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TARANG

TECHNICAL MAGAZINE 2021-22

DEPARTMENT OF ELECTRICAL ENGINEERING

Department Vision and Mission

VISION

To be a center of excellence in Electrical Engineering education to prepare professionally competent engineers with lifelong learning attitude for the accomplishment of ever-growing needs of society.

MISSION

- To prepare technically and professionally competent engineers by imparting quality education through effective teaching learning methodologies and providing stimulating environment for research and innovation.
- To develop professional skills and right attitude in students that will help them to succeed and progress in their personal and professional career.
- To imbibe moral and ethical values in students with concern to society and environment.

Program Educational Objectives (PEOs)

Graduates of the program will

- PEO I : Engage in design of system, tools & application in the field of electrical engineering & allied engineering industries.
- PEO II : Apply the knowledge of electrical engineering to solve problems of social relevance, pursue higher education & research.
- PEO III: Engage in lifelong learning, career enhancement & adapt to changing professional & societal needs.

Program Specific Outcomes (PSOs)

- PSO 1 : Identify, formulate and analyse electrical engineering problems for real life industrial and societal needs.
- PSO 2 : Design and develop systems in the emerging electrical engineering and allied disciplines to meet out the industry standards.

EXECUTIVE DIRECTOR'S MESSAGE:

Hon. Shri Anil Bagane
Executive Director

Good things remain good only because they are always scant. I am glad to unfold this wonderful magazine as an appreciation of the admirable efforts put forth by the team. The effort taken to bring about content is appreciable. This is a productive technical material and subsidiary skill developing tool for the students. The release of this brilliant forth issue of the technical magazine "TARANG" has added the value of department. I also applaud the coordination & efforts behind the team to bring out this issue.

PRINCIPAL MESSAGE:

Dr. Sanjay A Khot
Principal

We have been gifted with this blessed life. The program of society is mainly depend on many people who are working behind the scenes ,overtime round the clock planning things to the smallest. This technical magazine will be a medium to provide proper acknowledgement and respect to all of these effort and its results. This is only small step towards a long journey. This fourth issue of technical magazine should inspire all of us for a new beginning enlighten with hope , confidence and faith in each other In the road ahead for innovation work. It is expected that wide support for this mission will be provided through the reader's valuable suggestions and comments…….Happy reading.

HOD'S MESSAGE:

Dr.K Hussain
Head of the Department

I feel delight to introduced sixth issue of Technical Magazine prepared by department of Electrical Engineering. We at SITCOE promise of increasing the knowledge, enhancing the critical thinking, ability to change information into knowledge & power of analyzing the things technically of each & every individual of ever changing society through students.

Faculty Editors Message:

Mr. Chandrashekhar S Patil

Electrical Engineering Department

Greetings from the Editorial members' board of the Technical Magazine "TARANG".Although that has been enduring in mind, it becomes real. It is truly an interesting and exciting experience. It is the snap shot of the various technologies and technological changes associated with Electrical Engineering. It among all of us. We would like to place. On record our gratitude and heartfelt thanks to all those who have contributed to make this effort in a successful one.

We profusely thank our Honorable Executive Director Shri Anil Bagane, Principal Dr. S A Khot and Head of Electrical Engineering Department Dr. K Hussain for giving support and encouragement and a free hand in this endeavour. This Technical Magazine will be a medium to provide proper acknowledgement and respect to all of those efforts and its results.

Student Editors Message:

(Mr.Mahamadnouman Shaikh)

Third Year Electrical Engineering

It’s truly an interesting and exciting experience. This technical magazine was one such cherished work that had its roots in the persuasion. It would be a snap shot of the various activities and advancements in the field of Electrical Engineering Department.

This Technical Magazine will serve to reinforce and allow increased awareness about research activities. Interaction and Team Work among all of us, usually we fail to appreciate the good deeds of many people and activities that happen around us as we are engaged in irrelevant talks and assumptions. It could all change if we just pause to think of what is our contribution to the society**.**

CONTENTS

Energy Management System with Accidental Protection

Name: Aarti Ananda Kamble

Abstract:

Now a day's saving and management of electrical energy is very important thing because the demand is increasing day by day. And also the storage of fossil fuels is reducing day by day So from this project we are generating electricity from renewable energy sources like wind and solar and this generated energy utilized for different applications like automatic street light system,soil moisture irrigation system and electric vehicle charging by using arduino ,sensors and GSM modules by this dental protection for cars by using vibration sensor, G we are saving energy and utilizing it properly for various applications. Also we are creating accPS system and GSM module which are using in a car for detection. By this project we can save more and more lives who lost their life due to accidents.

Keywords- Energy management, soil moisture irrigation, street lights, Vehicle charging, Accidental protection, arduino, GSM module, GPS

Introduction:

We use intelligent instruments in every part of our lives. In our day-to-day life electrical energy is very important and the saving and using electrical energy efficiently is also important factor .And the storage of fossil fuels reducing day by day so the use of renewable energy is also important. In this project we are generating energy from sources like wind energy and solar energy which are renewable and pollution less so this project is ecofriendly. This generated energy is using for applications like street lights, Electric vehicle charging, Soil moisture irrigation, Accidental protection.

The whole project basically divided into 5 major parts:-

1. **Automatic street light-**

We know according to accident and security purpose of peoples. We must have the street light on the road the power supply given to the street light comes on different type of energy system in night light will on at 30% intensity but when vehicles pass the road intensity increased by 100% these increments in the intensity is done by LDR sensor.

2. **Hybrid energy sources-**

In which for their energy generation .we use the hybrid energy system there are various type of renewable energy sources .like solar energy system for the energy generation .so the pollution ratio is zero that's why it is eco-friendly project.

3. **Electric vehicle charging-**

We know 65% of pollution created by diesel and petrol vehicles. So government of many countries starts thinking about this problem and replacement of these vehicles. So they launched electrical vehicles. But there are main problem of charging station. So our project is based on charging station. We provided many charging stations. And also using online vehicle charging system for the road. In which system the charging takes place when car is running on road.

4. **IOT (Internet Of Things)-**

IOT play an important role in controlling this energy system. This system help that used to control the source of energy. Also the control the Street light. All the monetary can be done by Internet like any fault occurs any point of Street light then sensor detects and given a message of mobiles /computer system.

5. **Soil moisture irrigation system-**

The circuit is based on microcontroller and also a soil moisture sensor. A properly configured soil moisture sensor can save up to 60 percent of water used in irrigation. The designed system can be used in turf grass or with small garden place.

6. **Accidental protection-**

We are also providing accidental protection to the vehicles. In this we are using vibration system in car, in which vibration occurs when accident happens and it gives information to nearest ambulance. Which can save more and more lives which lost their lives due to delay in treatment?

Limitations:

- The initial investment is very high.
- Rechargeable batteries have to be replaced from time to time.
- Non-availability of sunlight during rainy and winter seasons is a problem.
- IOT is dependent on the internet.

Methodology:

1. Automatic street lights-

In this part we are creating street light system which used generated electricity. In this system A street lights automatically turns ON in night and turns OFF in day. And also in

night its intensity is less but when car passing from that location intensity increases to hundred percent.

2. Car accident detection-

On a road when happens an accident f car the message is sends to the nearest police station with the help of GPS receiver and Vibration sensor.

3. Soil moisture based irrigation system-

For farms this method is useful because this includes automatic system Means when the moisture of soil decreases to the low percentage then motor will automatically starts and when moisture increases to specific good percentage motor turns off automatically.

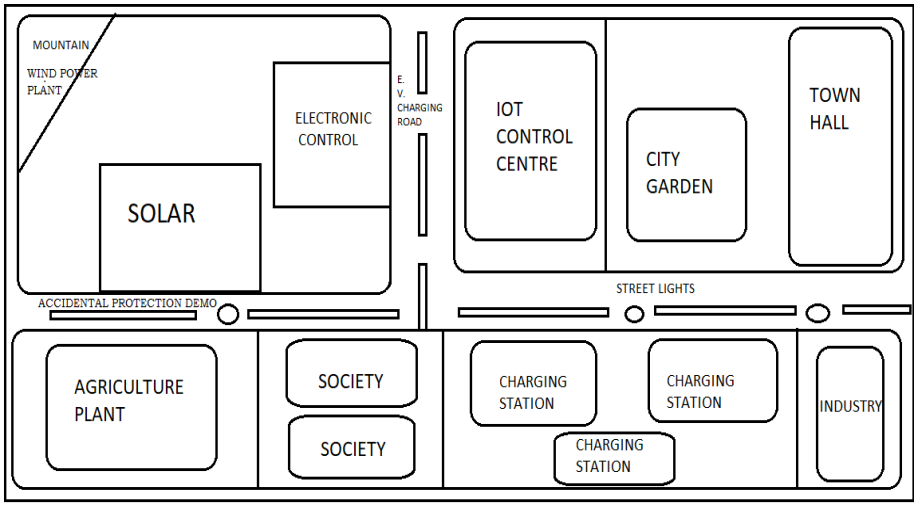
4. Electrical vehicle charging system-

Now to use electric vehicles .We need to charge electric vehicles hence for charging of electric vehicles we are using two types

1) Stationary charging – In this method stationary car is charged at charging station. With help of plug in method

2) Charging car on live road- The method of charging station takes time so to overcome on this issue we are creating this method. Due to this the car which is running on road is charges with the help of coil by transmitter receiver system.

Architecture:



1) Automatic Street light:

1. Power supply- DC battery for the supply to the street lights it receives supply and give it to Street light.

2. Light sensor- This is use to sense light hence it useful to detect night and day means atmospheric conditions.

3. Wi-Fi Module-It sends signal to IOT to operate street lights.

2) Car accident detection:

1. Vibration sensor module-When the accident happens there is vibration produced and this vibration is sensed by this

2. GSM module – It used to send message on smartphone after accident happens.

3. GPS receiver-It detect the proper location and sends it to aurdino.

4.16 *2 LCD Display- This is used to check result of this project

5. Arduno- It sends or receive signal from the all the parts of this detector

3) Soil moisture irrigation:

1. Soil moisture detector-It is used to detect the moisture level of moisture in soil.

2. Temperature and humidity sensor- It detects the temperature and humidity of soil

3. Relay module- This is used to turn ON or turn OFF the pump. Its working depends upon signal from arduino.

4. Arduino- It receives signal from sensors and gives it to the relay.

4) Electric vehicle charging system:

1. Charging stations –This are used to charge vehicles, in this method vehicle is stationary.

2. Power line-It used to send power along the road for wireless charging method.

3. Transmitting coil- It used to transmit power to the battery in car in wireless charging.

4. Receiver coil- It used to receive power from power line in wireless charging.

Future Scope:

The primary intention of this project is to generating renewable energy and also save and manage electrical energy. By the automatic street light we can improve lightning scheme along road side and with this we can save energy also. By soil moisture irrigation system we can regulate the water supply easily of our agriculture and also useful for save water. This system should be connect to every plot for this this system should attached with motor or pump from accident detection system we can improve our traffic technologies as well as car manufacturing technologies. By Electric vehicle charging system we can increase use of electric vehicles and due to this pollution level should be decrease and it is helpful for maintain global warming.

Conclusion:

Now the world is moving towards automation, so in this world if we want to do some changes in the previously used system we have to use the new techniques. So we need to use renewable energy instead of fossil fuel. To decrease accidents we need to use or improve protection system of car or traffic. To save water we need to use soil moisture irrigation system by this we can also save time of farmers. To decrease pollution level we need to use electric vehicles instead of traditional vehicles. Hence we need to increase number of charging stations and also look for on road vehicle wireless charging for time saving. This paper evaluates the working of Energy management system with accidental protection. This technology overcomes the drawback of Traditional vehicles, fossil fuels, street lights and irrigation system, which saves time, electrical energy and manpower.

Space-based solar power

Name : Disha Devendra Jangam

Space-based solar power (SBSP) is the concept of collecting solar power in outer space and distributing it to Earth. Potential advantages of collecting solar energy in space include a higher collection rate and a longer collection period due to the lack of a diffusing atmosphere, and the possibility of placing a solar collector in an orbiting location where there is no night. A considerable fraction of incoming solar energy (55–60%) is lost on its way through the Earth's atmosphere by the effects of reflection and absorption. Space-based solar power systems convert sunlight to microwaves outside the atmosphere, avoiding these losses and the downtime due to the Earth's rotation, but at great cost due to the expense of launching material into orbit. SBSP is considered a form of sustainable or green energy, renewable energy, and is occasionally considered among climate engineering proposals. It is attractive to those seeking large-scale solutions to anthropogenic climate change or fossil fuel depletion (such as peak oil).

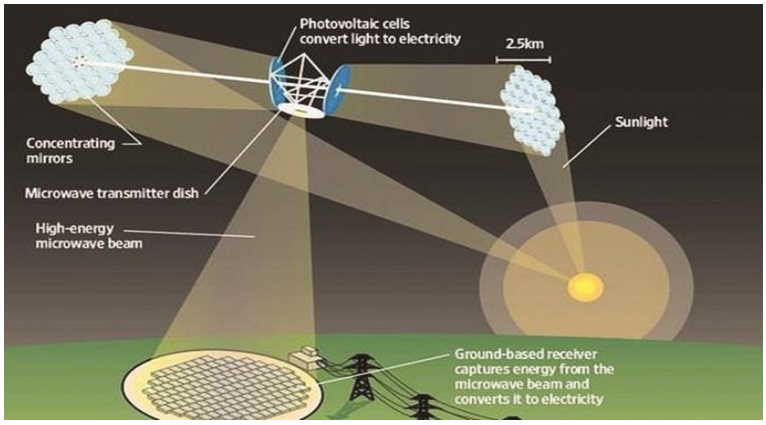
Various SBSP proposals have been researched since the early 1970s, but none are economically viable with present-day space launch infrastructure. Some technologists speculate that this may change in the distant future if an off-world industrial base were to be developed that could manufacture solar power satellites out of asteroids or lunar material, or if radical new space launch technologies other than rocketry should become available in the future.

