



SNS COLLEGE OF TECHNOLOGY

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Department of Mechanical Engineering

Steam Power Plant

STEAM (or) THERMAL POWER PLANT:

Steam is an important medium for producing mechanical energy. It is used to drive Steam engines and Steam turbines.

The advantages are:

Steam can be raised quickly from water which is available in plenty.
It does not react much with the material of the equipment's.
It is stable at temperature required in the plant.

FACTORS TO BE CONSIDERED IN CHOOSING STEAM POWER PLANT

1. Supply of fuel: Plant should be nearer to the coal mines. Transport cost can be reduced.
2. Availability of water: There should be natural source to get continuous water supply.
3. Transport facilities: There should be enough roads and rails connecting the plant.
4. Cost and type of land: Land cost should be cheap. Soil should have the bearing capacity of the weight of equipment and machineries.
5. Distance from populated area: It should be located at a favorable distance to prevent from pollution.

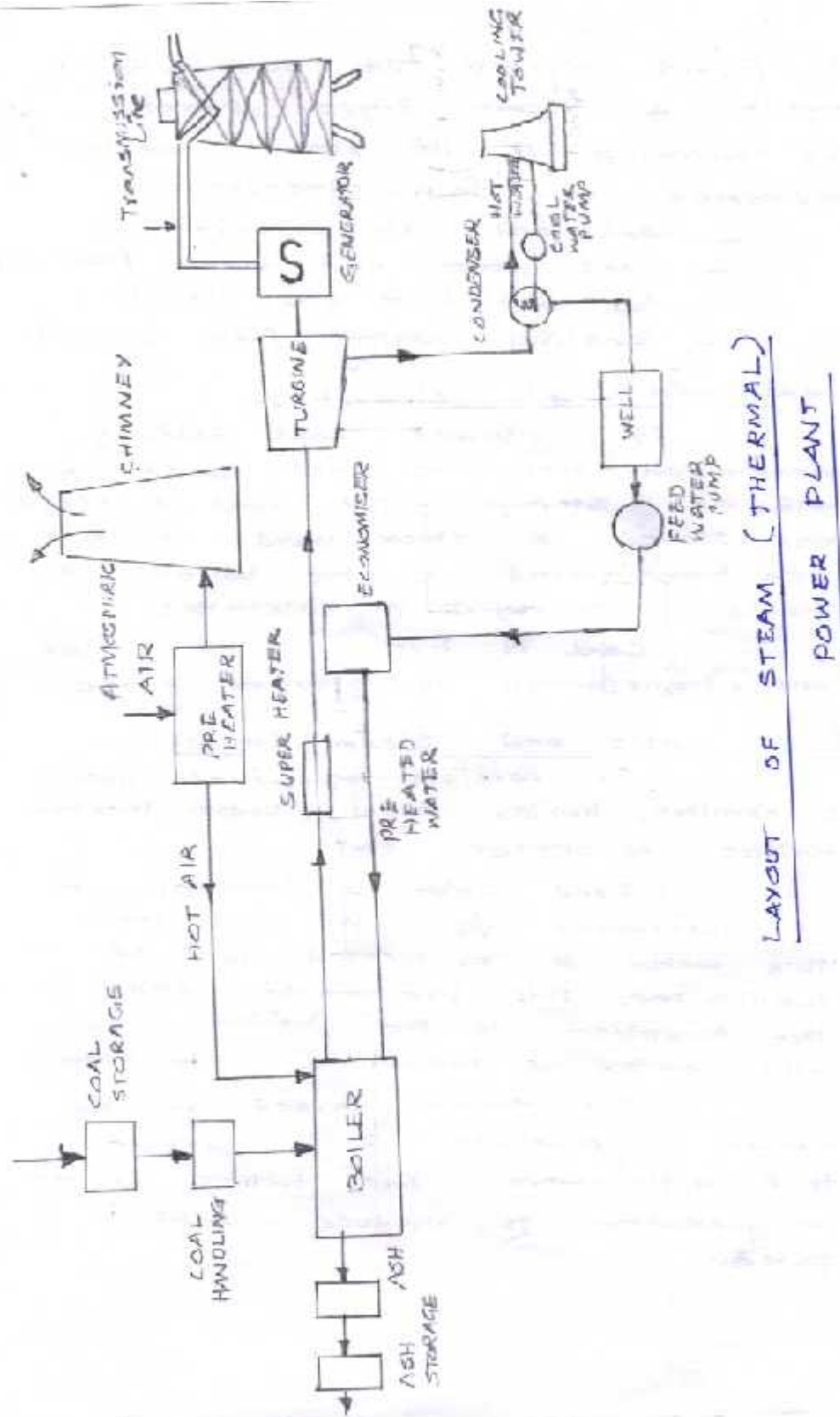
WORKING OF STEAM POWER PLANT

The plant should have the following equipment's:

- Furnace for burning the fuel.
- Steam generator or boiler for steam generation.

Power unit of an engine or turbine to convert heat energy into Mechanical energy.

- Generator to convert mechanical energy into electrical energy.
- Piping system to carry steam and water.



LAYOUT OF STEAM (THERMAL) POWER PLANT

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The figure shows the schematic layout of Steam power plant:

The working of the plant can be carried out in four circuits.

- 1.Coal and ash handling circuit.
- 2.Feed water and Steam flow circuit.
- 3.Air and Flue gases circuit.
- 4.Cooling water flow circuit.

1.Coal and ash handling circuit:

It includes coal delivery, preparation, handling, ash handling and ash storage. The coal is sized and stored in stock yard. It is then transported to the boiler by means of conveyors or elevators.

Coal is burnt in the boiler and ash is transferred to storage place.

2.Feed water and Steam circuit:

It consists of feed pump, economizer, boiler drum, super heater, turbine and condenser.

