Benha University

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Ameeria Integrated
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Undergraduate Course

Electric Installation Design

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Lecture (9)

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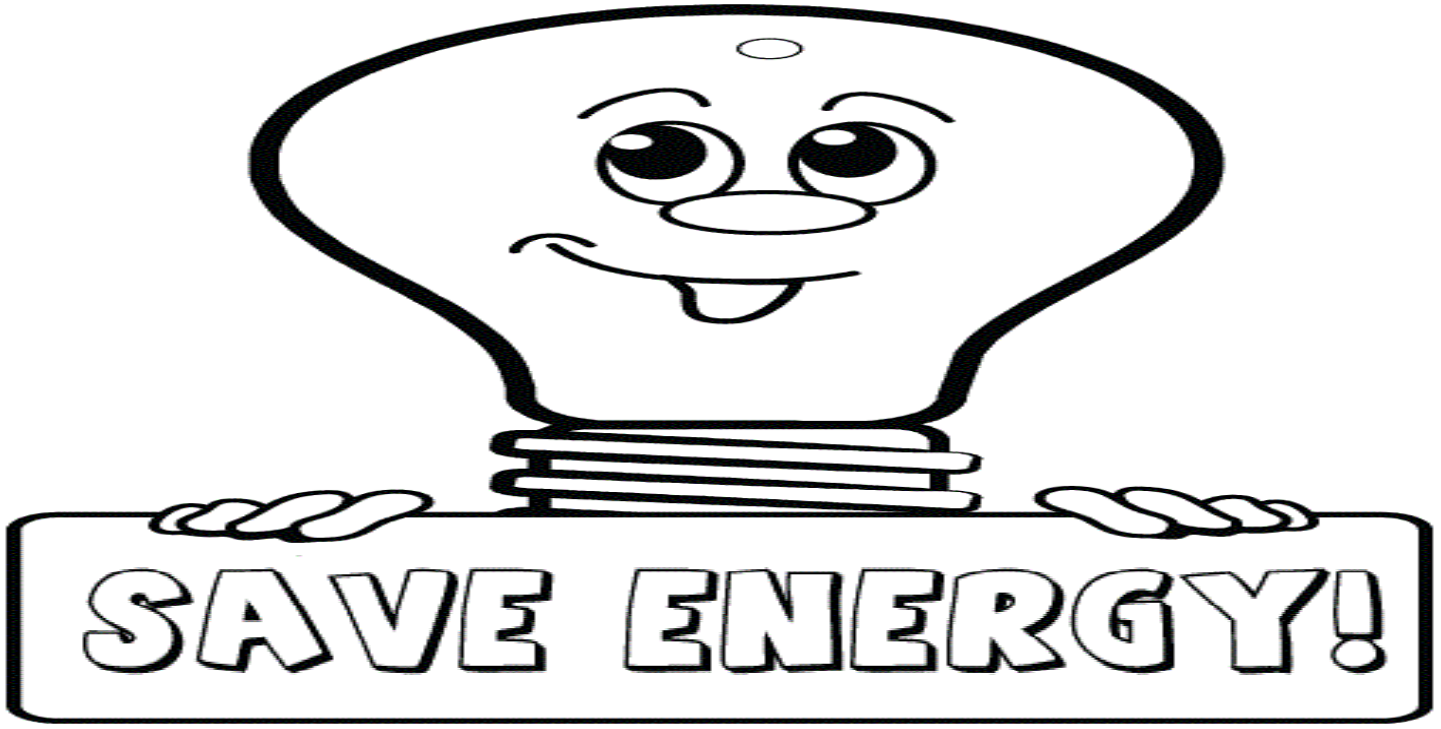
Energy Conservation



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Energy Conservation in industrial sector

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Energy Conservation in Industrial Sector

- In any industry, the 3 top operating costs, are often found to be energy (both electrical and thermal).
- Energy has the highest potential for cost reduction.

- ✓ To achieve and maintain optimum energy procurement and utilization.
- ✓ To minimize energy costs.
- ✓ To minimize environmental effects.

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- Industrial sector uses both, the thermal and the electrical energy in various equipment like:

  * Boilers.
  * Compressors.
  * Furnaces.
  * Diesel generating engine.
  * Motors.
  * Pumps.

