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BONAFIDE CERTIFICATE

Certified that this Report titled **“SOLAR POWER REMOTE MONITORING USING IOT [INTERNET OF THINGS]”** is the bonafide work of _____ who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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ABSTRACT

Solar power plants need to be monitored for optimum power output. This helps retrieve efficient power output from power plants while monitoring for faulty solar panels, connections, and dust accumulated on panels lowering output and other such issues affecting solar performance.

So here we propose an automated IOT based solar power monitoring system that allows for automated solar power monitoring from anywhere over the internet. We use Arduino based system to monitor a 10Watt solar panel parameters. Our system constantly monitors the solar panel and transmits the power output to IOT system over the internet. Here we use IOT Gecko to transmit solar power parameters over the internet to IOT Gecko server. It now displays these parameters to the user using an effective GUI and also alerts user when the output falls below specific limits. This makes remotely monitoring of solar plants very easy and ensure best power output.

The Internet of Things has a vision in which the internet extends into the real world embracing everyday objects. The IOT allows objects to be sensed and/or controlled remotely over existing network infrastructure, creating opportunities for pure integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

This technology has many applications like Solar cities, Smart villages, Micro grids and Solar Street lights and so on. As Renewable energy grew at a rate faster than any other time in history during this period. The proposed system refers to the online display of the power usage of solar energy as a renewable energy.

This monitoring is done through raspberry pi using flask framework. Smart Monitoring displays daily usage of renewable energy. This helps the user to analysis of energy usage. Analysis impacts on the renewable energy usage and electricity issues.

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ABBREVIATIONS

| | |
|---------------|--|
| IOT | Internet Of Things |
| HTML | Hypertext Markup Language |
| SGML | Standard Generalized Markup Language |
| WSN | Wireless Sensor Networks |
| MCU | Multipoint Control Unit |
| LCD | Liquid Crystal Display |
| PV | Photo Voltaic |
| WIFI | Wireless Fidelity |
| AC | Alternative Current |
| DC | Direct Current |
| LED | Light Emitting Diode |
| GSM | Global System For Mobile Communications |
| EEPROM | Electrically Erasable Programmable Read Only Memory |
| MYSQL | My Structured Query Language |
| PHP | Hypertext Preprocessor |

CHAPTER 1

INTRODUCTION

1.1 OBJECTIVES

Internet of things (IOT) is playing a major and crucial role in the daily life of humans by enabling the connectivity of many and most of the physical devices through internet to exchange the data for monitoring and controlling the devices from a remote location, where the devices are becomes intelligent.

1.2 OVERVIEW OF THE PROJECT

This technology can connect a wide range and varieties of things such as animals, humans, smart transport, smart grids, virtual power grids, smart cities, vehicles, heart monitoring systems, environmental sensing, shopping systems, automated homes, energy management, assistance for disabled and elderly individuals, cochlear implants, tracking of things, equipment manufacturing, agriculture, emergency monitoring systems, electronics tool collection systems, vehicle control etc. according to the survey there is a increase of 31% i,e 8.4 billion internet connected devices from 2016-2017. The connected device may increase to 30 billion by 2020 and which makes the business market around 7.1 trillion dollars by 2020

By using the IOT we can enable the machine to machine communication M2M or device to device communication without human intervention. In the modern life electricity became the important and essential part of the life. For any work now, a day we require electricity like lighting, heating, refrigeration, cooling, transportation systems what not allthe home appliance works on electricity.

In day to day life the consumption of electricity is increased but not decreased. To compete with the requirement of the public more and more electricity is to be generated and give to the end users. As the population increases the consumption also increases.

CHAPTER 2

BLOCK DIAGRAM

2.1 SYSTEM BLOCK DIAGRAM (A)

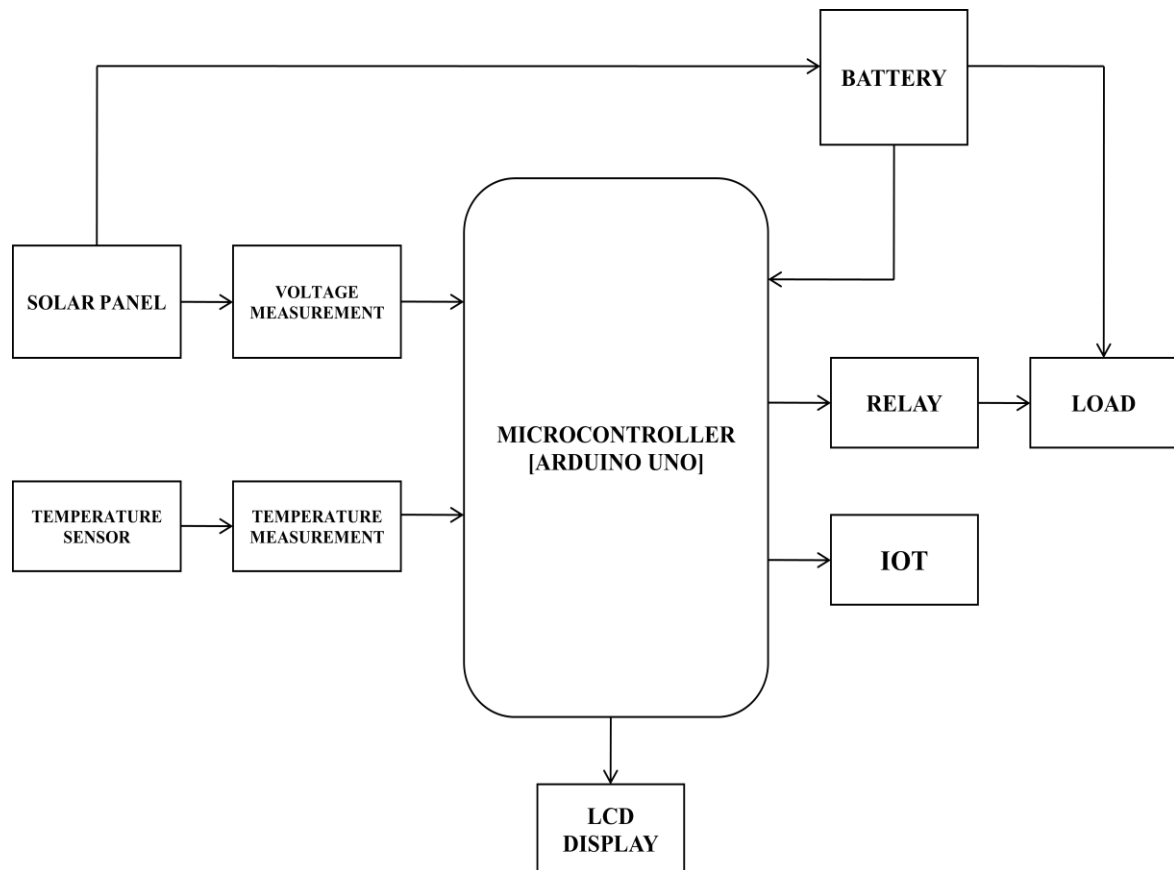


Fig 2.1 Block diagram

BLOCK DIAGRAM (B)

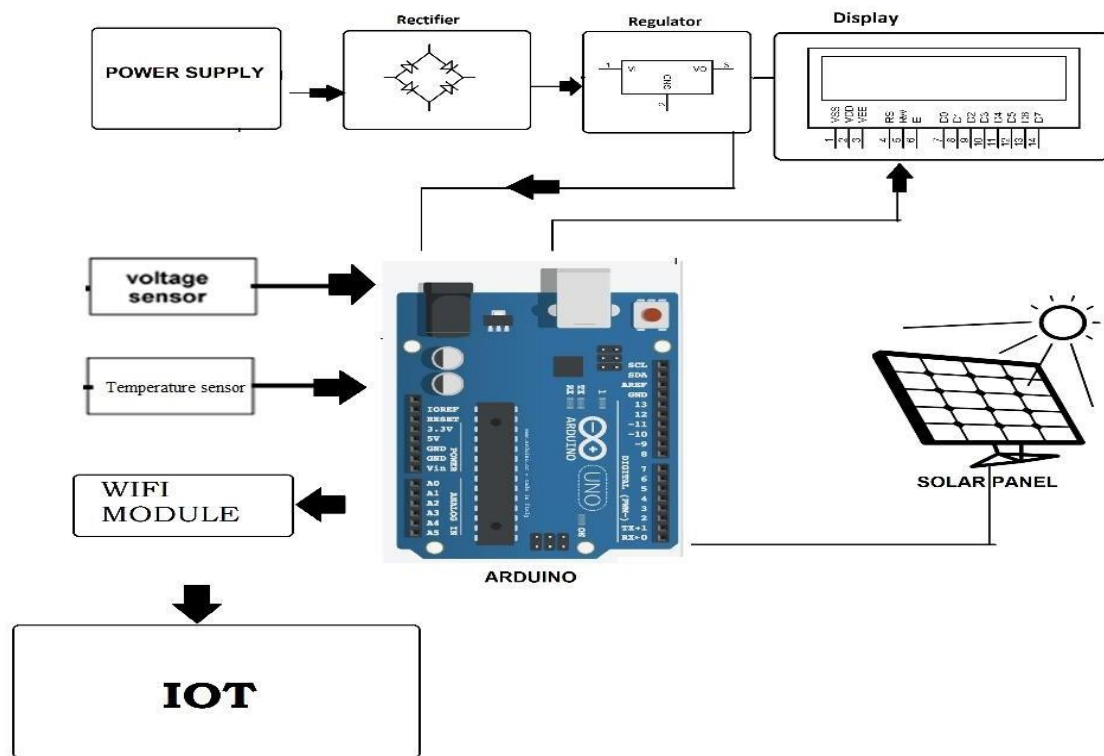


Fig 2.2 Block diagram

2.2 MODULES DESCRIPTION

A module is a software component or part of a program that contain one or more routines. One or more independently developed modules make up a program. The project “**SOLAR POWER REMOTE MONITORING USING IOT [INTERNET OF THINGS]**” consists of two main modules they are,

- Hardware
- Software

2.2.1 HARDWARE

A. ARDUINO UNO



Fig 2.3 Arduino Uno

The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P.

