Board (CGWB) and Groundwater Department of Uttar Pradesh (U.P.) government and were found the first group of aquifer. Conjunctive use of groundwater and surface water along with stream aquifer interactions was assessed in Daha region.The river–aquifer interaction was quantified in Ganga– Mahaba sub-basin.

Groundwater modeling has become a standard tool for effective groundwater management with rapid increases in computational ability and wide availability of computers and model softwares.

The present work investigates the effects of groundwater development and is also helpful to study the groundwater flow system in Yamuna-Hindon intersteam region using steady state groundwater models.

The partial differential equation for three dimensional anisotropic and heterogeneous flow of groundwater having constant density is expressed as:

$$\frac{d}{dx}\left[Kxx\frac{dh}{dx}\right]+\frac{d}{dy}\left[Kyy\frac{dh}{dy}\right]+\frac{d}{dz}\left[Kzz\frac{dh}{dz}\right]-W = Ss\frac{dh}{dt}$$

Where, Kxx, Kyy, Kzz are components of the hydraulic conductivity in x, y, z directions respectively,

h is potentiometric head, W is source or sink term, Ss is specific storage and t is time.

To simulate the groundwater flow in the study area, the above equation was used in finite difference computer based MODFLOW software.

Ground water level data

To monitoring water level of the study area, 26 tubewells were selected. In December 2013, the water level monitoring programme was initiated and supposed to monitor per year four times.During the month of May and November, water level data of the pre-monsoon and post-monsoon season were collected. In this period, the entire region can be divided into different zones on the basis of depth to water ranges. It was found that large area has shallow to moderate depth to water conditions. In heretic aquifer, the range of water level was found 3.75 to 15.14mbgl during pre-monsoon period while these ranges vary from 2.30 to 12.87mbgl during the post monsoon season. It was also found that the water level of non command areas was greater than 10mbgl.

Aquifer geometry

To define hydrostratigraphic units for the conceptual model with information on hydrogeological properties including cross sections, well logs and geological maps were combined together. Four distinct aquifer groups were reported in the area on the basis of electrical and lithological logs. These groups range at a depth of 82-132, 95-213,238-375,375-450 metres below ground level mbgl. First group of aquifers was restricted in this present study. For sketching horizontal and vertical disposition of aquifers and aquitards in the study area to a depth of 132 mbgl, the lithological data of 26 tubewells were utilized. The alluvial sediments are generally composed of a rapid alternation of sand and clay layers. A granular zone extends the top clay bed downwards upto a maximum depth of 132 mbgl. By the occurrence of sub-regional clay beds, the granular zone is subdivided into two to three subgroups. Local clay lenses are found common throughout the area. The top sandy layer consist the water table with a range from 10-80mbgl.

Aquifer parameters

The different aquifer parameters such as hydraulic conductivity and specific yield/specific storage were projected and assigned to different layers using data consequential from previous studies. The hydraulic conductivity values were choosen to run the model between 0.83 m/day to 5.31 m/day (Avg. 2.63 m/day).The value of specific yield for the entire area was taken 0.18. Hydraulic conductivity values were achieved from twenty six pump tests and were assigned to seven distinct zones using the Thiessen Polygon method. The value of conductivity for the first and third layers remained the same as 4m/day for both the layers are similar in nature.The value of conductivity for second aquitard layer was taken 1m/day while a similar conductivity values was taken for clay layers which was discontinuous. To maintain the interconnectivity between the first and third layers, the higher conductivity zones in the second layer were used.This hypothesis is based on the fact that clay layer is not a continuous layer and parallel confined out and at places the first and third layers converge with each other to present a single bodied aquifer.

Recharge

The Groundwater Estimation Committee (1997) stated that the groundwater will be recharge through many sources such as rainfall, canal seepage and irrigation return water. The following formula was used to recharge the groundwater by rainfall,

$R_{rf} = h * S_y * A + D_G - R_C - R_{SW} - R_{gw} - R_{wc}$,

Where, where, $R_{rf}$is the gross recharge due to rainfall and other sources including recycled water, h is the rise in groundwater level, A is the area of recharge assessment, S_y is specific yield, $D_G$is gross groundwater draft, $R_C$is recharge due to seepage from canal, $R_{SW}$is recharge from surface water rrigation, $R_{gw}$is recharge from groundwater irrigation, and $R_{wc}$is recharge from water conservation structure.

