

Steam Generator(Boiler)

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:

- (i) Producing mechanical work by expanding it in steam engine or steam turbine.
- (ii) Heating the residential and industrial buildings
- (iii) Performing certain processes in the sugar mills, chemical and textile industries.

CLASSIFICATION:

1-Steam pressure:

A-Low pressure $P < 2.4 \text{ Mpa}$

B- Medium pressure $2.4 < P < 6.4$

C- High pressure $P > 6.4$

2-Steam output:

A-Small capacity $\dot{m}_s < 10 \text{ ton/hr}$

B-medium capacity $10 < \dot{m}_s < 50 \text{ ton/hr}$

C-High capacity $50 < \dot{m}_s < 150 \text{ ton/hr}$

D- Super high capacity $\dot{m}_s > 150 \text{ ton/hr}$

Content:

1-Water container

2-Heating device

Steam Formation And Thermal Efficiency Improvement

Methods:

1-Superheated steam:

Wet steam is passed through the superheater which consists of along tube or series of tube suspended across the path of the hot gases from furnaces. The degree of superheat is controlled by injection of water or steam in the superheated steam.

2-Reheater:

An improvement of cycle thermal efficiency can be achieved by installation of a reheater, to avoid wet steam in the low-pressure stages of the turbine.

3-Economizer:

The flue gases are passed into the economizer, which is a heat exchanger to heat feed water into the boiler.

4-Air preheater:

The flue gases are still hot, further efficiency improvement can be obtained by passing then into the air heater which is a heat exchanger used to heat the air ducted to the furnace to get high furnace temperature ,more steam and hence high efficiency.

5-Attemperator:

In which the steam temperature is reduced by removing heat from the steam:

- 1-Tubular type: in this case, the boiler water is used as a cooling medium.
- 2-water injection: water from the boiler is sprayed directly into the steam .This water is evaporated ,hence the temperature of mixture is reduced.