Besides the cost of implementing such a system, SBSP also introduces several technological hurdles, including the problem of transmitting energy from orbit to Earth's surface for use. Since wires extending from Earth's surface to an orbiting satellite are neither practical nor feasible with current technology, SBSP designs generally include the use of some manner of wireless power transmission with its concomitant conversion inefficiencies, as well as land use concerns for the necessary antenna stations to receive the energy at Earth's surface. The collecting satellite would convert solar energy into electrical energy on board, powering a microwave transmitter or laser emitter, and transmit this energy to a collector (or microwave rectenna) on Earth's surface. Contrary to appearances of SBSP in popular novels and video games, most designs propose beam energy densities that are not harmful if human beings were to be inadvertently exposed, such as if a transmitting satellite's beam were to wander off-course. But the vast size of the receiving antennas that would be necessary would

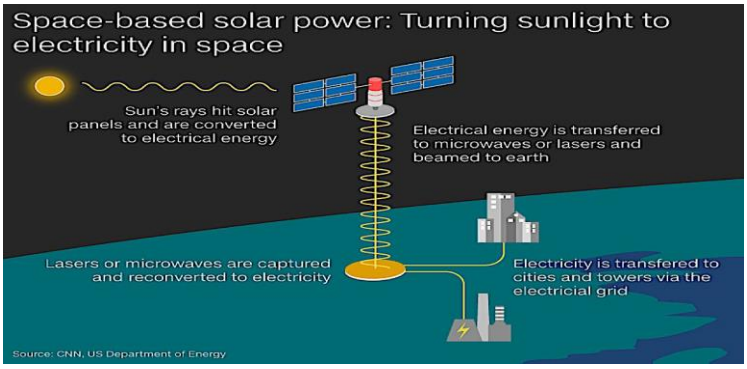
still require large blocks of land near the end users to be procured and dedicated to this purpose. The service life of space-based collectors in the face of challenges from long-term exposure to the space environment, including degradation radiation and micrometeoroid damage, could also become a concern for SBSP.

SBSP is being actively pursued by Japan, China, Russia, India, the United Kingdom and the US.

In 2008, Japan passed its Basic Space Law which established space solar power as a national goal and JAXA has a roadmap to commercial SBSP.

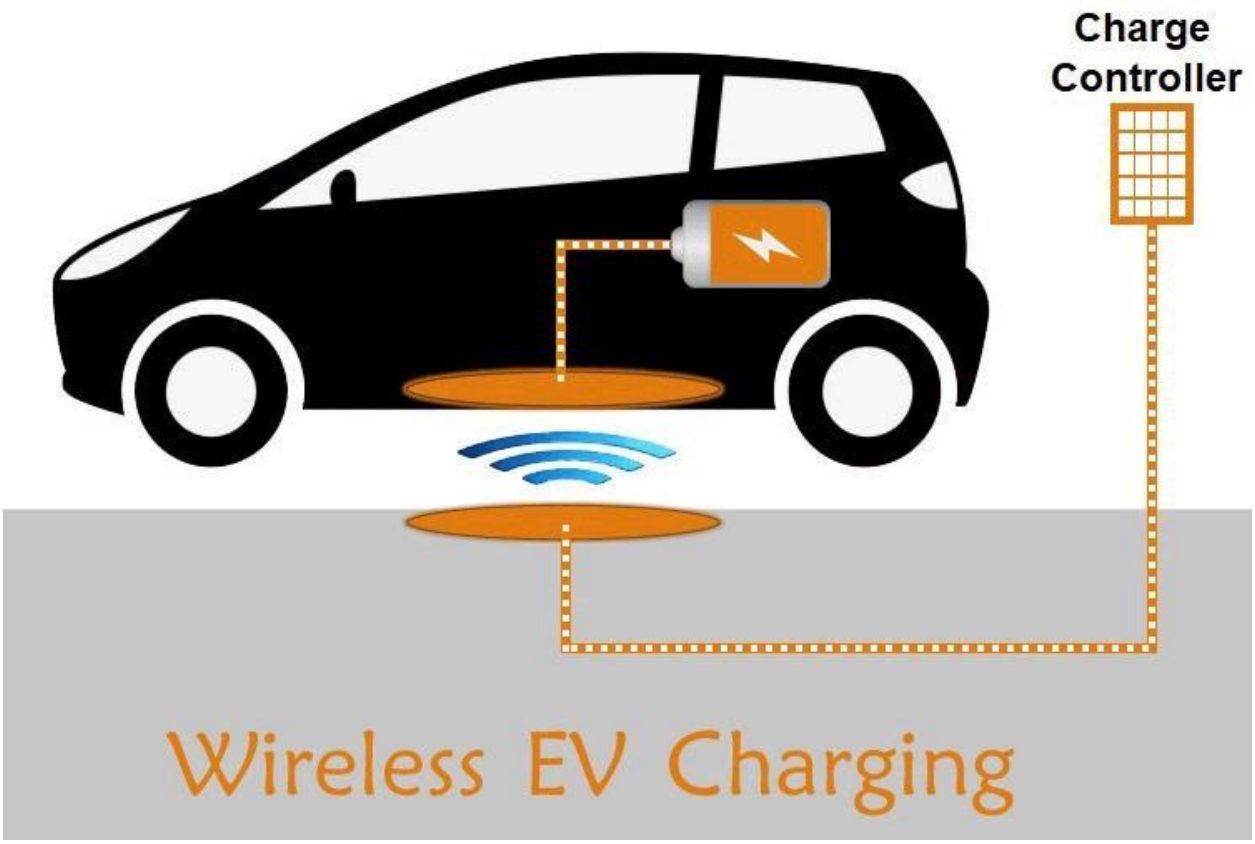


In 2015, the China Academy for Space Technology (CAST) showcased their roadmap at the International Space Development Conference. In February 2019, Science and Technology Daily, the official newspaper of the Ministry of Science and Technology of the People's Republic of China, reported that construction of a testing base had started in Chongqing's Bishan District. CAST vice-president Li Ming was quoted as saying China expects to be the first nation to build a working space solar power station with practical value. Chinese scientists were reported as planning to launch several small- and medium-sized space power stations between 2021 and 2025. In December 2019, Xinhua News Agency reported that China plans to launch a 200-tonne SBSP station capable of generating megawatts (MW) of electricity to Earth by 2035.



Wireless Electrical Vehicle Charging (WEVCS)

Name: Mr. Arihant Ashok Patil

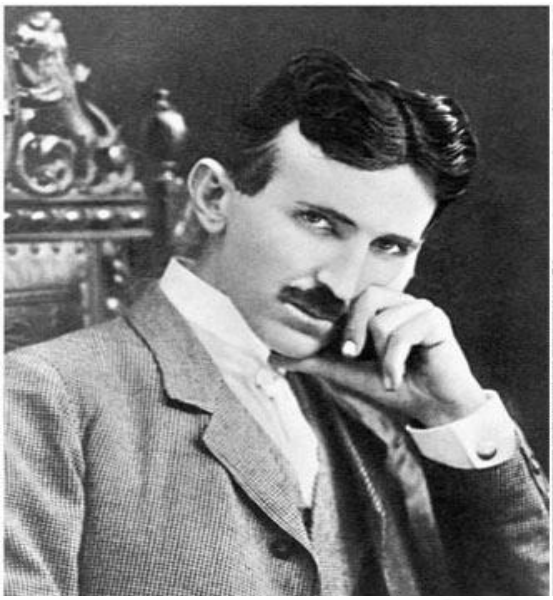


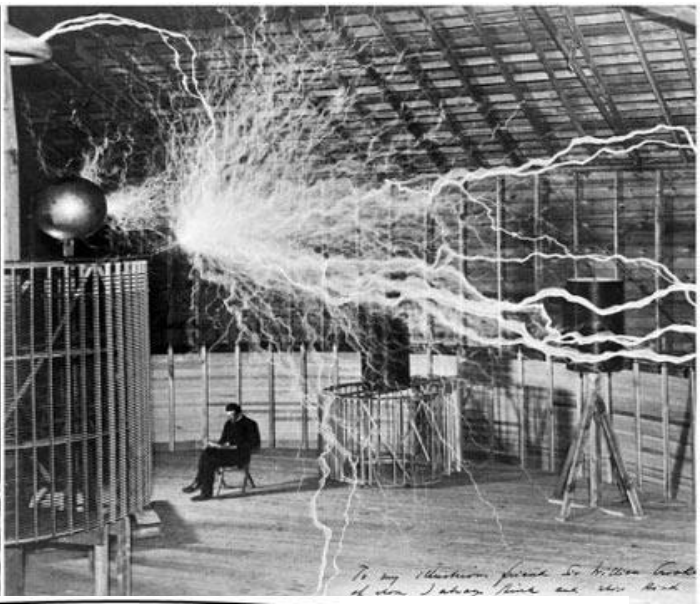
Now a day's world is shifting towards electrified mobility to reduce the pollutant emissions caused by non renewable fossil fuelled vehicles and to provide the alternative to pricey fuel for transportation. But for electric vehicles, travelling range and charging process are the two major issues affecting its adoption over conventional vehicles.

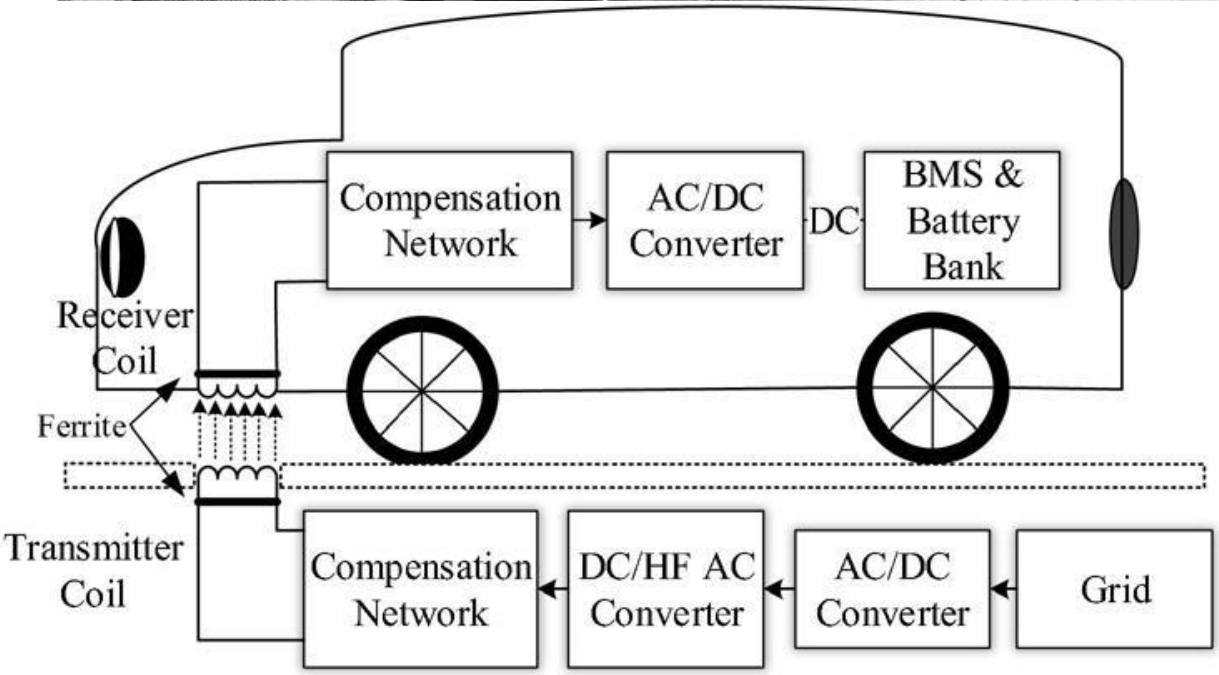
With the introduction of Wire charging technology, no more waiting at charging stations for hours, now get your vehicle charged by just parking it on parking spot or by parking at your garage or even while driving you can charge your electric vehicle. As of now, we are very much familiar with wireless transmission of data, audio and video signals so why can't we transfer power over the Air.

Thanks to great scientist Nikola Tesla for his limitless amazing inventions in which wireless power transfer is one of them. He started his experiment on wireless power transmission in 1891 and developed Tesla coil. In 1901 with the primary goal to develop a new wireless power transmission system Tesla started developing the Wardenclyffe Tower for large high-voltage wireless energy transmission station. The saddest part is to satisfy Tesla's debts; the tower was dynamited and demolished for scrap on July 4th 1917

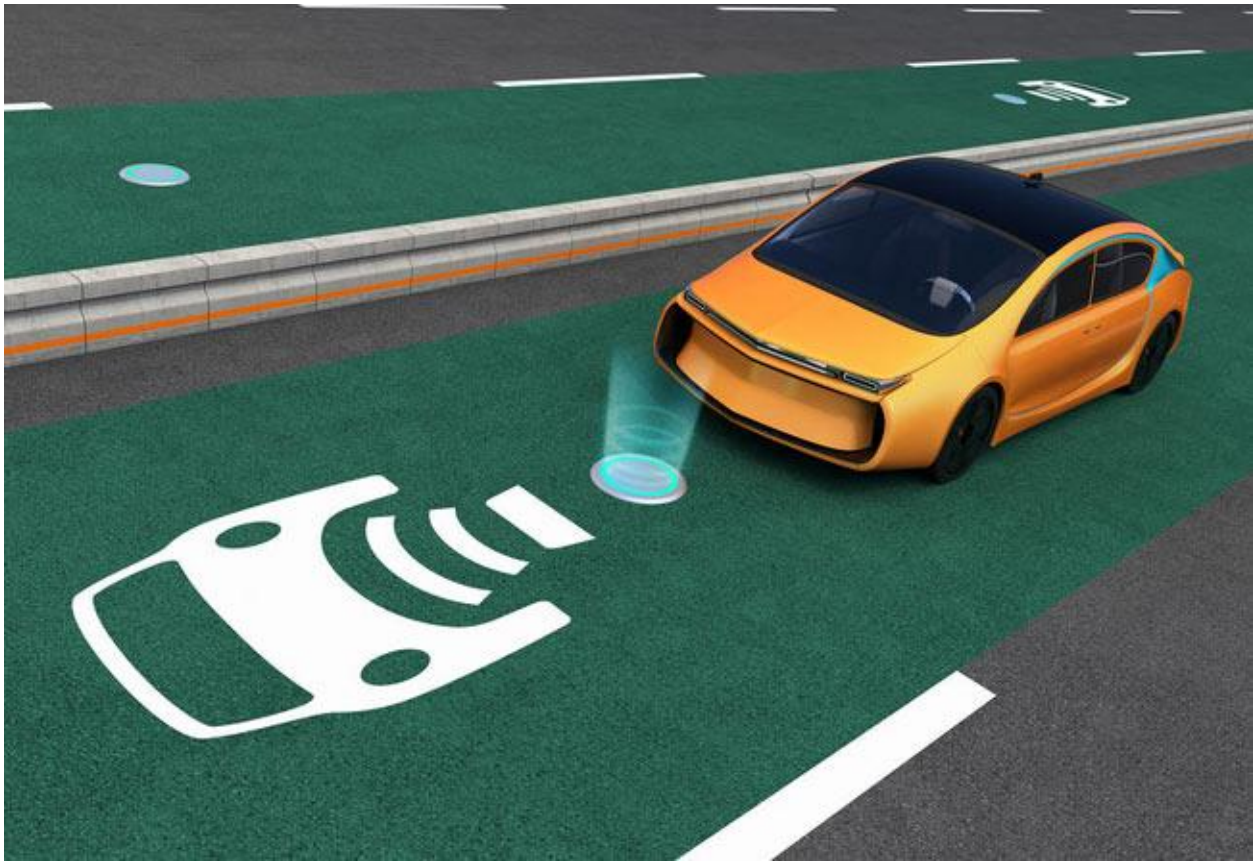
Basic principle of wireless charging is same as transformer working principle. In wireless charging there are transmitter and receiver, 220V 50Hz AC supply is converted into High frequency alternating current and this high frequency AC is supplied to transmitter coil, then it creates alternating magnetic field that cuts the receiver coil and causes the production of AC power output in receiver coil. But the important thing for efficient wireless charging is to







maintain the resonance frequency between transmitter and receiver. To maintain the resonant frequencies, compensation networks are added at both sides. Then finally, this AC power at receiver side rectified to DC and fed to the battery through Battery Management System (BMS).



