



### Manufacture of metallurgical coke by Otto-Hoffmann method

In order to: (i) *increase the thermal efficiency* of the carbonization process, and  
(ii) *recover valuable by-product* (like coal gas, ammonia, benzol oil, tar, etc.), Otto Hoffman developed modern byproduct coke oven.

The oven consists of a number of narrow silica chambers, each about 10-12 m long, 3-4 m tall and 0.4-0.45 m wide. Each chamber has a hole at the top to introduce the charge, a gas off take valve and a refractory lined cast iron door at each end for coke discharge.

Coal is introduced into the silica chamber and the chambers are closed. The chambers are heated to 1200°C by burning the pre heated air and the producer gas mixture in the interspaces between the chambers.

The air and gas are preheated by sending them through 2<sup>nd</sup> and 3<sup>rd</sup> hot generators. The hot flue gases produced during combustion are allowed to pass through 1<sup>st</sup> and 4<sup>th</sup> generators until the temperature has been raised to 1000°C. While 1<sup>st</sup> and 4<sup>th</sup> generators are heated by hot flue gases, the 2<sup>nd</sup> and 3<sup>rd</sup> generators are used for heating the incoming air and gas mixture

For economical heating, the direction of inlet gases and flue gases are changed frequently. The cycle goes on and the heating is continued until all the volatile matter has escaped. It takes nearly 12-20 hours for carbonization of a coal. When the carbonization is over, the red hot coke is quenched by spraying water (wet quenching). The yield of coke is about 70 %.

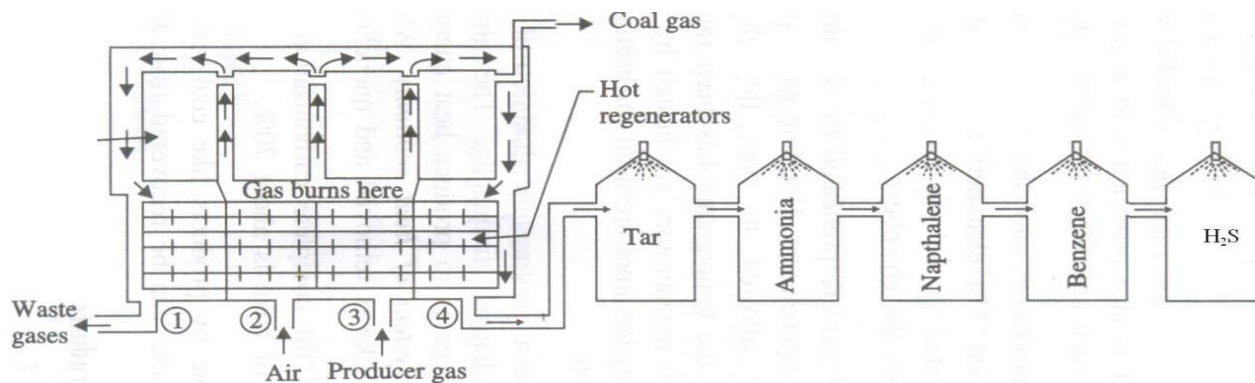


Figure 1: **Otto-Hoffmann method**



### **Recovery of by-Products**

The valuable by products like coal gas, tar, ammonia,  $H_2S$  and benzol, etc can be recovered from flue gas.

(i) **Recovery of Tar:** The flue gases are first passed through a tower, where liquor ammonia is sprayed. Here, dust and tar get dissolved and collected. The collected solution is heated by steam to recover the ammonia and used again.

(ii) **Recovery of Ammonia:** The gases are then passed through another tower, where water is sprayed. Here, ammonia goes into the solution as  $NH_4OH$ .

(iii) **Recovery of Naphthalene:** The gases are then passed through another tower, where cold water is sprayed. Here, naphthalene gets condensed.

(iv) **Recovery of Benzene:** The gases are then passed through another tower, where petroleum is sprayed. Here, benzene gets condensed to liquid.

(v) **Recovery of  $H_2S$  :** The remaining gases are then passed through a purifier packed with moist  $Fe_2O_3$ . Here,  $H_2S$  is retained.

### **Advantages of this method**

- Valuable by products are recovered.
- It requires less time.
- Heating is done externally by producer gas.
- Flue gas produced during carbonization is also used to preheat the coal.