BEES Magazine

February 2023

K S R Institute for Engineering and Technology

Department of Electrical and Electronics Engineering

Program Outcomes (POs)

PO1	**Engineering Knowledge:**Applythe knowledge of mathematics, science, and engineering fundamentals to solve thecomplex electrical engineering problems.
PO2	**Problem Analysis:**Identify, formulate, reviewresearchliterature, andanalyzecomplex Electrical and Electronics Engineering problems enabling attainment of conclusions usingfirst principles of mathematics, natural sciences,andengineering sciences.
PO3	**Design/Development of Solutions:**Designsolutions, components or processforcomplexElectricalEngineeringproblemsto meet thespecifiedneedsconsideringpublichealth, safety and environmental considerations.
PO4	**Conduct Investigations of complex problems:** Exerciseresearchknowledge and technical methodology for design,analysisandinterpretationof data to converge to a suitable solution.
PO5	**Modern Tool Usage**: Use modern engineering tools, softwares and equipments to predict, analyze and model engineering problems.
PO6	**The Engineer & Society:** Apply reasoning skills toassesssocietal,health,safety,legalandculturalissuesrelevanttotheprofessional engineering practice and take consequent responsibilities in the society
PO7	**Environment and Sustainability:** Realize theimpactoftheprofessionalengineering solutions anddemonstrate the knowledgeforsustainable developmentin environmental context
PO8	**Ethics:** Apply and realize theprofessionalethicsandresponsibilities in Electrical engineering practice.
PO9	**Individual and Team Work:** Exhibit Individuality, Leadership and Team spirit in multidisciplinarysettings.
PO10	**Communication:** Communicate, comprehend, write reports, design documentation and presentation effectivelyoncomplexengineeringactivities
PO11	**Project Management & Finance:** Demonstrate the Electrical engineeringandmanagementprinciples adhering to financial strategies to manage projects as a member or leader in a team
PO12	**Life Long Learning:** Inculcate independent and life-long learning inthebroadest context oftechnological change.

Program Specific Outcomes (PSOs)

PSO 1: Electrical drives and control: Graduates will Analyze, design and provide Engineering solutions in the field of Power Electronics and Drives

PSO 2: Embedded system: Graduates will Simulate, experiment and solve complex problems in Embedded System.

KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

VISION

To become a globally recognized Institution in Engineering Education, Research and Entrepreneurship.

MISSION

- Accomplish quality education through improved teaching learning process.
- Enrich technical skills with state of the art laboratories and facilities.
- Enhance research and entrepreneurship activities to meet the industrial and societal needs.

Department of EEE

VISION

To produce world class Electrical and Electronics Technocrats and Entrepreneurs with social responsibilities.

MISSION

- Impart quality education in the field of Electrical and Electronics Engineering through state of the art learning ambience.
- Enrich interdisciplinary skills and promote research through continuous learning.
- Enhance professional ethics, entrepreneurship skills and social responsibilities to serve the nation.

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BEES MAGAZINE

Together We Make Difference

February 2023

ENGINEERINGMADESIMPLE!

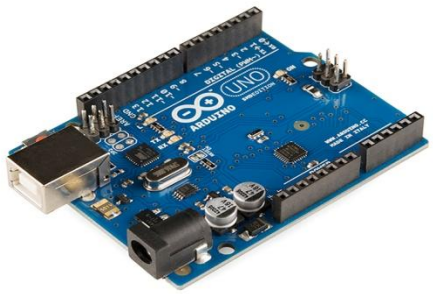
(Understand the Basics of the Components)

M.JEEVA BHARATHI
III-EEE

P. SANTHOSH
III-EEE

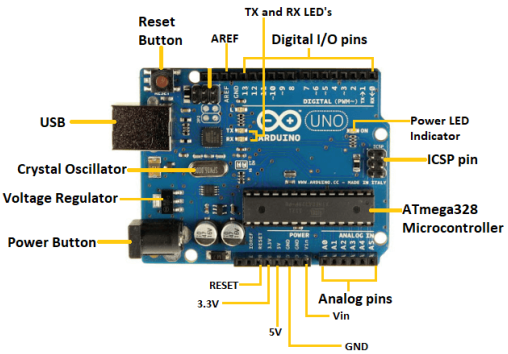
ARDUINO UNO:

Arduino is an open-source hardware and software company, projectand user community thatdesigns and manufactures single-board microcontrollers and microcontroller kits for buildingdigital devices and interactive objects that can senseand control objects in thephysical and digital world.



Starting clockwise from the top center:

- Analog Reference pin (orange)
- Digital Ground (light green)
- Digital Pins 2-13 (green)
- Digital Pins 0-1/Serial In/Out - TX/RX (dark green) – Thesepins cannot be used for digital I/O (digitalRead and digital Write) if you arealso using serial communication(e.g.Serial. Begin).



- Reset Button - S1 (dark blue)In-circuit Serial Programmer (blue green)
- Analog In Pins 0-5 (light blue)
- Power and Ground Pins (power:orange, grounds: light orange)External Power Supply In (9-12VDC)- X1 (pink)
- Toggles External Power and USBPower (place jumper on two pinsclosest to desired supply) -
- SV1 (purple)
- USB (used for uploading sketchesto the board and for serial communication between the board and thecomputer; can be used to power theboard) (yellow)

Advantages:

- Inexpensive
- Cross-platform
- Simple, clear programming environment
- Open source and extensible software

RASPBERRY PI:

A small and affordable computer that you can use The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in schools and in developing countries.

Two 5V pins and two 3V3 pins are present on the board, as well as a number of ground pins (0V), which are unconfigurable. The remaining pins are all general purpose 3V3 pins, meaning
Outputs are set to 3V3 and inputs are 3V3-tolerant.

Outputs:

A GPIO pin designated as an output pin can be set to high (3V3) or low (0V).

Inputs:

A GPIO pin designated as an input pin can be read as high (3V3) or low (0V). This is made easier with the use of internal pull-up or pull-down resistors. Pins GPIO2 and GPIO3 have fixed pull-up resistors, but for other pins this can be configured in software.

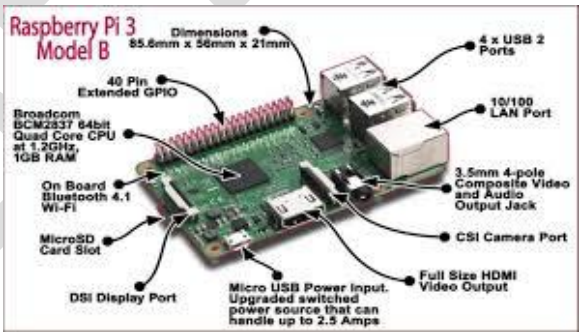
As well as simple input and output devices, the GPIO pins can be used with a variety of

SPI:

- ✓ SPI0: MOSI (GPIO10); MISO (GPIO9); SCLK (GPIO11); CE0 (GPIO8),CE1 (GPIO7)
- ✓ SPI1: MOSI (GPIO20); MISO (GPIO19); SCLK (GPIO21); CE0 (GPIO18); CE1 (GPIO17); CE2 (GPIO16)

I2C:

- ➢ Data: (GPIO2); Clock (GPIO3)
- ➢ EEPROM Data: (GPIO0); EEPROM Clock (GPIO1)



Serial:

- o TX (GPIO14); RX (GPIO15)

Applications:

- Home Automation System
- Miniature Camcorder
- Zero-Powered Smartphone
- Xbox Zero
- AI Assistant
- Wireless Print Server
- Motion Capture Security Camera.

