

3.3 GEOTHERMAL POWER PLANT (GTE)

1. Geothermal power

It is the electrical power generated from geothermal energy.

2. Geothermal Energy

It is the heat produced deep in the earth's core.

Origin

Geothermal energy is the thermal energy found in the earth's crust which originates from the formation of the planet and from radioactive decay of materials. The high temperature and pressure in earth's interior cause some rock to melt and solid mantle to behave plasmically. This results in parts of the mantle convecting upward since it is lighter than the surrounding rock. Temperatures at the core mantle boundary can reach over 400°C.

Geothermal technology extracts the heat found within the subsurface of the earth, which can be used directly for heating and cooling (or) converting it to electricity.

The steam comes from the reservoirs of hot water, found a few miles (or) more below the earth's surface, rotates a turbine that activates a generator, which produces electricity.

Power plants of GTE

Geothermal power plant uses hydrothermal resources that have both water (hydro) and heat (thermal).

Geothermal power plants require high temperature

(300°F to 700°F) hydrothermal resources that come from either dry steam wells (or) from hot water wells.

Generally, we use these resources by drilling wells into the earth and then piping steam (or) hot water to the surface. The hot water (or) steam rotates a turbine that generates electricity.

The depth of the geothermal wells is as much as 2 miles.

Type of Geothermal power plants

There are three basic types of geothermal power plants.

1. Dry steam power plant

It uses steam directly from a geothermal reservoir to drive generator's turbines.

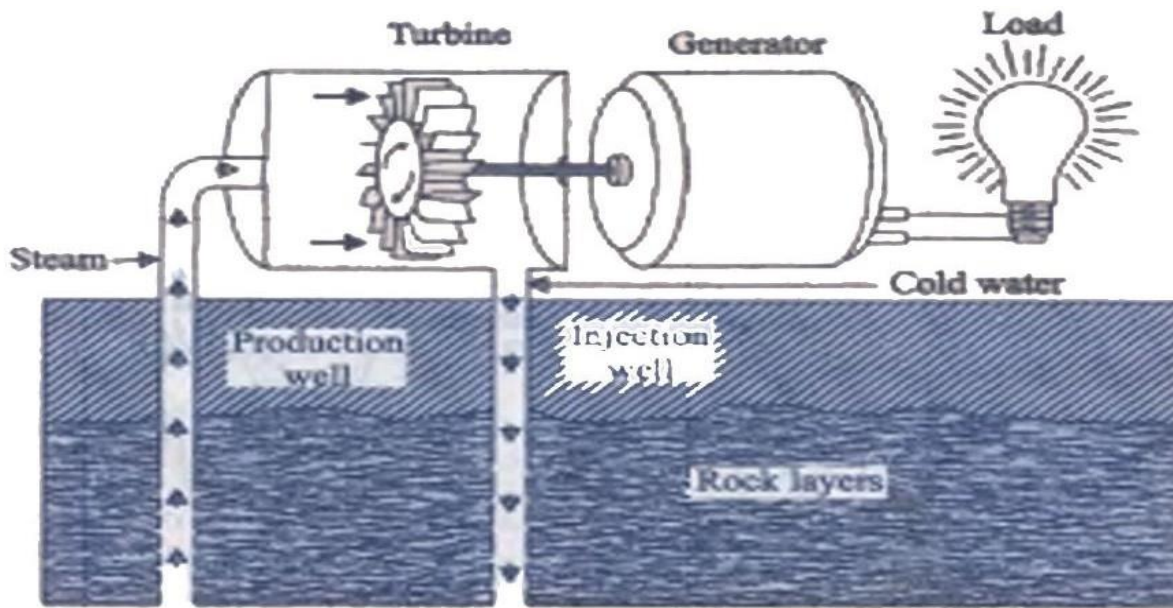


Fig. Dry steam power plant

2. Flash steam power plant

It takes high-pressure hot water from deep inside the earth and converts it into steam to drive generator's turbine.