The ATMEGA 328P has 32kB of flash memory for storing code. The board has 14 digital input and output pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed with the Arduino software.

B. TEMPERATURE SENSOR



Fig 2.4 Temperature sensor

A sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes depends upon transducer in its environment and send the information to other electronics, frequently a microcontroller. A sensor is always used with other electronics.

C. ESP8266 WIFI



Fig 2.5 Wi-fi modules

The ESP8266 Arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability, and the amazing thing is that this little board has a MCU (Micro Controller Unit) integrated which gives the possibility to control I/O digital pins via simple and almost pseudo-code like programming language. This device is produced by Shanghai-based Chinese manufacturer, Es press if systems.

D.VOLTAGE SENSOR



Fig 2.6 Voltage sensor

A voltage sensor is a sensor used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, analog voltage signal, a current signal, or an audible signal.

This sensor is used to monitor, calculate and determine the voltage supply. This sensor can determine the AC or DC voltage level. The input of this sensor can be the voltage whereas the output is the switches, analog voltage signal, a current signal, an audible signal, etc.

E. LCD DISPLAY 16x2

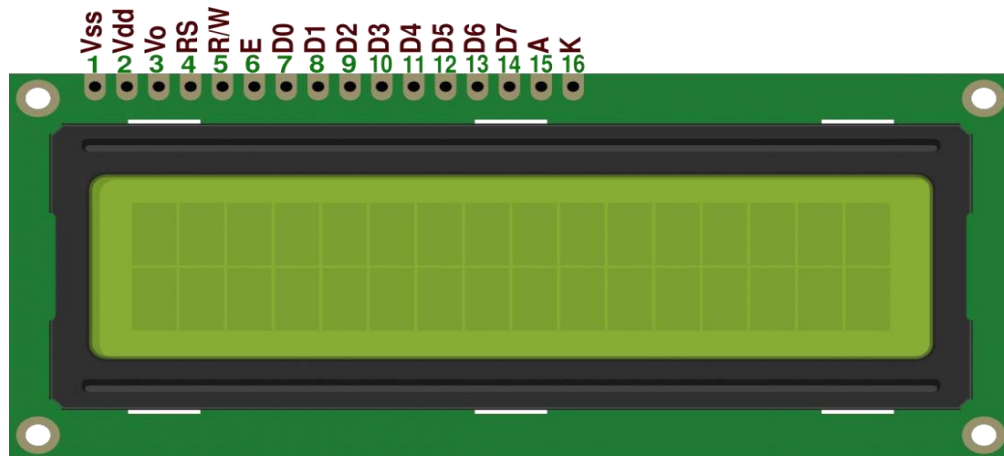


Fig 2.7 LCD Display 16x2

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smart phones, televisions, computer monitors and instrument panels.

They work by using liquid crystals to produce an image. The liquid crystals are embedded into the display screen, and there's some form of backlight used to illuminate them. The actual liquid crystal display is made of several layers, including a polarized filter and electrodes.

F. RELAY



Fig 2.8 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

G. SOLAR PANEL 9V



Fig 2.9 Solar panel

A solar cell panel, solar electric panel, photo-voltaic (PV) module or solar panel is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PV modules is called a PV panel, and a system of PV panels is called an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

H. BATTERY 12V



Fig 2.10 Battery

A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts. A battery cell consists of two lead plates a positive plate covered with apaste of lead dioxide and a negative made of sponge lead, with an insulating material(separator) in between.

2.2.2 SOFTWARE

A. COLLECT

SEND SENSOR DATA PRIVATELY TO THE CLOUD

There are sensors all around—in our homes, smart phones, automobiles, city infrastructure, and industrial equipment. Sensors detect and measure information on all sorts of things like temperature, humidity, and pressure. And they communicate that data in some form, such as a numerical value or electrical signal.

WHY WOULD YOU WANT TO COLLECT DATA IN THING SPEAK

Sensors, or things, sense data and typically act locally. Thing Speak enables sensors, instruments, and websites to send data to the cloud where it is stored in either a private or a public channel. Thing Speak stores data in private channels by default, but public channels can be used to share data with others. Once data is in a Thing Speak channel, you can analyze and visualize it, calculate new data, or interact with social media, web services, and other devices.

ANALYZE AND VISUALIZE YOUR DATA WITH MATLAB

Storing data in the cloud provides easy access to your data. Using online analytical tools, you can explore and visualize data. You can discover relationships, patterns, and trends in data. You can calculate new data. And you can visualize it in plots, charts, and gauges. Storing data in the cloud provides easy access to your data. Using online analytical tools, you can explore and visualize data. You can discover relationships, patterns, and trends in data. You can calculate new data. And you can visualize it in plots, charts, and gauges.

WHY WOULD YOU WANT TO ANALYZE AND VISUALIZE DATA IN THING SPEAK

Thing speak Provides Access To Mat lab To Help You Make Sense Of Data.

- Convert, combine, and calculate new data
- Schedule calculations to run at certain times
- Visually understand relationships in data using built-in plotting functions
- Combine data from multiple channels to build a more sophisticated analysis

B. ACT

TRIGGER A REACTION

Acting on data could be something as simple receiving a sensor (specified in Block) from Arduino and data send to web server via Wi-Fi module.

WHY WOULD YOU WANT TO USE THING SPEAK TO ACT ON DATA

Thing speak Provides Tools That Enable Device Communication For All Of These Actions And More. You Can:

- React to data both raw data and new data that you calculate as it comes into a channel
- Queue up commands for a device to execute.

CHAPTER 3

CIRCUIT DIAGRAM

3.1 OVER ALL CIRCUIT DIAGRAM

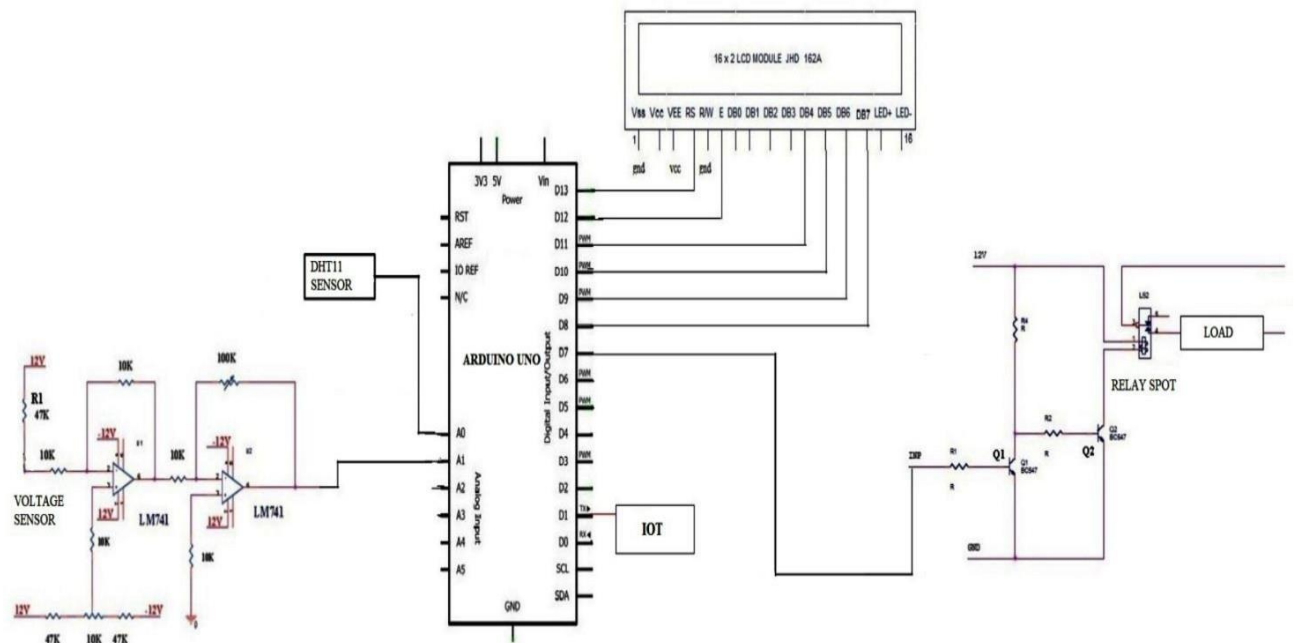


Fig 3.1 Circuit diagram

CHAPTER 4

SYSTEM SPECIFICATION

4.1 HARDWARE SPECIFICATION

- Arduino Uno
- Solar Panel
- Battery
- Relay
- Rectifier
- Regulator
- LCD Display
- Voltage measurements
- Temperature measurements
- Wi-Fi Module

4.2 SOFTWARE SPECIFICATION

- EMBEDDED C
- MP LAB

4.3 ABOUT THE SOFTWARE

PHP

PHP stands for Hypertext Preprocessor. PHP scripts run inside Apache server or Microsoft IIS. PHP and Apache server are free. PHP code is very easy. PHP is the most used server side scripting language. PHP files contain PHP scripts and HTML. PHP files have the extension “php2”, “php3”, “php4”, or “phtml”. Generate dynamic web pages.