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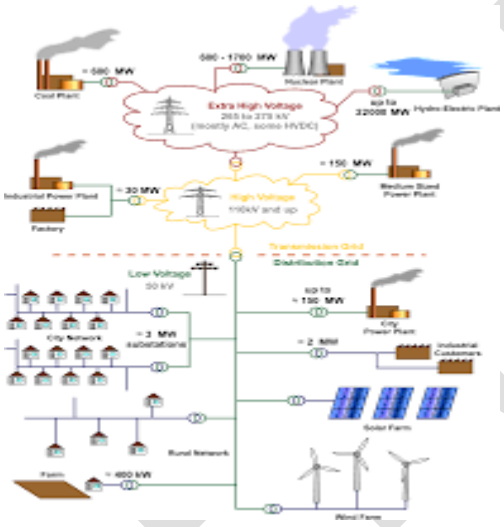
IMPACT OF ELECTRICAL ENGINEERING IN DIGITALIZATION

C.KAMALESH **T.BALAJI**
III-EEE **III-EEE**

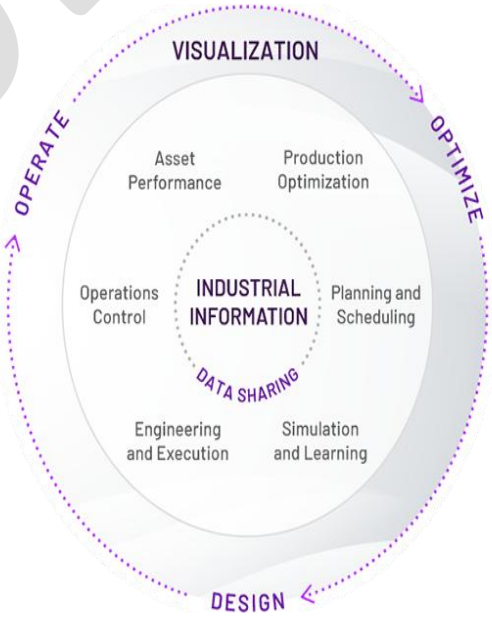
Introduction:

Today's world is world of high technology starting from most complex rocket science including AIrobots. The technical world is dominating the human. Our country India which is developing country isdigitalization in the Sector of electrical machinery, electronic manufacturing, high speed internet,broadband highway etc.



The electrification of Indian rail network was increasing day by day and In future we have high speedbullet train which get more electricity to run in high speed,

The electrification of airports in India was also increasing day by day and in future we have more airports to run this airport in future we want more electricity, In India the vehicles are increasing day by day which need more petrol or diesel to run but in future wedo not have more petrol or diesel to run. To short out this problem In future we have another goodtechnology that is **ELECTRIC CAR** which needs electricity to run,In future we have ROBOTS and there also we need electricity and In India the quantity of homes, buildings, and hospitals, super markets etc are increasing where we need more electricity. In this all fieldthe hand of **"ELECTRICAL ENGINEERING" is INVALUABLE.**



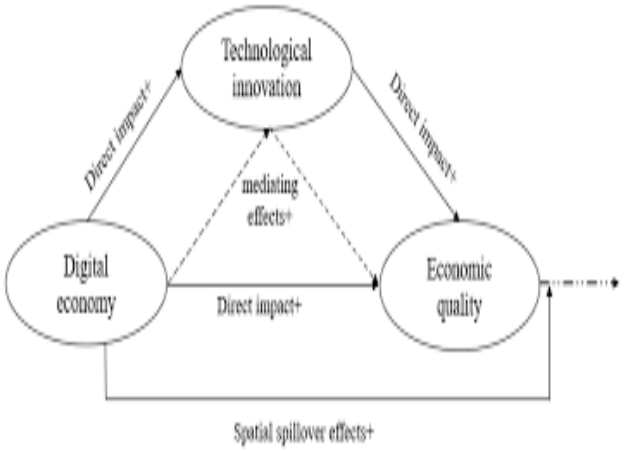
Electrical Engineering is the main force behind the digital India, make in India and the power ministryfocus on three things one is the village electrification, second one is household electrification andumbrella program for 24×7 power supply. For the

continuous supply of power to the smart cities, railsnetworks, airports, etc. is very

essential to have strong and smart transmission and distribution systems.

The electrical machinery industry contributes massively to the capital goods sector of India and theelectrical machinery industry holds about 69% share in the capital goods industry.

The Indian government has **started "MAKE IN INDIA"** plan and it is a way ahead. **MAKE IN INDIA** waslaunched in 25 September 2014 with objective of job creation, skill enhancement and transform India intoglobal design and manufacturing hub.



Now India is the 4th largest wind power capacity in the world and its capacity stands at 34 GW,6th largest solar power capacity in the world and its capacity stands at 22 GW and7th largest producer of hydroelectric power in the world and its capacity at 44,594 MWBiomass power is the installed in India which produces 8.1 GW power as in November 2017.

The total power generation in India is 70 GW in 2017-2018.

The Indian government has set target of adding 175 GW power in the country by 2022!!

After the surveying of all this above information we found that In future **ELECTRICAL ENGINEERING is much more helpful for MAKE IN INDIA AND DIGITAL INDIA POGRAM.**

Conclusion:

As a result, electrical engineers have made significant contributions to society and improved our quality of life. Electrical engineers contribute to the generation of energy from power plants, contributions to medicine and biology, contributions to telecommunications, and contributions to computer systems.

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SMART CARD

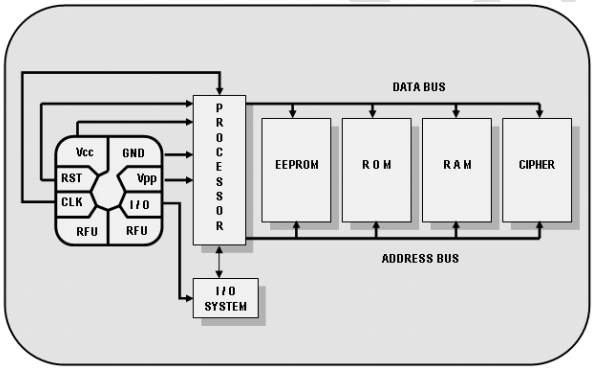
S. KARTHICK RAJA
III-EEE

S.SUBHASH
III-EEE

What is a Smart Card?

A smart card is a special type of card like device which contains an integrated circuit chip embedded onit. The IC chip can be a microprocessor with memory or just simple memory circuit. In simple layman'swords, a smart card is the card with which we can exchange the data, store it and manipulate data.

Smart cards are designed to be tamper-resistant and use encryption to provide protection for in-memory information. Cards with microcontroller chips can perform on-card processing functions and manipulate information in the chip's memory.

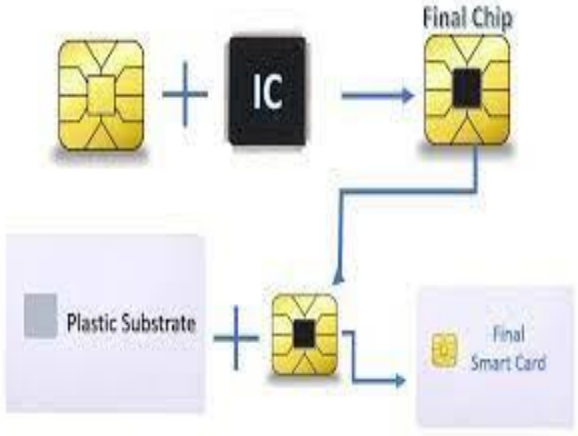


How does the Smart Card Works?

A smart card is connected to the host computer or controller via a card reader which gets informationfrom the smart card and accordingly passes the information to the host computer or controller.

What is a Smart Card Reader?

A smart card reader is a device to which the smart card is connected either directly or



indirectly using RFcommunication. It interfaces with the PC or a microcontroller using USB port or RS232 serial ports. Itcan be a contact or contactless reader.

Types of Smart Card based on Connection to the Smart Card Reader

Contact Smart Card: This type of smart card consists of electrical contacts which are used toconnect to the card reader where the card is inserted. The electrical contacts are deployed on aconductive gold-plated coating on the card surface. A Contact Smart Card with Electrical Connections

Contactless Smart Card: This type of smart card communicates with the reader without any physicalcontact. Rather it consists of an antenna with which it is used to communicate using Radio Frequencyband with the antenna on the reader. It usually receives power from the reader via the electromagneticsignal.

Types of Smart Cards based on their Functionalities and Configuration

Memory Cards: These are cards which only consist of memory circuits. It can only store, read andwrite data to a particular location. The data cannot be processed or manipulated. It can be a straightmemory card which is only used to store data or a protected memory card with a restricted access tothe memory and which can be used to write data. It can also be a rechargeable or a disposable cardwhich contains memory units which can be used only once.

Memory Smart Card

Microprocessor Based Cards: These cards consist of microprocessor embedded onto the chip inaddition to the memory blocks. It also consists of specific sections of files with each file associatedwith a particular function. The data in files and the memory allocation is managed via an operating system which can be a fixed operating system or dynamic operating system. It allows for dataprocessing and manipulations and can be used for multi-functioning.

Steps to Construct a Smart Card:

- The first step involves designing. The designing involves specifying the chip for the memory size, clockspeed, volatile memory types, type of operating system and specifying the application software,specifying the card type, size and functioning and additional features.
- The second step involves chip fabrication. This involves mounting the silicon chip on an epoxy glasssubstrate with gold plated connectors, using a die. The silicon chip is bonded to the connectors usingconnecting wires (wire bonding technique) or using flip chip technology (using a solder). The chip onboard substrate is then sealed using epoxy resin and glued to the card substrate. The card substrate canbe PVC based plastic card or Polyester based card.
- The third step involves loading the code to the memory using special commands.
- The fourth step involves data loading into the PROM memory such that the data pertains to the singleperson.

