Types of power plants

A **power plant** can be of several types depending mainly on the type of fuel used. Since for the purpose of bulk power generation, only thermal, nuclear and hydro power comes handy, therefore a power generating station can be broadly classified in the 3 above mentioned types. Let us have a look in these **types of power stations** in details.

Thermal power plant

A thermal power station or a coal fired thermal power plant is by far, the most conventional method of generating electric power with reasonably high efficiency. It uses coal as the primary fuel to boil the water available to superheated steam for driving the steam turbine. The steam turbine is then mechanically coupled to an alternator rotor, the rotation of which results in the generation of electric power. Generally in India, bituminous coal or brown coal are used as fuel of boiler which has volatile content ranging from 8 to 33% and ash content 5 to 16 %. To enhance the thermal efficiency of the plant, the coal is used in the boiler in its pulverized form.

- **Advantages of Thermal Power Plants**
- Fuel used i.e coal is quite cheaper.
- Initial cost is less as compared to other generating stations.
- It requires less space as compared to hydro-electric power stations.
- **Disadvantages of Thermal Power Plants**
- It pollutes atmosphere due to production of smoke & fumes.
- Running cost of the power plant is more than hydro electric plant.

Nuclear Power Station

The nuclear power generating stations are similar to the thermal stations in more ways than one. How ever, the exception here is that, radioactive elements like uranium and thorium are used as the primary fuel in place of coal. Also in a Nuclear station the furnace and the boiler are replaced by the nuclear reactor and the heat exchanger tubes. For the process of nuclear power generation, the radioactive fuels are made to undergo fission reaction within the nuclear reactors. The fission reaction, propagates like a controlled chain reaction and is accompanied by unprecedented amount of energy produced, which is manifested in the form of heat. This heat is then transferred to the water present in the heat exchanger tubes. As a result, super heated steam at very high temperature is produced. Once the process of steam formation is accomplished, the remaining process is exactly similar to a thermal power plant, as this steam will further drive the turbine blades to generate electricity.

Hydro-Electric Power Station

In Hydro-electric plants the energy of the falling water is utilized to drive the turbine which in turn runs the generator to produce electricity. Rain falling upon the earth's surface has potential energy relative to the oceans towards which it flows. This energy is converted to shaft work where the water falls through an appreciable vertical distance. The hydraulic power is therefore a naturally available renewable energy given by the eqn:

$P = g\rho QH$

Where, g = acceleration due to gravity = 9.81 m/sec^2

ρ = density of water = 1000 kg/m^3

H = height of fall of water.

- **Advantages of Hydro Electric Power Station**
- It requires no fuel, water is used for generation of electrical energy.
- It is neat and clean energy generation.
- Construction is simple, less maintenance is required.
- It helps in irrigation and flood control also.
- **Disadvantages Hydro Electric Power Station**
- It involves high capital cost due to dam construction.
- Availability of water depends upon weather conditions.
- It requires high transmission cost as the plant is located in hilly areas.

Apart from these major types of power generations, we can resort to small scale generation techniques as well, to serve the discrete demands. These are often referred to as the alternative methods or non conventional energy of power generation and can be classified as

- Solar power generation. (making use of the available solar energy)
- Geo-thermal power generation. (Energy available in the Earth's crust)
- Tidal power generation.
- Wind power generation (energy available from the wind turbines)