Tips for Electrical Energy Saving

- Improve power factor by installing capacitor to reduce KVA demand charges and also line losses within the plant.
- Avoid repeated rewinding of motors. Observations show that rewound motors practically have an efficiency loss.
- Use a variable frequency drives and fluid coupling for variable speed applications such as fans, pumps, and helps in minimize consumption.

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Energy Conservation in Electrical Motors

- **The total electrical consumed in the industrial sector, electrical motors account for approximately 70%.**
- The motors should be energy efficient.
- Convert delta to star connection for lightly loaded motors.
- Install variable voltage frequency drives for speed control of motors.
- Install multi speed motor.
- Optimize operating voltage level of motor for lightly loaded motors.
- Provide interlock for electric motor to avoid idle running.

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- **Advantages of energy efficient motors:**

1. Reduce operating costs.
2. Less heat losses.
3. Extend winding lifespan.

Energy Conservation in Air compressor

- Compressed air is very energy intensive. Only 50% of electrical energy is converted to useful energy.
- Ensure low temperature of inlet air (increase in inlet air temperature by 3^0C increase power consumption by 1%.
- Air output for compressor per unit of electricity input must be measured at regular intervals.

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Energy Conservation in Pumps

- **Most of industrial processes in and out of plants involve transportation of fluids and the pump is the only mechanical means available to facilitate this transportation.**

- Select a pump of the right capacity in accordance with the requirements.
- Matching of the motor with the appropriate sized pump.
- Proper installation of the pump system.
- Drive transmission between pumps and motors is very important that's lead to cause energy loss up to 15-20%.

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Energy Conservation in Lighting

- Use of electronic ballast in place of conventional choke saves energy up to 20%.
- Use LED lamps, it can save energy up to 70%.
- Clean the lamps and luminaires regularly (illumination levels fall by 20-30% due to collection of dust).
- Use of 36W tube light instead of 40W, that's saves electricity by 8 to 10%.
- Use of sodium lamps for area lighting in place of mercury, thats saves electricity up to 40%.

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Energy Conservation in Boilers

- **Boilers are used in various industrial units to convey heat for different process applications.**

- Improve boiler efficiency. Boilers should be monitored for flue gas losses, radiation losses, and blow down losses (proper control can decrease the consumption up to 20%).
- Use only treated water in boilers.
- Stop steam leakage.
- Maintain steam pipe insulation.

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Energy Conservation in agriculture sector

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Mitigation options for energy conservation in agriculture sector

Potential mitigation options for agricultural energy use are described below (while some of the options are not yet available for widespread implementation).

1. Reduce energy use for irrigation.
2. Increase the efficiency of non-pumping farm machinery.
3. Switch to lower-carbon energy sources.
4. Reduce input of chemical fertilizers.
5. Use conservation tillage systems.
6. Improve efficiency of post-harvest drying and storage.
7. Reduce post-harvest food grain losses.

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The challenges faced by agriculture in world

- World population.
- Natural resources scarcity.
- Climate change.
- Rapid rising energy price and higher demand for energy.

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Electrical Safety Tips for Homes

1. Electrical Hazards

Shocks

- Electric Shock causes an involuntary grip which prolongs the period of contact.
- More the period of contact, more the damage.
- Passage of current through the heart , stops the blood supply to the brain , resulting in loss of consciousness and termination of breathing.
- Personal sensitivity to electrical shock varies from person to person.

Burns

- Whenever an electrical flash appears, and if a part of a body comes within flashing distance, burns can be caused.
- Burns may be caused by short circuits as well, because a short circuit could create an electrical fire

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2. Preventive Measures

- Allow only a qualified person to attend to your electrical repairs.
- Service your electrical equipment at frequent intervals through a competent electrician.
- In case of a short circuit or a fire, switch off the mains instantly Make sure that you have easy access to switch off the supply source quickly, in case of an emergency.
- Make sure your extension cords are free from cuts, improper insulation, or joints.
- Ensure pins of your plugs are tight and not loose.

- Use switches of the correct current rating and preferably with indicators to indicate whether the switch is ON/OFF.
- Use appliances with 3 pin plugs and connect them to 3 pin sockets.
- Do not overload electrical outlets or use extension cords in place of additional outlets.
- Switch off electrical appliances when not in use.
- Provide proper earthing for the building/house.