I: Steam Power plant (or) Thermal power plant:

(A) Working principle of steam Power plant:

1. Steam is used as working fluid.
2. Heat energy → Mechanical energy → Electrical energy.
3. Steam is produced in the boiler and is used to drive the steam turbine which is coupled with a generator.

Device	Energy Conversion
Boiler	Fuel → Heat energy
Turbine	Heat energy → Mechanical energy.
Generator	Mechanical energy → Electical energy.

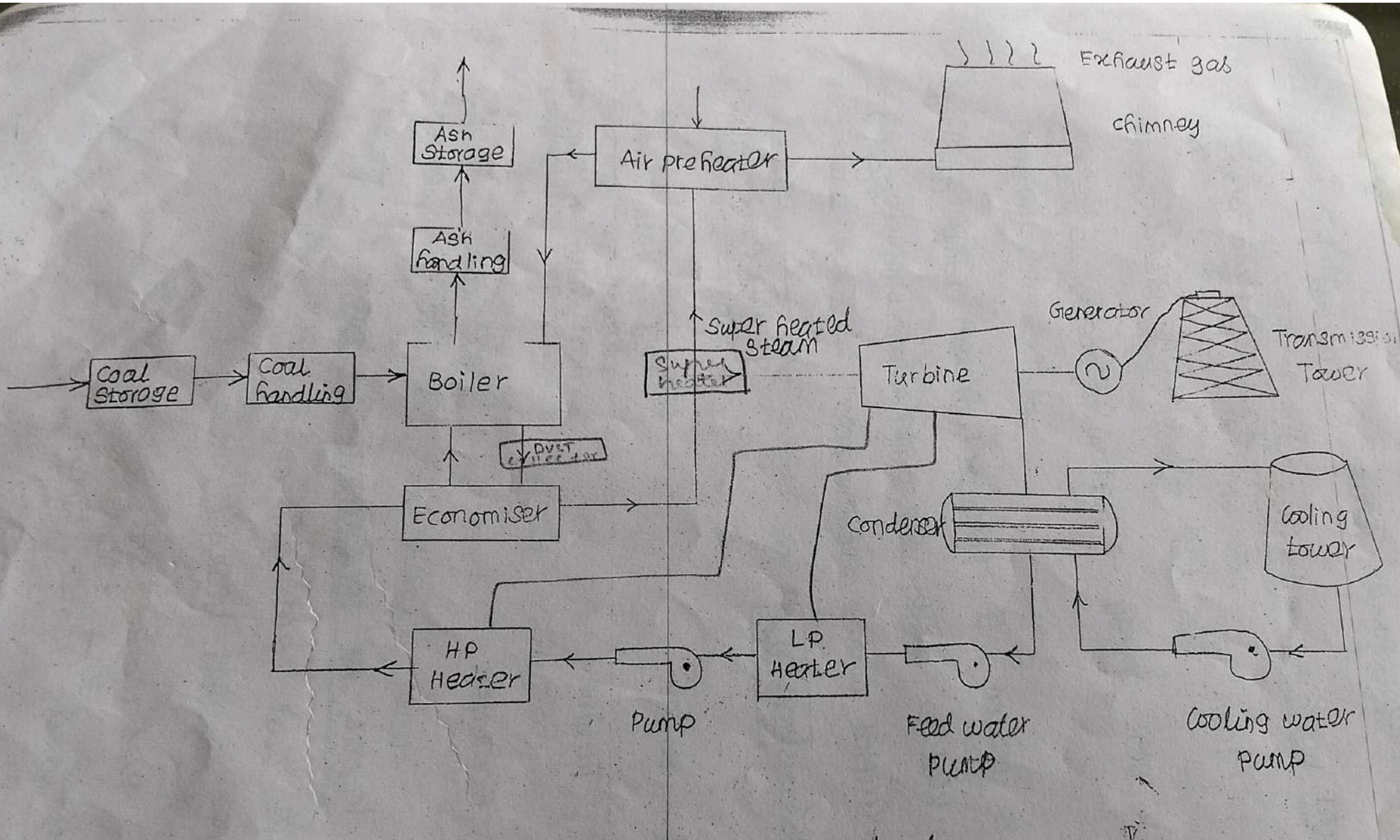
(B) layout of steam power plant:

(a) Coal and ash circuit.

(b) Air and flue gas circuit.

(c) Feed water and steam circuit.

(d) Cooling water circuit.



Layout of steam power plant.

(a) Coal and Ash circuit :

1. It consist of coal storage, coal handling system, ash storage, ash handling systems.
2. Coal from the storage yard is transfered to the boiler furnace through coal handling system.
3. Ash produced due to combustion of fuel.
4. Normally Indian coal contains 30 to 40% ash.

Hence sufficient space is necessary nearer to the power plant for ash disposal.

(b) Air and flue gas circuit :

1. It consist of air filter, air preheater, economiser dust collector, chimney flowers and draught fans
2. Air is taken from atomshere through fans to the air preheater.

3. Air is heated by the heat of flue gases which is passing through the chimney.

4. Hot air is supplied to the furnace of the boiler

5. Dust from the air is removed by means of using air filter.

6. After combustion, the flue gas has sufficient quantity of heat is passed around boiler, dust collector, economiser and preheater.

7. The flue gas around the economiser and air-preheater the water and air are preheated before going to the boiler.

c) Feed water and steam circuit :

1. It Consist of boiler fed pump, boiler, turbine and feed heater.
2. The steam generated in the boiler passes through super heater and is supplied to the turbine.
3. Steam is expanded in the steam turbine, then passed to the condenser.
4. The condensate is heated in the HP and LP heaters using the steam tapped from the different points of turbine.
5. The feed water is passing through the economiser.
6. Using the economiser, the feed water is heated by the feed water heaters and fed into the boiler.

d) Cooling water circuit :

1. It Consist of circulating water pump, condenser, cooling water pumps and cooling tower.
2. water is required for condensing the steam in the condenser.
3. Adequate water supply is available from various sources like river or lake.
4. Adequate quantity of water is not available at plant sites, the warm water coming out from the condenser is cooled in cooling tower.

(D) Advantages of steam power plant :

1. Initial cost is low.
2. Generation of power is continuous.
3. Less space is required.
4. Transmission cost and Transmission losses are reduced.
5. It can respond to rapidly changing load.

(E) Dis Advantages of steam power plant :

1. Efficiency is less.
2. Power generation cost is high.
3. Maintenance and operating cost are high.
4. Transportation and handling of fuel is difficulty.
5. Air pollution is major problem.