**Experiment-3 MODEL STUDY OF LANCASHIRE BOILER**

Objective

Model study of Lancashire Boiler

Theory

1. **Definition:** A boiler is a closed vessel that produces steam at high pressure and high temperature.
2. **Size of boiler:** Length 8-10 m, Diameter 2- 4 m, Plate thickness 6-12 mm
3. **Types of boiler:**
   1. Horizontal or Vertical type
   2. Stationery or Mobile boiler
   3. Coal or Oil fired boiler
   4. Fire tube or Water tube boiler
4. **Manting and accessories:**
   1. Mantings - They are safety devices in a boiler.
   2. Accessories - They are used for increasing the efficiency.
5. **Deadweight safety valve:** It is located at the top of the boiler. Its weight is designed such that it can give an amount of pressure. If the pressure of the steam In the boiler exceeds the working pressure then the safety valve allows off the excess quantity of the steam to the atmosphere. But if the pressure of the steam is less than the working pressure then the valve gets closed.
6. **High-pressure low water safety valve:** It acts as an auxiliary safety valve. Its weight is designed to give more amount of pressure than the deadweight safety valve. Thus if the deadweight safety valve does not work for some reason then it is used.

On the other hand, when the water level falls below the normal level it also gets opened and there is an alarm that rings to alert everyone.

1. **Steam stop valve:** It is located on the top of the boiler. It regulates the steam supply to use.
2. **Anti-priming device:** It is used to separate dry stream and moisten steam because dry steam should be supplied from the boiler otherwise moisten steam can damage the turbine.
3. **Man-hole cover:** It is generally closed when the boiler works. But for maintenance purposes, the cover should be taken out from the hole.
4. **Steam pressure gauge:** A pressure gauge is fitted in front of a boiler in such a position that the operator can conveniently read it. It reads the pressure of the steam.
5. **Water level indicator:** It indicates the level of water in the boiler.
6. **Feedwater check valve:** The feedwater check valve is fitted to the boiler slightly below the working level of the boiler. By this valve, we feed water to the boiler.
7. **Fuel charging doors:** By these doors we produce heat. At the upper doors, we give coal and at the lower doors, we give fire. The upper doors get closed after giving coal. But the lower doors remain open.
8. **Drain valve:** After 3-4 hours of working of the boiler, this valve gets opened and the wastages come out from the boiler.
9. **Boiler drum:** Two flue tubes are kept in this boiler drum.
10. **Fire brick wall:** It gives rigidity to the system. It supports the total system.
11. **Path of the flue gas:** flue gas is produced by the burning of coal. the gas has three parts - (1) Main Flue, (2) Bottom Flue, and (3) Side Flue.

The gas passes through the internal tubes and then passes downwards. The flue gas passes through the bottom to the left side of the boiler from the right side. Then it splits into paths and flows through the sides and finally gets discharged to the atmosphere.

The purpose of using those paths is (i) to maximize heat and (ii) to get steam as quickly as we can. We can get steam more quickly by giving more heat.