Advantages of Smart Card:

- ✓ Might be promptly reconfigured

- ✓ Reusable
- ✓ Secure transactions
- ✓ Gives more security
- ✓ More tough and dependable
- ✓ Permit numerous provisions to be saved in one card

Smart Card Applications:

Telecommunications: The most prominent use of smart card technology is in the developmentof SIM card or Subscriber Identity Module. A SIM card provides unique identification to eachsubscriber and provides network access to each subscriber and manages its authentication.

Domestic: The most frequently used smart card in domestic field is the DTH smart card. This cardprovides authorized access to the information coming from the satellites. In simple words the cardwith which we can get access to the Direct to Home TV services is nothing but a smart card. Theinformation is encrypted and decrypted within a smart card.

Ecommerce and Retail: Smart card can be used to store information like a person's account details,

Benefits:

The benefits of smart cards are directly related to the volume of information and applications that are programmed for use on a card. A single contact/contactless smart card can be programmed with multiple banking credentials, medical entitlement, driver's license/public transport entitlement, loyalty programs and club memberships to name just a few. Multi-factor and proximity authentication can and has been embedded into smart cards to increase the security of all services on the card. For example, a smart card can be programmed to only allow a contactless transaction if it is also within range of another device like a uniquely paired mobile phone. This can significantly increase the security of the smart card.

Governments and regional authorities save money because of improved security, better data and reduced processing costs. These savings help reduce public budgets or enhance public services. There are many examples in the UK, many using a common open LASSeO specification.

Individuals have better security and more convenience with using smart cards that perform multiple services. For example, they only need to replace one card if their wallet is lost or stolen. The data storage on a card can reduce duplication, and even provide emergency medical information.

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POWER LOSSES

M.SARANYA
III-EEE

S.MANGAYARKARASI
III-EEE

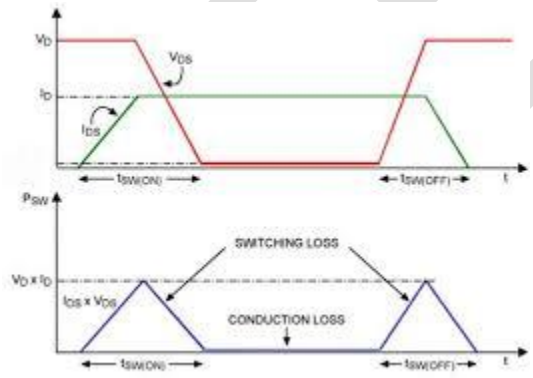
Introduction:

The electrical transmission and distribution losses accounts for most of the power losses in the entire system.

The largest amounts of these losses occur in the primary and secondary distribution lines, and can beclassified as either technical losses or non-technical losses.

Technical electrical power losses:

Technical losses occur when the energy is dissipated by the equipment and conductors in thedistribution lines. The losses depend on the network characteristics, and mode of operation. There are twocategories of technical power losses; the fixed technical losses and the variable technical losses.



Fixed Technical Losses:

The fixed losses in the distribution lines account for between a quarter and a third of the totaltechnical losses. These are usually in the form of heat and noise and occur whenever thetransformer is energized.

The fixed losses are not influenced by the amount of load current flowing, but rather by the leakage current losses

- Open circuit losses
- Corona losses
- Dielectric losses

Variable Technical Losses:

The variable losses are proportional to the square of the load current and accounts to between2/3 and ¾ of the technical losses in a distribution system.The variable losses arise due to the line impedance, contact resistance and the joule heating losses.

Causes of Technical Losses:

Inefficient equipment such as the transformers, pumps, electrical machines, and industrial loads.

- Inadequate size of conductor in the distribution lines
- Long distribution lines
- Load imbalance among the phases
- Low power factor.
- Over loading of lines
- Transformers installed far from the load centers
- Haphazard installation of distribution systems to cope with demands to new areas
- Bad workmanship

Commercial Power Losses:

The non-technical losses, also referred to as commercial losses, are those related to unmetered supplies,

incorrect billing, untimely billing, wrong tariff, defective meters, and energy thefts.

The unmetered supplies are those that may be left out when estimated amounts are used to calculate the

amount of power to bill for. In addition, some consumers may tamper with the meters to make themindicate less power than what is actually used.The energy theft may occur when consumers tamper with the metering, or collude with the utilitypersonnel to make illegal connections.

Analysis of Loss Reduction Initiatives :

Following analysis are performed on the various loss reduction initiatives –

1. Type 1 Analysis – Overall Analysis of Loss Reduction initiatives included, classifyinginitiatives in 4 broad categories based on the number of states adopted for the same.

2. Type 2 Analysis – State Specific analysis included analysis to map types of initiatives againsttype of losses they are effective in reducing.

Type 1 Analysis – Overall Analysis of Loss Reduction:

Depending on the number of states has adopted a particular initiative, an analysis has been done andinitiatives are classified into four categories:

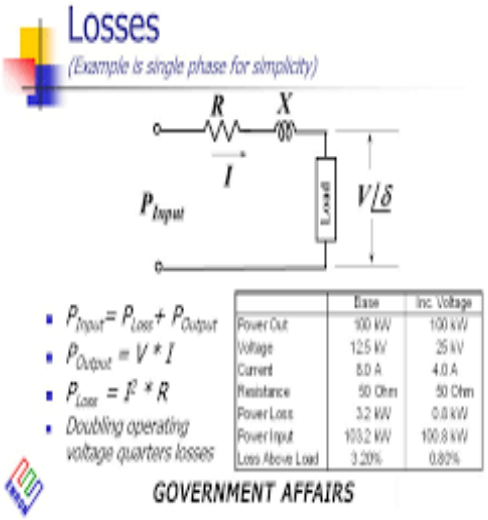
I. Must have Initiatives: Initiatives adopted by 8 or more utilities out of 10 selected utilities.

II. Strongly desirable initiatives: Initiatives adopted by 5 to 7 utilities out of 10 selected utilities.

III. Good to have initiatives: Initiatives adopted by 3-4 utilities out of 10 selected utilities.

IV. Other initiatives: Initiatives adopted by 2 or less no. of utilities out of 10 selected utilities.

Type 2 Analysis - State Specific analysis:



Development of Loss Reduction Strategy:

To develop a loss reduction strategy, the following framework can be adopted -

Measurement of loss - Various types of losses can be measured as follows:

Technical Loss = Energy input in the Discom periphery – Energy Consumed in the Distribution

Network, or Technical Loss = [Energy input at the discom periphery – (DT level consumption+ sumof sales to consumer on HT)] + LT technical loss

Non-Technical Loss (occurring due to incorrect energy accounting) = Energy Consumed in them Distribution Network – Energy billed to consumers, or non-technical loss (occurring due to incorrectenergy accounting) = Energy input in the Discom periphery – (technical loss + energy sales)

Non-Technical Loss (occurring due to non-recovery) = Energy billed to consumers – Energy collectedfrom consumers, or Non-technical loss (occurring due to non-recovery) = 100% - [billing efficiency(%)*collection Efficiency (%)] Where billing efficiency=100-distribution losses (%).

How to reduce power losses in distribution lines?

Losses in the distribution of electricity cannot be eliminated, but can be minimized by properplanning of the distribution systems to ensure that power remain within limits. Some of the ways toreduce losses Use of proper jointing techniques, and keeping the number of the joints to a minimum.

Regular inspection of the connections, isolators, drop out fuses, LT switches, transformers,transformer bushing-stem, and other distribution equipment.

Proper selection of conductor size, as well as the transformer in terms of efficiency, size, andlocation. It is important to locate the distribution transformers at the load center andif possible, keep the number to a minimum.

Feeding heavy consumers directly from the feeders.

Maintain the network components and replace those that are deteriorating, worn out or faulty.

Proper load management and load balancing

Use of electronic meters which are accurate and tamper-proof.

Improving power factor by adding shunt capacitors.

Summary:

Power losses in an electrical distribution network can be minimized by proper planning and designing ofthe lines, use of efficient equipment at both the distribution and consumer levels. In addition, there shouldbe periodic maintenance, and replacing of malfunctioning and energy inefficient distribution equipmentand parts.

