



## MANUFACTURE OF METALLURGICAL COKE

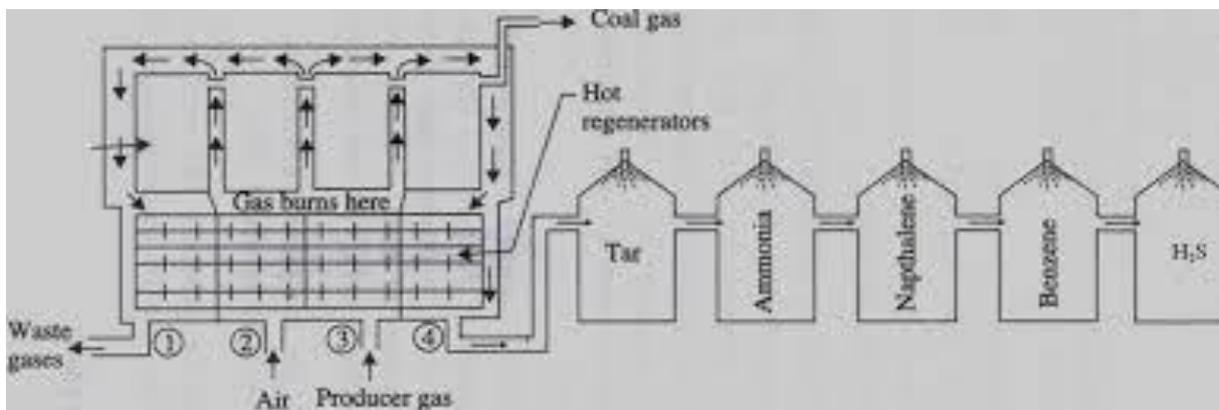
### OTTO - HOFFMAN'S BY-PRODUCT OVEN METHOD

Otto – Hoffman designed the modern by-product oven in order to,

- Increase the thermal efficiency of the carbonization process.
- To recover the various by –products.
- Heating is done on the basis of ‘**regenerative system of heat economy**’ by using the waste flue gases for heating purpose.

#### Description of the oven

- The oven consists of number of silica chambers.
- The chambers are about 10 – 12 m long, 3 – 4 m height and 0.42 – 0.45 m wide.
- Each chamber is provided with a charging hole at the top, gas off take valve at the top end and iron door at each end for discharging coke.



#### Working

- **Coal** is introduced into the **silica chambers** and the chambers are closed.
- The chambers are heated to **1200°C** by burning of gaseous fuels (air and producer gas) by passing them through **2<sup>nd</sup> and 3<sup>rd</sup>** hot regenerators.
- **Hot flue gases** produced during carbonization come out through **1<sup>st</sup> and 4<sup>th</sup>** regenerators raising the temperature to 1000°C.
- The fuel gas is now passed through the **1<sup>st</sup> and 4<sup>th</sup>** regenerators (preheating).
- Flue gases come out through the **2<sup>nd</sup> and 3<sup>rd</sup>** regenerators raise the temperature to 1000°C. This cycle goes on. This process of reversing the direction of fuel & flue gases is known as ‘**regenerative system of heat economy**’.



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- The time taken for the carbonization process is 11 to 18 hours.
- When the process is over, coke is removed from oven and cooled by dry quenching.

## Recovery of by – Products:

The gas coming out from the oven is known as ‘coke oven gas’ consisting of ammonia, H<sub>2</sub>S, Naphthalene, benzene, tar, moisture etc.

### I. Recovery of Tar

- The gas is passed through a tower in which **liquor ammonia** is sprayed.
- Tar and dust gets dissolved and gets collected in a tank below.
- The tank is heated by steam coils to recover ammonia.

### II. Recovery of Ammonia

- The gases from the chamber are then passed through another tower in which **water** is sprayed.
- Ammonia dissolves and gets collected as NH<sub>4</sub>OH.

### III. Recovery of Naphthalene

- The gases are again passed through a tower where **cold water** is sprayed. Here naphthalene gets condensed.

### IV. Recovery of Benzene

- The gases are passed through another tower where **petroleum** is sprayed. Here benzene gets condensed.

### V. Recovery of Hydrogen sulphide

- The remaining gases are then passed through a purifier packed with **moist Fe<sub>2</sub>O<sub>3</sub>**. Here H<sub>2</sub>S is retained.

### VI. Recovery of Coal gas

The final gas left out is called **coal gas** which is used as **fuel gas**.

### Advantages

- Time taken for carbonization is 11 – 18 hrs.
- The yield of coke is 70%.
- Valuable by-products are obtained.