Static and Dynamic Wireless Charging

Based on the application, **Wireless charging systems for EV can be distinguished into two categories**,

1. Static Wireless Charging
2. Dynamic Wireless Charging

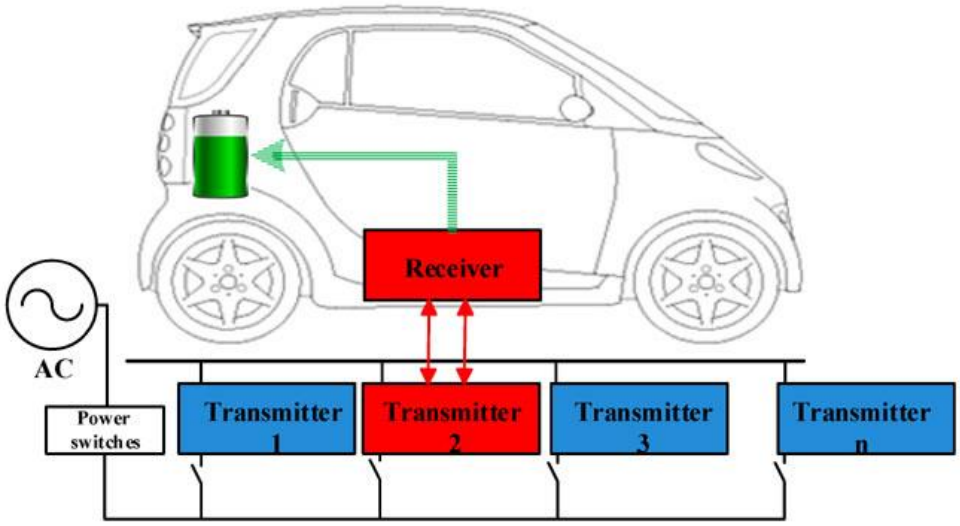
1. Static Wireless Charging

As the name indicates, the vehicle gets charged when it remains static. So here we could simply park the EV at the parking spot or in garage which is incorporated with WCS. Transmitter is fitted underneath the ground and receiver is arranged in vehicle's underneath. To charge the vehicle align the transmitter and receiver and leave it for charging. The

charging time depends on the AC supply power level, distance between the transmitter & receiver and their pad sizes. This SWCS is best to build in areas where EV is being parked for a certain time interval.

2. Dynamic Wireless Charging System (DWCS):

As the name indicates here vehicle get charged while in motion. The power transfers over the air from a stationary transmitter to the receiver coil in a moving vehicle. By using DWCS EV's travelling range could be improved with the continuous charging of its battery while driving on roadways and highways. It reduces the need for large energy storage which further reduces the weight of the vehicle.



Types of EVWCS

Based on operating Techniques EVWCS can be classified into four types

1. Capacitive Wireless Charging System (CWCS)
2. Permanent Magnetic Gear Wireless Charging System (PMWC)
3. Inductive Wireless Charging System (IWC)
4. Resonant Inductive Wireless Charging System (RIWC)

Companies Currently Developed and Working on WCS

- **Evatran group's** making Plug less Charging for passenger EVs like Tesla Model S, BMW i3, Nissan Leaf, Gen 1 Chevrolet Volt.
- **WiTricy Corporation** is making WCS for Passenger cars and SUVs till now it is working with Honda Motor Co. Ltd, Nissan, GM, Hyundai, Furukawa Electric.
- **Qualcomm Halo** is making WCS for Passenger, sport and race car and it is acquired by Witricity Corporation.
- **Hevo Power** is making WCS for Passenger car
- **Bombardier Primove** is making WCS for Passenger car to SUVs.
- **Siemens and BMW** is making WCS for Passenger car.
- **Momentum Dynamic** is making WCS Corporation Commercial fleet and Bus.
- **Conductix-Wampfler** is making WCS for Industry fleet and Bus.

Challenges Faced by WEVCS

- To install static and dynamic wireless charging stations on the roads, new infrastructure development is required as current arrangement are not suitable for the installations.

Automation in lighting system

Name: Amarjeet Sudhir Badave

INTRODUCTION

A good lighting design includes a good controls design. Lighting controls play a critical role in lighting systems, enabling users manually or Automatically to:

- Turn the lights ON and OFF using a switch; and/or
- Adjust light output up and down using a dimmer.

This basic functionality can be used to generate these benefits for the Lighting owner:

- Flexibility to satisfy user visual needs; and/or
- Automation to reduce energy costs and improve sustainability.

In recent years, lighting controls have evolved two additional capabilities:

- Adjust light source colour, including shade of white light; and/or
- Generate data via measuring and/or monitoring.

1) Lighting Automation Technology

In to technological world everything is controlled and monitored by smart touch then why don't light? This demand gave birth to lighting automation technology. Lighting Automation is a sphere used for remote monitoring and controlling of outdoor as well as indoor lights. Lighting automation system is used to Switch ON/ OFF lights. In some cases we can use automation to dim the light. In case of street lights we do not require more brightness during mid night instead; we require more brightness during evening. Lighting automation provide us require brightness as per the requirement without any manual intervention.

As the demand of electric energy increases day by day due to the entry of new upcoming electronic devices / gadgets in human life, there is a gap between supply and demand. So let's use this electronic technology itself as an energy saving tool. Lighting Automation gives us control of all lighting devices on our desktop monitor or we can control our lighting through our smart phones. This technology helps us to control our lighting load with a single click. Smart lighting, for instance, gives flexibility because we can control it with timers, plus can set schedules and monitor bulb status remotely, etc. There are four reasons why you should use smart lighting. First and foremost it can save money on a utilities

bill. That's because a smart lighting network is very energy efficient; it allows us to calibrate when exactly a light should be on. Smart lights can also simplify our life. When preparing to travel, we won't have to physically alter the settings of each smart light or check to see if it is off before we leave., we can do all this remotely, from a far.

2) A Key Factor in Energy Saving

In this fast moving world, people prefer to buy in malls and commercial complexes as they get so many options under single umbrella. Many people choose these commercial complexes as amusement centre. Light plays vital role in these crowded commercial complexes. So lighting automation is a key factor in energy saving in these commercial complexes.

In industrial scenario man hour cost has also increased, so deputing person for fault analysis and resume the system is not an effective solution. Lighting automation provides us exact location and cause of the fault. So breakdown period is reduced. Engineers can also find real time data of a device through lighting automation. This feature of Lighting Automation is highly appreciated by industrials experts. Another major advantage of Lighting Automation is it provides total remaining life of a device which is very much useful in case of preventive maintenance. Considering all these features of Lighting Automation System, this major industry is welcomed by this technocrat world!

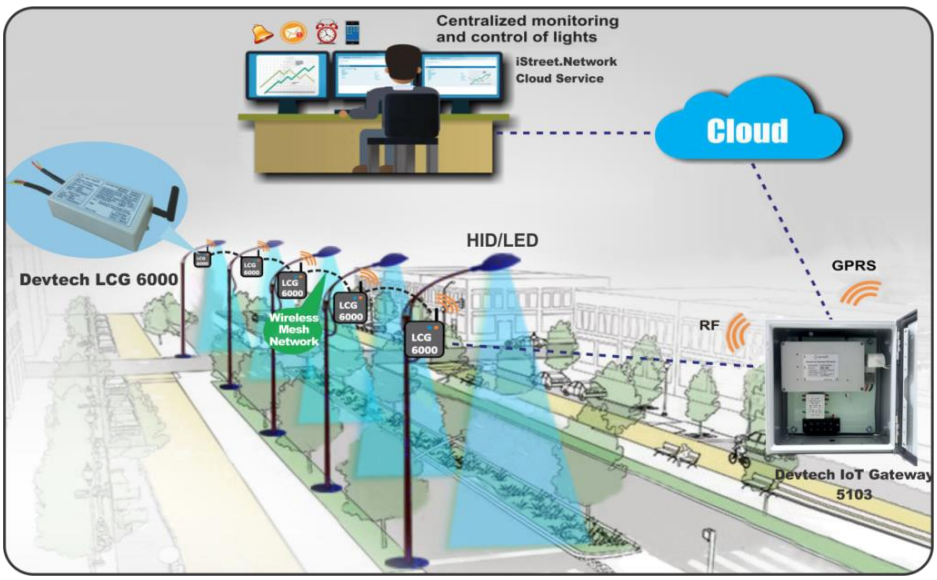
Lighting controls provide the following basic functions. End-users harness. These functions to support energy management and/or visual needs.

WHAT	HOW
Produce the right amount of light …	Light output (intensity) dimming
… where the light is needed …	Zoning of luminaries to controllers
… and when the light is needed.	Automatically reduce lighting when the space is unoccupied
Produce light at the right colour or shade of white light …	Separately dimming arrays of LEDs with different colours or white-light correlated colour temperatures

… allow remote programming and control …	Control systems with programming and lighting management capability
… and tell you how your lights are performing	Centralized intelligent control systems with measuring and/or monitoring/alarm capability -

Lighting is a vital part of life at home. It makes our homes safer, cozier and more welcoming. Lighting plays an important role in our well-being and use of smart lighting system adds elegance, ambience, convenience and energy efficiency to any place. Warm, dimmed light creates a calming atmosphere which encourages socializing and relaxation. At present, incorporating smart lighting in homes is easier than to think.

There are two main types of smart lighting networks: sensor-integrated and non-sensor integrated. Sensor-integrated lights feature sensors that enable them to recognise people and daylight, among other things. These lights automatically send data to the smart lighting network, which sets specific parameters for each light. Although non-sensor integrated lights don't have sensors, they're still considered smart, because we can program them. There are two main ways of controlling smart lights: control hubs and smart devices.



We can use tablets, smart phones, laptops, and even desktop computers (as long as both the device and the smart lights are connected to Wi-Fi or Bluetooth) to remotely configure and manage smart lighting. New technologies, like LED lighting and data science, do not only contribute to energy saving, but at the same time provide opportunities for value adding services.

Application:-

Raise or dim any light in the room or the entire house with a single touch, using just our voice or using remote control or App.

Conclusion:-

The future of the smart lighting market looks promising with opportunities in the residential and commercial sectors. The major drivers of growth for this market are development of smart cities, increasing usage of wireless technology, and increasing awareness of energy saving. Emerging trends, which have a direct impact on the dynamics of the smart lighting industry, include growing demand for Internet of Things (IoT) technology and emergence of light fidelity (Li-Fi) technology in the field of smart lighting market.

References:-

1) www.wikipedia.org

5G Wireless Technologies

Name: Miss. Rutuja Ekate

Introduction:

Fifth generation wireless (5G) is the latest iteration of cellular technology, engineered to greatly increase the speed and responsiveness of wireless networks. 5G will also enable a sharp increase in the amount of the data transmitted over wireless system due to more available bandwidth and advanced antenna technology.

What is 5G?

The process of learning, our way to working, thinking and interaction has all changed due to the internet supported by world wide mobile evolution.

Currently the 4G's concept is marching towards the standardization phase. So, that has come to introduce an technology in which we can connect to multiple wireless technologies, networks, terminals and applications all simultaneously and we can switch between them this latest technology is named as 5G. (5^{th} Generation mobile networks or 5th generation wireless system)

Fifth generation wireless (5G) is the latest iteration of cellular technology, engineered to greatly increase the speed and responsiveness of wireless networks. 5G will also enable a sharp increase in the amount of data transmitted over wireless system due to more available bandwidth and advanced antenna technology.

Features of 5G:

- Worldwide cellular phones.
- Extraordinary data capabilities.
- High connectivity.
- Longer battery life.
- More power and features in hand held phones.
- Large phone memory, more dialing speed, more clarity in audio and video.
- Globally accessible.
- Dynamic information access beneficial to domestic users.
- Data bandwidth of 1Gbps or higher.
- Greater capacity (1000 times capacity of 4G).
- Allow access to parallel multiple services.
- Provide uninterrupted and consistent connectivity.
- Provide high resolution large bandwidth.

Wireless communication has started in each 1970s. In next four decades, a mobile wireless technology has evolved from 1G to 5G generations. Fifth generation technology offers very high bandwidth that user never experience before. The fifth-generation technology offers various new advanced features which makes it most powerful and in huge demand in future.

Fifth generation technology provide facilities camera, MP3 recording, video player etc… That user never image and for children rocking fun with Bluetooth technology. The fifth-generation wireless multimedia internet networks can completely wireless communication with imitation, which makes perfect wireless real World-World Wide Wireless Web (WWWW). 5^{th} generation is based on 4G technologies. The 5^{th} wireless mobile internet networks are real wireless world which shall be supported by LASCDMA (Large Area Synchronized Code Multiple Access), OFDM (Orthogonal Frequency Division Multiplexing), MICCDMA (Multi Carrier Code Division Multiple Access), UMB (Ultra-wideband), and Network – LMDS (Local Multipoint Distribution).

Fifth generation technology offers tremendous data capabilities and unrestricted call volumes and infinite data broadcast together within latest mobile operating system. Fifth generation should make an important difference and add more services and benefits to the world over 4G. Fifth generation should be more intelligent technology that interconnects the entire world without limits.

The 5G networks being planned right now will operate in a high-frequency band of wireless

spectrum-between 30GHZ, in what is known as the millimeter ware spectrum, this millime Tree wave can transfer heap of data at very high speeds, but they don't travel as far as the lower-frequency wave used in 4G networks. High-frequency millimeter wave also have difficulty getting around walls, buildings and other obstacles.

The term 5G speed refers to ratio of data transmitted in units of time over 5G cellular network. It is also known as 5G through put. It is usually measured in Mbps or Gbps. The link from 5G Smart phone towards 5G networks (i.e.gNB or base station) is known as uplink whereas the link from 5G networks to smart phone is known as downlink. 5G speed of about 20 Gbps in the downlink and 10 Gbps in the up mark are benchmarked by 5G operators once the 5Gnetwork matures. Recently many operators have achieved 5G through put or 5G speed in the range of about 5 Gbps.

5G network cell towers can support dozens of antennas in MIMO configuration in comparison to 4G LTE newton cells which support maximum of 8 transmitters and 4 receivers.