*****

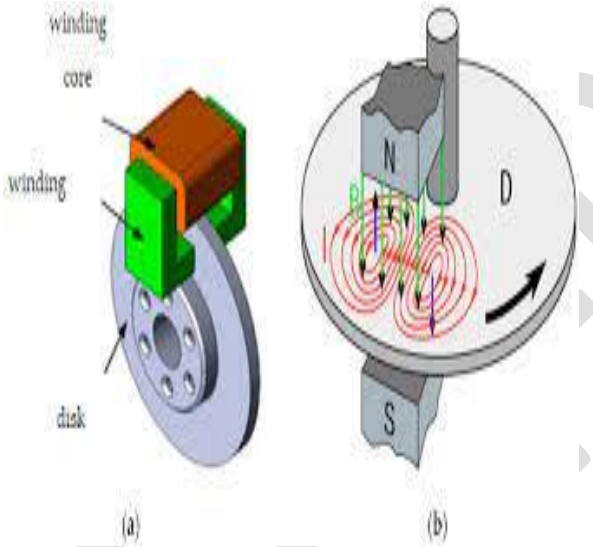
EDDY CURRENT BRAKE

D.PAVITHRA
III-EEE

S.TAMILARASAN
III-EEE

Need For It:

Many of the ordinary brakes, which are being used now a days to stop the vehicle by means ofmechanical blocking. This causes skidding and wears & tears of the vehicle and if speed of the vehicle isvery high, the brake can't provide that much high braking force & it will cause problem. These drawbacksof ordinary brakes can be overcome by "The Eddy current brake".



Principle Of Operations:

It works according to Faraday's law of electromagnetic induction. Essentially the Eddy current brake consists of two parts, a stationary magnetic field system and a solidrotating part, which include a metal disc. During braking the metal disc is exposed to a magnetic fieldfrom an electromagnet, generating Eddy currents in the disc. The magnet interaction between the appliedfield and the Eddy currents slows down the rotating disc. Thus, the wheels of the vehicle also slow downsince the wheels are directly coupled to the disc of the Eddy current brake, thus producing smoothstopping motion.

Types:

It is of two types

1- Electrically excited eddy current brake

2- Permanent magnetic eddy current brake

Electrically Excited Eddy Current Brake:

Electrically excited eddy current brakes are abruption-free method for braking. In high-speed trains theyoffer a good alternative to the mechanical rail brakes which are being used now a-days. During braking, the brake meets the rail, and the magnetic poles of brakes are energized by a windingsupplied. Magnetic poles of brakes are energized by a winding supplied with current from the battery.

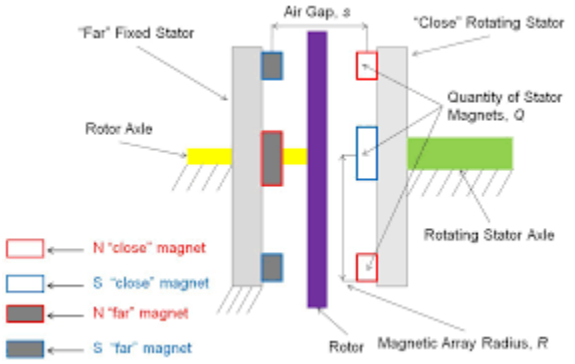
Then the magnetic flux is distributed over the rail. The eddy currents are generated in the rail, producingan electromagnetic braking force. These types of braking need an additional safety power supply whenthere are breakdowns in the electrical power supply.

The maximum diameter of the Eddy current brake is decided by

1- The spacing of vehicle chassis frame

2- Vehicle floor clearance

In this breaking system kinetic energy of the vehicle is converted to heat and this heat is dissipatedthrough the rotating disc.



Working:

When the vehicle is moving, the rotor disc of eddy current brake which is coupled to the wheels of thevehicle rotates, near stationary magnetic poles. When we want to brake the vehicle, acontrol switch is put on which is placed on the steering column in a position for easy operation.

When the control switch is operated, current flows from a battery to the field winding, thus energizing themagnet. Then the rotating disc will cut the magnetic field. When the disc cuts the magnetic field, fluxchanges occur in the disc which is proportional to the strength of the magnetic field. The current will flowback to the zero field areas of the metal plate and thus create a closed current loop like a whirl or eddy. Aflow of current always means there is a magnetic field as well.

Due to Lenz's law, the magnetic fieldproduced by the eddy currents works against the movement direction. Thus instead of mechanical friction,a magnetic friction is created. In consequence, the disc will experience a "drag" or the braking effect, andthus the disc stops rotation.

The wheels of the vehicle, which is directly coupled to the disc, also stoprotation. Faster the wheels are spinning, stronger the effect, meaning that as the vehicle slows, the brakingforce is reduced producing a smooth stopping action.

The control switch can be set at different positions for controlling the excitation current to several setvalues in order to regulate the magnetic flux and consequently the magnitude of braking force. i.e. if thespeed of the vehicle is low, a low braking force is required to stop the vehicle. So, the control switch is setat the lowest position so that a low current will be supplied to the field winding. Then the magnetic fieldproduced will be of low strength, so that a required low braking force is produced.

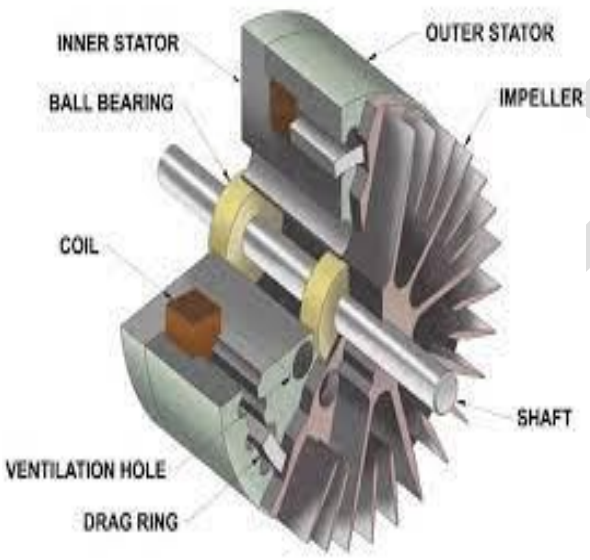
When the control switch is operated during the standby position of the vehicle, the magnet will beenergized and magnetic field is created. But since the wheels are not moving, magnetic lines of force arenot cut by it, and the brake will not work. However, a warning lamp is provided on the instrument panel to indicate whether the brake is energized. This provides a safe guard for the driver against leaving theunit energized.

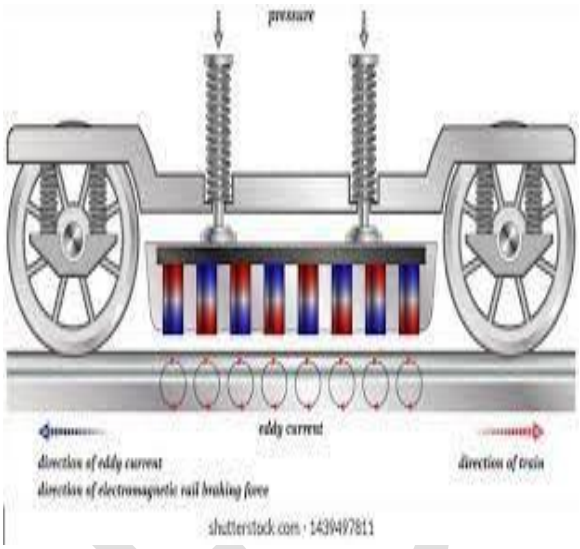
When control switch is put in any one of the operating positions, the corresponding conductor in thecontractor

box is energized and current flows from the battery to the field winding to the contractor box.

This current magnetizes the poles in stator, which placed very near to the rotor. When rotor rotates it willcut magnetic lines and eddy current will set up in the rotor.

The magnetic field of this eddy currentproduces a braking force or torque in the opposite direction of rotation disc. This kinetic energy of rotor isconverted as heat energy and dissipated from rotating disc to surrounding atmosphere. Current in the fieldcan change by changing the position of the controls switch. Thus, we can change the strength of thebraking force.





Application:

In case of TRAINS, the part in which the current is induced is rail. Brake shoe is enclosed in a coil froman electromagnet, when the magnet is energized, Eddy current are induced in the rail by means of anelectromagnetic induction probablyproducing braking action.

*****

ROBO PETS

HARISH P
II-EEE

DEEPAK RAJ M
II-EEE

Introduction:

Pets are often lovable companions that bring joy to their respective owners. However, one of theinconveniences of pet ownership is the constant support that pets require as most are not self-sufficient.For those seeking a pet companion but not the responsibilities a robotic pet may be a option. While themajor benefit of a live pet is the unwavering companionship, robotic pets have nice benefits.