PHP can display different content to different user or display different content at different times of the day. Process the contents of HTML forms. We can use an PHP to retrieve and respond to the data entered into an HTML form. Can create database-driven web pages. An PHP can insert new data or retrieve existing data from a database such as MySQL.

PHP is a standard HTML file that is extended with additional features. Like a standard HTML file, PHP contains HTML tag that can be interpreted and displayed by a web browser. Anything we could normally place in an HTML file Java applets, Blinking text, server side scripts. we can place in PHP.

However, PHP has three important features that make it unique. PHP contains server side scripts. PHP provides several built-in objects.

HYPER TEXT MARKUP LANGUAGE (HTML)

HTML is an application of the Standard Generalized Markup Language (SGML), which was approved as an international standard in the year 1986. SGML provides a way to encode hyper documents so they can be interchanged SGML is also a Meta language for formally describing document markup system. In fact HTML uses SGML to define a language that describes a WWW hyper document's structure and inter connectivity.

Following the rigors of SGML, TBL bore HTML to the world in 1990. Since then, many of us have it to be easy to use but sometimes quite limiting. These limiting factors are being addressed but the World Wide Web Consortium (aka W3c) at MIT. But HTML had to start somewhere, and its success argues that it didn't start out too badly.

PHP SYNTAX

A PHP scripting block always starts with `<?php` and ends with `?>`. A PHP scripting block can be placed anywhere in the document.

On servers with shorthand support enabled you can start a scripting block with `<?` And end with `?>`.

For maximum compatibility, we recommend that you use the standard form (`<?php`) rather than the shorthand form.

A PHP file normally contains HTML tags, just like an HTML file, and some PHP scripting code. each code line in PHP must end with a semicolon. The semicolon is a separator and is used to distinguish one set of instructions from another.

4.4 BENEFITS OF PHP

➤ CROSS PLATFORM

All the PHP based applications can run on various types of platforms. PHP is supported by majority of Operating Systems, some of which includes Solaris, UNIX, Windows and Linux. The mentioned platforms can be used to write codes in PHP and also view web pages or run the PHP based applications.

➤ EASY DATABASE CONNECTION

A programming language like PHP is widely used on the internet and needs to connect to the database very often. Therefore, having a feature that could help PHP to connect to database easily is mandatory. Several websites such as the ecommerce web sites, require good database management system.

➤ EASY TO USE

PHP is widely used because it is easy to use. In contrast with other programming languages that are complex, PHP is simple, fluent, clean and organized, hence it is a boon for the new users. PHP has a well-organized syntax which is logical at the same time. The high speed of PHP gives it an advantage over other scripting languages and gives it an application in important administrations such as the server administration and mail functionalities.

➤ OPEN SOURCE

One of the important advantages of PHP is that it is Open Source. Therefore, PHP is readily available and is entirely free. In contrast to other scripting languages used for web development which requires the user to pay for the support files, PHP is open to everyone, anytime and anywhere.

PHP is maintained and developed by a large group of PHP developers which helps in creating support community of PHP that helps people in PHP implementation and manipulation.

➤ MYSQL DATABASE

A database is simply a collection of used data just like phone book. MySQL database include such objects as tables, queries, forms, and more.

➤ TABLES

In MySQL tables are collection of similar data. With all tables can be organized differently, and contain mostly different information- but they should all be in the same database file. For instance we may have a database file called video store. Containing tables named members, tapes, reservations and so on. These tables are stored in the same database file because they are often used together to create reports to help to fill out on screen forms.

➤ RELATIONAL DATABASE

MySQL is a relational database. Relational databases tools like access can help us manage information in three important ways.

- Reduce redundancy
- Facilitate the sharing of information
- Keep data accurate

➤ FIELDS

Fields are places in a table where we store individual chunks of information.

➤ PRIMARY KEY AND OTHER INDEXED FIELDS

MySQL use key fields and indexing to help speed many database operations. We can tell MySQL, which should be key fields, or MySQL can assign them automatically.

➤ CONTROLS AND OBJECTS

Queries are access objects us display, print and use our data. They can be things like field labels that we drag around when designing reports. Or they can be pictures, or titles for reports, or boxes containing the results of calculations.

➤ QUERIES AND DYNASTS

Queries are request to information. When access responds with its list of data, that response constitutes a dynast. A dynamic set of data meeting our query criteria. Because of the way access is designed, dynasts are updated even after we have made our query.

➤ FORMS

Forms are on screen arrangement that make it easy to enter and read data. we can also print the forms if we want to. We can design form our self, or let the access auto formfeature.

➤ **REPORTS**

Reports are paper copies of data sets. We can also print reports to disk, if we like. Access helps us to create the reports. There are even wizards for complex printouts.

➤ **PROPERTIES**

Properties are the specification we assigned to parts of our database design. We can define properties for fields, forms, controls and most other access objects.

➤ **FEATURES OF MYSQL**

- MySQL is a relational database system. If you can believe many diehard MySQL fans, MySQL is faster, more reliable, and cheaper -- or, simply put, better -- than any other database system (including commercial systems such as Oracle and DB2).
- Many MySQL opponents continue to challenge this viewpoint, going even so far as to assert that MySQL is not even a relational database system. We can safely say that there is a large bandwidth of opinion.
- The fact is that there is an ever increasing number of MySQL users, and the overwhelming majority of them are quite satisfied with MySQL. Thus for these users we may say that MySQL is good enough.
- It is also the fact, however, that MySQL still lacks a number of features that are taken for granted with other database systems.
- If you require such features, then MySQL is (at least for the present) not the database system for you. MySQL is not a panacea.
- The following list shows the most important properties of MySQL. This section is directed to the reader who already has some knowledge of relational databases. We will use some terminology from the relational database world without defining our terms exactly. On the other hand, the explanations should make it possible for database novices to understand to some extent what we are talking about.
- **Relational Database System:** Like almost all other database systems on the market, MySQL is a relational database system.

- Client/Server Architecture: MYSQL is a client/server system. There is a database server (MYSQL) and arbitrarily many clients (application programs), which communicate with the server; that is, they query data, save changes, etc. The clients can run on the same computer as the server or on another computer (communication via a local network or the Internet).
- The familiar large database systems (Oracle, Microsoft SQL Server, etc.) client/server systems. These are in contrast to the file-server systems, which include Microsoft Access, dBase and FoxPro. The decisive drawback to file-server systems is that when run over a network, they become extremely inefficient as the number of users grows.

CHAPTER 5

SYSTEM STUDY

5.1 EXISTING SYSTEM

Establishment of the Solar Parks have the potential of reducing the cost of electricity from solar power. The sensors are used to monitor and collect the information about the climatic condition of the farm like temperature, humidity, day/night mode and also to check the power generated on the field. GSM-based Wireless Sensor Network (WSN) has the features of high bandwidth and rate, non-line-transmission ability, large-scale data collection and high cost-effective, and it has the capability of video monitoring, which cannot be realized with Zing Bee.

For the wireless section, GSM type network has been used because it is modern wireless sensor networks. Development of Real-Time atomization of solar power system with various parameters being controlled by a microcontroller and maintained using the low power by adaption of wireless technology. The status of the load is monitored and data is stored at EEPROM, depending on the requirement of load application adequate facilities is chosen by the controller. Things get interesting when smart devices combines with smart services to create compound applications.

5.2 PROPOSED SYSTEM

The main objective of this project is to get an optimum power output from the solar panels during dust is accumulated on it. Also, if there is any malfunctioning of the solar panels will be displayed on and we can also get information about whether the solar orbattery connected for the loads.

The system detects and alerts the user or the administrator when is fall below the pre- define conditions, and display on the GUI. A solar panel is used that keeps monitoring the sunlight. Here different parameters like voltage, current and temperature are displayed on theLCD by using IOT technology.

CHAPTER 6

SYSTEM DESIGN

6.1 DATA FLOW DIAGRAM

System design is the process of planning a new system or to replace the existing system. Simply, system design is like the blueprint for building, it specifies all the features that are to be in the finished product. System design phase follows system analysis phase. Design is concerned with identifying functions, data streams among those functions, maintaining a record of the design decisions and providing a blueprint the implementation phase.

Design is the bridge between system analysis and system implementation. Some of the essential fundamental concepts involved in the design of application software are:

- Abstraction
- Modularity
- Verification

A data flow diagram is graphical tool used to describe and analyze movement of data through a system. These are the central tool and the basis from which the other components are developed. The transformation of data from input to output, through processed, may be described logically and independently of physical components associated with the system. These are known as the logical data flow diagrams.

The physical data flow diagrams show the actual implements and movement of data between people, departments and workstations. A full description of a system actually consists of a set of data flow diagrams. The development of DFD'S is done in several levels.

