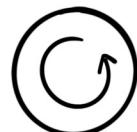


How Things Work

Introduction to -

- Cost-Saving Instrument
- Electronic System
- Automation System



Lesson Aims:

1. Summarize different electrical energy-saving ideas.
2. Identify cost-saving instruments.
3. Classify the Electronic Automated System.

What do you mean by Cost Saving in Electricity?

What is Electronic Automation?

Classify Types of Electronic Instruments.



Electrical Instrument:

We believe in the importance of conserving energy for better tomorrow. If we all take a few simple steps to reduce our energy consumption, we can go a long way in securing our futures.



A few simple activity steps and we can avoid power cuts. But before we list out those steps, just ask yourself, "Am I willing to do my bit for the future of our great city?" I think we all know the answer.

Shift consumption away from the 10 am - 8 pm peak times:

Let's avoid adding to the power demand during this peak time. By simply using some of our common electrical appliances before and after this time band. Washing machines, geysers, irons, building water pumps - all can be shifted without much inconvenience.

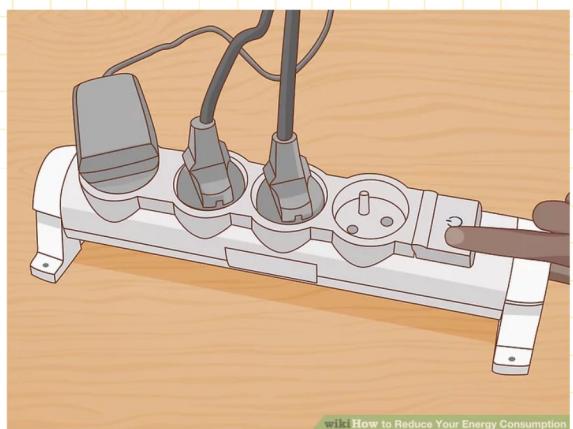
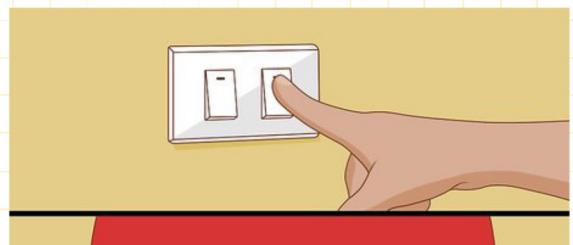
ACs at 26° C

ACs are possibly the biggest cause of any summer power crisis. Every time one more AC is switched on and every time the temperature is lowered by one more degree, a huge load is added to the system. We can however work towards uninterrupted power - if we give up 'freezing' for 'cool enough'. Let's all go 26 this summer - it's actually quite comfortable.

Switch off from the plug point

Whenever we leave a plug point 'ON' after switching an electrical appliance 'OFF' with the remote, power is still being consumed in 'stand-by mode. And no small amount either - these little wastages account for an unbelievable 5% of the city's power consumption. You will agree that's a sheer waste. So, after usage, let's switch off our ACs, TVs, washing machines, microwaves, geysers, and mobile chargers from the plug point. Every single time.

It is up to each one of us to make the change



Brainstorming on Cost-Saving Instrument:

People use energy in all aspects of their lives—for cooking, lighting, and entertainment. Much of this energy use takes place in buildings, such as our homes. To save money and reduce the impact on our environment, many people are reducing their energy use. In this activity, students act as **energy conservation engineers** and identify how energy is conserved or wasted. They also learn many ways to personally conserve energy every day.



Some basic level of saving tips

Light Bulb :

- Switch off lights and fans when not required.
- Replace bulbs with tube lights & CFL(Compact Fluorescent Lamps).
- Turn off the lights when not in use.
- Take advantage of daylight
- De-dust lighting fixtures to maintain illumination.
- Compact fluorescent bulbs are four times more energy efficient than incandescent bulbs and provide the same lighting.
- Use electronic chokes in place of conventional copper chokes.



Electrical iron :

Select iron boxes with automatic temperature cutoff.

Use the appropriate regulator position for ironing.

Do not put more water on clothes while ironing.

Do not iron wet clothes.



Fan :

Replace conventional regulators with electronic regulators for ceiling fans.

Install exhaust fans at a higher elevation than ceiling fans.



Refrigerator :

Do not open the door frequently.

Set the thermostat in a medium cooling position.

Keep adequate space from the wall.

Do not overload the refrigerator. Defrost your refrigerator regularly



Activity

Washing Machine:

- Use after 10 PM or before 10 AM.
- Run the washing machine only with a full load.
- Use the shortest cycle time.
- Always wash only with full loads.
- Use an optimal quantity of water.



Geyser:

- Use before 10 AM.
- Switch off when not required.
- Reduce the thermostat setting from 60° to 50° C.
- Use Solar Water Heater - a good replacement for an electric water heater.
- Mixers
- Avoid dry grinding in your food processors (mixers and grinders) as it takes longer time than liquid grinding.



Microwave Ovens:

- Consume 50 % less energy than conventional electric/gas stoves.
- Do not bake large food items.
- Unless you're baking bread or pastries, you may not even need to preheat.
- Don't open the oven door too often to check food condition as each opening leads to a temperature drop of 25° C.



Electric Stove:

- Turn off electric stoves several minutes before the specified cooking time.
- Use flat-bottomed pans that make full contact with the cooking coil.



Gas Stove:

- When cooking on a gas burner, use moderate flame settings to conserve LPG.
- Remember that a blue flame means your gas stove is operating efficiently.
- Yellowish flame is an indicator that the burner needs cleaning.
- Use pressure cookers as much as possible.
- Use lids to cover the pans while cooking.