Fewer Responsibilities:

Unlike a real pet, there is no need to continually refill the water and food bowls. Better yet, there are nosad, puppy-dog eyes seeking food off the dinner table.As there is no need to feed the robotic pet, there is also no dealing with any after-dinner walks. Andthere's the benefit of a home free of the odors associated with those bodily functions. Live animals,especially dogs, get dirty, can smell, and need a bath. However, with a robotic pet, none of that isrequired.

Robotic Pets won't be a "Bad" Pet:

Real pets, especially those that are not trained, may chew on or damage furniture or other property.Animals may also bite those who feed, pet, or attempt to play with them. A live pet may make unwantedor excessive noises, such as loud barking from a dog or continuous chirping from a bird. (Time to call atrainer)On the other hand, a robotic pet's actions are always controllable.Less in the Long Run.

The price of a robotic pet willvary and the same is true for the price of a live pet as it would apply to thepet's breed, heritage, and consumer market. However, robotic pets will cost less in the long run as most of the expenses will be absorbed in the initial purchase, given that only batteries or electricity forrecharging will need to be purchased in the future.

The cost of a live pet becomes more expensive overtime as an owner will continually have to purchase food, toys, and health care.

Robotic Pets Are Convenient:

Some studies have shown that robotic pets are just as beneficial in preventing loneliness particularlyamong the

senior population. Robotic-pet owners have full control over their pet and can initiate attentionand playtime because a robotic pet can be turned off.

The absence of support required when an ownerleaves the home or goes on vacation is another consideration.

Robotic Pets Do Things Live Pets Can't:

Robots are programmed to perform certain functions, such as to communicate with the owner. Somehighly-advanced robotic pets can be trained by the owner. If the owner prefers a pet that has the excitement of a new puppy, that is a behavioral option for the robotic pet allowing an owner to indefinitelyhave a puppy.

Robotic pets will vary in technological capabilities, but robotic pets will only get better as technologycontinues to advance. A simple robotic pet may be stationary and have limited actions, typically facialmovements such as closing and opening the eyes and mouth. While robotic pets may not fulfill the real-life aspect desired by some, thepets certainly do have their own advantages. Some of the benefits are directly the opposite of thenegatives associated with a live pet, which will greatly appeal to some prospective owners. It willultimately be a personal choice, but don't forget: Having one doesn't mean not having the other. Owningboth is always a possibility, and an owner's live pet will possibly enjoy playing with the robotic pet too.

Conclusion:

At last, we can see that a robotic pet can also speak, whereas only few birds can accomplish that feat; butwho wants to carry on a conversion with their cat.

A robotic dog will not bite or scratch yourrobotic pet technology will soon be sophisticated enough tocover our emotional needs robotic dogs, for instance, will have social intelligence, providing what peopleneed from their dogs, such as companionship, love, obedience, dependence etc. just because you have arobotic pet doesn't mean that you couldn't also have a live pet as well. Possessing both is always aprospect benefit from playing with the robotic pet as well.

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HARMONICS IN POWER SYSTEM AND HOW IT CAN BE REDUCED

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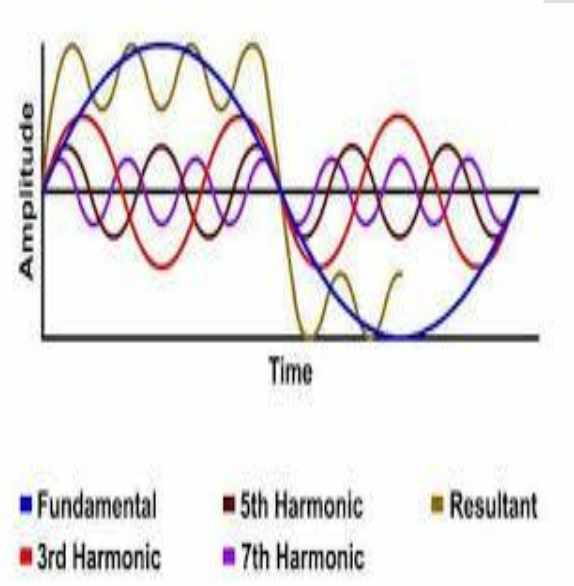
Harmonics:

Harmonics are electric voltages and currents on an electric power system that can cause power qualityproblems. Harmonics are created by electronic equipment with nonlinear loads drawing in current inabrupt short pulses. The short pulses cause distorted current waveforms, which in turn cause harmoniccurrents to flow back into other parts of the power system.



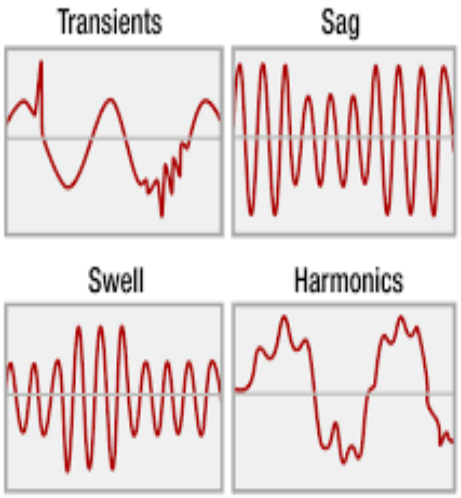
Problems Caused byHarmonics:

1. Overloading neutral conductor

The three-phase system consists of three individual phase conductors and a neutral conductor. If all thephase conductors carry the same current, the phase currents tend to cancel one another out provided thereis a balanced load. This balanced load makes it possible to reduce the size of the neutral conductor.Unfortunately, switched mode power supplies used in computers have a very high third-harmonic current.Whileharmonic currents cancel out on the neutral wire, the third harmonic current is additive in theneutral. In buildings with many installed personal computers, the neutral wire can carry muchhigher currents than the wire was designed to accommodate, creating a potential fire hazard.

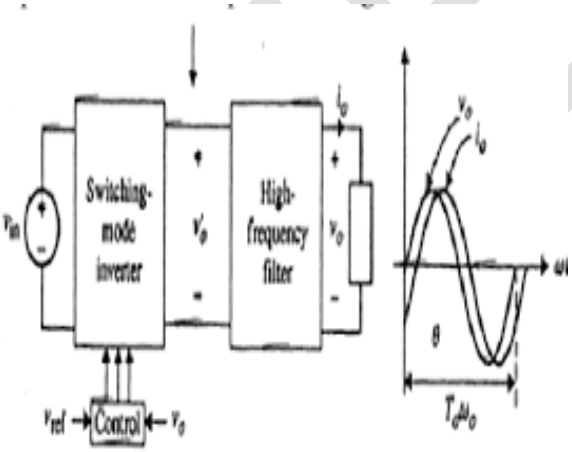
2. Overheating Transformers and Increased Associated Losses

For transformers feeding harmonic-producing loads, the eddy current loss in the windings is the mostdominant loss component in the transformer. This eddy current loss increases proportionate to the squareof the product's harmonic current and its corresponding frequency. The total transformer loss to a fullyloaded transformer supplying to a nonlinear load is twice as high as for an equivalent linear load. Thiscauses excessive transformer heating and degrades the insulation materials in the transformer, whicheventually leads to transformer failure.



3. Nuisance Tripping of Circuit Breakers

All circuits containing capacitance and inductance have one or more resonant frequencies. When any ofthe resonant frequencies correspond to the harmonic frequency produced by nonlinear loads, harmonicresonance can occur. Voltage and current during resonant frequency can be



highly distorted. Thisdistortion can cause nuisance tripping in an electrical power system, which can ultimately result inproduction losses.

How The Harmonics Can Be Reduced:

1. Reducing Harmonic Currents in Loads

There is often little that can be done with existing load equipment to significantly reduce the amount ofharmonic current it is producing unless it is being mis-operated.

An overexcited transformer can bebrought back into normal operation by lowering the applied voltage to the correct range, arcing devicesand most electronic power converters are locked into their designed characteristics.

PWM drives that charge the dc bus capacitor directly from the line without any intentional impedanceare one exception to this. Adding a line reactor or transformer in series will significantly reduceharmonics, as well as provide transient protection benefits.