Feed water is pumped to the economizer from the hot well. This water is pre heated in the economizer. This pre heated water is then supplied to the boiler drum and water is converted into steam.

The steam raised in the boiler is expanded in a turbine to do the work. The turbine drives the generator to electric power.

3.Air and Flue gas circuit:

Air is taken from the atmosphere and passed through the air pre heater and the air is pre heated. This air is supplied to the furnace to aid the combustion of fuel and hot gases (Flue gases) are formed.

The flue gases passed through the economizer to heat the feed water.

4.Cooling water circuit:

It consists of a pump, condenser, cooling tower etc. The exhaust steam is (from turbine) is condensed in a condenser. In the condenser cold water is supplied to condense the steam into water. This hot water is taken to a cooling tower for removing heat from water. This water is again circulated and the cycle is repeated.

A steam power station mainly works on Rankine cycle. Steam is produced by the combustion of coal and hence producing steam from water in the boiler. The steam is made to expand in the prime mover and then it is condensed using a condenser to feed back it to the boiler again.

The steam turbine rotates due to the impact of steam on its blades and this sets the coupled to alternator in motion which converts mechanical energy into electrical energy.

MERITS (ADVANTAGES) OF STEAM POWER PLANTS:

- 1.The unit capacity is more.
- 2.Life of the plant is more (25 to 30 years)
- 3.Maintenance cost is less.
- 4.Initial cost of the plant is less when compared to Nuclear power plants.
- 5.Suitable for varying load conditions.
- 6.No harmful radio active wastes are produced as in Nuclear plants.
- 7.Unskilled operators can operate the plant.
- 8.There is no transmission losses since they are near to the load centers.

DEMERITS (DISADVANTAGES) OF STEAM POWER PLANTS

- 1.Bringing the plant to put into service takes more time.
- 2.Cooling water is required more.
- 3.More space is required.
- 4.Ash handling and disposing will be a problem.
- 5.Transport, handling and storage charges are more.
- 6.Not economical in remote areas from coal fields.