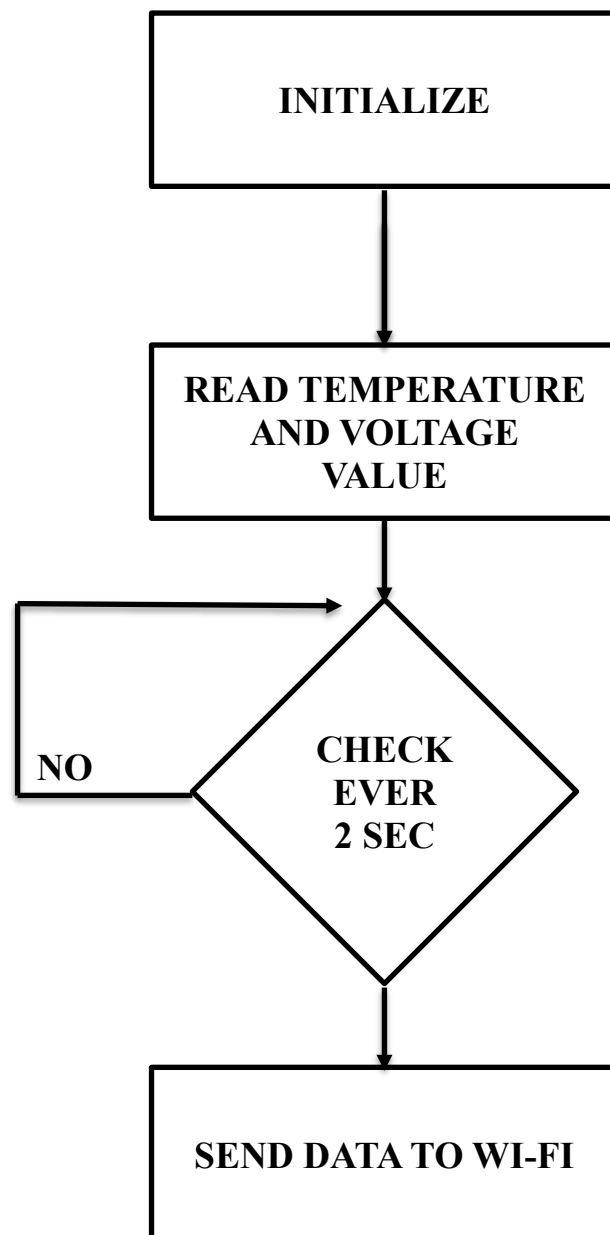
TRANSMITTER SIDE

Fig 6.1 Transmitter side

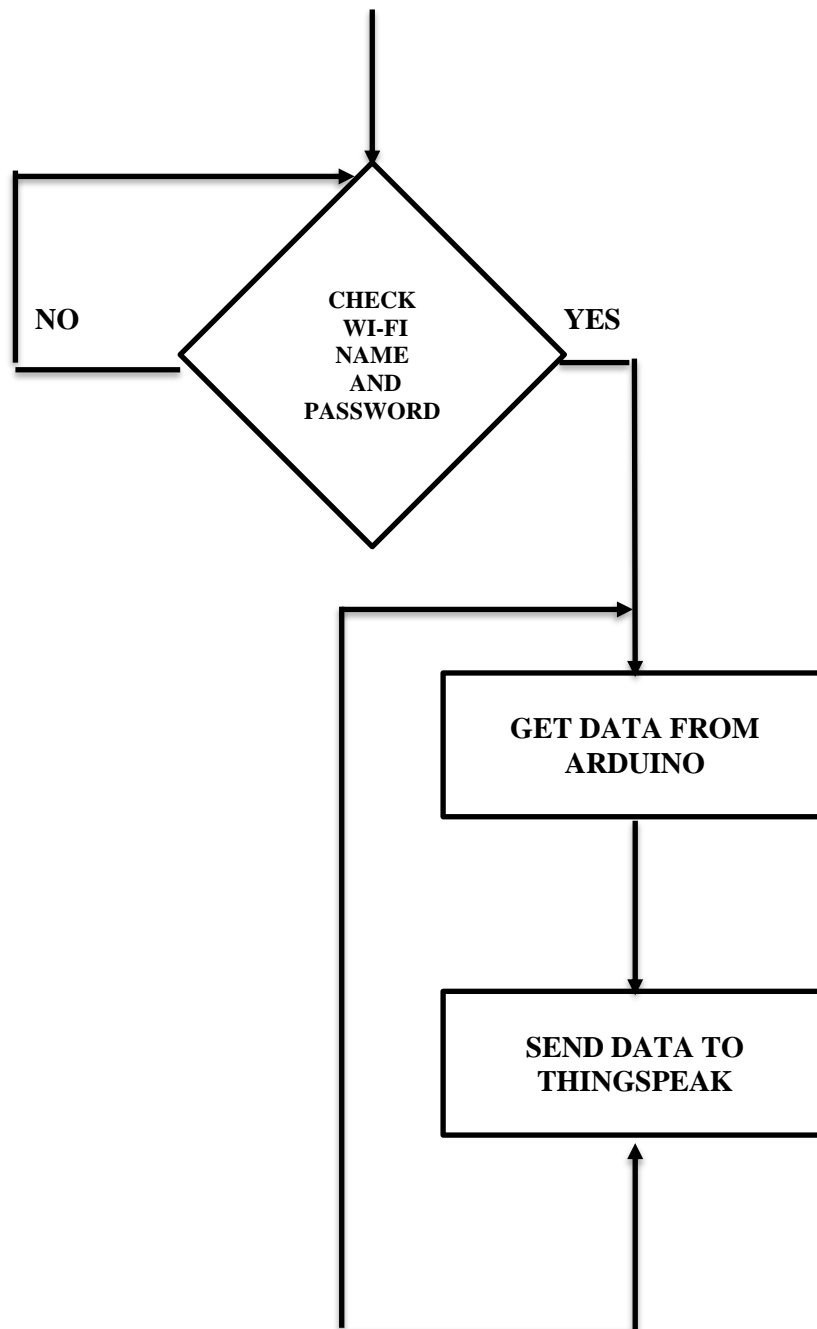
RECEIVER SIDE

Fig 6.2 Receiver side

6.2 TABLE DESIGN

Solar panel system by using IOT

Table Description: This table stored Solar Panel information.

Table No: 6.1 Solar panel system by using IOT

| Field Name | Attribute | Type | Size | Description |
|-------------|----------------|------|------|--|
| ID | Primary key | Int | 10 | It uniquely store id in the table |
| Voltage | Null | Int | 12 | It store voltage of the Solar Panel information |
| Temperature | Null | Int | 12 | It store Temperature of the Solar Panel information |

6.3 INPUT DESIGN

Input design is one of the most expensive phases of the operation of computerized system and is often the major problem of a system. A large number of problems with the system can usually be traced back to fault input design and method. Needless to say, therefore that the input data is the life block of a system and has to be analyzed and designed with the most consideration.

The decisions made during the input design are:

- To provide cost effective method of input.
- To achieve the highest possible level of accuracy.
- To ensure that input is understood by the user.

System analysts decide the following input design details like, what data item to input, what medium to use, how the data should be arranged or coded data items and transaction needing validations to detect errors and at last the dialogue to guide users in providing input. Input data of a system may not be necessarily a raw data captured in the system form scratch. These can also be the output of another system or sub-system. The design of input covers all phases of input from the certain of initial data to actual entering the data to the system for processing.

6.4 OUTPUT DESIGN

Output design generally refers to the results and information that are generated by the system. For many end-users, output is the main reason for developing the system and the basis on which they evaluate the usefulness of the application.

The objective of a system finds its shape in terms of output. The analysis of the objective of a system leads to determination of outputs. Outputs of a system can take various forms. The most common are reports, screens displays printed form, graphical drawing etc. the outputs vary in terms of their contents, frequency, timing and format. The users of the output, its purpose and sequence of details to be printed are all considered.

When designing output, the system analyst must accomplish things like, to determine what information to be present, to decide whether to display or print the information and select the output medium to distribute the output to intended recipients.

Internal outputs are those, whose destination is within the organization. It is to be carefully designed, as they are the user's main interface with the system. Interactive outputs are those, which the user uses in communication directly with the computer.

CHAPTER 7

SYSTEM TESTING AND IMPLEMENTATION

7.1 TESTING AND METHODOLOGIES

System testing is the stage before system implementation where the system is made error free and all the needed modifications are made. The system was tested with test data and necessary corrections to the system were carried out. All the reports were checked by the user and approved. The system was very user friendly with online help to assist the user wherever necessary.

7.1.1 TEST PLAN

A test plan is a general document for the entire project, which defines the scope, approach to be taken, and schedule of testing, as well as identifying the test item for the entire testing process, and the person responsible for the different activities of testing. This document describes the plan for testing, the knowledge management tool.

Major testing activities are:

- Test units
- Features to be tested
- Approach for testing
- Test deliverables
- Schedule
- Personal allocation

7.1.2 TEST UNITS

Test Case specification is major activity in the testing process. In this project, I have performed two levels of testing.

- Unit testing
- System testing

The basic units in Unit testing are

- Validating the user request

- Validating the input given by the user
- Exception handling

The basic units in System testing are

- Integration of all programs is correct or not
- Checking whether the entire system after integrating is working as expected.
- The system is tested as whole after the unit testing.

TEST DELIVERABLES

The following documents are required besides the test plan

- Unit test report for each unit
- Test case specification for system testing
- The report for system testing
- Error report

The test case specification for system testing has to be submitted for review before the system testing commences.

7.1.3 TEST CASE AND TEST REPORTS

UNIT TESTING

The system is tested as whole after the unit testing.

Table No: 7.1 Test case and test reports

| Test Case No | Test Case | Test Case Description | Expected Result | Observed Result | Result Pass/Fail |
|--------------|---------------------------------|---------------------------------------|--|---|------------------|
| 1 | Enter the username and password | Check the valid username and password | The username and password has to be accepted | The username and password has entered correctly | Pass |

VALIDATION TESTING

The objectives of this testing is to tell user about the validity and the reliability of the system.