2. Filtering

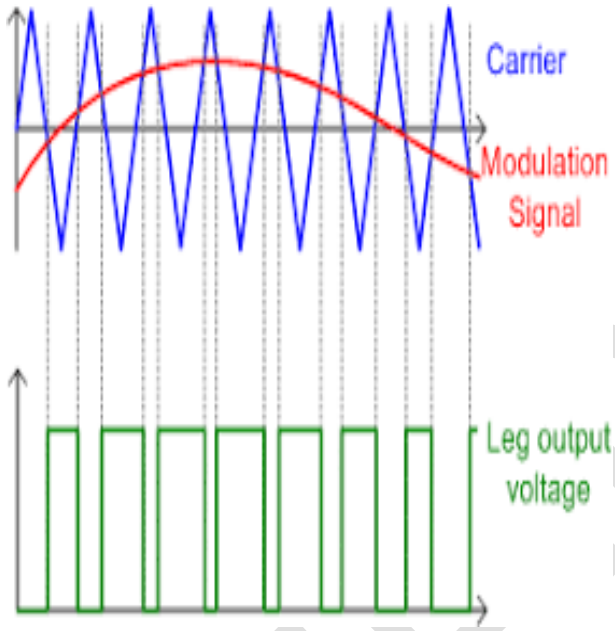
The shunt filter works by short circuiting harmonic currents as close to the source of distortion aspractical. This keeps thecurrents out of the supply system. This is the most common type of filteringapplied because of economics and because it also tends to correct the load power factor as well asremove the harmonic current.

3. Modifying the System Frequency Response

There are number of methods to modify the frequency response of the system:

Add a reactor to detune the system. Harmful resonances generally occur between the systeminductance and shunt

power factor correction capacitors. The reactor must be added between thecapacitor and the supply system source. One method is to simply put a reactor in series with thecapacitor to move the system resonance without tuning the capacitor to create a filter.Another is to add reactance in the line.



Change the capacitor size. This is often one of the least expensive options for both utilities andindustrial customers. Move a capacitor to a point on the system with a different short-circuit impedance or higherlosses. This is also an option for utilities when a new bank causes telephone interferencemoving the bank to another branch of the feeder may very well resolve the problem.

This is frequently notan option for industrial users because the capacitor cannot be moved far enough to make adifference.

Harmonics frequency effects caused either by the power supply or by equipment operating within the system. Unbalance the effect of voltage or current variations on each of the electrical phases. Flicker effects caused by repetitive switching of electrical loads such as arc furnaces or other processes.

Remove the capacitor and simply accept the higher losses, lower voltage, and power factorpenalty. If technically feasible,this is occasionally the best economic choice.By using these methods, we can eliminate harmonics in a proper manner.

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PLC - PROGRAMMABLE LOGICCONTROLLER

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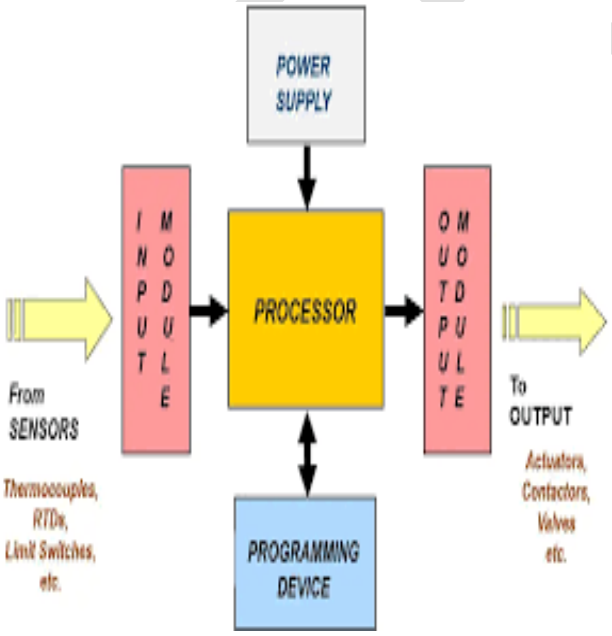
Introduction:

Programmable Logic Controller (PLC) is a special computer device used in industrial control systems.Due to its robust construction, exceptional functional features like sequential control, counters and timers,ease of programming, reliable controlling capabilities and ease of hardware usage – this PLC is used asmore than a special-purpose digital computer in industries as well as in other control-system areas. Mostof the industries abbreviate these devices as "PC" but it is also used for personal computers; due to this,many manufacturers named these devices as PLCs.



The programmable logic controller is used not only for industrial purpose but also in civil applicationssuch as washing machine, elevators working and traffic signals control. Different types of PLCs from avast number of manufacturers are available in today'smarket. Therefore, in the following paragraphs, letus study about programmable logic controller's basics, principles, and applications.

Principle of Programmable Logic Controller:

A programmable logic controller is used for continuously monitoring the input values from sensors andproduces the outputs for the operation of actuators based on the program. Every PLC system comprisesthese three modules:

- ✓ CPU module
- ✓ Power supply module
- ✓ One or more I/O module
- ✓ PLC Architecture

CPU Module:

A CPU module consists of central processor and its memory. The processor is

responsible for performingall the necessary computations and processing of data by accepting the inputs and producing theappropriate outputs.

Power Supply Module:

This module supplies the required power to the whole system by converting the available AC power toDC power required for the CPU and I/O modules. The 5V DC output drives the computer circuitry.

I/O Modules:

The input and out modules of the programmable logic controller are used to connect the sensors and

actuators to the system to sense the various parameters such as temperature, pressure, and flow, etc.

TheseI/O modules are of two types: digital or analog.

Communication Interface Modules:

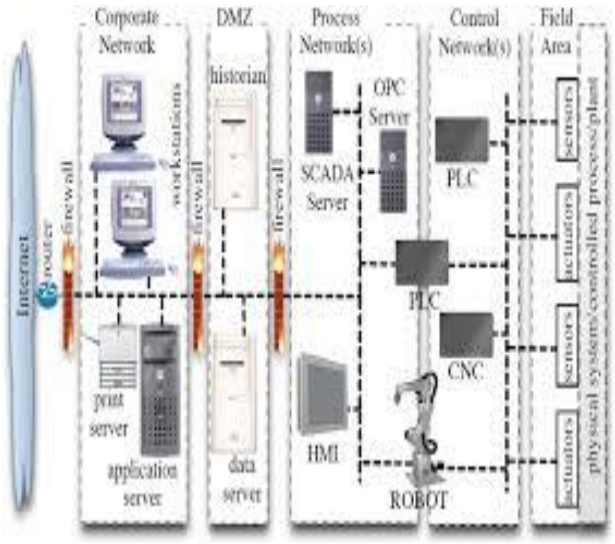
These are intelligent I/O modules which transfers the informationbetween a CPU and communication network These communication modules are used for communicatingwith other PLC's and computers, which are placed at remote place or far-off locate.The program in the CPU of programmable logic controller consists of operating system and userprograms. The purpose of the operating system with CPU is to deal with the tasks and operations of thePLC such as starting and stopping operations, storage area and communication management, etc. A userprogram is used by the user for finishing and controlling the tasks in automation.The Principle of operation of the PLC can be understood with the cyclic scanning also called as scancycle, which is given in the below figure.

Applications of Programmable Logic Controller (PLC):

The PLC can be used in industrial departments of all the developed countries in industries like chemicalindustry, automobile industry, steel industry and electricity industry. Based on the development of allthese technologies, functionality and application, the scope of the PLC increases dramatically.

1. Application of PLC in Glass Industry

From the year 1980 the Programmable-logic controllers are in use in the glass industry, and they areassembled bit by bit. PLCs are used mainly in every procedure and workshop for controlling the materialratio, processing of flat glasses, etc.With the development of PLC and increasing demand in the real world, the control mode of theprogrammable-logic controller with an intelligent device is applied in the glass industry.



In making of afloat glass, PLC itself cannot finish some controlling tasks because of the complexity of the controlsystem and processing of huge data. To produce glass, we make use of bus technology to construct the control mode of a PLC with a distributed-control system.

This control system deals withanalog controlling and data recording; the PLC is also used for digital quality control and position control.This type of control mode is a big advantage for PLC and DCS for improving reliability and flexibility ofthe control system.

2. Applications of PLC in Cement Industry

Along with the best-quality raw materials, the accurate data regarding process variables, especially duringmixing processes within the kiln, ensures that the output provided should be of the best possible quality.Nowadays a DCS with bus technology is used in the production and management industry. By using thisexisting DCS control system, the PLC is in user mode of SCADA. This mode comprises PLC andconfiguration software. This SCADA mode comprises the PLC and host computer. The host computerconsists ofslave and master station. The PLC is used for controlling the ball milling, shaft kiln and Kilnof coal.