Evaluation of 5G:

Future scope:

- 5G is considerable as beyond 2020 mobile communication technology.
- ITU-R launched "IMT for 2020 and beyond" in 2012, setting the stage the stage for 5g.
- Japan and Korea started to work on 5G requirements in 2013.
- NTT docomo did first 5G experimental trials in 2014.
- Samsung, Huawei and Ericsson started prototype development in 2013.
- South Korean SK telecom plans to demo 5G in 2018 at the pyeongchang winter Olympics.
- Japan target is to launch 5G for the 2020 Tokyo summer Olympics.

Know all about Raspberry Pi Board Technology

Name: Miss Tejaswinee Kadam

The Raspberry pi is a single computer board with credit card size, that can be used for many tasks that your computer does, like games, word processing, spreadsheets and also to play HD video. It was established by the Raspberry pi foundation form the UK. It has been ready for public consumption since 2012 with the idea of making a low-cost educational microcomputer for students and children. The main purpose of designing the raspberry pi board is, to encourage learning, experimentation and innovation for school level student. The raspberry pi board is a portable and low cost. Maximum of the raspberry pi computers is used in mobile phones. In the 20th century, the growth of mobile computing technologies is very high, a huge segment of this being driven by the mobile industries. The 98% of the mobile phones were using ARM technology.

Raspberry Pi Technology –

The raspberry pi comes in two models; they are model A and model B. The main difference between model A and model B is USB port. Model A board will consume less power and that does not include an Ethernet port and designed in China. The raspberry pi comes with a set of open source technologies,

i.e. communication and multimedia web technologies. In the year 2014, the foundation of the raspberry pi board launched the computer module that packages a model B raspberry pi board into module for use as a part of embedded systems, to encourage their use.

Raspberry Pi Hardware Specifications –

The raspberry pi board comprises a program memory (RAM), processor and graphics chip, CPU, GPU, Ethernet port, GPIO pins, Xbee socket, UART, power source connector. And various interfaces for other external devices. It also requires mass storage, for that we use an SD flash memory card. So that raspberry pi board will boot form this SD card similarly as PC boots up into windows from its hard disk.

Essential hardware specification of raspberry pi board mainly include SD card containing Linux OS, US keyboard, monitor, and power supply and video cable.

Optional hardware specifications include USB mouse, powered USB hub, case, internet connection, the Model A or B: USB WiFi adaptor is used and internet connection to Model B is LAN cable.

Memory –

The raspberry pi model aboard is designed with 256MB of SDRAM and model B is designed with 51MB. Raspberry pi is a small size PC compare with other PCs. The normal PCs RAM memory is available in gigabytes. But in raspberry pi board, the RAM memory is available more than 256GB or 512GB.

CPU (Central Processing Unit) –

The Central Processing Unit is the brain of the raspberry pi board and that is responsible for carrying out the instruction of the computer through logical and mathematical operations. The raspberry pi uses ARM11 series processor, which has joined the ranks of the Samsung galaxy phone.

Ethernet Port –

The Ethernet port of the raspberry pi is the main gateway for communicating with additional devices. The raspberry pi Ethernet port is used to plug your home router to access the internet.

XBee Socket

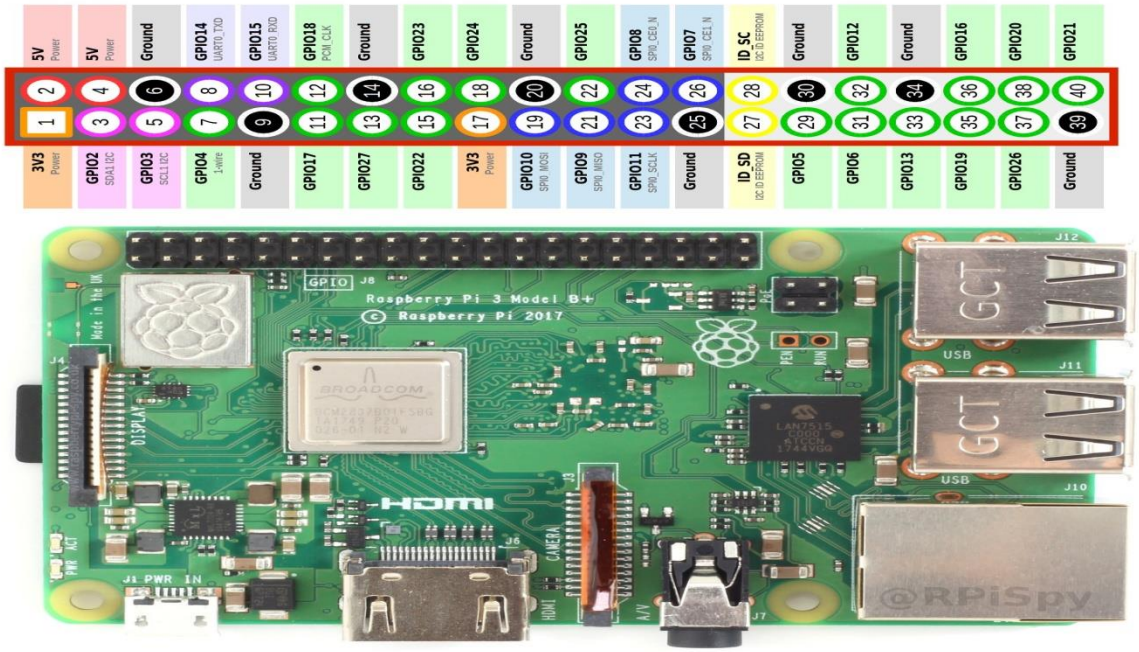
The XBee socket is used in raspberry pi board for the wireless communication purpose.

GPIO Pins –

The general purpose input and output pins are used in the raspberry pi to associate with the other electronics boards. These pins can accept input and output commands based on programming raspberry pi. The raspberry pi affords digital GPIO pins .These pins are used to connect other electronics components. For example, you can connect it to the temperature sensor to transmit digital data.

GPU (Graphics Processing Unit) -

The GPU is a specialized chip in the raspberry pi board and that is designed to speed up the operation of image calculation. This board designed with a Broadcom video core IV and it supports OpenGL.



Power Course Connector

The power source cable is a small switch, which is placed on a side of the shield. The main purpose of the power source connector is use to enable an external power source.

UART

The Universal Asynchronous Receive/Transmitter is a serial input and output port. That can be used to transfer the serial data in the form of text and it is useful for converting the debugging code.

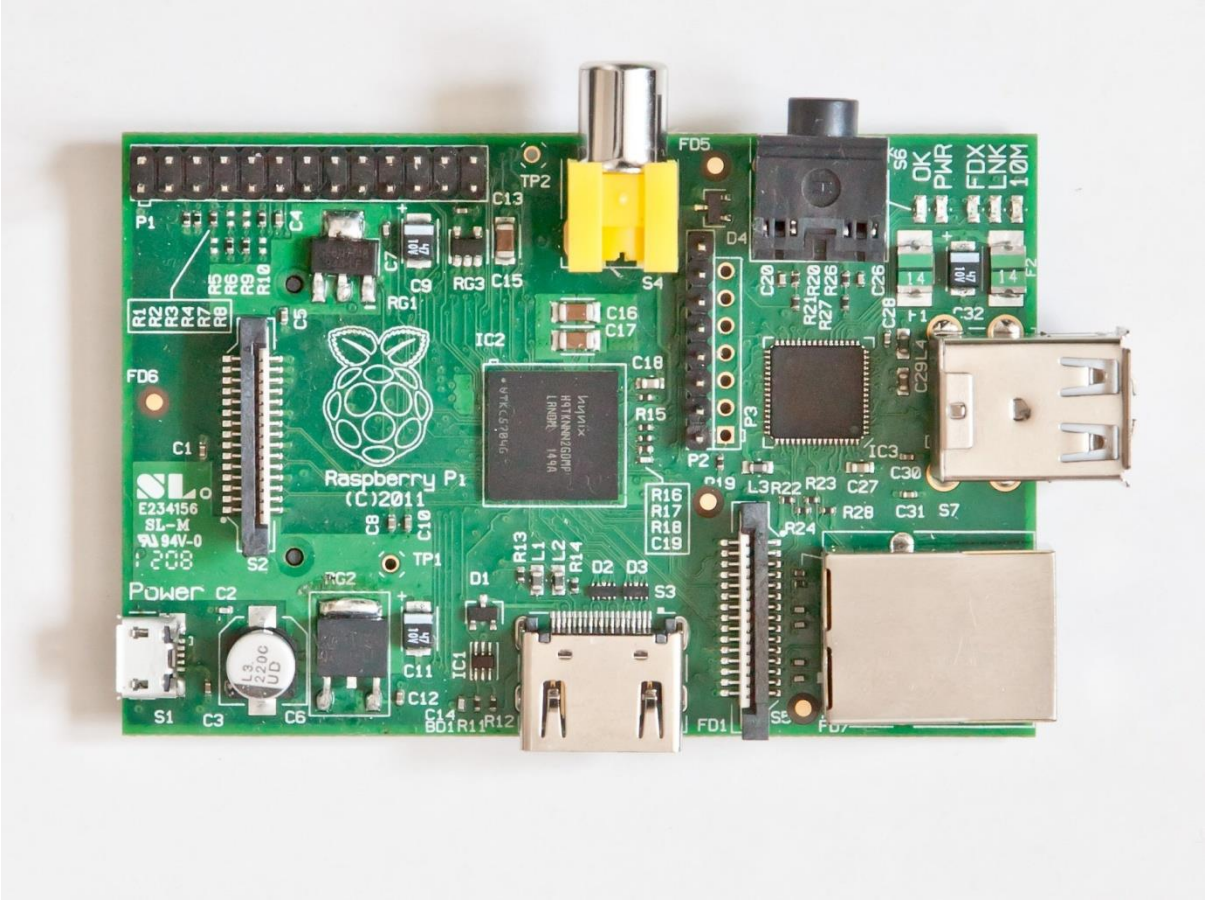
Display

The connection options of the raspberry pi board are two types such as HDMI and Composite. Many LCD and HD TV monitors can be attached using an HDMI male cable and with a low-cost adaptor. The versions of HDMI are 1.3 and 1.4 are supported and 1.4 version cable is recommended. The O/Ps of the Raspberry Pi audio and video through HMDI, but does not support HDMI I/p. Older TVs can be connected using composite video. When using a composite video connection, audio is available from the 3.5mm jack socket and can be sent to your TV. To send audio to your TV, you need a cable which adjusts from 3.5mm to double RCA connectors

.

Model A Raspberry Pi Board

The Raspberry Pi board is a Broadcom(BCM2835) SOC(system on chip) board. It comes equipped with an ARM1176JZF-S core CPU, 256 MB of SDRAM and 700 MHz,. The raspberry pi USB 2.0 ports use only external data connectivity options. The board draws its power from a micro USB adapter, with min range of 2. Watts (500 MA). The graphics, specialized chip is designed to speed up the operation of image calculations. This is in built with Broadcom video core IV cable that is useful if you want to run a game and video through your raspberry pi.



Features of Raspberry PI Model A

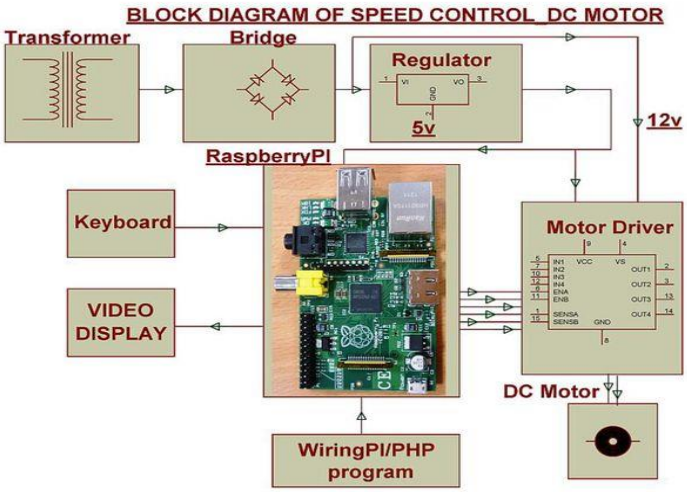
- The Model A raspberry pi features mainly includes
- 256 MB SDRAM memory
- Single 2.0 USB connector
- Dual Core Video Core IV Multimedia coprocessor
- HDMI (rev 1.3 & 1.4) Composite RCA (PAL and NTSC) Video Out
- 3.5 MM Jack, HDMI, Audio Out
- SD, MMC, SDIO Card slot on board storage
- Linux Operating system

- Broadcom BCM2835 SoC full HD multimedia processor
- 8.6cm*5.4cm*1.5cm dimensions

Hardware and software Requirements

DC Motor, Raspberry pi model, TV or PC monitor, Motor Driver IC, LED, Resistors, Capacitors, Diode, Transformer, Voltage Regulator and PHP program/wiring pi

BLOCK DIAGRAM



This project uses a Raspberry Pi board to control the DC motor speed. The speed of a DC motor is directly proportional to the voltage applied across its terminals, When the voltage across the motor terminal is varied, then the speed also gets varied accordingly. So this is the main principle of this project. A keyboard is connected to the Raspberry pi board to run the motor at different speeds by pressing the key.

According to the program, the PWM (pulse width modulation) is caused at the output, and it can be programmed by using PHP/wiring pi. Depending on the duty cycle, the average current and voltage change, so the speed of the DC motor will also change. A motor driver IC is interfaced to the board for receiving PWM signals and sending desired O/P to the DC motor.

List of Raspberry Pi Based Projects

- Programmable Sequential Switching by Using Raspberry pi
- Raspberry Pi Based Solar Street Light
- Synced Music and Christmas Lights

- Raspberry pi Powered Wearable Computer
- Home Automation Using Raspberry pi
- Touch Screen Tablet
- Raspberry pi Based Industrial Automation Using Zigbee Communication

Buy a Raspberry Pi Online

It is always better to buy a raspberry pi board online. Because it saves money as well as time. There are many online sites are listed below to buy a raspberry pi board.