Table No: 7.2 Validation testing

| Test Case No | Test Case | Test Case Description | Expected Result | Observed Result | Result Pass/Fail |
|--------------|---------------------------------------|---|--|--|------------------|
| 1 | Testing all the modules in the system | It tests all the modules based on the input from the system and getting an valid output from the system | Valid input from the user to the system and getting a valid output from the system | Getting a valid and reliable output from all the modules in the system | Pass |

SYSTEM TESTING

Entire system is tested as per the requirements. Black-box type testing that is based on the overall requirements, covers all combined parts of a system.

Table No: 7.3 System testing

| Test Case No | Test Case | Test Case Description | Expected Result | Observed Result | Result Pass/Fail |
|--------------|---------------------------------------|---|---|---|------------------|
| 1 | Testing all the modules in the system | It tests all the modules in the system whether it is executing in the system or not | By testing all the modules it is accepted by the system and should execute the result | It tests all the modules and the system accept all the modules and it produces an expected result | Pass |

INTEGRATION TESTING

This type of testing is especially relevant to client/server and distributed systems.

Table No: 7.4 Integration testing

| Test Case No | Test Case | Test Case Description | Expected Result | Observed Result | Result Pass/Fail |
|--------------|--|--|--|--|------------------|
| 1 | Testing all the modules to verify combined functionality after integration | It tests all the modules in the system based on the inputs from the user to the system and getting an valid output from the system | Valid input from the user to the system and getting a valid output from the system | Getting a valid reliable output from all the modules in the system | Pass |

7.2 SYSTEM IMPLEMENTATION

System Implementation is the stage of the project when the theoretical design is tuned into working system. If the implementation system stage is not carefully controlled and planned, it can cause chaos. Thus it can be considered to be the most critical stage in achieving a successful new system and in giving the users a confidence that the system will work and be effective.

The implementation stage in a project involves,

- ❖ Careful Planning investigation of the current system, checking constraints and the implementation.
- ❖ Training the staffs in the newly developed system.

A software application in general is implemented after navigating the complete life cycle method of a project. Various life cycle processes such as requirement analysis, design phase, verification, testing and finally followed by the implementation phase results in a successful project management. The software application which is basically a Windows based application has been successfully implemented after passing various life cycle processes mentioned above.

As the software is to be implemented in a high standard industrial sector, various factors such as application environment, user management, security, reliability and finally performance are taken as key factors throughout the design phase. These factors are analyzed step by step and the positive as well as negative outcomes are noted down before the final implementation.

Security and authentication is maintained in both user level as well as the management level. The data is stored in MySQL, which is highly reliable and simpler to use, the user level security is managed with the help of password options and sessions, which finally ensures that all the transactions are made securely.

The application's validations are made, taken into account of the entry levels available in various modules. Possible restrictions like number formatting, date formatting and confirmations for both save and update options ensures the correct data to be fed into the database. Thus all the aspects are charted out and the complete project study is practically implemented successfully for the end users.

CHAPTER 8

CONCLUSION

8. CONCLUSION

As this system keeps continues track of solar power plant ,the daily weekly and monthly analysis becomes easy and efficient also with the help of this analysis it is possible to detect any fault occurred within power plant as the generated power may show some inconsistency in data of Solar power plant.

Renewable energy sources are the non conventional type of energy which can be continuously relished by natural process. The solar panel voltage generation is one amongthe better solution for clean energy production by monitoring and controlling the voltage generated by our proposed system we could overcome the drawbacks of earlier proposed system.

This topology allows us to power the load from solar panel with the available sun energy. This system has a low operating cost and finds its application in remote areas andalso this method reduces the man power required.

CHAPTER 9

FUTURE ENHANCEMENT

9. FUTURE ENHANCEMENT

Since the system requires external power supply of 5 volts and 3.3 volts for its operation which can be taken rid of by utilizing the power generated by solar panel only. Also with the help of motor and controlling it is possible to track the sun for better power generation.

Apart from that by using various Machine Learning algorithms and model it is possible to make system smart enough to take decision about data and performance. Implementing Renewable Energy technologies is one recommended way of reducing the environmental impact. Because of frequent power cut it is important to use renewable energy and monitoring it.

Monitoring guides the user in analysis of renewable energy usage. This system is cost effective. The system efficiency is about 95%. This enables the efficient use of renewable energy. Thus it is reducing the electricity issues. This project can be further enhanced, by using the results of this current project, i.e. the monitoring values obtained are helpful in predicting the future values of the parameters considered.

The data stored in cloud can also be analyzed using the Mat Lab. The CSV file from the cloud is taken for analysis in R. The web application can be developed for interaction with the end user; the user can also predict values of the future events. In the same way we can go for android application also. During the prediction two or more models can be used for same dataset, to find the accuracy of each model.

CHAPTER 10

CODING

10.1 APPLICATION CODING

EMBEDDED C

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

// You should get Auth Token in the Blynk App.
// Go to the Project Settings (nut icon).
char auth[] = "2pWboHpXs3JlmkDR9FKyZYcGnA0SPHch";

// Your WiFi credentials.
// Set password to "" for open networks.char
ssid[] = "IOT";
char pass[] = "123456789";

unsigned int m=0,act=0,val,val1,val2,val3,val4,val5,val6,val7;

String inputString = "";
unsigned char a[200];

void setup()
{
  Serial.begin(9600); Blynk.begin(auth,
  ssid, pass);

} BLYNK_WRITE(V0)
{
  int button = param.asInt(); // read button
```

```

if (button == 1)
{
    Serial.print('*');
    Serial.print("001");

}
else
{
    Serial.print('*');
    Serial.print("000");

}
}

void loop()
{
    while(Serial.available())
    {
        char data;
        data=Serial.read();

        a[m]=data; if(a[0]
            == '*')
        {
            if(m<=6)
            {m++;}
        }
    }
    if(m > 1)
    {
        val1 = (a[1]-0x30)*100 + (a[2]-0x30)*10 + (a[3] - 0x30);
        val2 = (a[4]-0x30)*100 + (a[5]-0x30)*10 + (a[6] - 0x30);

        m=0;
    }
}

```

```

Int X=12;

Blynk.virtualWrite(V1,val1);

delay(100);
Blynk.virtualWrite(V2,val2);

delay(100);
Blynk.virtualWrite(V3,X);
delay(100);
Blynk.run();
delay(100);
}

```

10.2 PROJECT CODING

EMBEDDED C

```

#include <Wire.h>
#include <LCD_I2C.h>
LCD_I2C lcd(0x27);
# define solar A0
#include "DHT.h"
#define DHTPIN A3
#define relay 2
#define DHTTYPE DHT11 DHT
dht(DHTPIN, DHTTYPE);
int t,solarval;
unsigned int m=0,act=0,val1;

String inputString = "";
unsigned char a[200];
void setup() {

```

```

// put your setup code here, to run once:
Serial.begin(9600);
Wire.begin();
lcd.begin();           //Init the LCD
lcd.backlight();       //Activate backlight
lcd.home();
dht.begin(); pinMode(solar,INPUT);
pinMode(relay,OUTPUT);
digitalWrite(relay,HIGH);
lcd.setCursor(0,0); lcd.print("SOLAR
VOLTAGE");lcd.setCursor(3,1);
lcd.print("MEASUREMENT");
delay(3000);
lcd.clear();
}

void loop() {

    solarval=analogRead(solar);
    solarval=map(solarval,95,140,1,9);
    if(solarval<=0){ solarval=1;}
    else if(solarval>=9){ solarval=9;}
    Serial.print("solar:");
    Serial.println(solarval);

    lcd.setCursor(0,0);lcd.print("SOLAR VOLT:");
    if(solarval <= 9){lcd.print("00");lcd.print(solarval);}
    else if(solarval <= 99){lcd.print("0");lcd.print(solarval);}else
    if(solarval <= 999){lcd.print(solarval);}

    t = dht.readTemperature();
    lcd.setCursor(0,1);lcd.print("TEM:");

```



```

if(t <= 9){lcd.print("00");lcd.print(t);}
else if(t <= 99){lcd.print("0");lcd.print(t);}
else if(t <= 999){lcd.print(t);}
lcd.setCursor(8,1);lcd.print("B:");lcd.print("12V");
while(Serial.available())
{
    char data;
    data=Serial.read();

    a[m]=data; if(a[0]
    == '*')
    {
        if(m<=3)
        {m++;}
    }
}
if(m > 1)
{
    val1 = (a[1]-0x30)*100 + (a[2]-0x30)*10 + (a[3] - 0x30);

    m=0;
}
delay(200);

Serial.print("VAlue :");
Serial.println(val1);
    if(val1==1)
    {
        digitalWrite(relay,LOW);
        Serial.println("received. .... ");
    }
    else if(val1==0)
    {
        digitalWrite(relay,HIGH);

```