The principle of operation of programmable logic devices or controller anditsapplications in various industries like glass industry, steel industry and cement industry

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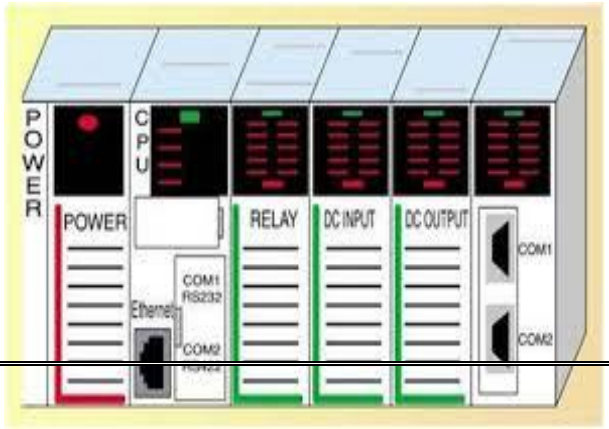

SOLAR PHOTOVOLTAIC MAXIMUM POWER POINTTRACKING

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Introduction:

PHOTOVOLTAIC power is an established technology and has recently experienced rapid growth overthe last twenty years. The maximum power point tracking (MPPT) is the automatic control algorithm toadjust the power interfaces and achieve the greatest possible power harvest, during moment-to-momentvariations of light level, shading, temperature, and photovoltaic module characteristics. It has become anessential component to evaluate the design performance of photovoltaic power systems.

In recent years,many publications give various solutions to the problem of maximum power point tracking forphotovoltaic power systems. In 2006, the review study has summarized various MPPT techniques and haspresented valuable comparisons between them. To continue the literal chronology, focuses more on the implementation topology and the latest

MPPT techniques with a brief discussion andclassification, which can be useful as a reference for future research.Maximum Power Point Tracking algorithms (MPPT)are used to track maximum power, a DC-DC Boostconverter is used to obtain the impedance matching between the PV array and the load. Although a hugenumber of approaches have been proposed in literature, the methods based on the perturb and observe(P&O) technique are the most widely employed in commercial products. The reason lies in the fact thatP&O can be implemented in cheap digital devices by

ensuring high robustness and a good MPPTefficiency.

The design and development of a photovoltaic system based on theenhanced P&O algorithm that allows improving efficiency, stability, and accuracy of solar systems. Theeffectiveness of the proposed solar regulator system is verified by the simulation by Power Sim simulatorand experimental results under our developed system using two MPPT algorithms, classical P&O, and anew enhanced P&O algorithm.

DC-DC Converter Analysis:

DC/DC Converters are most widely applied in photovoltaic systems as an intermediary between the PVand the load to follow up the maximum power point (MPP). Different topologies and different designapproaches could be used for DC/DC converters. In this part two different models of converters areintroduced, buck and boost converters.

A. Buck Converter:

The buck converter is known as the voltage step down and current step-upconverter.This gives a hintof its typical application of converting its input voltage into a lower output voltage, where the conversionratio M = Vout/Vin varies with the duty ratio D of the switch. The state space equation of buckconverter is as follows:

$$\frac{dI_L}{dt} = -\frac{1}{L}V_0 + \frac{d}{L}V_{pv}$$

B. Boost Converter:

The boost converter is also known as the step-up converter. The name implies its typically application ofconverting a low input-voltage to a high output voltage, essentially functioning like a reversed buckconverter. The state space equation of boost converter is as follows:

$$\mathbf{dIL/\,dt = -(1 - d)/\,L.Vo + 1/\,L.Vpv \quad (2)}$$

MPPT Technique:

As was previously said, MPPT algorithms are necessary in PV applications because the MPP of a solarpanel varies with the irradiation and temperature, so the use of MPPT algorithm is required in order toobtain the maximum power from a solar array.

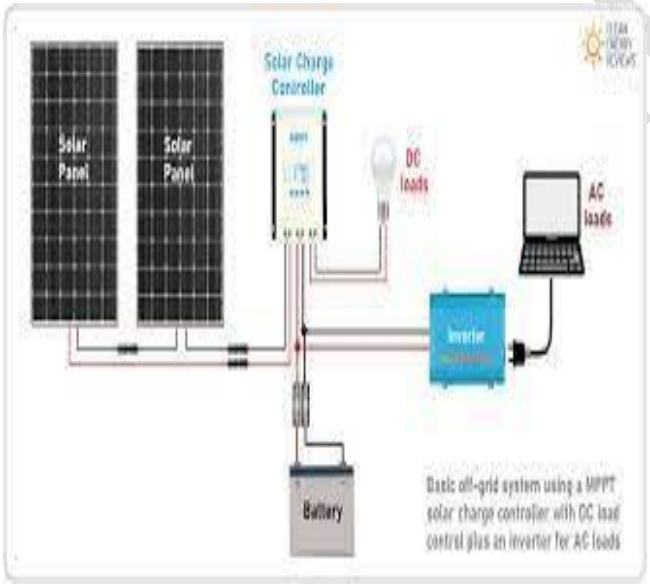
A. P&O Method:

The Perturb and Observe (P&O) method is one of the most used methods in practice. TheP&O algorithms operate by periodically perturbing, i.e., incrementing or decrementing, the array terminalvoltage and comparing the PV output power with that of the previous perturbation cycle. If the PV arrayoperating voltage changes and power increases, the control system moves the PV array operating point inthat direction. Otherwise, the operating point is moved inthe opposite direction, Figure demonstrates theprinciple of the P&O algorithm. The DC-DC controller adjusts slightly the voltage from the PV array andmeasures power, then it varies the terminal voltage of the PV and takes a second measurement of thepower, if it increases, further adjustments in that

direction are tried until power no longer increases

B. Enhanced P&O

The P&O algorithm is based on the "hill-climbing" principle, which consists of moving the operationpoint of the PV array



in the direction in which the power increasesare the most popular MPPT methods thanks to their ease of implementation and good performance whenthe irradiation is constant. The advantages of P&O method are the simplicity and low computationalpower they need. The drawbacks of this technique are mainly two; the main one is that they can easilylose track of the MPP if the irradiation changes rapidly. The other handicap of P&O methodis the oscillations of the voltage and current around the MPP in the steady state.

To overcome these drawbacks, we propose a new enhanced P&OIn this technique, the Maximum Power is calculated based on the measurements of the Irradiance and theTemperature using a model of the PV module. After calculating the max power, we run the classical P&Oalgorithm and after each complete execution cycle the difference between the current power (real power)and the power estimated at the beginning of the algorithm is calculated.

If the difference is zero, then wehave reached the max power, so the present duty cycle value is the optimal control signal. This value isfixed and is taken as control signalfor DC- DC boost converter until the next variation of the maximumpower that PV can provide. The efficiency of the classical P&O algorithm tracking is improved by thenew enhanced algorithm. This technique was simulated in power Sim, implemented, and tested using acomplete system based on a microcontroller, a DC-DC boost converter, a voltage and current sensors anda software application.

C. Incremental Conductance Method:

This method uses two sensors for sensing voltage and current. The controller measures the incrementalchanges in the

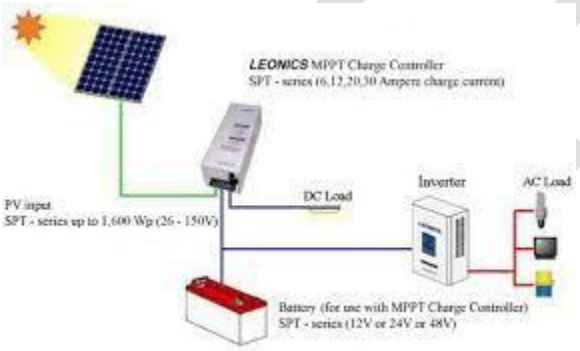
voltage and current, hence conductance of the array and predicts the effect of voltage change. Controller compares the changes in the incremental conductance and array conductance. When these two are same the array voltage is MPP voltage. The drawback of this method is that it losestrack of MPP due to changes in the irradiation level.

D. Fractional Open Circuit Voltage Method (FOCV)

The value of V_{mpp} is almost equal to V_{oc} under changing irradiance and temperature conditions, so itbecomes easy to track MPP [18]. Vmpp of a solar cell is given by equation (3),

$$\mathbf{V_{mpp} = K\, V_{oc}} \quad \mathbf{(3)}$$

The value of K lies between 0.71 to 0.78, and using the value of K and $V_{oc,}V_{mpp}$ can be easilydetermined.



E. Fractional Short Circuit Current Method (FSCI)

In this method the FOCV method is considered in terms of current. Here, short circuit current and currentat MPP are related. The relation is given by equation (4),

$$\mathbf{I_{mpp} = KI_{sc}} \quad \mathbf{(4)}$$

It is difficult to measure Isc during operation, so an additional switch is added to the converter to short PVarray periodically and measure Isc.

F. Fuzzy Logic Control:

Fuzzy logic control is a soft computing tool. This method consists of three stages: Fuzzification, rule basetable and de-fuzzification. The advantage of this method is that it can work with imprecise andvague inputs and is able to handle non-linearity.