Surface water irrigation and groundwater irrigation was calculated separately to recharge the groundwater and it was obtained from the following formula,

$R_F = R_C * Q$

The seepage factor was used as $0.15 < R_C < 0.45$ (GEC 1997).

Recharge through canal seepage was evaluated with the following expression.

Canal seepage = length × wetted perimeter× total running days× specific loss

The estimation of discharge and recharge parameters were accomplished for monsoon and non-monsoon periods. The assessed values were then applied to the particular grid in the model utilizing recharge boundaries. The entire recharge evaluated was as per water table fluctuation strategy and Groundwater Estimation Committee (GEC 1997) philosophy for groundwater asset estimation. Recharge through irrigation system returns and drainage through unlined waterways was evaluated utilizing standards prescribed by GEC-97. Site explicit recharge information are frequently utilized simply as fitting parameters during model calibration where site explicit data is accessible and an accepted part of this is generally appointed as the recharge boundary condition. Such presumptions are satisfactory for the long haul propagation of provincial groundwater flow framework and were utilized during the present study.

Groundwater draft through pumping

During the period of December 2013 to November 2018, several fields visited to the study area and collected the existing tubewell data. For the same purpose, census from the Statistical Department was also used. It is found that the discharge rate of tubewell varies from 1500 L/min to 3000 L/min.

Boundary Conditions

Boundary conditions are required for every model to represent the system's relationship with the surrounding area. Northern, Southern and Eastern

parts of study area were assigned general head boundary conditions.Previous water level data of heads were assigned as general head boundary. The western part representing the hindon river having the river head and bed bottom elevations at the initial and end points are 199 m and 198 m amsl and 194 and 193m amsl, respectively. It has river bed conductance between 200 to 260 m^2/day. The reason for utilizing this boundary condition is to maintain a strategic distance from pointlessly stretching out the model area outward to meet the component impacting the head in the model.

Model Calibration

Model Calibration comprises of changing estimations of model input parameters trying to coordinate field conditions inside an adequate foundation. Calibration is done by experimentation alteration of parameters. After a number of trial runs, computed water levels, Heads, Drawdown were matched fairly reasonably with observed values by changing hydraulic conductivity, specific yield and recharge values.

Steady State Calibration

The steady state condition is a condition that existed in the aquifer before any advancement had happened. Coordinating the initial heads watched for the aquifer with the hydraulic heads recreated by MODFLOW is called steady state calibration. The calibration was mentioned utilizing 26 tube wells monitored during December 2013. Pumping test was used as initial values of hydraulic conductivities for steady state simulation. The conductivity values were increased by trial and error calibration during various sequential runs till the match between the simulated and observed water level contours were obtained.

LITHOLOGS OF FEW LOCATIONS IN STUDY AREA (Fig 3)