```
    Serial.println("not received. .... ");
}
senddata();
delay(500);
}
void senddata()
{
    Serial.print("*");
    if(solarval <= 9){ Serial.print("00");Serial.print(solarval);}
    else if(solarval <= 99){ Serial.print("0");Serial.print(solarval);}else
    if(solarval <= 999){ Serial.print(solarval);}

    if(t <= 9){ Serial.print("00");Serial.print(t);}
    else if(t <= 99){ Serial.print("0");Serial.print(t);}else
    if(t <= 999){ Serial.print(t);}
}
```

CHAPTER 11

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11. REFERENCES

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CHAPTER 12

ENVIRONMENTAL & DISASTER MANAGEMENT

RESPONSIBILITY OF AN ENGINEER-IN-CHARGE OF AN INDUSTRY WITH RESPECT TO PUBLIC HEALTH

Health of the human beings largely depend sup on the hygienic environmental condition.

All types of pollution will affect the public health. The role of an environmental engineer is

- To prevent or eliminate the pollutions from an industry
- To resolve problems of providing safe drinking water
- Cleaning of sites, contaminated with hazardous materials.
- Cleaning up and preventing air pollution
- Treating waste water
- Managing solid waste.

ENVIRONMENTAL ETHICS

Environmental ethics is the part of Environmental philosophy. It considers the traditional boundaries of ethics from solely including humans to including the non-human world. It exerts influence on a large range of disciplines including law, sociology, theology, economics and geography.

INDUSTRIALIZATION CREATES FOLLOWING FOUR TYPES OF POLLUTIONS

- Air pollution
- Water pollution
- Land pollution
- Noise pollution

Industrial noise of the running mechanical machines may cause impairment of hearing among people working in the industries. One of the most common is water pollution, caused by dumping of industrial waste into water waste.

It causes leakage into ground water and water ways. Industrial pollutions can also impact air quality and it can enter the soil, causing wide spread Environmental problems.

NECESSITY OF POLLUTION CONTROL

Health of the human beings largely depends upon hygienic Environmental conditions. Unhealthy conditions of human health or due to human beings themselves. Environment and all its components have been polluted to such an extent that they have become health hazards.

Degradation of Environment has affected the plants and domestic animals adversely. So, to live hygienic life thus the need of pollution control.

DIFFERENT ORGANIZATIONS DEALS WITH POLLUTION CONTROL ARE

- Central Pollution Control Board
- Tata Energy Research Institute
- National Environmental Engineering Research Institute
- Indian Board of wild Life.

DIFFERENT TYPES OF POLLUTIONS

- | | |
|------------------------|--|
| • Chemical industry | - Water pollution, air pollution, and land pollution |
| • Textile industry | - Air and noise pollutions |
| • Leather industry | - Water and land pollutions |
| • Auto mobile industry | - Air pollutions |
| • Cement factory | - Air, water, and land pollutions |

HAZARDOUS WASTE

A hazardous waste is waste that poses substantial or potential threat to public health or to Environment and generally exhibitioner more of the following characteristics.

- Carcinogenic
- Oxidant
- Toxic
- Explosive
- Ignitable(i.e., flammable)
- Corrosive
- Radioactive.

INDUSTRIAL WASTE MANAGEMENT

- Waste management is the collection, transport, processing, recycling or disposal, and monitoring of waste materials.
- The term usually relates to the material produced by human activity.

- It is generally undertaken to reduce their effect on health, the Environment or aesthetics.
- Waste management is also carried out to recover resources from it
- Waste management can involve solid, liquid, gases or radioactive substances.

DIFFERENTIATION

| | | |
|---------|---|---|
| Garbage | : | decomposable wastes from food. |
| Rubbish | : | non decomposable wastes, either combustible. |
| Refuse | : | rejected as of little or no value, worthless. |
| Trash | : | a useless or worthless stuff. |

THE QUANTITY OF SOLIDWASTE GENERATED IN AN INDUSTRY CAN BE REDUCED BY THE FOLLOWING METHODS

- Reuse of second hand products,
- Repairing broken items instead of buying new,
- Designing products to be refillable or reusable
- Encouraging consumers to avoid using disposable products
- Designing products that use less materials to achieve the same purpose.

OBJECTIVE METHODS OF TREATMENTS OF SOLID WASTE

- To breakdown large materials in small pieces to reduce the volume and for easy handling
- To separate the non combustible products such as glass, metal and ceramics.

DIFFERENT METHODS OF DISPOSAL OF SOLID WASTE

- Land fill
- Incineration

Disposal of waste in a landfill. Landfills were often established in abandoned or unused quarries, mining voids or borrow pits.

Incineration is a disposal method that involves combustion of waste materials. Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". Incineration converts waste materials into gas, steam, heat and ash.

PRINCIPLE OF RECYCLING

Metal implements were melted down and recast in prehistoric times. Today, recyclable materials are recovered from municipal refuse by a number of methods, including, shredding, magnetic separation of metals, air classification that separates light and heavy fractions, screening, and washing. Thus, the recycling principles minimize the waste.

ENVIRONMENTAL WASTE AUDIT

The term Environmental waste audit is a formal, structured process used to quantify the amount and types of waste being generated by an organization. Information from the audits will help identify current waste practices and how they can be improved.

LANDFILL DESIGNERS ARE PRIMARILY CONCERNED WITH THE SELECTION OF A SITE.

THE LOCATION SHOULD BE

- Easy access to transport by road
- Rail network is preferred.
- Land value (price) should be minimum
- Cost of meeting government requirements.
- The site should not affect the soil and water through
- The capacity of the land fill is based on density of the wastes.
- Amount of intermediate and daily cover
- Amount of settlement that the waste will undergo following tipping
- Thickness of capping
- Construction of lining and drainage layers

PURPOSE OF DAILY COVER IN A SANITARY LAND FILL

Daily cover is the name given to the layer of compressed soil or earth which is laid on top of a day's deposition of waste on operational landfill site.

The cover helps prevent the interaction between the waste and the air, reducing odors and enabling a firm based upon which for vehicles to operate.

METHODS OF CONVERTING WASTE INTO ENERGY

Waste materials can directly be combusted for the generation of energy as fuel or other method, indirect combustion can also be opted for energy generation. Among thermal treatments we have two related kinds.

PYROLYSIS AND GASIFICATION

In these sorts of methods, materials are heated with the little supply of oxygen at high temperature. This process is conducted in sealed vessels with high pressure.

In pyrolysis, the solid is converted into liquid state and liquid is converted into gas. These products of treatment can then be used for production of energy. The residue that is left behind is generally known as “char”, which is further treated for the production of more usable products. In gasification however, the material to be treated is directly converted into synthetic gas (Sync gas) which has hydrogen and carbon dioxide as its components.

A local body such as a municipality can take the following steps, when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days.

- They can get help from nearby corporation and municipalities.
- These contender opted agencies may be appointed after cancelling the failed agency.
- Local municipalities can use their own facilities as war front.
- They can get help from volunteers like NSS, NCC, ETC.

Characteristics of hazardous wastes are defined as wastes that exhibit the following characteristics: light ability, corrosively, reactivity or toxicity.

IGNITABILITY

Ignitable wastes can create fires under certain conditions are spontaneously combustible, or have a flashpoint less than 60°C (140°F). Examples include waste oils.

CORROSIVE

Corrosive wastes are acids or bases that are capable of corroding metal containers, such as storage tanks, drums, and barrels. Battery acid is an example.

REACTIVITY OR TOXICITY

Reactive wastes are unstable under “normal” conditions. They can cause explosions, toxic, gases, or vapors when heated, compressed, or mixed with water, examples include lithium-sulfur batteries and explosives.

DIFFERENCE BETWEEN MUNICIPAL AND INDUSTRIAL EFFLUENT

MUNICIPAL EFFLUENTS:

Municipal effluents are obtained from the local residential areas. A municipal effluent is less concentrated.

Example : plastic waste, garbage.

INDUSTRIAL EFFLUENTS:

Industrial effluents are obtained from process of products in an industry. Comparing to municipalities more concentrated.

Example: chemical discharge, scraps.

EQUALIZATION SYSTEM

Waste water is directed to the equalization tank. The tank is designed to equalize concentration fluctuations of the incoming wastewater. The contents of equalization tank are continuously agitated by a 15 HP side mounted mixer and liquid level and temperature controls mounted in the tank provide continuous monitoring of the wastewater flow.

SEDIMENTATION

Sedimentation is a physical water treatment process used to settle out suspended solids in water under the influence of gravity.

FLOTATION

Dissolved air flotation is a water treatment process that clarifies waste waters by the removal of suspended matter such as oil or solids. The removal is achieved by dissolving air in the wastewater under pressure and then releasing the air at atmospheric pressure in a flotation tank or basin. The released air forms tiny bubbles which adhere to the suspended matter causing the suspended matter to float to the surface of the water where it may be removed by a skimming device.

CHEMICAL AND BIOLOGICAL TREATMENTS

The chemical processes intervene during the waste water chlorination, coagulation of suspended solids and during the removal of toxic matter.

The chemical effluents can be removed by the following chemical treatments

- Neutralization
- Chemical precipitation
- Chemical reduction and oxidation

The biological process usually takes place at the same time with chemical ones. During these processes the organic matters in waste water and in sludge's decomposed. The organic matters being unstable are easily decomposed and purification of waste water takes place at the same time with decomposition.

