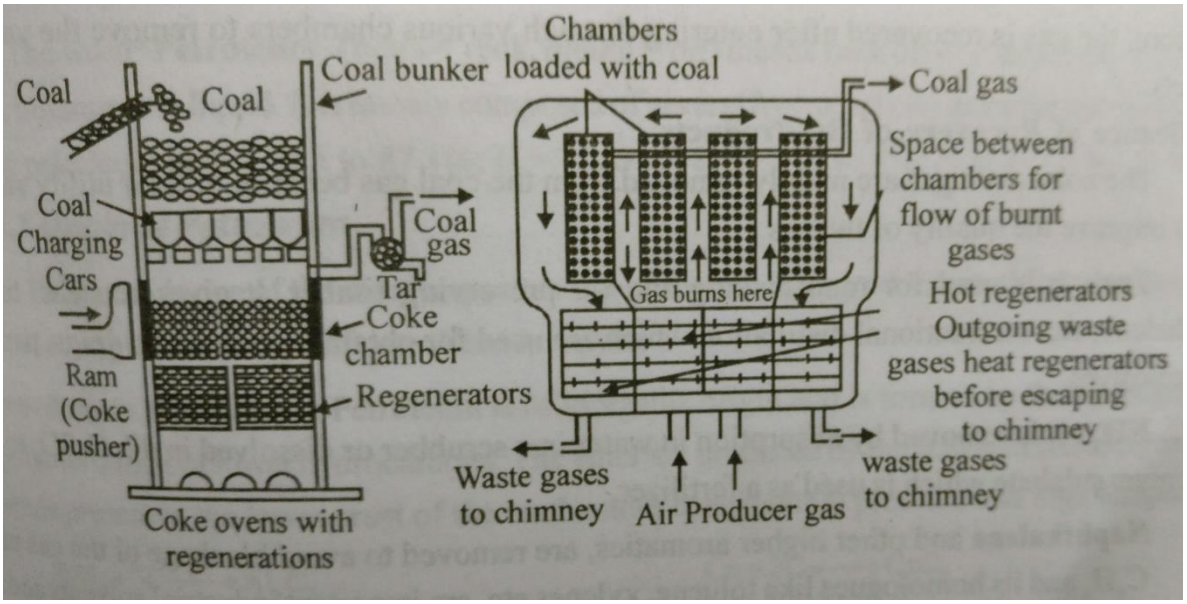
Otto-Hoff mann's By Product Coke OvenPocess

Principle: The heating is done on the basis of regenerative system of heat economy, i.e. utilization of the waste flue gases for heating of checker work of bricks.

Construction:

1. Otto-Hoff mann's oven consists of a number of narrow silica chambers.
2. Each chamber is about 10-12 m long, 3-4m high and 0.4-0.45 m wide.
3. These chambers are erected side by side with vertical flues in between them to form a sort of battery.
4. The chambers are tightly closed so that no air is admitted.
5. At the top of each chamber, there are three holes for charging the coal.
6. It is also provided with a gas off -take (which carries out the volatile matter) and iron door at each end for discharging coke as shown in figure
7. A single oven can hold 16-24 tons of coal.



Working:

1. Finely powdered Coal is charged into the chamber and the chambers are closed.
2. The heat for the carbonization reaction is obtained by burning the preheated air and the producer gas in the interspaces between the chambers.
3. The gas and the air are preheated by means of regenerators.
4. The temperature goes around 1200 °C and the yield of coke is about 70%.
5. Each oven holds about 20 tons of coal charge and the time taken for carbonization is about 12-20 hours.

6. When the process is complete, the end doors are opened and coke is withdrawn.
7. It is then cooled by quenching with water.
8. Hot exhaust gases after combustion are allowed to pass through the two sets of regenerators which are staked by brick work.
9. The hot gases heat up the brick work. While one regenerator is heated by the hot gases, the other regenerator is used for heating the incoming air and gas mixture.
10. This process of alternately passing of hot exhaust gases and cold air and gas through regenerators continues and this process is called regeneration.

Recovery of by-products

The volatile matter coming out from the oven in the form of gas, known as cokeoven gas, is composed of tar, ammonia, naphthalene, benzene, etc. These products are separated from each other.

(1) Recovery of Coal Tar: The coke-oven gas is passed through a tower where liquid ammonia is sprayed. Dust and tar along with ammonia are collected in a tank.

(2) Recovery of Ammonia: The gas free from tar is passed through another tower in which water is sprayed. Ammonia goes into solution as ammonium hydroxide.

(3) Recovery of Naphthalene: The gas is then passed through another tower where water is sprayed at low temperature. Here naphthalene gets condensed.

(4) Recovery of Benzene: The gas is then passed through a tower where petroleum is sprayed. Here benzene and its higher homologous are condensed.

(5) Recovery of H_2S: The gases are then passed through a purifying chamber, packed with moist ferric oxide to retain H_2S

$$Fe_2O_3 + 3\,H_2S \longrightarrow Fe_2S_3 + 3H_2O$$

After sometime when allFe_2O_3 is changed intoFe_2S_3, the purifier is exposed to the air when Fe_2S_3 is oxidized toFe_2O_3 as

$$Fe_2S_3 + 4O_2 \longrightarrow 2FeO + 2SO_2 \uparrow$$

$$4FeO + O_2 \quad 2\,Fe_2O_3 \longrightarrow$$

Advantage of Otto-Hoff mann's Method:

1. Valuable by-products like ammonia and coal gas are recovered.
2. Utilization of heat of waste flue gases.