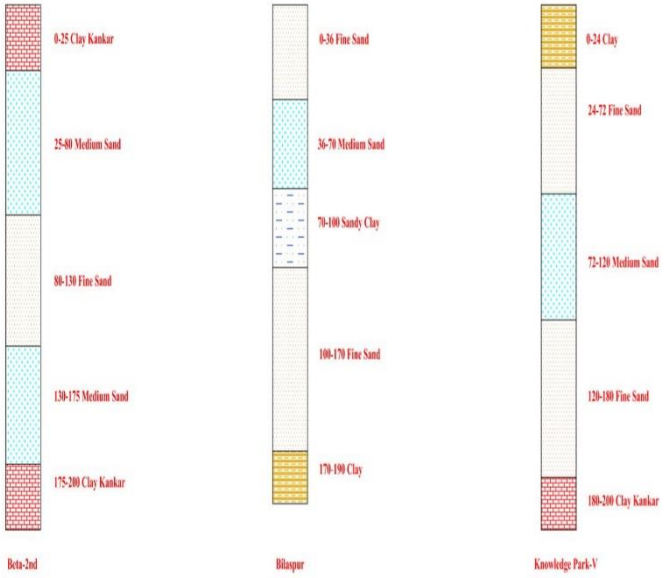

Fig 3: Few Lithologs of Study Area

Table 2: Rainwater harvesting potential of study area

S. No	Different type of catchments	Area (A) m^2	Runoff Coefficients (C)	Annual Rainfall (I) (m)	Volume of the water collected (Q=CIA) (cu.m)
1.	Concrete Roof	331002.874	0.95	0.600	188671.638
2.	Concrete Road	117389.466	0.95	0.600	66911.996
3.	Vegetation	67287.513	0.10	0.600	4037.251
4.	Bare land	130641.314	0.3	0.600	23515.436
	Total	**646321.167**			**283136.321**

RESULT AND DISCUSSION

Aquifer Modelling using MODFLOW:

From the mass balance chart of MODFLOW, it was observed that the inflow is greater than outflow

before the land use master plan whereas in the case of after land use master plan outflow is greater than inflow. Therefore to overcome this deficit, it is suggested to use rainwater harvesting to recharge the groundwater. (Fig 8 (a), 8 (b))Unplanned urbanization has drastically altered the drainage characteristics of natural catchments by increasing the volume and rate of surface runoff. Over exploitation of ground water sources like wells for drinking water and industrial use has also resulted in depleted water levels and drying up of bore wells due to the imbalance of inflow and outflow for sub-surface water. The original permeable ground surface has reduced due to urbanization. Pavements, roads and construction of storm water drains to drain the rain water as quickly as possible to natural stream, river to avoid flooding of grounds. These surfaces and quick run off gives no scope for percolation of rain water to replenish the sub-surface aquifer causing the dropping of water levels or drying up of wells. In addition to this, land use and land cover changes have contributed to the regional and global climate changes, resulting in irregular, reduced, erratic and uncertain rainfalls. Protection and reasonable administration depict helps in the reclamation of the regular affinity. In this context, rainwater harvesting is seen as a viable alternative to replenish the groundwater.