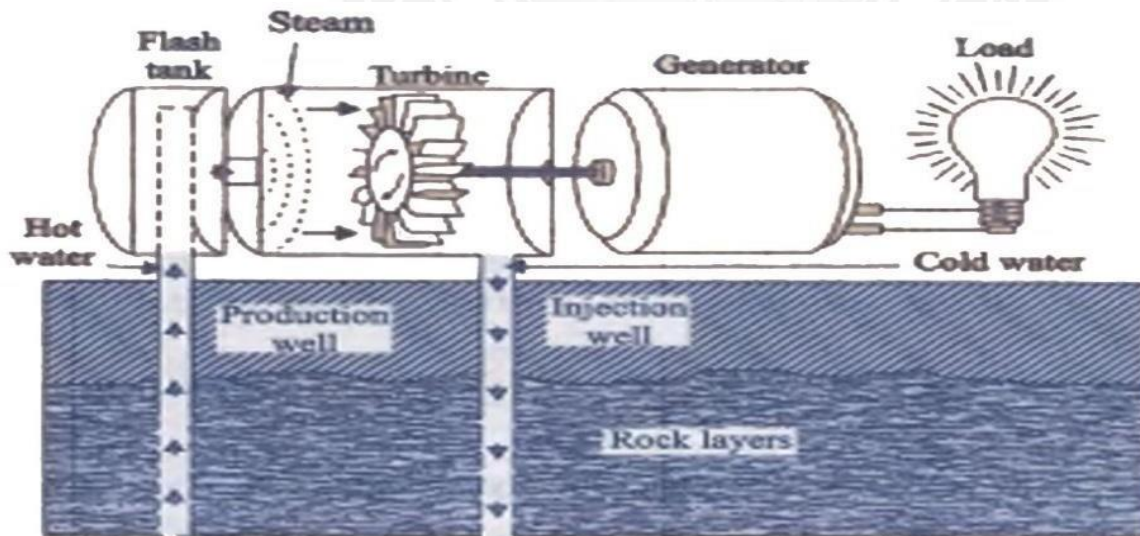
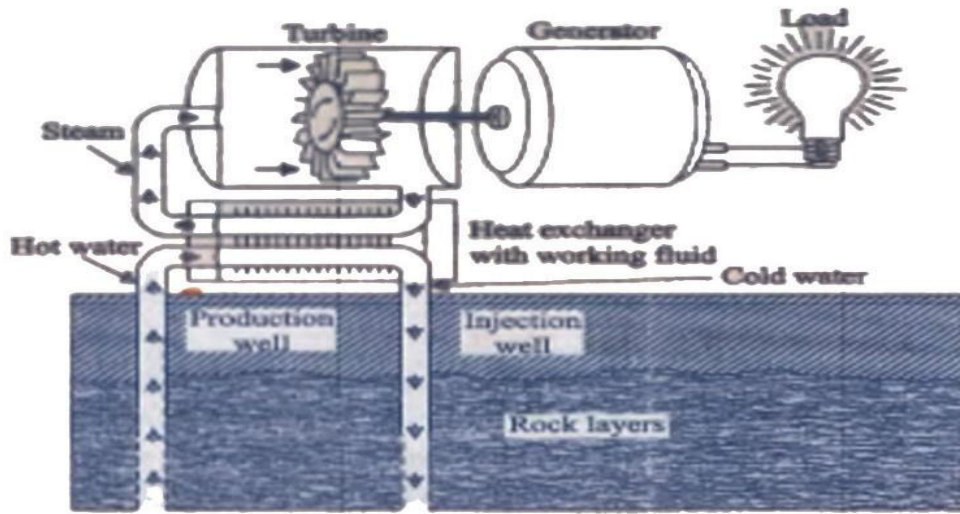


Fig. Flash steam power plant

When the steam cools, it condenses to water and is injected back into the ground to be used again. Most geothermal power plants are flash steam plants.

3. Binary cycle power plants



Binary cycle power plants

It transfers the heat from geothermal hot water to another liquid. The heat causes the second liquid to convert it into steam, which is used to drive a generator's turbine.

Advantages

- GTE is environmentally friendly.
- GTE is a source of renewable energy.
- It is the sustainable form of energy.
- The potential of GTE is huge.
- Energy generated from this resource is reliable.
- As GTE is natural, no fuel is required.

Disadvantages

- Location is restricted.
- As GTE does not release greenhouse gases, there are many other gases released into the atmosphere (cause side effects).
- May cause earthquakes.
- It is expensive resource.
- Management is required to maintain sustainability.

Applications of GTE

- GTE is used for space heating and cooling.
- GTE is used to generate electricity.
- It is also used for industrial process heat.

- It is used for desalination of geothermal water and heavy water production.
- It is also used in the extraction of minerals from geothermal fluids.
- Geothermal Heat Pumps (GHPs) are used to heat buildings in the winter and cool them in summer
- The direct use of GTE involves the use of heated water from the ground without the need for any other source