- https://www.modmypi.com/shop
- http://www.crazypi.com/
- http://www.amazon.com/
- http://potentiallabs.com/cart/
- http://downloads.element14.com/raspberryPi3.html?isRedirect=true
- http://authenticate.rsdelivers.com/
- http://shop.pimoroni.com/
- http://uk.rs-online.com/web/p/processor-microcontroller-development-kits/7568308/
- http://www.vesalia.de/
- http://www.aliexpress.com/
- http://www.adafruit.com/
- http://www.100randomtasks.com/

Nuclear Power plant

Name: Miss Simran Hukkeri

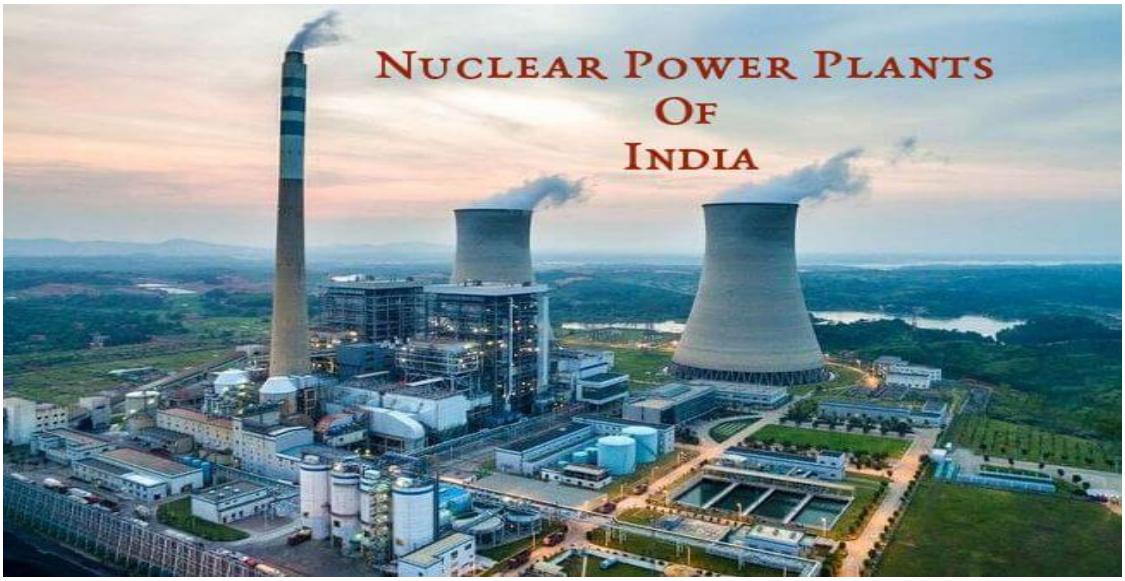
Introduction-

A nuclear power plant (sometimes abbreviated as NPP) is a thermal power station in which the heat source is a nuclear reactor. As is typical of thermal power stations, heat is used to generate steam that drives a steam turbine connected to a generator that produces electricity. As of 2018, the International Atomic Energy Agency reported there were 450 nuclear power reactors in operation in 30 countries around the world. Nuclear plants are very often used for base load since their operations, maintenance, and fuel costs are at the lower end of the spectrum of costs. However, building a nuclear power plant often spans five to ten years, which can accrue to significant financial costs, depending on how the initial investments are financed. Nuclear power plants have a very low carbon footprint (on par with hydroelectricity), and, despite some spectacular catastrophes, are the safest mode of electricity generation.

History

The first time that heat from a nuclear reactor was used to generate electricity was on December 20, 1951 at the Experimental Breeder Reactor I feeding four light bulbs. On June 27, 1954, the world's first nuclear power station to generate electricity for a power grid the Obninsk Nuclear Power Plant commenced operations in Obninsk, in the Soviet Union The world's first full scale power station, Calder Hall in the United Kingdom opened on October 17, 1956.The world's first full scale power station solely devoted to electricity production—Calder Hall was also meant to produce plutonium the Shipping port Atomic Power Station in Pennsylvania United States—was connected to the grid on December 18, 1957.

The science of atomic radiation, atomic change and nuclear fission was developed from 1895 to 1945, much of it in the last six of those years. Over 1939-45, most development was focused on the atomic bomb. From 1945 attention was given to harnessing this energy in a controlled fashion for naval propulsion and for making electricity. Since 1956 the prime focus has been on the technological evolution of reliable nuclear power plants.

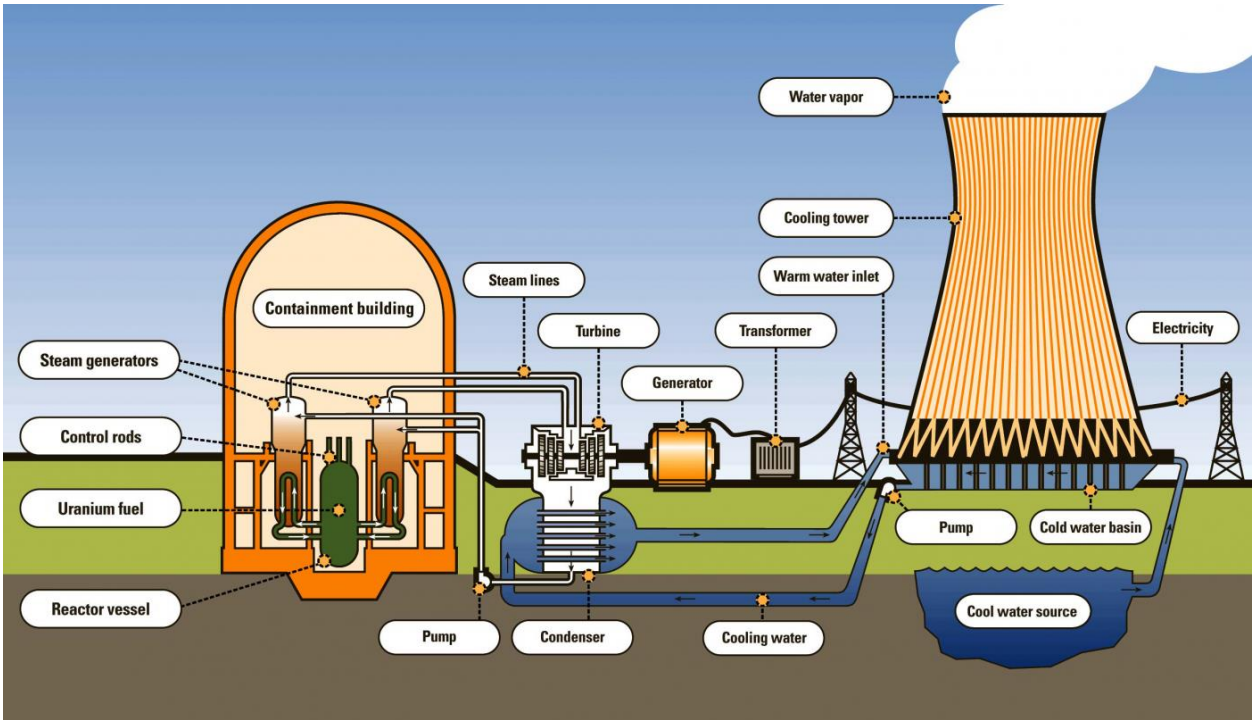


Systems (construction & working) -

The conversion to electrical energy takes place indirectly, as in conventional thermal power stations. The fission in a nuclear reactor heats the reactor coolant. The coolant may be water or gas, or even liquid metal, depending on the type of reactor. The reactor coolant then goes to a steam generator and heats water to produce steam. The pressurized steam is then usually fed to a multi-stage steam turbine. After the steam turbine has expanded and partially condensed the steam, the remaining vapor is condensed in a condenser. The condenser is a heat exchanger which is connected to a secondary side such as a river or a cooling tower. The water is then pumped back into the steam generator and the cycle begins again. The water-steam cycle corresponds to the Rankine cycle.

The nuclear reactor is the heart of the station. In its central part, the reactor's core produces heat due to nuclear fission. With this heat, a coolant is heated as it is pumped through the reactor and thereby removes the energy from the reactor. The heat from nuclear fission is used to raise steam, which runs through turbines, which in turn power the electrical generators.

Nuclear reactors usually rely on uranium to fuel the chain reaction. Uranium is a very heavy metal that is abundant on Earth and is found in sea water as well as most rocks. Naturally occurring uranium is found in two different isotopes: uranium-238 (U-238), accounting for 99.3% and uranium-235 (U-235) accounting for about 0.7%. U-238 has 146 neutrons and U-235 has 143 neutrons.



Different isotopes have different behaviors. For instance, U-235 is fissile which means that it is easily split and gives off a lot of energy making it ideal for nuclear energy. On the other hand, U-238 does not have that property despite it being the same element.

Different isotopes also have different half-lives. U-238 has a longer half-life than U-235, so it takes longer to decay over time. This also means that U-238 is less radioactive than U-235.

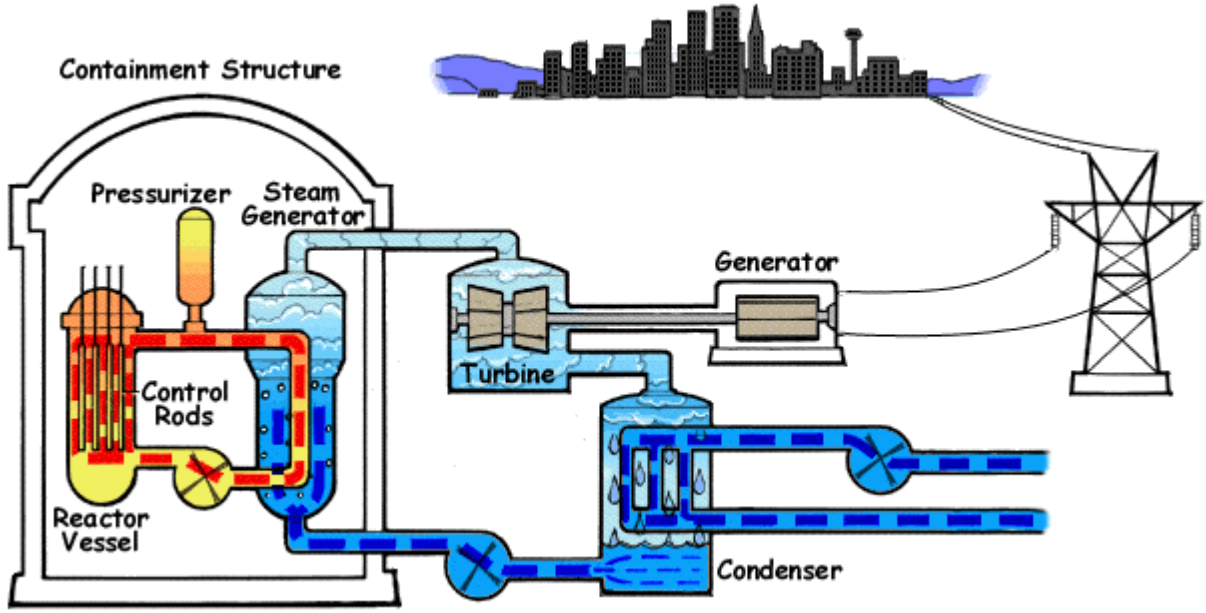
Since nuclear fission creates radioactivity, the reactor core is surrounded by a protective shield. This containment absorbs radiation and prevents radioactive material from being released into the environment. In addition, many reactors are equipped with a dome of concrete to protect the reactor against both internal casualties and external impacts.

The purpose of the steam turbine is to convert the heat contained in steam into mechanical energy. The engine house with the steam turbine is usually structurally separated from the main reactor building. It is aligned so as to prevent debris from the destruction of a turbine in operation from flying towards the reactor. In the case of a pressurized water reactor, the steam turbine is separated from the nuclear system. To detect a leak in the steam generator and thus the passage of radioactive water at an early stage, an activity meter is mounted to track the outlet steam of the steam generator. In contrast, boiling water reactors pass radioactive water through the steam turbine, so the turbine is kept as part of the radiologically controlled area of the nuclear power station.

The electric generator converts mechanical power supplied by the turbine into electrical power. Low-pole AC synchronous generators of high rated power are used. A cooling system removes heat from the reactor core and transports it to another area of the station, where the

thermal energy can be harnessed to produce electricity or to do other useful work. Typically the hot coolant is used as a heat source for a boiler, and the pressurized steam from that drives one or more steam turbine driven electrical generators

In the event of an emergency, safety valves can be used to prevent pipes from bursting or the reactor from exploding. The valves are designed so that they can derive all of the supplied flow rates with little increase in pressure. In the case of the BWR, the steam is directed into the suppression chamber and condenses there. The chambers on a heat exchanger are connected to the intermediate cooling circuit.



The main condenser is a large cross-flow shell and tube heat exchanger that takes wet vapor, a mixture of liquid water and steam at saturation conditions, from the turbine-generator exhaust and condenses it back into sub-cooled liquid water so it can be pumped back to the reactor by the condensate and feed water pumps.

In the main condenser, the wet vapor turbine exhaust come into contact with thousands of tubes that have much colder water flowing through them on the other side. The cooling water typically come from a natural body of water such as a river or lake. Palo Verde Nuclear Generating Station, located in the desert about 60 miles west of Phoenix, Arizona, is the only nuclear facility that does not use a natural body of water for cooling, instead it uses treated sewage from the greater Phoenix metropolitan area. The water coming from the cooling body of water is either pumped back to the water source at a warmer temperature or returns to a cooling tower where it either cools for more uses or evaporates into water vapor that rises out the top of the tower.

The water level in the steam generator and the nuclear reactor is controlled using the feed water system. The feed water pump has the task of taking the water from the condensate system, increasing the pressure and forcing it into either the steam generators—in the case of a pressurized water reactor — or directly into the reactor, for boiling water reactors.

Continuous power supply to the plant is critical to ensure safe operation. Most nuclear stations require at least two distinct sources of offsite power for redundancy. These are usually provided by multiple transformers that are sufficiently separated and can receive power from multiple transmission lines. In addition, in some nuclear stations, the turbine generator can power the station's loads while the station is online, without requiring external power. This is achieved via station service transformers which tap power from the generator output before they reach the step-up transformer.

Safety and Accidents

Modern nuclear reactor designs have had numerous safety improvements since the first-generation nuclear reactors. A nuclear power plant cannot explode like a nuclear weapon because the fuel for uranium reactors is not enriched enough, and nuclear weapons require precision explosives to force fuel into a small enough volume to go supercritical. Most reactors require continuous temperature control to prevent a core meltdown, which has occurred on a few occasions through accident or natural disaster, releasing radiation and making the surrounding area uninhabitable. Plants must be defended against theft of nuclear material and attack by enemy military planes or missiles.

The most serious accidents to date have been the 1979 Three Mile Island accident, the 1986 Chernobyl disaster, and the 2011 Fukushima Daiichi nuclear disaster corresponding to the beginning of the operation of generation II reactors.

Professor of sociology Charles Perrow states that multiple and unexpected failures are built into society's complex and tightly-coupled nuclear reactor systems. Such accidents are unavoidable and cannot be designed around. An interdisciplinary team from MIT has estimated that given the expected growth of nuclear power from 2005 to 2055, at least four serious nuclear accidents would be expected in that period. The MIT study does not take into account improvements in safety since 1970.

Reprocessing

Nuclear processing technology was developed to chemically separate and recover fissionable plutonium from irradiated nuclear fuel. Reprocessing serves multiple purposes, whose relative importance has changed over time. Originally reprocessing was used solely to extract plutonium for producing. Nuclear weapons. With the commercialization of Nuclear power, the reprocessed plutonium was recycled back into MOX nuclear fuel for thermal reactor. The reprocessed uranium, which constitutes the bulk of the spent fuel material, can in principle also be re-used as fuel, but that is only economic when uranium prices are high or disposal is expensive. Finally, the breeder reactor can employ not only the recycled plutonium and uranium in spent fuel, but all the actinides, closing the nuclear fuel cycle and potentially multiplying the energy extracted from Natural uranium by more than 60 times.

