

Energy Conservation

Unit - 2

Power factor correction and role of capacitor in power factor requirement.

Q) Who measures of how efficiently a piece of facility uses power to produce work is its power factor. Although resistive loads such as heating and lighting have a high power factor.

Power factor correction (PFC) aims to improve power factor and power quality. Power factor correction (PFC) actually does not save much energy.

→ Capacitors are used to improve power factor because the capacitor stores energy in the form of voltage, and that will help in reducing the reactive power.

② Capacitor Types:

Capacitor is a passive component and it stores the electrical energy into an electric field. The effect of the capacitor is called Capacitance.

$C = \frac{Q}{V}$

Capacitance in Farad → electric charge in coulombs
 voltage in Volts

Types of Capacitor:

- ① Electrolytic Capacitor: are used when the large capacitor values are required.
- ② Mica Capacitor: is a group of natural minerals and Silver Mica Capacitor.
 There are 2 types of mica capacitors
 1) Clamped ✓ 2) Silver Mica ✓
- ③ Paper Capacitor - The construction of paper capacitor is between two tin foil sheet and they are separated from the paper.
- ④ Film Capacitor - They are capacitors that uses a thin plastic as the dielectric.
- ⑤ Ceramic Capacitor - are the capacitors which uses the Ceramic material as a dielectric.

② Placement of capacitor for power factor improvement in power system.

→ The power factor improvement capacitor can be installed at system bus. Capacitors are connected directly to the terminals of inductive circuit.

③ HT and LT Supply.

① HT supply - it means it will provide a high high tension & voltage. HT supply uses step up transformer. HT panels are installed at both indoor and outdoor.

② LT supply - it means it will provide a low low tension & voltage. LT supply uses step down transformer. LT panels are installed at only indoor, because of their low tension.

④ Transformer working and its application in electrical energy system.

→ A transformer a device used in the power transmission of electric energy. The transmission current is AC. It is commonly used to increase or decrease the supply voltage without change in frequency.

→ The main application of a transformer is to step up or step-down the ~~voltage~~ ^{of} and current.

5) Cables : construction of cables, types of cables, application of cables.

⑤ A cable consists of an aluminium conductor covered by a screening layer.

Types of cable:

① Fiber optic Cable: It consists of a bundle of glass threads which are used to transmit the messages.

② Twisted Pair Cable: It is a type of ordinary wiring which connects home and many business computers.

③ Coxial Cable: Coxial cable, or coax cable is another type of copper cable which has an inner conductor surrounded by foam insulation.

→ Choosing among coxial, twisted and fiber optic cable mainly depends on your needs and network topology.

Applications of cable:

- Used in process controls
- transmission of signals
- computers and control systems.

cameras, calculators

⑧ LEDs application

→ Picture phones and Digital Watches.

⑨ Energy saving in Illumination:

→ Luminaries which utilize energy efficient lamps and central gear also produce less heat. This means that less mechanical energy is required to maintain working conditions.

→ In lamps, 90% of electricity is wasted as heat rather than light and also 3-5 times more power is consumed.

→ So replacing these bulbs with energy saving bulbs gives efficient energy lighting system.

⑩ Power Losses in Electrical Machines:

→ Electrical machines are mainly of 2 types:

- 1) Static Machine
- 2) Rotating Machine

Static Machine Loss

The machines which do not contain any rotating part are called static machines.

There are 2 types of static machines:

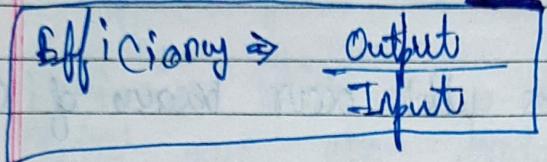
- 1) Single Phase Transformer
- 2) Three Phase Transformer

Transformer Losses:

- ① Iron Loss: The losses caused by the alternating flux in the core of the transformer are iron losses.
It is of 2 types:
- Hysteresis Loss: The losses which occur because of the variation of the magnetization.
 - Eddy Current Loss: The circulating small currents in the core of transformer due to magnetic material.
- ② Copper Loss: The losses which occur because of transformer winding resistance are called copper losses.
- ③ Stray Loss: The loss that occurred due to leakage flux from the core is called stray loss.
- ④ Dielectric Loss: The loss which occurs due to failure or damage of insulating material.

(10) Energy Efficient Motors

→ It is a motor that gives you the same output strength by consuming lesser amounts of power;



→ Energy efficient motors are the type of motors which uses less electricity and energy. Some types of energy efficient motors are dual speed motor, brake motor.

→ Energy efficient motors are the best solution to solve the energy crisis in industry.

→ Energy efficient motors combines of enhanced manufacturing techniques which improves its reliability.

→ Energy efficient motors gives a very good output for the energy they consume.

- Low cost of operation ✓
- Low noise / silent operation ✓
- Less heating of motor. ✓
- Requires less maintenance. ✓

6) Harmonics, causes of Harmonic Generation, importance of Harmonics?

- A harmonic is a wave or signal whose frequency is integral (whole number).
- Harmonics in transformers may cause an increase in the iron and copper losses.
- Harmonics play an important role in uplifting the sound.
- Harmonics will also help in understanding the working of instrument, and make a better musician overall.

(11)

Electrical Energy system and its components:

Components:

- ① Resistor - Resistance
- ② Capacitor - Capacitance
- ③ Inductor - Inductance