BOILERS

Boiler is an apparatus to produce steam. Thermal energy released by combustion of fuel is transferred to water, which vaporizes and gets converted into steam at the desired temperature and pressure.

The steam produced is used for:

•Producing mechanical work by expanding it in steam engine or steam turbine.

•Heating the residential and industrial buildings.

•Performing certain processes in the sugar mills, chemical and textile industries.

Boiler is a closed vessel in which water is converted into steam by the application of heat. Usually boilers are coal or oil fired.

A boiler should fulfil the following requirements;

Classification of Boilers

The boilers can be classified according to the following criteria.

According to flow of water and hot gases.

•Water tube.

•Fire tube.

In water tube boilers, water circulates through the tubes and hot products of combustion flow over these tubes. In fire tube boiler the hot products of combustion pass through the tubes, which are surrounded, by water.

to explosion, water volume is large and due to poor circulation they cannot meet quickly the change in steam demand. For the same output the outer shell of fire tube boilers is much larger than the shell of water-tube boiler. Water tube boilers require less weight of metal for a given size, are less liable to explosion, produce higher pressure, are accessible and can response quickly to change in steam demand.

According to position of furnace.

(*i*) Internally fired (*ii*) Externally fired

In internally fired boilers the grate combustion chamber are enclosed within the boiler shell whereas in case of extremely fired boilers and furnace and grate are separated from the boiler shell.

According to the position of principle axis.

(*i*) Vertical (*ii*) Horizontal (*iii*) Inclined.

According to application.

(*i*) Stationary (*ii*) Mobile, (Marine, Locomotive).

According to the circulating water.

(*i*) Natural circulation (*ii*) Forced circulation.

According to steam pressure.

(*i*) Low pressure (*ii*) Medium pressure (*iii*) Higher pressure.

HIGH PRESSURE BOILERS

A **boiler** is a closed vessel in which water or other fluid is heated. The heated or vaporized fluid exits the boiler for use in various processes or heating applications.

In all modern power plants, high pressure boilers (> 100 bar) are universally used as they offer the following advantages. In order to obtain efficient operation and high capacity, forced circulation of water through boiler tubes is found helpful.

1.The efficiency and the capacity of the plant can be increased as reduced quantity of steam is required for the same power generation if high pressure steam is used.