Nuclear reprocessing reduces the volume of high-level waste, but by itself does not reduce radioactivity or heat generation and therefore does not eliminate the need for a geological waste repository. Reprocessing has been politically controversial because of the potential to contribute to Nuclear proliferation, the potential vulnerability to nuclear terrorism, the political challenges of repository siting (a problem that applies equally to direct disposal of spent fuel), and because of its high cost compared to the once-through fuel cycle. In the United States, the Obama administration stepped back from President Bush's plans for commercial-scale reprocessing and reverted to a program focused on reprocessing-related scientific research.

TRANSFIRMER HEALTH MONITORING SYSTEM BY USING GSM

Name: Miss. Sameena S. Makhamalla

ABSTRACT

The main aim of the paper is to acquire real-time data of transformer remotely over the internet falling under the category of Global Service Mobile modem (GSM). For this real-time aspect, we take one temperature sensor, one potential transformer and one current transformer for monitoring T, V, I data of the transformer and then send them to a remote location. These three analog values are taken in multiplexing mode and connected to a programmable microcontroller of 8051 families through an ADC 0808. They are then sent directly to a Wi-Fi module under TCP IP protocol to a dedicated

IP that displays the data in real-time chart form in any web connected PC / Laptop for display in 3 different charts. So, This Transformer Health Measuring will help to identify or recognize unexpected situations before any serious failure which leads to a greater reliability and significant cost savings.

INTRODUCTION

1.1Overview:

Electricity plays an important role in our life. Every moment of our life depends upon electricity. The majority of the devices have been in service for many years in different (electrical, mechanical, environmental) conditions. They are the main components and constitute the large portion of capital investment. Operation of distribution transformer under rated condition (as per specification in their name plate) guarantees their long service life. However their life is significantly reduced if they are subjected to overloading, heating low or high voltage current resulting in unexpected failure and loss of supply to a large number of customers thus is effecting system reliability.

1.2 Scope:

Overloading, oil temperature load current and ineffective cooling of transformer are the major cause of failure in distribution transformer. As a large number of transformers are distributed over a wide area in present electric systems, it's difficult to measure the condition manually of every single transformer. So we need a distribution transformer system to monitor all essential parameters operation, and send to the monitoring system in time. It provides the necessary information about the health of the transformer. This will help and guide the utilities to optimally use the transformer and keep this equipment in operation for a longer period.

1.3 Purpose:

This Proposed project presents design and implementation of a IOT embedded system to measure load currents, over voltage, transformer oil level and oil temperature. The output values of sensors are processed and recorded in the system memory. System programmed with some predefined instructions to check abnormal conditions. If there is any abnormality on the system, details are automatically updated in the internet through serial communication. system is used to collect and analyze temperature data over time. So Transformer Health Measuring will help to identify or recognize unexpected situations before any serious failure which leads to a greater reliability and significant cost savings.

1.4 End users :

Transformer is one of the important electrical equipment that is used in power system. Monitoring transformer for the problem before they occur can prevent faults that are costly to repair and result in a loss of electricity. Currently, failure of the transformer can be detected by colour changing of silica gel and decreasing the quality and viscosity of oil. The main aim of the project is to acquire real-time data of transformer remotely over the internet falling under the category of GSM.

For this real-time aspect, we take one temperature sensor, one potential transformer and one current transformer for monitoring Temperature(T), Voltage(V), Current (I) data of the transformer and then send them to a remote location.

1. These three analog values are taken in multiplexing mode and connected to programmable microcontroller of 8051 families through an ADC 080.

2. They are then sent directly to a Wi-Fi module under TCP IP protocol to a dedicated IP that Displays the data in real-time chart form in any web connected PC / Laptop for display in different charts. The real-time data is also seen at the sending end LCD display interfaced with the microcontroller.

LITERATURE SURVEY

In most power companies, for online monitoring of power transformers, use supervisory control and data acquisition(SCADA) system, but for online monitoring of power transformer, the extending the SCADA system is an expensive proposition. Power transformers are currently monitored manually, where a person visits a transformer site, for maintenance and taking records purpose. Butmain drawbacks of these systems are, it cannot provide information about overloads (Voltage& Current) and overheating of transformer oil& windings. Due to these, the transformer life is reduced.

For this we are using Transformer, microcontroller, logic level converter and GSM i.e. global system for mobile communication modem. This GSM modem helps to monitor transformer health by sending message to the system.

The obtained parameters are processed and recorded in the system memory. If any abnormality or an emergency situation occurs the system sends SMS (short message service) messages to the mobile phones containing information about the abnormality according to some predefined instructions programmed in the microcontroller. This mobile system will help the transformers to operate smoothly and identify problems before any catastrophic failure.

DESCRIPTION:

A 230V AC supply is given to the 12 -0-12v transformer. If any fault occurs in transformer while operating, its fault can be sensed using different sensors. Voltage is sensed by bridge rectifier. Current is sensed by using current sensor, Temperature can be detected by using DTH11.All the analog signal is converted into digital by ADC .Voltage is regulated by using 5v voltage regulator. Output is viewed in phone by BLYNK WEB SERVER through NODE MCU wifi module.

In this receiver side internet and blink web server. Blink web server is app which can viewed through mobile phone. When there is any fault occurs in transformer, the digital output will display in phone.

DETAILS OF DESIGN, WORKING AND PROCESS

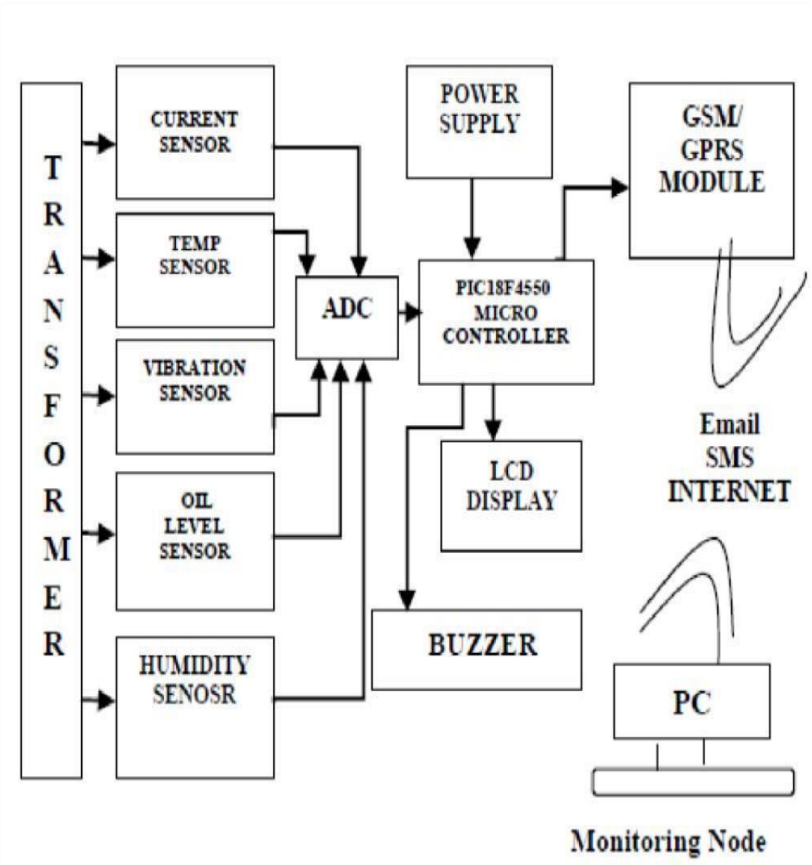
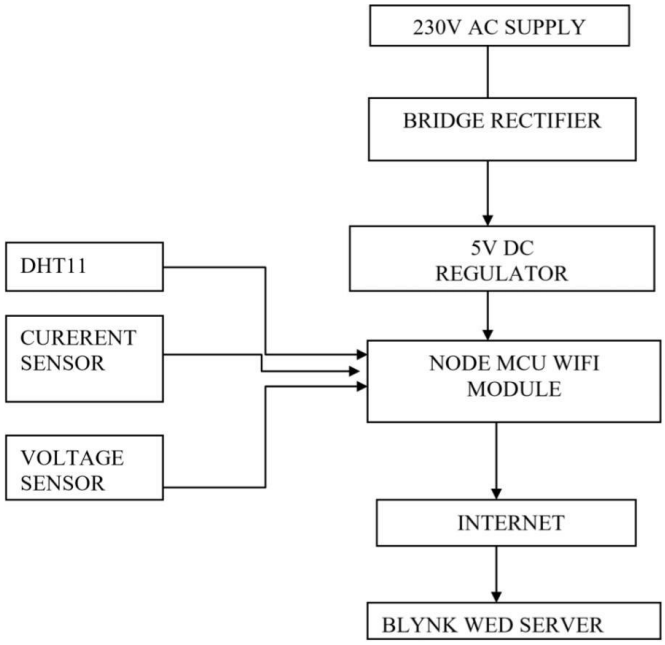


Fig2. BLOCK DIAGRAM OF OVERALL SYSTEM DESIGN



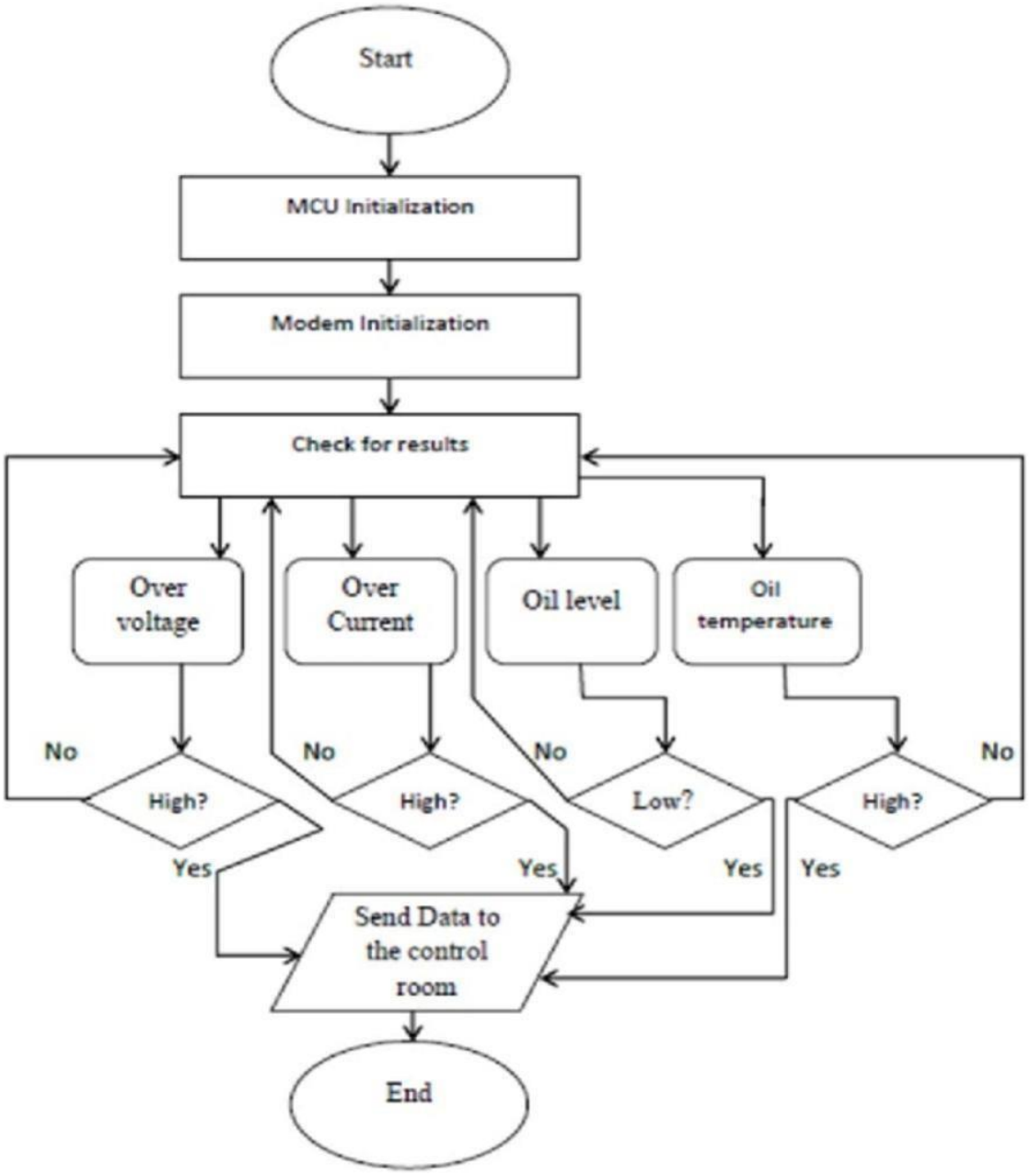


Fig. 1: Flow chart of THMS system

Working And Process

The system design consists of two parts:

A) Hardware Design:

The block diagram shows Implementation of transformer condition monitoring hardware setup of computer aided design using 3D modeling. PIC 18F4550Microcontroller with different sensors such as current sensor, temperature sensor, voltage sensor comes in hardware design as input devices at Remote Terminal Unit (RTU). After getting all parameter values from microcontroller are displayed on liquid crystal display and similarly on web page.

PIC Microcontroller module sends all parameter values to webpage as online interface to engineers. If any emergency condition occurs like overvoltage, over current, rise and fall of oil level, increased temperature range, abnormality in vibrations and change in humidity affects the transformer life, so we are informing engineers by giving notification by SMS through GSM, as well as displaying on LCD with buzzer sound at Remote Terminal Unit (RTU). At monitoring node whole system can be accessed by webpage. The proposed system is discussed below:

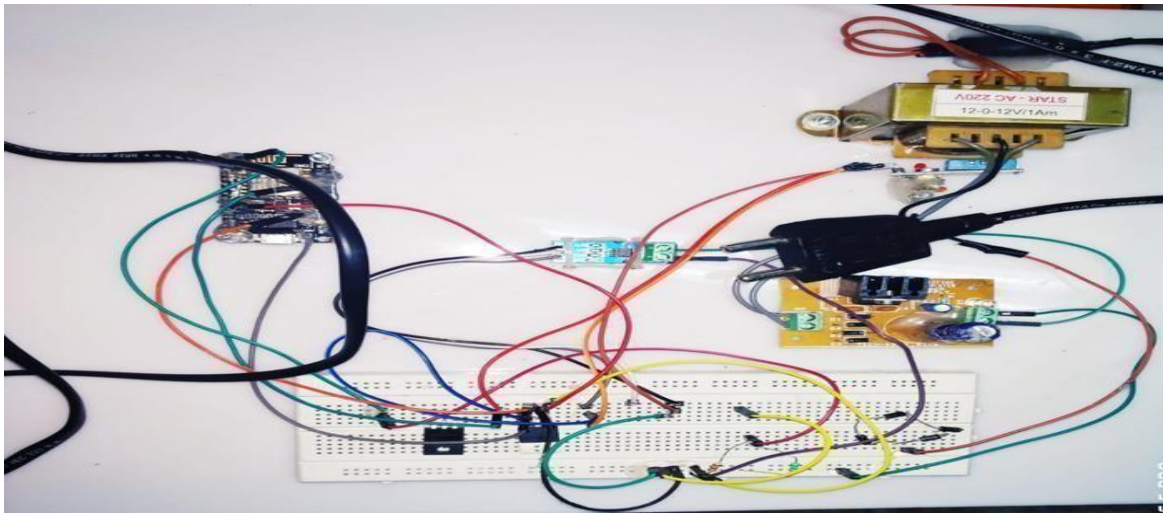


Fig. Hardware implementation of proposed system

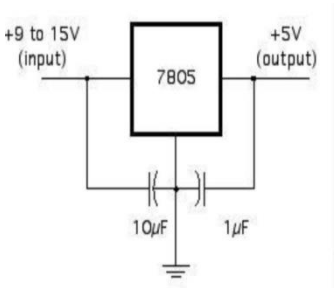
Transformer

Transformer is a passive electrical device that transfers electrical energy from one electrical circuit to one or more circuit. A varying current in any one coil of the transformer produces a varying magnetic flux, which in turn, induces a varying electromotive force across any other coils wound around the same core.