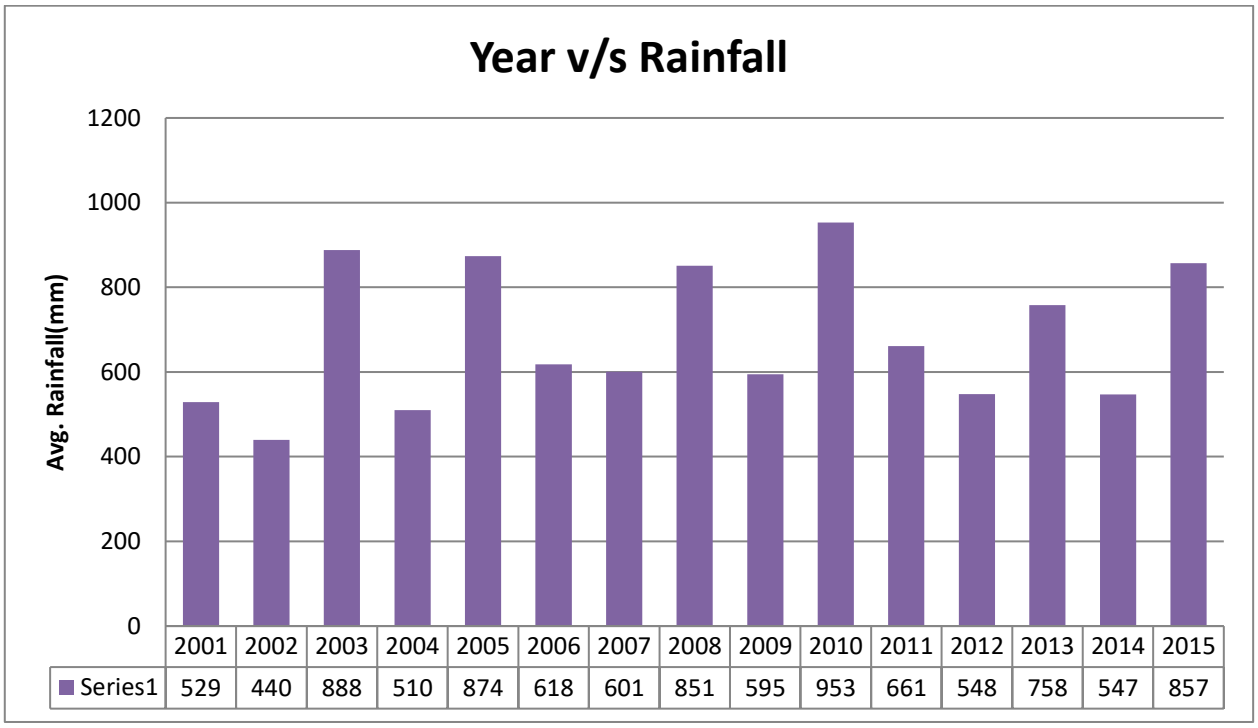

Fig 4 : Rainfall Chart

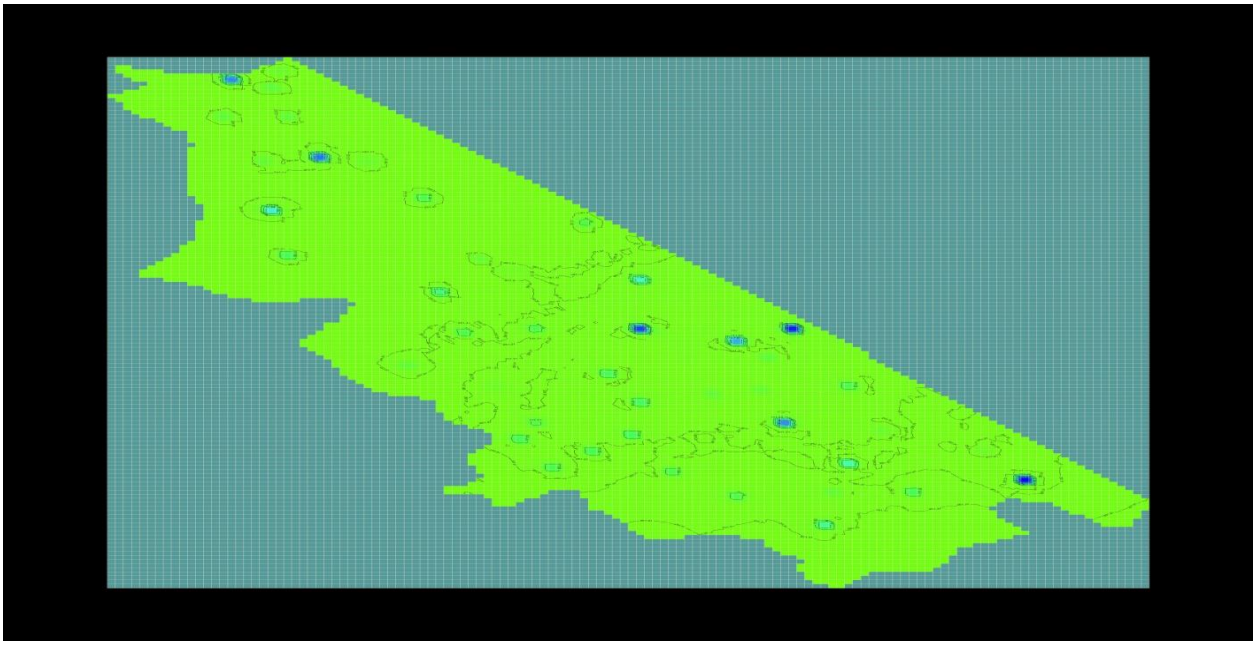

Fig 5 : Heads