Organics in waste water is decomposed by the following methods

- Aqueous waste treatment
- Bio-degradation
- Waste incineration.

TREATMENT PROCESS WHICH REMOVE POLLUTANTS

- Paralysis- no halogenated organics chlorinated organics
- Solidification- corrosives, cyanides
- Ion exchange- cyanides, chlorinated organic.

BIOLOGICAL NITRIFICATION

Nitrification is the biological oxidation of ammonia with oxygen into nitrite followed by the oxidation of these nitrites into nitrates. Degradation of ammonia to nitrite is usually the rate limiting step of nitrification. Nitrification is an important step in the nitrogen cycle in soil.

BIOLOGICAL DENITRIFICATION

De-nitrification is an anaerobic biological process, employed to convert the nitrate- nitrogen in the effluent from the activated sludge-nitrification process into nitrogen gas. De-nitrification takes place in the deep bed, mono-media de-nitrification filters. A supplemented carbon source (methanol) is added to the de-nitrification filter influent to provide a food source.

LAND TREATMENT OF INDUSTRIAL EFFLUENT

A land treatment unit is a location in which land is treated, usually through bio remediation processes, to reduce the toxicity of the soil. Land treatment units are used as where hazardous waste is applied in to the soil surface. Land treatment units are typically units consisting of natural soils where natural biological and chemical degradation and attenuation processes immobilize, transform or degrade hazardous constituent's over time.

LOCATION FOR THE ULTIMATE DISPOSAL OF SLUDGE

The ultimate disposal of water treatment sludge entails two techniques

- Land filling
- Land application

LAND FILLING

Landfills may be on public land such as municipality owned land fill, or on private land. Landfill operators commonly require 15 to 30% sludge. The minimum concentration required is often determined by local sanitary landfill regulation. For alum sludge effective land filling requires the solid concentration to be at least 25%. At lower concentrations, land application is more appropriate.

LAND APPLICATION

Alum sludge, at concentrations less than 25%, is best land applied. Sludge may be applied to croplands, to marginal land for land reclamation, to forest land or to dedicated sites. Other than at dedicated sites, usually more than 20 dry tones of sludge per acre land applied.

MAJOR SOURCE FOR HAZARDOUS AIR POLLUTANTS

- Thermal power plant
- Oil refineries
- Automobile
- Chemical industries
- Cement industries.

AIR POLLUTIONS AND THEIR EFFECTS ON HUMAN HEALTH OXIDES OF CARBON

These include CO and CO₂ which are formed by the burning of carbon of the fuels. Carbon monoxide (Co) is highly toxic and dangerous for human beings. Co₂ is released by animals and plants during respiration.

BURNING OF FUELS EMITS LEAD PARTICLES

The 400kg of lead is released into the air daily in the capital alone. If absorbed in the body, it affects formation hemoglobin adversely.

INCOMPLETE COMBUSTION OF HYDROCARBONS

In fuels it forms several gases pollutants and soot. Soot often proves cause of cancer and harms plants as well.

ACUTE AND CHRONIC HEALTH EFFECTS DIFFERENTIATION ACUTE HEALTH EFFECTS

- A short period of exposure and very short latent period.
- Visibility loss, suffocation are some health effects caused by acute.
- Source is toxic gases.

CHRONIC EFFECTS

- Duration of relevant exposure period and latent period is long.
- Visibility reduction, lungs disease, cancer, blood chemistry changes, asthma, are health effects caused by air pollution.
- Sources are cement industry and automobile vehicles.

ACID RAIN

Acid rain is a result of air pollution. Power stations, factories and cars all burn fuels and therefore they all produce polluting gases. Some of these gases react with the tiny droplets of water in clouds to form sulphuric and nitric acid. The rain from these clouds then falls as very weak acid-which is known as “acid rain”. The pH value is less than 5.6

GLOBAL WARMING

Global warming is the heat on earth’s surface temperature rising. It is caused by burning too many fossil fuels and the green house effects. Fossil fuels are the mains of once-living organisms that are burned to make energy. Some examples are coal, oil, and natural gas. There are two major effects of global warming

Increase of temperature on the earth by about 3to5 degree Celsius by the year 2100.
Rise of sea levels by at least 25m by the year 2100.

AIR POLLUTION CONTROL DEVICES FOR A FEW POLLUTANT AND SOURCE

The following items are commonly used as pollution control devices by industry or transportation devices. They can either destroy contaminants or remove item from an exhauststream before it is emitted into the atmosphere

- Mechanical collectors
- Electrostatic precipitators: An Electrostatic precipitators or Electrostatic air cleaner is a particulate collection device that removes particles from a following gas using the force of an induced electro static charge.
- Bag houses: designed to handle heavy duty loads, a dust collector consists of a blower, dust filter, a filter cleaning system, and dust removal system.

EVAPORATIVE EMISSION

Motor fuels give off vapors that contain harmful hydro carbons such as benzene. In order to restrict emission of hydro carbons from the fuel tank, vehicle system or equipped with a carbon canister. This canister contains activated charcoal which has the ability to bind substance in to hydro carbon molecules.

EXHAUSTIVE EMISSION

To reduce the exhaust emissions from auto mobile the following emission control systems

- Catalytic converter
- Air injection method
- Exhaust gas re-circulation system.

CATALYTIC CONVERTER

It is placed between the exhaust manifold and silencer. There is a honeycomb structure of a ceramic or metal inside the cover. It is coated with aluminum base materials there after a second coating of precious metals platinum, palladium or radium or combinations of the same. This second coating serves as a catalyst.

A catalyst is a substance which causes a chemical reaction. As a result of catalytic reactions, as the exhaust gases pass over the converter substrate, toxic gases such as CO_2 , HC and NO_x are converted in to harmless CO_2 , H_2 , and N_2 .

HARMFUL ELEMENTS PRESENT IN THE AUTO MOBILE SMOKE

The harmful elements present in the auto mobile smokes are hydrocarbon, toxic gases such as CO , NO_x .

The presence could be controlled by implementing emission control system like catalytic converter, air injection method, and exhaust air re-circulation system.

ADVANTAGES OF OZONE LAYER

The ozone layer is a deep layer in the stratosphere, encircling the earth, that has large amount of ozone in it. The layer shields the entire earth from much of the harmful ultra violet radiations that comes from the sun.

The stratosphere reaches 30 miles above the earth, and at the very top it contains ozone. The sun's rays are absorbed by the ozone in the stratosphere and thus do not reach the earth. Ozone is a bluish gas that is formed by three atoms of O_2 .

The main cause of this is the release of CFCs. Antarctica was an early victim of ozone destruction. Reason for destruction: sending of number of satellites.

EFFECTS OF NOISE OTHER THAN HEARING DAMAGE

- Causes anxiety.
- Distracts the attention
- Causes head ache, migraine, depression
- Causes abnormal imbalance leading to increased heartbeat, BP, hypertension and constriction of blood vessels
- Continuous noise may damage heart, brain, cells and liver in the case of animals.

HOW REDUCE THE NOISE OF SILENCERS OR MUFFLERS

Silencers or mufflers are used in the automobile, IC engines, power generators. A muffler (or silencer in British English) is a device for reducing the amount of noise emitted by a machine. In an internal combustion engine, the engine exhaust blows out through the muffler.

Muffler are typically installed along the exhaust pipes as part of the exhaust system of an internal combustion engine (of a vehicle or stationary) to reduce its exhaust noise. The muffler accomplishes this with a resonating chamber, which is specifically tuned to cause destructive interference, where opposite sound waves cancel each other out. Problems faced by the people residing along the side of a railway track and near to airport, Railways and aero plane cause unbearable sound.

Person residing near the railway tracks, railway stations, and airports have to bear the sound level of fast running trains and the take-off and landing of the aircraft. These noise levels are more than 45 db. Noise absorbing materials may be used for construction of building such as hollow blocks and wooden materials or glass materials.

DIASASTER MANAGEMENT

Disaster management usually refers to the management of natural calamities such as fire, flooding or earthquake, Tsunami. The stages of disaster management are:

- Planning
- Preparedness
- Mitigation (reducing the intensity of a situation)
- Response and

NATURAL DISASTER AND MANMADE DISASTER DIFFERENTIATION

Natural disaster is the effect of natural hazard that affects the environment and leads to financial, environmental and/or human losses.

Natural disasters are like earth quake, a tornado, hurricane, flood, blizzard, and forest fire. Manmade disaster are events which, either intentionally or by accident cause severe threats to public health and well-being. A man-made disaster is a flood left by carelessly running water.

NECESSITY OF RISK IDENTIFICATION AND ASSESSMENT SURVEYS WHILE PLANNING A PROJECT

While planning a project, disaster, risk identification and assessment would help the community to participatory assess the hazards, which threaten the community, its vulnerabilities and capacities. It identifies what element at risk analysis the causes and root causes vulnerable conditions. The assessment takes into account the physical, geographical, social, political and psychological factors that cause some people to be particularly exposed to various hazards.

DISASTER RECOVERY

Disaster recovery is the process, policies and procedures related to preparing for recovery to an organization after a natural or human induced disaster.

Disaster recovery in industries includes,

- Failure due to fire accidents
- Failure due to sudden high voltage
- Failure of machines and infrastructures due to floods.

FACTORS TO BE CONSIDERED WHILE PLANNING

- Land use planning