Electrical energy can be transferred between the coils, without a metallic connection between the two circuits. Faraday's law of induction discovered in 1831 described the induced voltage effect in any coil due to changing magnetic flux encircled by the coil.

Transformer range in size from of transformer less than a cubic centimeter in volume to units weighing hundreds of tons used to interconnect the power grid.

5V REGULATOR

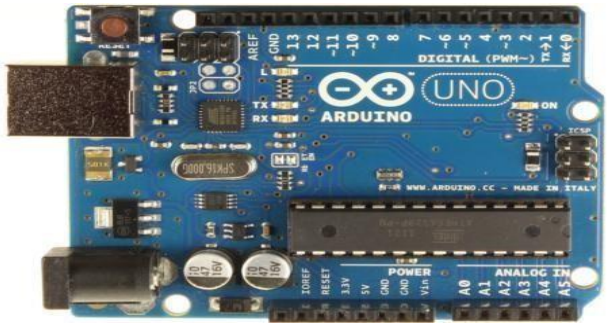


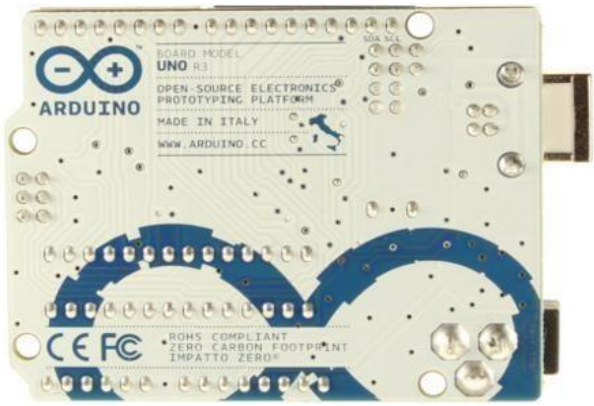
A voltage regulator is a system designed to automatically maintain constant voltage level. It is used to regulate the voltage level. A voltage regulator is may use a simple feed-forward designed or may include the negative feedback. It may electrical components.

Applications:

1. Use in all power supply to electronic gadgets to regulate.
2. Used for electronic circuits to supply precise amounts of voltage.

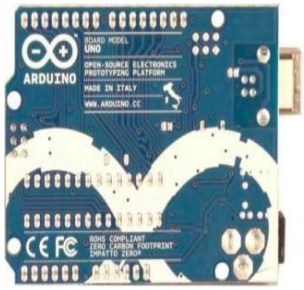
Arduino Uno board





Arduino Uno R3 Front *Arduino Uno R3 Back*

Arduino Uno R2 Front *Arduino Uno* *Arduino Uno Front* *back*



Overview

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

Revision 3 of the board has the following new features:

- 1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Summary

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)

SOFTWARE DESIGN POWER PROGRAM:

