

# Nuclear power plant and diesel power plant

## UNIT 4

# Nuclear Energy

The heavy substance whose nucleus can be broken into fragments is called nuclear fuel. The only substance found in nature which fissions and is capable of propagating nuclear chain reaction is Uranium. By fission of nucleus of Uranium, binding energy is released in the form of heat energy, which is used for conversion of water into steam. Steam is used to run turbines, and a coupled generator produces electrical energy. The operating cost is very low, however limited availability of material and high initial cost are the main drawbacks.

# Source of energy

1. Non renewable sources : The sources of energy which once used can not be replaced are called as non renewable source of energy such as coal, petroleum etc.
2. Renewable sources : The source of energy which will never runout are called renewable source of energy such as sun, water, wind, tides and biomass etc.

# Units of Energy

The capacity to do work is known as energy.

The most important form of energy are mechanical energy, electrical energy and thermal energy.

$$1 \text{ calories} = 4.18 \text{ joule}$$

$$1 \text{ kWh} = 36 \times 10^5 \text{ Nm}$$

$$1 \text{ kWh} = 860 \text{ k calories}$$

# Diesel Power Station

A power station in which diesel engines are used as prime mover and energy produced by the combustion of diesel oil is converted into electrical energy is called as diesel power station.

In these power stations the gases produced by the combustion of diesel oil are used to produce mechanical energy. An alternator is coupled to the diesel engine , which converts mechanical energy into electrical energy.

# Advantages of Diesel Power Station

1. less space is required for installation.
2. design and installation is simple.
3. Less quantity of water is required for cooling purposes.
4. Over all initial cost is low.
5. It is quickly started in operation.
6. These types of plants are located near load centre.
7. Cost of transportation diesel oil and transmission of power is low.

# Disadvantages of Diesel Power Station

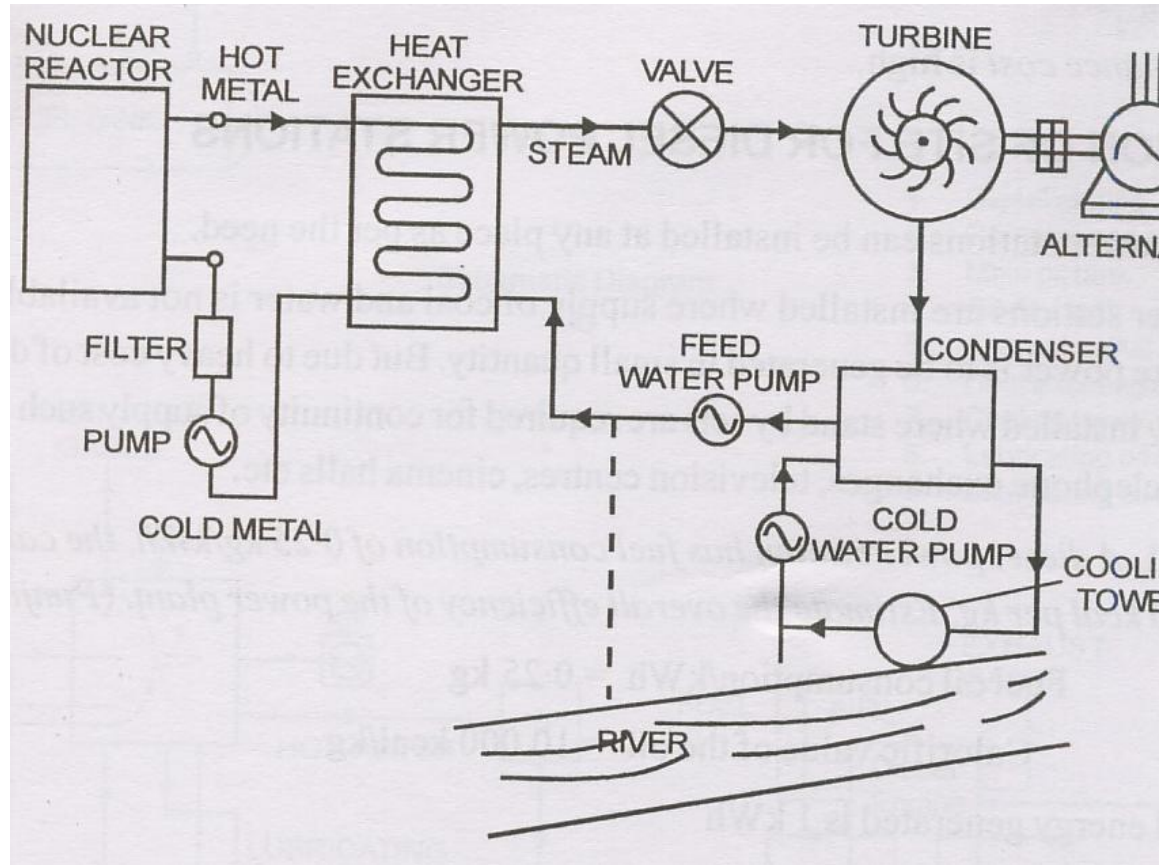
1. Diesel is costly, thus running cost is high.
2. Capacity of diesel engine is limited.
3. Maintenance cost of diesel engine is more.

# Nuclear Power Station

A power station in which nuclear energy is used to produce electrical energy is called a nuclear power station.

It is interesting to know that 1 kg of nuclear fuel produces the same amount of heat which is produced by 2700 tons of coal.





## Schematic diagram of Nuclear Power Station

It is basically a steam power station in which steam boiler is replaced by nuclear reactor. A reactor is part of plant in which chain reaction of nuclear fission is controlled. The heat produce converts water into steam and rotate the turbine. Steam after giving heat is condensed and again feed.

# Advantages of Nuclear Power Plant

1. Amount of fuel requires is very small thus transportation cost reduces.
2. It requires less space.
3. The running cost is very low so it most economical.

# Disadvantages of Nuclear Power Plant

1. The danger of radioactivity is always there.
2. Initial cost is high.
3. Maintenance cost is more.
4. More time is required for installation.

# Elements of Nuclear power Plants

The following are the important parts of nuclear power plant :

1. Nuclear Reactor
2. Heat exchanger
3. Steam turbine
4. Alternator

# Nuclear Reactor

It is a nuclear furnace for carrying out controlled fission of radioactive material like Uranium-235.

It provides neutrons with sufficient energy so that it is absorbed by the nuclei and causing fission.

It also controls the chain process.

# Heat Exchanger

It is an arrangement by which heat produced due to nuclear fission.

Heat produced in the nuclear reactor is given to the coolant and it convert water into steam.

After giving up heat, the coolant is again back to the reactor.

# Steam Turbine

The steam produced by the heat exchanger is fed to the steam turbine through valve, which converts heat energy into mechanical energy.

# Alternator

An alternator is coupled to the steam turbine which converts mechanical energy into electrical energy.