Conclusion:

In this paper the increasing demand for renewable resources of energy has been emphasized.Mathematical model for PV cell is explained and the need for MPPT to achieve maximum power outputis presented with the help of diagram. It provides classification of various MPPT techniques,their advantages and disadvantages. An enhanced P&O algorithm has been proposed to improve themaximum power point tracking in PV systems. The proposed system offers powerful abilities which are:good tracking efficiency, high response, simple user interface, sophisticated control, high processingspeed, real time monitoring and good control for the extracted power. This paper will serve as a referencepaper for the future work in PV power generation.

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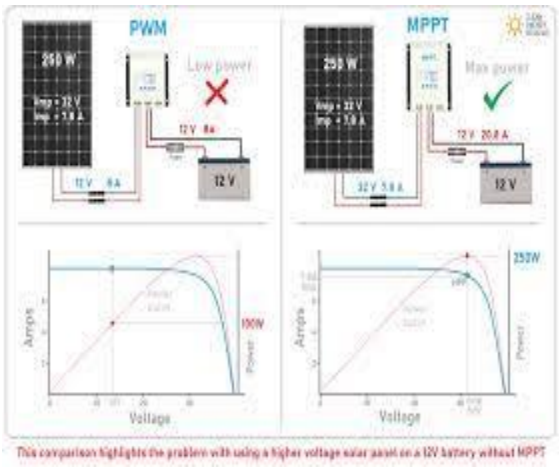

CIRCUIT BREAKER MAINTENANCE BY MOBILE AGENT SOFTWARE TECHNOLOGY

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Introduction:

Circuit breakers are crucial components for power system operations. They play an important role inswitching for the routine network operation and protection of other devices in power systems. To ensurecircuit breakers are in healthy condition, periodical inspection and preventive maintenance are typicallyperformed.

New maintenance techniques and methodologies are emerging, while the circuit breakers keep improvingin their designs and functions. As an example, some new circuit breakers have embedded monitoringinstruments available to measure the coil current profiles and the operation timing.

The recordedinformation can be used to monitor the condition of breakers during each operation. In this case, it may bemore appropriate to replace the time-directed maintenance by condition-directed maintenance practice.Since the number of circuit breakers in a power system is usually very big, a small maintenance costsaving per each circuit breaker can accumulate to a considerable benefit for the whole system.

An information access method that is capable of handling heterogeneous information sources will behelpful to achieve the above goal. Also, the new information access method should be secure and able towork on unreliable public networks.The mobile agent softwareprovides a flexible framework for mobile agent applications. An agentapplication program can travel through the internet/intranet to the computers where the mobile agentserver or transporter is running. The mobile agent software also supports Distributed Events, AgentCollaboration and Service Bridge. The mobile agent software may fit very well in the circuit breakermaintenance scenario. In this paper, we considered how mobile agent software might be applied in circuitbreaker maintenance and monitoring from the viewpoint of the maintenance crew.

Circuit Breaker Maintenance Tasks:

The maintenance of circuit breakers deserves special consideration because of their importance forequipment destruction can occur if a circuit breaker fails to operate because of a lack of a preventivemaintenance. The need for maintenance of circuit breaker is often not obvious as circuit breakers mayremain idle, either open or closed, for long periods of time. Breakers that remain idle for six months ormore should be made to open and close several times in succession to verify proper operation and removeany accumulation of dust or foreign material on, moving parts and contacts.

The circuit breakers mainly consist of the interrupter assembly (contacts, arc interrupters and arc chutes),operating mechanism, operation rod, control panel, sealing system, and breaking medium (SF6, oil,vacuum, and air). To ensure theperformance of a circuit breaker, all the components should be kept in good condition; therefore time-directed preventive maintenance has been widely adopted. Themaintenance practices can be divided into three categories: corrective maintenance, preventivemaintenance, and predictive maintenanceSince the maintenance information is distributed among different systems, a software technique that hasthe flexibility of interfacing with multiple heterogeneous information systems is desired.

Mobile Agent Software:

There are different definitions of what is a software agent. An agent is a proactive software component,which can act reasonably to accomplish tasks on behalf of the user. An agent should beautonomous and have sound intelligence. Agent-based programming offers greater flexibility andadaptability than component-based programming.

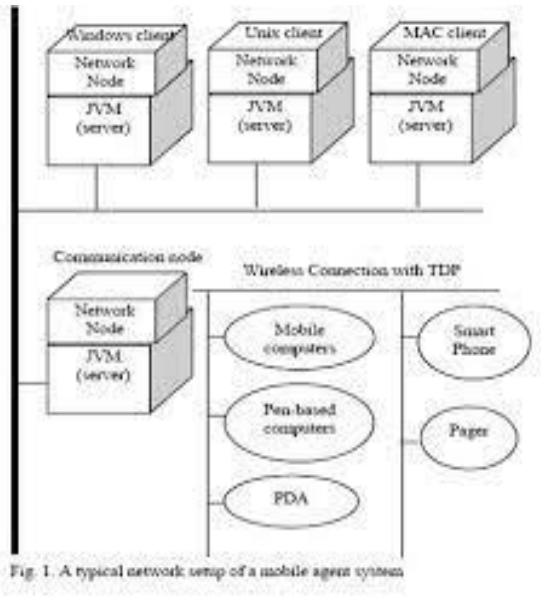
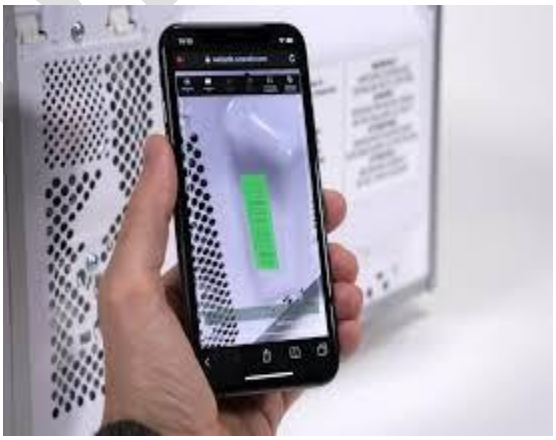


Fig. 1. A typical network setup of a mobile agent system

Agents communicate with each other by passing messages or by synchronization. Depending on themfunctions, we can classify agents into several categories like Personal agents, mobile agents, collaborativeagents, etc. Mobile agents are small software entities that can travel around the network, performing theirfunctions on behalf of users. As the next generation middle-ware infrastructure for developing distributedapplications, it meets all the requirements mentioned above. The mobile agent server can run on any platform where the Java runtime environment is available, and the devices without Java Virtual Machine(JVM) are supported through a communication node.

Application Scenarios:

To reflect the distributed characteristic of the data sources, three computers are used to represent theenterprise maintenance system, the substation concentrator and the maintenance crew respectively asshown in FigureInformation Storage and RetrievalThe mobile agent can help storing and retrieving all the information needed to perform maintenance orrepair work. Mobile agent software supports accessing the data saved into heterogeneous systems. Theheterogeneity may be reflected platform wise (differences in protocol, differences in format), conceptwise (differences in schema and vocabulary, relative incompleteness), or both. Mobile agent softwareprovides a framework to work in heterogeneous environments. At first, the Java platform is highlyportable, which makes the mobile agent server run on a plethora of platforms. Second, the mobile agentserver will save the status of mobile agents, therefore providing reliable transmits on slow or part-timeconnected networks.



Circuit Breaker Monitoring:

The distributed event mechanism is helpful in monitoring the status and events of circuit breakers. Theuser can select the event of interest to monitor. Once the monitoring starts, the selected events will

beregistered with the mobile agent server running on the corresponding substation concentrator. Theconcentrator can get the real time information about the circuit breakers by communicating with sensors,and it can notify the user when the selected type of event happens.Security ConsiderationTwo apparent security problems arise when applying mobile agents. First, the mobile agents need to beauthenticated and authorized at the servers. Second, to ensure the integrity of the data, it must betransmitted in secure communication channels. Every mobile agent must be authenticated at first toidentify whom it represents. Secure Agent supports user authentication by using the username/passwordpairs. Once identified, mobile agents can be checked against the security policy to see whether they areauthorized to do certain things at a server. For example, agents can improve theusability of some software by providing a friendly user interface with ability of speech recognition andsynthesisSo Mobile agent software may be suitable for applying in circuit breaker maintenance practice due to itssupport for heterogeneous systems, security, distributed events, low-bandwidth usage, etc. Using themobile agent software, the development work can be greatly simplified.

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