2. The forced circulation of water through boiler tubes provides freedom in the arrangement of

3. The tendency of scale formation is reduced due to high velocity of water.

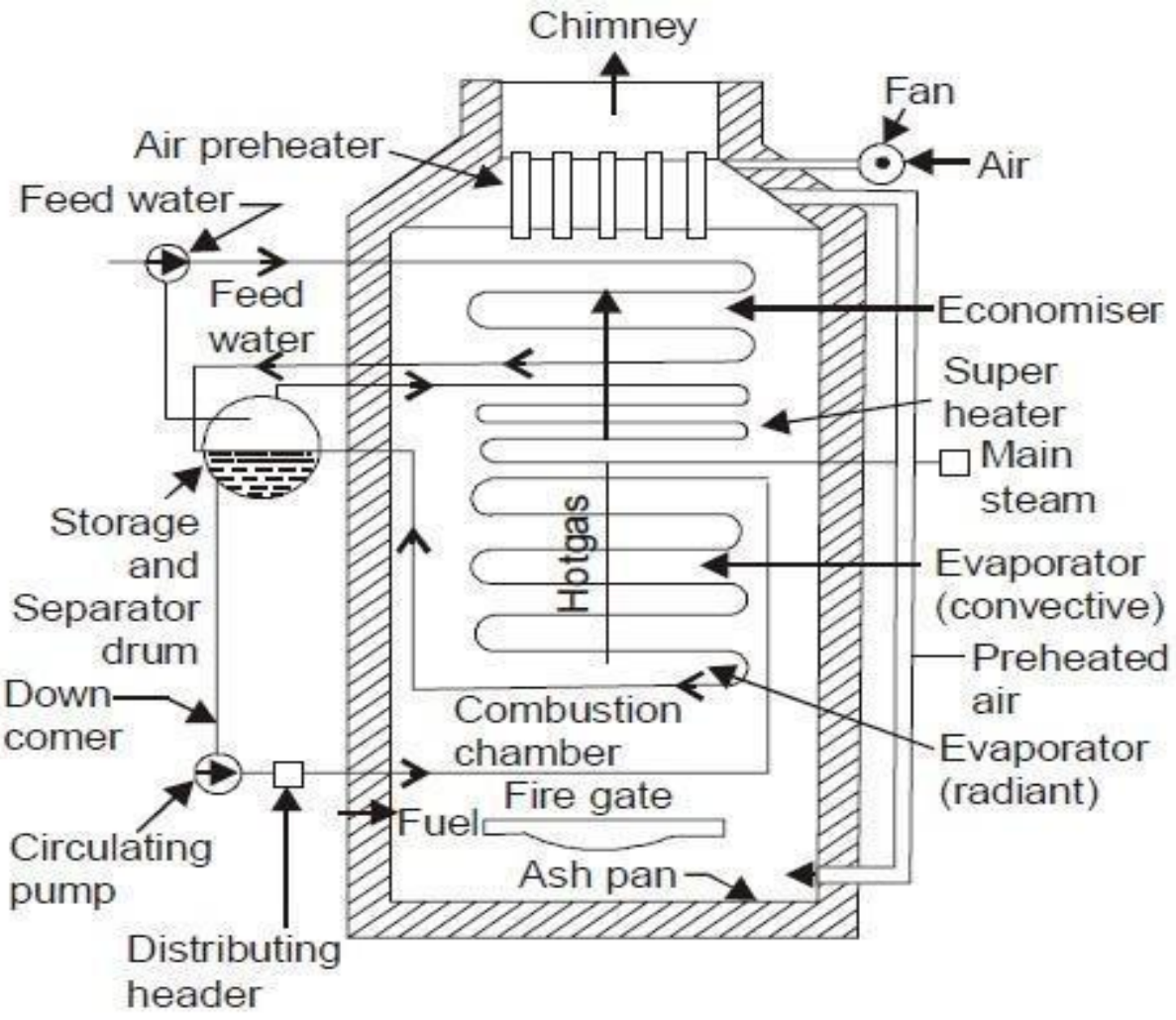
4. The danger of overheating is reduced as all the parts are uniformly heated.

The differential expansion is reduced due to uniform temperature and this reduces the possibility of gas and air leakages.

LA-MONT BOILER

It is a forced circulation- water tube boiler which was first introduced in 1925 by La Mont.

The feed water from hot well is supplied to a storage and separating drum (boiler) through the economizer. Most of the sensible heat is supplied to the feed water passing through the economizer


Chimney
Fan
Air
Air preheater
Feed water
Feed water
Economiser
Super heater
Main steam
Storage and Separator drum
Hotgas
Evaporator (convective)
Preheated air
Down comer
Combustion chamber
Evaporator (radiant)
Fire gate
Fuel
Circulating pump
Ash pan
Distributing header

The centrifugal pump delivers the water to the headers at a pressure of 2.5 bar above the drum pressure. The distribution headers distribute the water through the nozzle into the evaporator. The steam separated in the boiler is further passed through the super-heater.

To secure a uniform flow of feed water through each of the parallel boiler circuits a choke is fitted entrance to each circuit. These boilers have been built to generate 45 to 50 tons of superheated steam at a pressure of 120 bar and temperature of 500°C.

Advantages

1.La-Mont boilers can generate 45 to 50 tons of superheated steam at a pressure of 120 bar and temperature of 500°C.

•Drum is of small size.

•Tendency of scale formation is eliminated due to forced circulation of water.

Disadvantages

•Bubbles are formed on the inside of the water tubes and this bubbles reduce the heat transfer rate.

•Initial and operating costs are high.

•Maintenance costs are very high.

FACULTY OF ENGINEERING & TECHNOLOGY