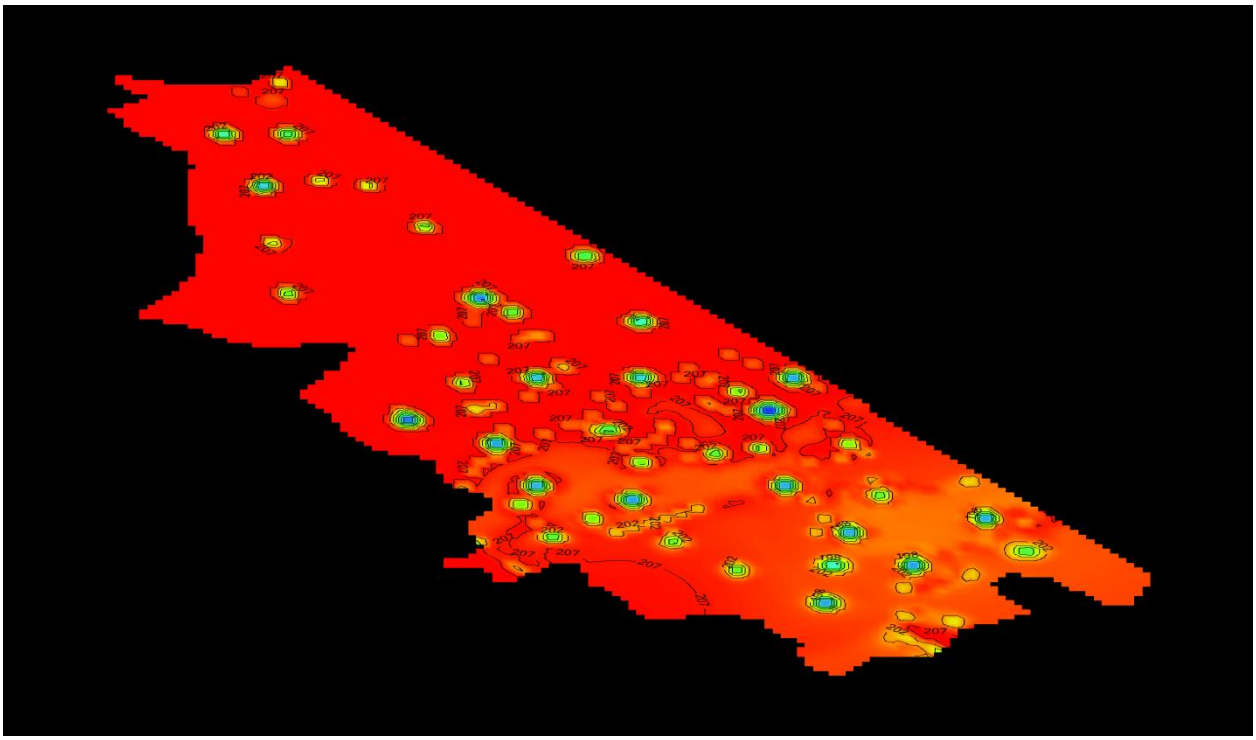

Fig 6 : Water table

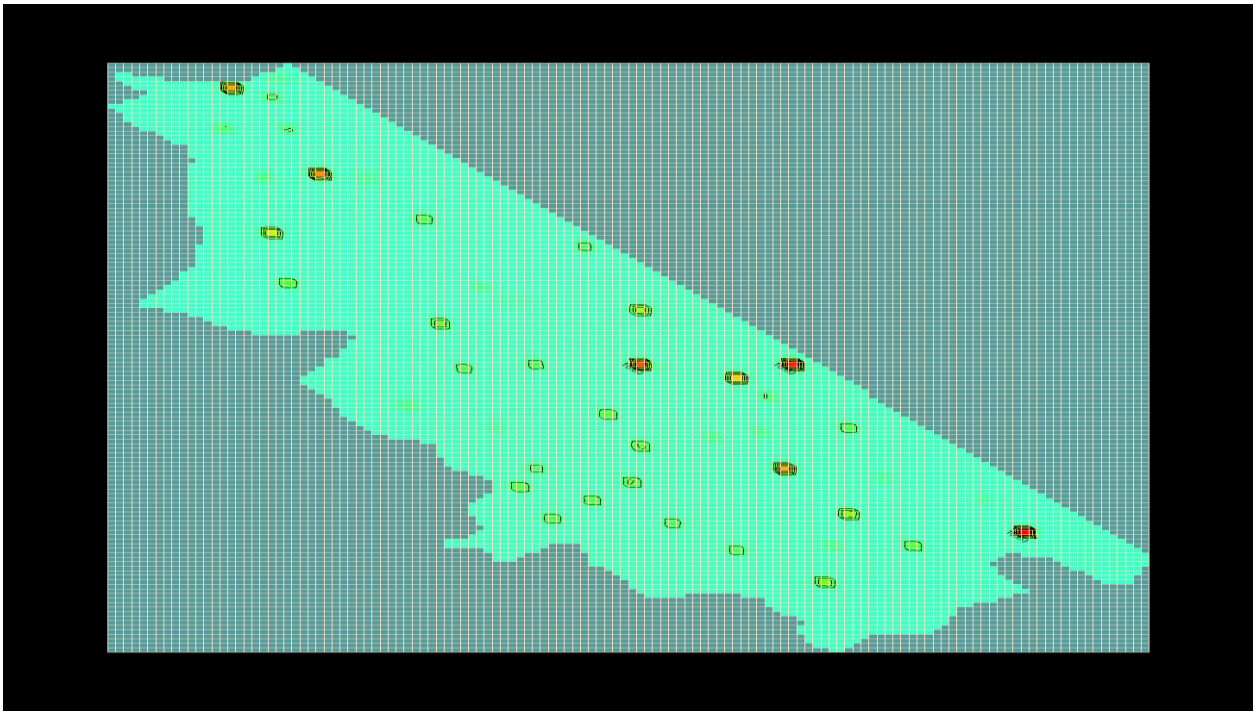

Fig 7 : Draw down

