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UNIVERSITY

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FACULTY OF ENGINEERING &
TECHNOLOGY

FUEL COMBUSTION EQUIPMENTS

STEAM POWER PLANTS:

A thermal power station is a power plant in which the prime mover is steam driven. Water is heated, turns into steam and spins a steam turbine which drives an electrical generator.

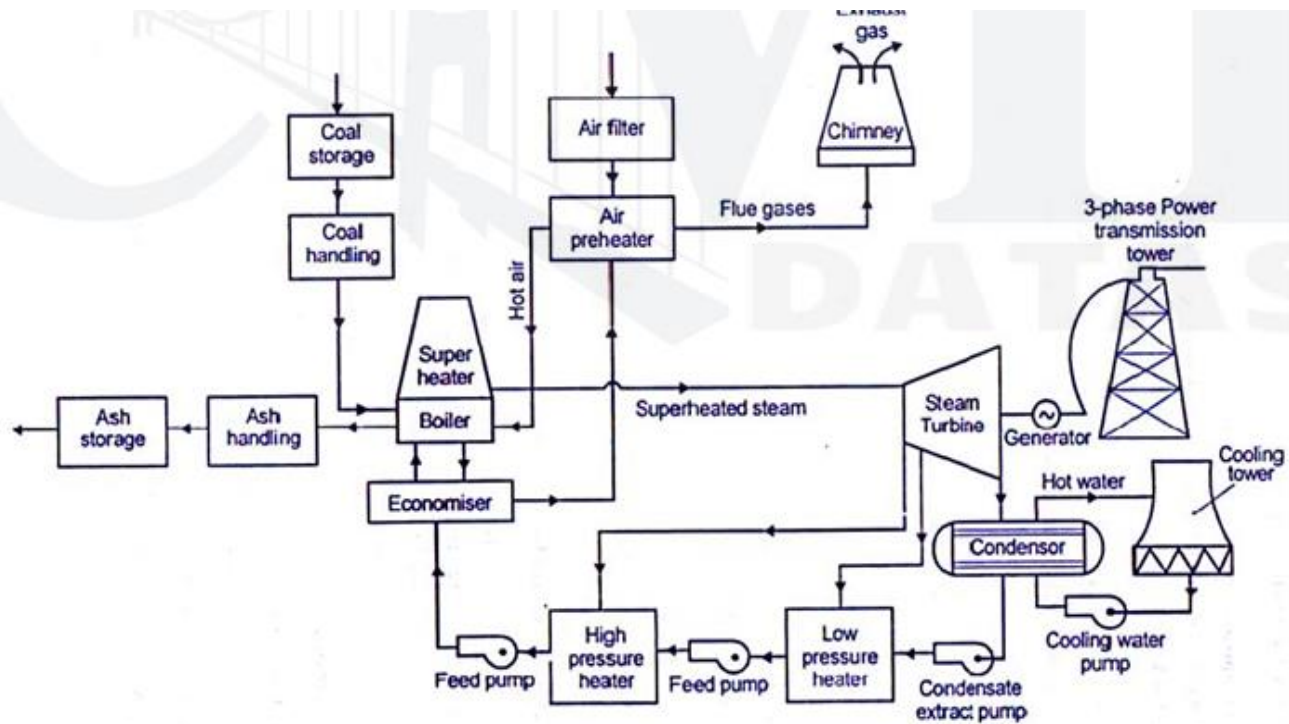
After it passes through the turbine, the steam is condensed in a condenser and recycled to where it was heated; this is known as a **Rankine cycle**.

The greatest variation in the design of thermal power stations is due to the different fuel sources. Some prefer to use the term *energy center* because such facilities convert forms of heat energy into electricity.

Some thermal power plants also deliver heat energy for industrial purpose, for direct heating or for desalination water as well as delivering electrical power. A proportion of CO₂ is produced by the world's fossil fired thermal power plants; efforts to reduce these outputs are various and widespread.

The four main circuits one would come across in any thermal power plant layout are

- Coal and Ash Circuit
- Air and Gas Circuit
- Feed Water and Steam Circuit
- Cooling Water Circuit



Coal and Ash Circuit

Coal and Ash circuit in a thermal power plant layout mainly takes care of feeding the boiler with coal from the storage for combustion.

The ash that is generated during combustion is collected at the back of the boiler and removed to the ash storage by scrap conveyors. The combustion in the Coal and Ash circuit is controlled by by regulating the speed and the quality of coal entering the grate and the damper openings.

Air and Gas Circuit

Air from the atmosphere is directed into the furnace through the air preheated by the action of a forced draught fan or induced draught fan. The dust from the air is removed before it enters the combustion chamber of the thermal power plant layout. The exhaust gases from the combustion heat the air, which goes through a heat exchanger and is finally let off into the environment.

Feed Water & Steam Circuit

- The steam produced in the boiler is supplied to the turbines to generate power.
- The steam that is expelled is heated using the steam from different points in the turbine. To make up for the lost steam and water while passing through the various components of the thermal power plant layout, feed water is supplied through external sources.
- Feed water is purified in a purifying plant to reduce the dissolved salts that could scale the boiler tubes.

Cooling Water Circuit

- The quantity of cooling water required to cool the steam in a thermal power plant layout is significantly high and hence it is supplied from a natural water source like a lake or a river.
- After passing through screens that remove particles that can plug the condenser tubes in a thermal power plant layout, it is passed through the condenser where the steam is condensed.
- The water is finally discharged back into the water source after cooling. Cooling water circuit can also be a closed system where the cooled water is sent through cooling towers for re-use in the power plant.
- The cooling water circulation in the condenser of a thermal power plant layout helps in maintaining a low pressure in the condenser all throughout.

Advantages

- 1.Generation of power is continuous.
- 2.Initial cost low compared to hydel plant.
- 3.Less space required.
- 4.This can be located near the load centre so that the transmission losses are reduced.
- 5.It can respond to rapidly changing loads

Disadvantages

- 1.Long time required for installation.
- 2.Transportation and handling of fuels major difficulty.
- 3.Efficiency of plant is less.
- 4.Power generation cost is high compared to hydel power plant.
- 5.Maintenance cost is high.

STEAM POWER PLANT

Coal needs to be stored at various stages of the preparation process, and conveyed around the CPP facilities. Coal handling is part of the larger field of bulk Material handling, and is a complex and vital part of the CPP.