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <DHT.h>
// You should get Auth Token in the Blynk App.
// Go to the Project Settings (nut icon). "b7f2fbee2d61425eb7ff15b2b12abbdb"; // Your WiFi credentials.
// Set password to "" for open networks. char
ssid[] = "hello"; char #define DHTPIN 2          // What digital pin we're connected to //
Uncomment whatever type you're using!
#define DHTTYPE DHT11     // DHT 11
//#define DHTTYPE DHT22   // DHT 22, AM2302, AM2321
//#define DHTTYPE DHT21   // DHT 21, AM2301
WidgetLCDlcd(V1);
DHT dht(DHTPIN, DHTTYPE);
BlynkTimer timer;
// This function sends Arduino's up time every second to Virtual Pin (5). // In the app, Widget's reading frequency should be set to PUSH. This means // that you define how often to send data to Blynk App. void sendSensor()
  float h = dht.readHumidity();   float t = dht.readTemperature(); // or
dht.readTemperature(true)
```

It has any negative value than this particular post is detected as theft paint. This compared value is transmitted to electricity board this value display in LCD display. The information will then be quickly processed by the Microcontroller and a SMS will be send through the GSM technology.

APPLICATION *:-*

The hardware of the automatic meter reading and theft control system by using GSM module our project at designed such a system which will automatically collect the reading and also detect the theft current transformer is used to measure the total power consumption for house or industrial purpose.

SF_6 circuit breaker

Name: Mr. Mahamadnouman A. Shaikh

F_6 circuit breaker:

One of the recent developments in the field of high voltage switchgear is the SF6 circuit breaker. In this a gas called sulphur hexafluoride is used as the medium of insulation and arc interruption.

Basic Features of SF6 Breaker:

SF6 is about 5 times heavier than air. It is chemically very stable, odourless, inert, noninflammable and nontoxic. The gas has a high dielectric strength and outstanding arc-quenching characteristics.

In SF6 the arc voltage remains low until immediately before current zero so that the arc energy does not attain a high value. Moreover the arc time constant for SF6 is also very low. Furthermore, SF6 and its decomposition products are electronegative, permitting electron capture at relatively high temperature. Thus the dielectric strength rises rapidly and enables the breaker to withstand the recovery voltage even under extreme switching conditions. In air-blast circuit breakers air is allowed to escape following the quenching operation. This obviously would be uneconomical in the case of SF6 circuit breaker. Hermetically sealed circuit breaker chambers are therefore developed in which even the gas pressure remains practically constant over long periods. Owing to the low contact erosion in SF6 and almost negligible decomposition of the gas in arc, the breaker can be operated for several years without having to be opened for the purpose of overhauling.

Dielectric Properties of SF6

At atmospheric pressure the dielectric strength of SF6 is about 2.5 times that of air. Actually speaking this value will depend upon the nature of field existing between the electrodes, which in turn will depend on the shape and configuration of electrodes, and the gap between the electrodes. The dielectric strength may actually increase to about 5 times depending upon the non homogeneity of the field. Figure (16.10) shows the relation of dielectric strength vs. pressure.

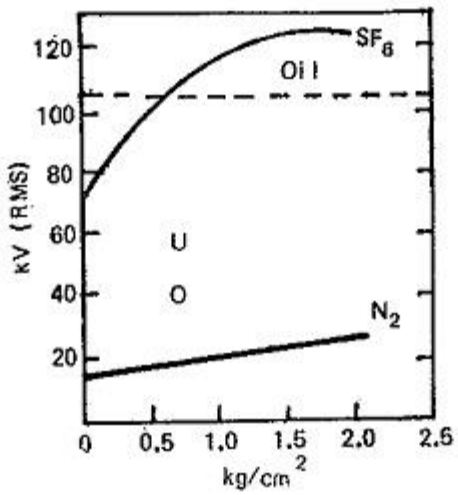


FIGURE 16.10 Dielectric strength vs. pressure for air, oil and SF_6.

It may be seen from the curves that dielectric strength which is 30% less than that of oil at atmospheric pressure increases rapidly with increase of pressure. It attains a value equal to that of oil at a pressure of 650 gm/cm2 and at a pressure of 1.25 kg/cm2 it is about 15% higher.

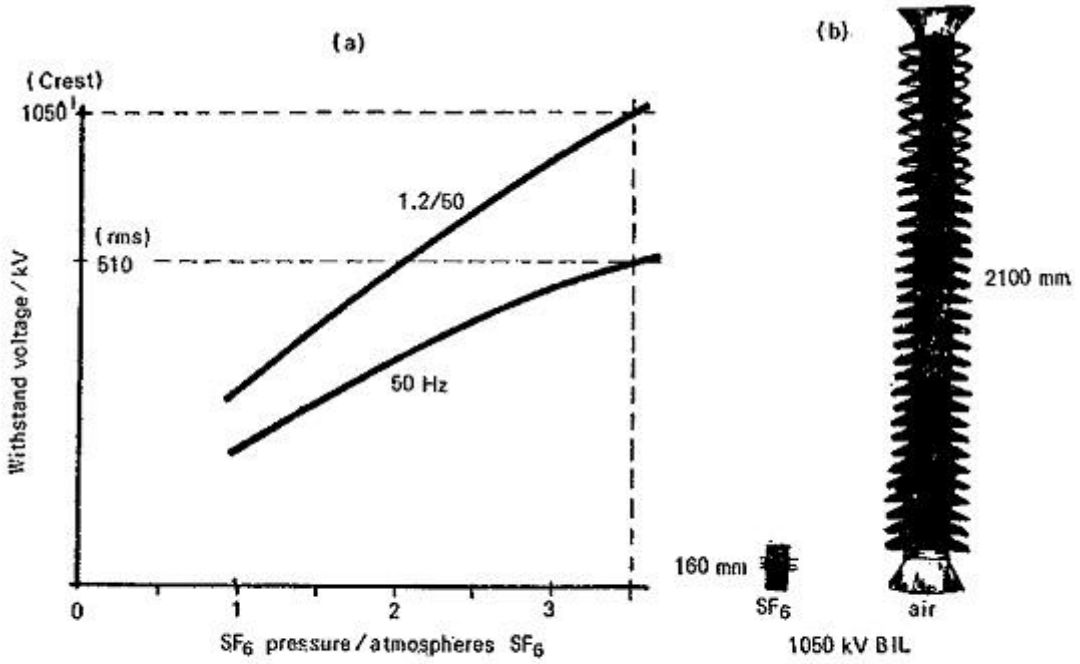


FIGURE 16.11 (a) Insulator in SF_6: impulse and a.c. withstand voltage; (b) comparison of 245 KV insulators in SF_6 and air 1050 KV BIL.

For an insulator with an overall height of 160 mm the impulse and power frequency withstand voltages are shown in Fig. (16.11 a) as a function of the SF6 pressure.

At a pressure of 3.5 atmospheres the withstand voltages are almost equal to those for outdoor post-insulators measuring 2100 mm (Fig. (16.11 b)).

This gas is strongly electronegative, which means that free electrons are readily removed from a discharge by the formation of negative ions through processes by which a free electron is attached to .a neutral gas molecule. The attachment may occur in two ways:

- As direct attachment

$$SF_6 + e^- = SF_6^-$$

- As dissociative attachment

$$SF_6 + e^- = SF_5 + F^-$$

The resulting ions which are heavy and relatively immobile are thus ineffective as current carriers so that ionized SF6 has as high an electric strength as unionized gases such as N2 at equal density.

Quenching Properties of SF6

The extinction of a.c. arc at the instant of current zero is primarily influenced by the speed with which the dielectric strength in the contact gap regenerates immediately before and after the passage of current zero.

Its efficacy as an arc quenching medium can be explained by the tow dynamic time constant (about 1 μs compared with about 100μs in N2) of arcs drawn in it. In the case of cylindrical arcs, the time constant (H) is a function of the square of arc radius (r). The radius of an arc approaching zero should, therefore, be kept to a minimum.

Now SF6 circuit breaker has a favorable thermal characteristic which is a function of temperature, i.e. the thermal conductivity is low between 3000°K and 7000°K whereas it is high below 3000°K.

The low time constant of SF6 is due to its ability for free electrons to be captured by molecules of SF6 gas. These SF6 ions surround the arc and form an insulating barrier. This reduces the diameter of arc column and hence results in reduction of time constant, which aids arc quenching. Figure (16.12) shows time constants of SF6 and air as functions of pressure.

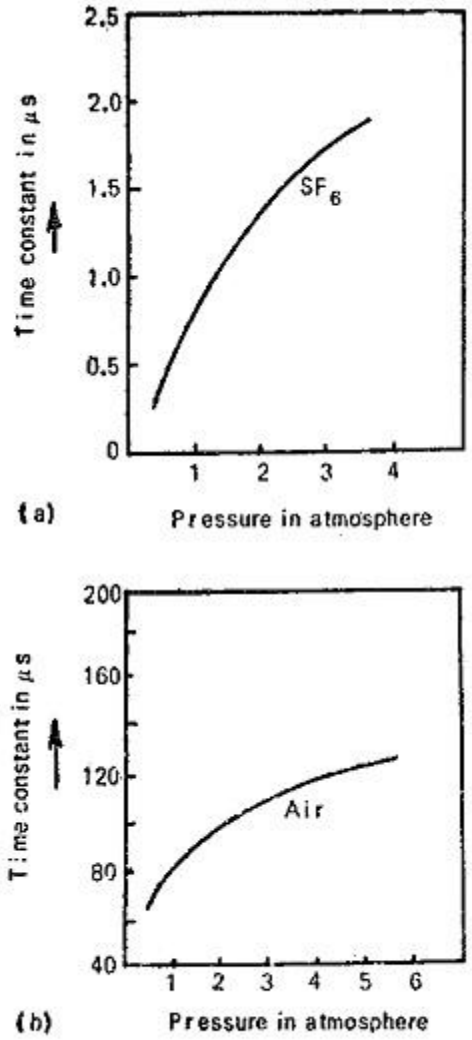


FIGURE 16.12 Time constants of SF_6 and air as a function of pressure.

Conditions are much less favorable where the arc burns in nitrogen. No thin core forms in the critical temperature range between 3000°K and 7000°K because of the good thermal conductivity of nitrogen. The diameter of the arc approaching extinction remains considerably larger and its time constant, which varies as the square of the radius, is therefore, very much greater. The boundary regions below the ionization temperature do not have the same dielectric strength as SF6, because nitrogen is not electronegative. SF6 and almost all its decomposition products are electronegative and have an affinity for electrons. During cooling the dielectric strength of the breaker, therefore, rises more rapidly than, for example, with air.

The influence of low arc time constants on circuit breakers can be seen as follows.

Mayer's equation for the limiting value of recovery voltage after the current has passed through zero above which arc restrikes is given by

$$E = \frac{E_a}{2\sqrt{3}\,(H\omega_0)^2} \text{ volts}$$

Where

Ea = arc voltage.

$\omega 0 = 2\pi f0$ where f0 is the natural frequency of the mains.

H = are time constant.

Since H is 100 times smaller for SF6 than air, for the same value of limiting voltage the natural frequency of mains may be 100 times greater. In other words SF6 circuit breaker can withstand severe RRRV, and thus are most suitable for short line faults without switching resistors, and can interrupt capacitive currents without iestriking.

Behavior of SF6 Gas in ARC:

The high temperature of arc causes all molecular gases, including SF6, to be decomposed into atoms, electrons and ions. These atomic components do not recombine completely to the original SF6 gas on cooling. They form low molecular gaseous sulphur fluorides and compounds with the contact metals, e.g. copper fluorides. Extensive tests have shown that the percentage of gaseous decomposition products is extremely small. These products and any other secondary gaseous reaction products are removed from the gas circuit by filters containing activated aluminum oxide (Al2O3) when the gas is pumped back into the high-pressure tank. The metal fluorides are deposited as a thin nonconductive and harmless layer of fine dust.

Essential Parts of SF6 Breaker:

The essential parts of a SF6 circuit breaker are: (a) the tank, (b) the interrupter units, (c) the operating mechanism, (d) the bushings, and (e) the gas system.

(a) Tank: The distance between line and earthed parts inside the tank is very much reduced due to better insulating properties of SF6. As already illustrated in Fig. (16.11) at 3.5 atmospheres, the dielectric withstands 510 KV at 50 Hz and a 1050 KV BIL test. Even at atmospheric pressure, the insulation distances are sufficient to withstand nearly twice the rated voltage to earth. No large pressure rises are caused due to the operation in SF6, the tanks being designed for a pressure of nearly four times and tested at six times the pressure. Special neoprene gaskets are used in the inspection doors for ensuring protection against leaks. The rotating shaft which transmits mechanical motion to the outside of the tank is sealed by teflon ‘V’ rings which are unaffected by change in ambient temperature.

(b) Interrupter Units: Organic insulation like fiber or micarta should not be located in the arc path since they will be decomposed thus diluting the Teflon which is resistant to arcing and produces negligible gas contamination is generally used.

The interrupter arrangements range from plain break contacts to gas blast designs. Because of its superior arc interrupting ability SF6 gas flow in the orifice is very small, also the flow producing pressures required for arc extinction are only to 1/3 to 1/2 the values required for air.

The arc is extinguished by SF6 gas under a pressure of 14 kg/cm2 which reduces the mechanical energy for operation of the breaker. The important parts of the interrupter are: (i) main reservoir containing gas at 14 kg/cm2, Rip blast valve and control mechanism, (iii) piping for the gas under pressure, (iv) axial flow interrupter units and (v) tripping spring. Capacitor units are placed across each break to ensure equal voltage distribution. Metallic parts are surrounded by electrostatic shields which provide correct distribution of electric field between the interrupter and tank. The various parts are supported by two insulating bars running the whole length of the interrupter.

(c) Operating Mechanism: In operation the tripping spring drives the moving contacts and simultaneously opens the valve of the pressure The gas under pressure flows into the breaking chambers and extinguishes the arc. At the end of the operation the mechanism releases the valve of the pressure reservoir which is closed by the action of a set of springs.

It has been conventional to provide high voltage circuit breakers with compressed-air drives, i.e. switching on by means of compressed air, and switching off by means of charged spring, which is charged during the switching on of the circuit breaker. However, electrical drives can also be provided for the operating mechanisms in circuit breakers.

(d) Bushings: These contain SF6 at a pressure of 2 kg/cm2 and are much simpler than the condenser bushings. They contain a hollow conductor, a fixing flange, the upper and lower porcelain insulators and the springs which hold the assembly together. The SF6 gas in bushings communicates with that in the tank through small holes in the upper part of the hollow conductor. The gas in the bushing is thus unaffected by any disturbances in the tank at the instant the current is broken. A filter containing activated alumina is placed at the bottom of the hollow conductor eliminating all chance of contamination of SF6 inside the bushing.

Toroidal type CTs are located outside the breaker, being threaded on to the bushing externally. The windings are contained in a metal frame and embedded in epoxide resin.

(e) Gas System: A compressor sends the gas back after each break to the high pressure reservoir. Being a closed circuit, no gas escapes to the An auxiliary reservoir of SF6 at 14

kg/cm2 is located below each tank, containing enough gas for four consecutive breaks without the need for starting up the compressor.

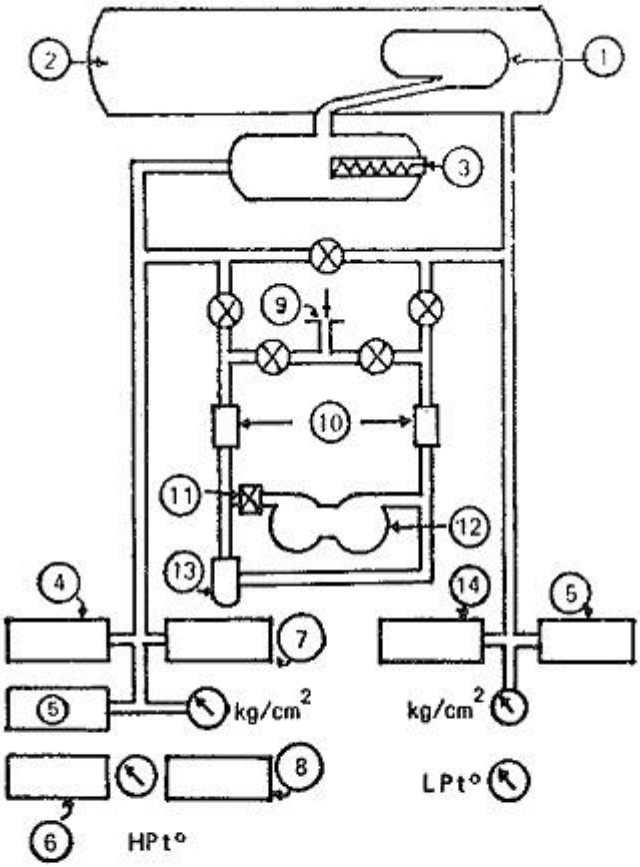


FIGURE 16.13 SF_6 gas circuit and control as fitted to a circuit breaker: (1) high pressure reservoir; (2) low pressure tank; (3) heater resistance; (4) HP alarm; (5) compressor control; (6) HP thermostat; (7) gas control; (8) temperature alarm; (9) test cock; (10) filters; (11) nonreturn valve; (12) compressor; (13) relief valve; (14) LP alarm.

The principal components of the SF6 circuit breaker system are: a filter for removing traces of impurities by the contact of the gas with the arcs, the compressor for circulation of the gas, filter for removal of traces of oil in the gas, a relief valve for holding the valve of the high pressure within correct limits, and safety control devices for maintaining the operating pressure, for considering the mechanism inoperative when the pressure is low, where the temperatures are likely to fall below 5°C. Resistance heaters are provided in the auxiliary reservoir to maintain the gas temperature above the liquefaction point. Figure (16.13) shows the SF6 gas circuit and control as fitted to a circuit breaker.

Puffer Type Breaker:

Figure (16.14) illustrates the mode of operation of a puffer type breaker. The drawings show the contacts in the closed position, opening of the contacts with the gas being initially

compressed, the instant of are extinction with the hot gases flowing through the hollow contacts, and the fully open position. Among the known Puffer type breakers this design has the following outstanding properties.

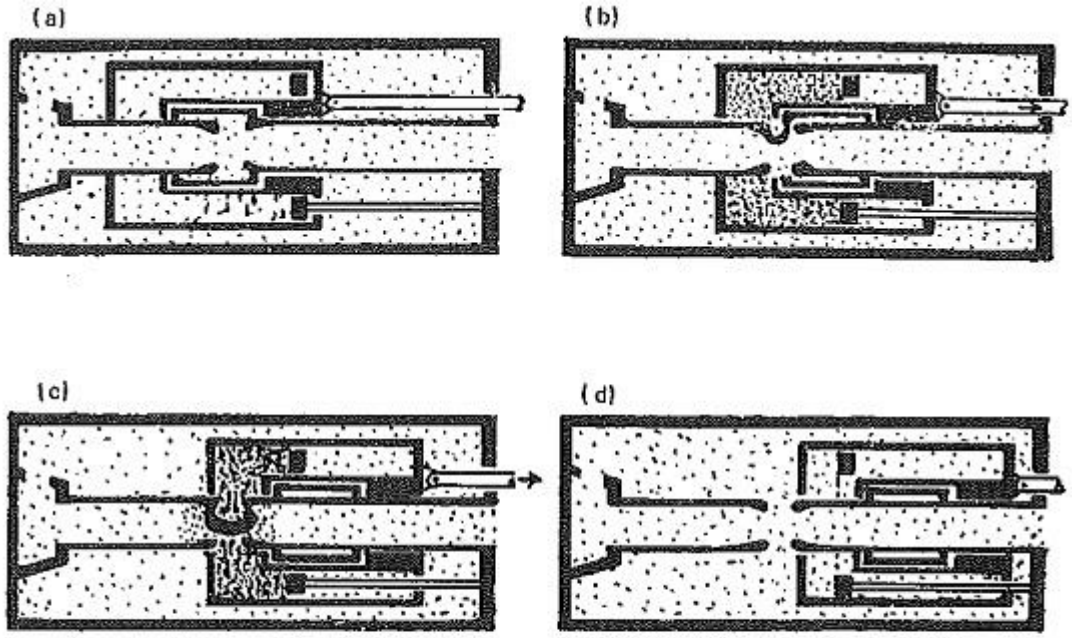


FIGURE 16.14 Operation of a SF_6 puffer-type circuit breaker. Four different interrupting positions are shown: (a) 'closed': equal pressure conditions in the interrupter: (b) contacts just opened: gas in the puffer chamber being compressed by the moving cylinder and fixed piston; (c) contacts at breaking distance: the compressor SF_6 flows through the nozzles, cools and interrupts the arc; (d) 'open': equal pressure conditions in the interrupter.

A relatively small contact clearance is used by taking full advantage of the high dielectric strength of SF6 gas. Together with short contact travel from contact separation to the extinguishing position, this results in a small arc energy, high extinguishing ability and short interrupting time. A wide clearance between the are and the insulation material, the transport of plasma and arcing products to regions with zero or low dielectric stress and a contact clearance not bridged by insulation material make use of the full dielectric properties of the SF6 gas during and after arc extinction.

Metal clad HV Switchgear:

All items of equipment including bus bars, isolators, breakers, etc. are assembled in a self-contained unit. The individual elements are arranged as standardized building blocks allowing diverse combinations to be made to suit the requirements of a given installation. The complete metal enclosure is earthed to provide a safe gas-tight encasement for all line parts. The installation consists of several gas-tight compartments, SF6 pressure is kept at an average

of about 4 atmospheres at 20°C. The breaker has also a high pressure section with about 14 atmospheres at 20°C for quenching the arc and operating the contacts. After every operation gas is raised to the required pressure in a closed circuit by the compressor. The operating mechanism consists of a spring and rewind motor but a hand crank is provided for emergencies. A specially designed cable-end box provides the isolation between the SF6 insulation and cable insulation. It is so designed as to permit all usual types of cables to be connected.

Recent Results and Prospects of Future Development:

Whether these techniques based on new- principles will succeed is more difficult to estimate. It is not probable that a better multiatomic gas than SF6 will be found, but perhaps a better liquid than oil is feasible. There are attractive possibilities of the combination of SF6 insulation with vacuum interrupters. Another recent suggestion is to use liquid SF6 in a container much like oil in minimum oil breakers. This may provide a solution to the problem of higher speed of operation.

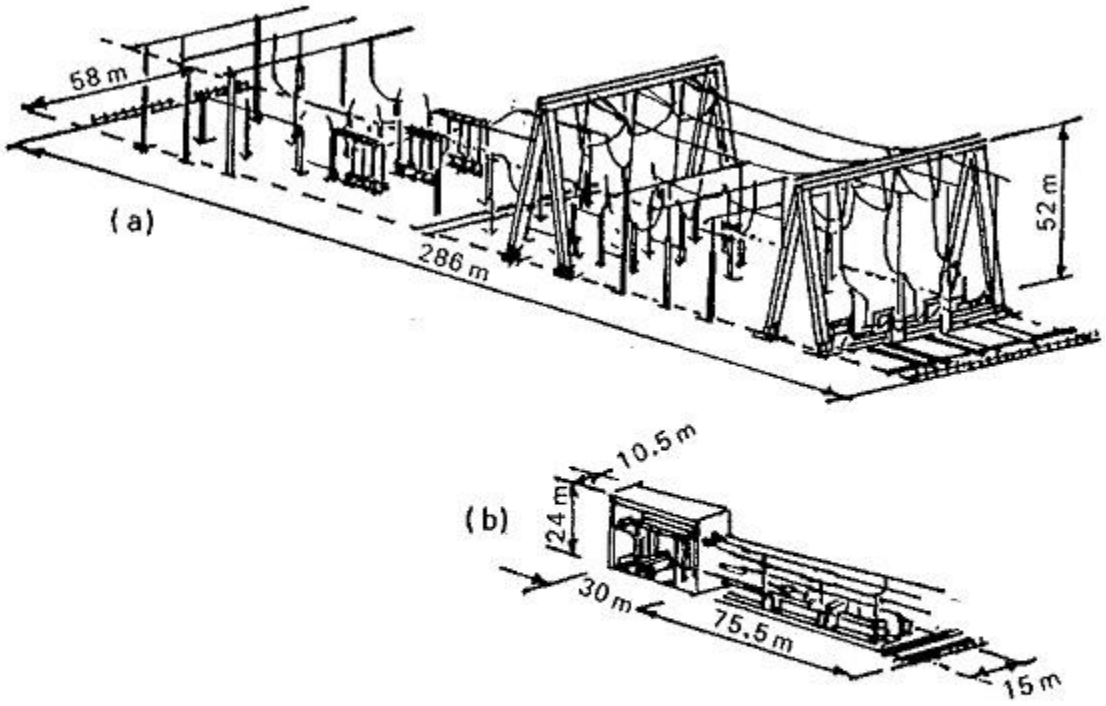


FIGURE 16.15 1300 KV switchgear transformer feeder 3000 MVA, single busbar with auxiliary bus: (a) conventional switchgear: area requirement 16700 m², volume 887800 m³; (b) SF_6 insulated switchgear: area requirement 1500 m², volume 36000 m³.

On the basis of the results obtained so far and in view of the fact that future development looks promising, a paper dealing with switchgear for a maximum operating voltage of 1300 KV has been drafted for CIGRE (Muller, 1971; Boeck and Troger, 1972).

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