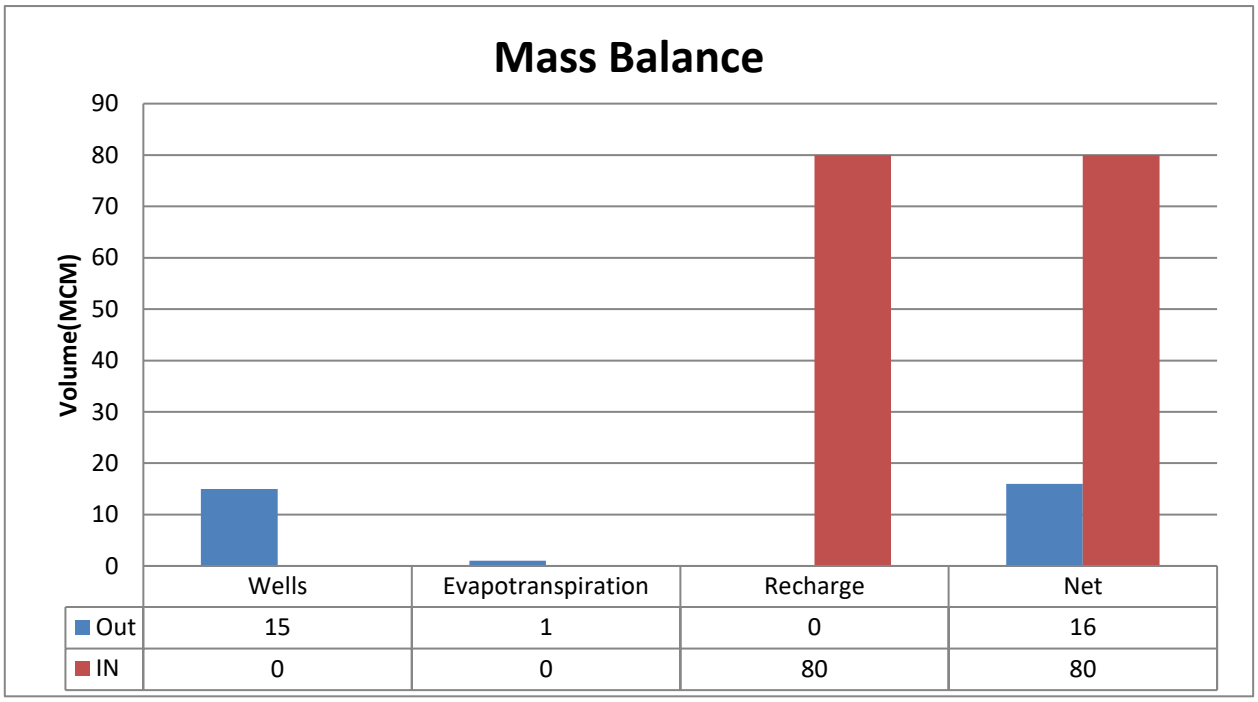

Fig 8(a) : Mass balance before land use master plan

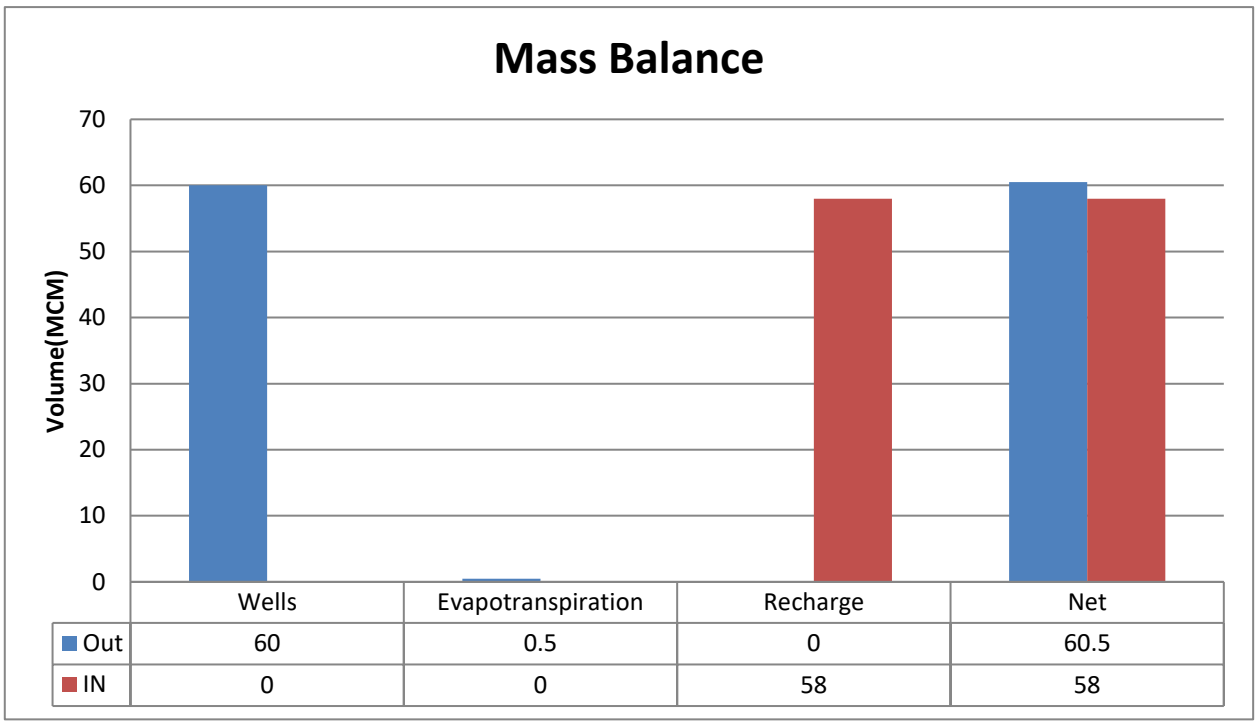

Fig 8(b) : Mass balance after land use master plan

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