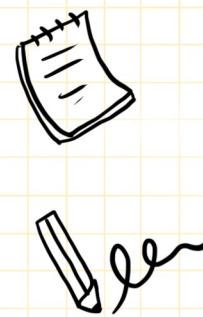
Air Conditioning:

- Ensure proper sealing of doors and windows.
- Set the thermostat at 26° C for optimum cooling.
- Clean the AC filter every month.
- Use film / tinted glass on windows.
- Prefer air conditioners having automatic temperature cut-off.



Types of Electronic Home Automated Systems:

A home automation system makes the operations of various home appliances more convenient and saves energy. With the energy-saving concept, home automation or building automation makes life very simple nowadays. It involves the automatic control of all electrical or electronic devices in homes or even remotely through wireless communication. Centralized control of lighting equipment, air conditioning and heating, audio/video systems, security systems, kitchen appliances, and all other equipment used in home systems is possible with this system.



1. Power Line Home Automation System

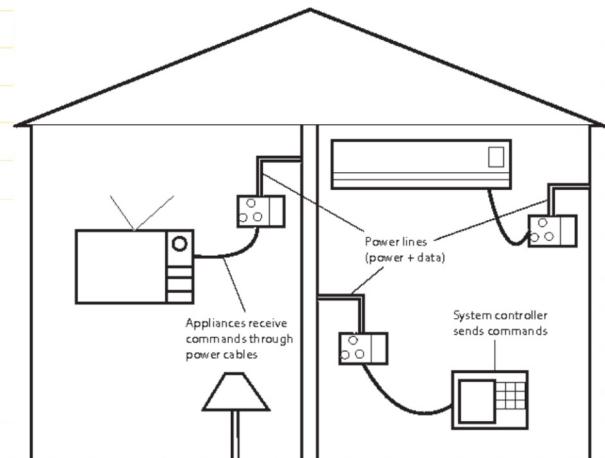
This automation is inexpensive and doesn't require additional cables to transfer the information, but uses existing power lines to transfer the data. However, this system involves a large complexity and necessitates additional converter circuits and devices.

2. Wired Home Automation System

In this type of automation, all the home equipment is connected to the main controller (programmable logic controller) through a communication cable. The equipment is attached to actuators to communicate with the main controller. The entire operations are centralized by the computer that continuously communicates with the main controller.

3. Wireless Home Automation

This is the expansion and advancement of wired automation which uses wireless technologies like IR, Zigbee, Wi-Fi, GSM, Bluetooth, etc., for achieving remote operation. As an example, GSM-based home automation provides the control of home equipment by an SMS to the GSM modem.



Activity

- 1) Watch the video - https://youtu.be/D11iFUw_ImU
- 2) Read the worksheets and complete them as per the instructions

Conserving Energy	Wasting Energy
Use a pan that matches the size of the stove burner	Use a small pan on a large burner
Cook many items in the oven at the same time	Cook one item in the oven at a time
Run the washing machine with a full load	Running the washing machine half full
Take a shower, instead of a bath	Take a bath
Close the curtains in the room that you are cooling	Leave the curtains open while trying to cool a room
Turn off the TV or radio when no one is watching or listening	Leave on the TV or radio when no one is watching or listening
Fix the leaking faucet	Let water drip from a leaking faucet
Open and close the refrigerator door quickly	Keep the refrigerator door open
When it is cold, wear warm clothes in several layers	Not wearing a coat when it is cold
Stuff rags, paper or rugs in the crack under an outside door	Have leaking doors or windows
Have good insulation in outside walls and roof	Have no insulation in walls
Turn off the lights that you do not need.	Leave lights on when you are not using them
Wash and rinse in dirty pans, instead of a sink	Wash and rinse in two sinks

Activity

In the grid below, color each square according to the following guidelines:

If it describes a waste of energy, color the square RED.

If it describes a way to save energy, color the square YELLOW.

A dripping hot water faucet	A room with thermostat set below 68°F in winter	A house with poor insulation	Leaving lights on in an empty room	Driving in rush-hour traffic	Driving a hybrid car
Growing a garden	Using an electric blanket	Turning the TV off when no one is watching	Turning off appliances when on vacation	Car pooling	Using an electric can opener
A low-water landscape	Using fluorescent lights	Using lamps with 150-Watt bulbs	Driving a car with no other passengers	Leaving the faucet on when brushing your teeth	Taking showers instead of baths
Wearing sweaters and warm clothes in cold weather	Driving an oversized car	Riding your bike instead of taking the car	Using an electric toothbrush	Driving your car over 55 mph	Leaving outside lights on during the day
Opening curtains on the south side of the house during a summer day	Running full loads in the washing machine	Using solar thermal panels to heat hot water	Using both sides of a piece of paper	Closing windows and doors when the air conditioner or heat is on	Recycling cardboard and magazines
Leaving the car running in the driveway while you go inside	Using an electric knife	Hanging clothes outside to dry	Leaving the computer on when no one is using it	Recycling paper, glass and metal	Watching TV instead of playing outdoors

In the space below, describe additional activities that you can do to conserve energy.

Reflection

- 1) What is an example of an electrical instrument?
- 2) How many types of electrical instruments are there?
- 3) What are some electrical instruments that are used in industry?
- 4) What is an electricity bill?
- 5) What is meant by the loading effect?
- 6) What is electrical instrumentation?



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