- Preventing habitation in risk zone
- Disaster resistant buildings
- Finding way store reduce risk even before the disaster strikes
- Community awareness and education

PUBLIC EMERGENCY SERVICE AVAILABLE IN THE STATE

- | | |
|--|--------|
| • Police | -100 |
| • Fire control | - 101 |
| • Ambulance | - 108 |
| • Traffic | - 103 |
| • Lions blood bank | - 1910 |
| • Child help line | - 1098 |
| • Ambulance of fire service department | - 102 |

ROLE PLAYED BY AN ENGINEERING THE PROCESS OF DISASTER MANAGEMENT

Disaster is a threat environmental and society disaster management deals with preparation store reduce the impact of natural or man-made disasters roll of engineer.

- To carry out the four phases of disaster management :mitigation, preparedness, response and recovery
- Mitigation focuses on avoiding hazards or reducing the impact of disasters
- Preparedness involves developing action plans to combat disasters when it happens
- Response includes mobilization of emergency services evacuation and rescue operation.
- Recovery is involved in there building process

CAUSES FOR EARTH QUAKES

An earth quake (also known as a tremor) is the result of sudden release of energy in the Earth's crust that creates seismic waves. Earth quakes are recorded with a seismometer, also known as seismography in richer magnitude.

The magnitude 3 or lower earthquakes being mostly imperceptible and magnitude causing serious damage over large areas. Intensity of shaking is measured on the modified Mercalli scale.

The following parts in India are more vulnerable for frequent earth-quakes

- Gujarat
- Assam
- Jammu and Kashmir
- Bihar
- Manipur

EARTHQUAKE HAZARD ZONE

| Place | Type of zone | Rating |
|--------------|-----------------|----------|
| Chennai | Low hazard | 0.3 -0.5 |
| Nagapattinam | Low hazard | 0 |
| Madurai | Low hazard | 0 |
| Coimbatore | Moderate hazard | 0.7-0.8 |
| Salem | Low hazard | 0 |

HUGE LOSSES DUE TO FLOODS

Orissa, west Bengal, Andhra Pradesh, Tamil Nadu.

EVER CYCLONES

Gujarat, Rajasthan, Punjab, Haryana, Delhi, Uttar Pradesh, Assam, West Bengal, Orissa, Kerala, Andhra Pradesh.

BASE WIND SPEED

The average speed of air in a particular area is called the basic wind speed of the area.

DESIRABLE HEIGHT FOR THE LOCATION OF BUILDINGS

- The desirable minimum distance from these as here for the location of buildings is 500 meters
- The desirable minimum height above mean sea level for buildings is 81 feet.

CYCLONE SHELTER

- Cyclone shelters are the places used to accommodate the cyclones-affected persons during cyclones.
- It is provided in densely populated coastal areas and where large-scale evacuation are not always feasible.

PRECAUTIONARY MEASURES

- River side residents are to be alerted through radio television and loud speakers
- Weakened river banks to be strengthened by placing sand bags.
- Rescue arrangements to be made such as plastic boats, fire and rescue department may be brought nearer to dam.

CAUSES FOR FIRE ACCIDENTS

- Heating sources are often causing of fire
- Electrical wiring can cause fire if it is not large enough to carry the load being supplied
- Rubbish and waste materials that are left to accumulate can easily contribute to the spread of fire
- Combustible materials like flammable liquids or gases stored in work place can be extremely dangerous.

REMEDIAL MEASURES

- Don't keep highly flammable liquids in the building
- Don't plug several devices in to one socket
- Keep away flammable material from heat source
- Don't smoke inside the house
- Determine at least two ways to escape from buildings and practice the escape plan at least twice a year
- In the event of fire call, provide them with your address and the nature and location of the fire
- Have a fire extinguisher readily.

FIRE ESCAPE

FIRE ESCAPE REQUIREMENTS ARE

- Safety ladder
- A knock drop or rope ladder
- Descending devices
- Escape chutes
- Enclosed fire and smoke proof stairway
- Interior fire escape chutes
- Exterior fire escape stairway
- A aerial ladder

FIRE FIGHTING ARRANGEMENTS

- Fire extinguishers
- Multistage pumps
- Sand buckets
- Fire fighting robots
- Fire engine

WARNING SYSTEM IN INDUSTRY

- To avoid the physical damage (damage of loss of building and service structure)
- To avoid the casualties
- To save guard the workers health
- To safe guard the power supply and communication system

RESCUE OPERATION

- If an emergency is occurred it should be notified to the request like fire and rescue department.
- Rescue locates the trapped person. Then dig or cut them free from collapsed building. The location of people under rubble and their excavations can be achieved with relatively simple search and rescue technique
- First aid is provided to retrieved persons from the buildings. Collapsed structures of building are removing by using crane and other lifting devices.

NECESSARY STEPS TO AVOID DANGEROUS EPIDEMICS AFTER A FLOOD DISASTER

- Contingency plan form response should be prepared after identifying the epidemics that are likely to occur in the region.
- Early warning system by a surveillance system is the primary requirement so as to have an effective response and prevent any outbreaks.
- Personal protection through vaccination is an effective mitigation strategy and will protect the persons at risk.

RELIEF WORKS DANGEROUS GAS LEAK

- The safety mask provided in the place must be used immediately
- Relief gas provided in the factory should be sprinkled automatically
- They must be evacuated from the place to the safety place by the provided means of conveyance.

SUDDEN FLOOD

- They must evacuate to safer area by using plastic boats
- We have to initiate the drainage process
- Blocking of doors and windows of quarters.

DIFFICULTY FACED BY AN INDUSTRY WHEN THERE IS SUDDEN POWER FAILURE

- Accidents may occur to laborers
- Machine may be damaged
- Products may be damaged
- Total production may affect
- Providing generator set
- Time schedule can be made.

DIFFICULTY FACED BY THE MANAGEMENT

- Loss of production
- Financial problems
- Loss of raw materials
- Theft may occur
- Damage to company properties
- Calling police service
- Calling fire service
- Counseling workers

PROBLEMS FACED BY MANAGEMENT OF MECHANICAL DEVICE DUE TO POOR MAINTENANCE

- Their reputation will fall in the market due to poor quality of products
- Job compensation to family members according to their knowledge
- Cost of maintenance will increase
- Factory may be closed
- Production schedule may not be met by the factory.

MANAGING THE SITUATION

- Insuring for the machineries and workers
- From the beginning required kind of maintenance should be provided.

MEDICAL FACILITY IN A INDUSTRY

- If any accidents occur persons may be injured or disablement may happen
- Due sickness worker may absent to the work
- Production schedule may be delayed
- Quality may be reduced
- Firm reputation will be loss.

TYPES OF DISASTER EXPECTED DISASTER OCCURS IN COAL MINING

- Mine flooding
- Mine ground subsidence.

DISASTER IN OIL REFINERIES

- Fire and explosions of oil tanks
- Emission of toxic oils in water
- Water and other usable.

DISASTER IN COTTON MILLS

- Fire accidents

DISASTER IN SHIP YARD

- Flood
- Cyclone
- Tsunami
- Fire

EMERGENCY PLAN REHEARSAL

- An emergency plan is designed for all types of calamities by the govt. and organization
- The method of actions to be carried out during an un expected calamities (like flood, earth quake, cyclone, gas leakage, terrorist attack etc.....) is to be rehearsal according to the plan at definite intervals.

ADVANTAGES OF SUCH REHEARSALS

- Minimize the loss of property
- Reduces the loss of life
- Reduces the fear of attack

THE STEPS TO BE TAKEN TO AVOID THE BREAKDOWN

- Give an opportunity to took part in the discussion of their problems with management
- Discussion should be frank and free without reservation
- Workers those who are probable of understanding the problems has been selected.
- Grievance procedure be provided
- Proper communication channel must be established

SOME POSSIBLE CRISIS IN AN ORGANIZATION

- Strike threatening
- Slow down the workers
- Pen down strike
- Picketing

TYPES OF WARNING SYSTEM

- Radio
- Loud speakers
- Television
- Centralized warning centers.

THE FOLLOWING ARE A FACTOR TO BE CONSIDERED WHILE FIXING COMPENSATION

- Employees age
- Service factor
- Level of works
- Level of disability

THE LEGAL OR FINANCIAL PROBLEMS TO FACE THE MANAGEMENT

- Compensation should be provided
- Production loss may occur
- Meeting the orders in due date will be difficult
- Meeting the hospital expenses
- Wage payment without work to the injured persons
- Machines may be repaired or replacement cost
- Legal expenses

INSURANCE TO THE MAN AND MACHINERY OF AN INDUSTRY

- Due to the sudden and unexpected breakdown, there will be inefficiency in the operation of machinery and financial loss, there in
- Insurance is a widely accepted method of safe guarding people against various hazards of life
- Life assurance fulfills the following needs of a person dealing with dangerous jobs
- Family needs
- Old age needs
- Needs for education, marriage and settlement of children etc.

THE PRECAUTIONS HAVE TO BE TAKEN WHILE STORING EXPLOSIVE IN A MATCH/FIRE CRACKERS FACTORY

- Source of heat such as portable heaters are kept well away from the fire works
- Smoking is not allowed
- Any electrics or lightning do not pose a risk of ignition
- Fireworks are not to be emptied in to metal dust bins
- There are adequate means of escape in case of fire
- Suitable lightning and ventilation must be provided within the store room.

ARRANGEMENT REQUIRED FOR EMERGENCY

- Notification: notification plan promptly notified to the concerned personnel. Assignment action during
- emergency: indicating regarding and announcing in the main control rooms radiations surveys environmental, surveys meteorological, data and status of plant are utilized to assess the situation
- Corrective actions: corrective actions are taken to plan abnormal situation and to bring the plan under control
- Productive measures: (countermeasures) the measures are taken mitigate the consequences of a radiological event and to protect site personnel members of the public and livestock radiations.

THE RESIDENTIAL QUARTERS ARE NOT CONSTRUCTED NEARER TO AUTOMATIC POWER PLANTS, BECAUSE

- Very difficult to get the basic amenities like drinking water, transport facilities
- Exposure of radiations will affect the human health
- In emergency cannot rescue them easily.