

Boiler Troubles- Scale, Sludge, Priming, Foaming and Caustic Embrittlement

Boiler troubles

Boilers are used to generate steam in industries. The water used for this purpose if has hardness or other impurities, it causes boiler troubles like faulty reading in pressure and temperature gauge.

Sludge, scale, priming and foaming, caustic embrittlement and boiler corrosion are collectively known as boiler troubles.

1. Scale:

It is Hard, thick, strong adherent precipitate formed due to salts like CaSO_4 , $\text{Ca}(\text{HCO}_3)_2$. Scale cannot be removed even by hammering. It is generally formed at lower part of the boiler.

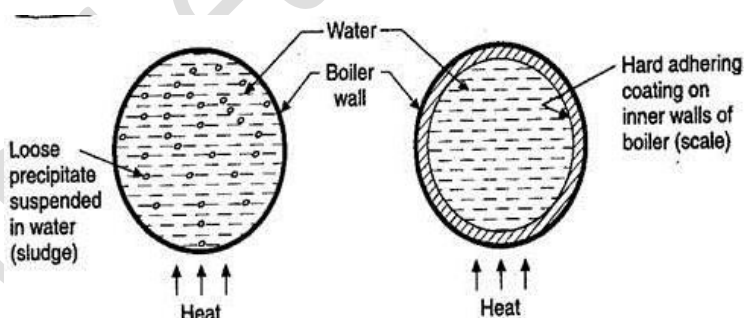
Due to poor conductance of heat, they decrease the boiler efficiency and reduce fuel economy due to improper boiling. This may cause boiler explosion.

Scale formation can be prevented by external treatment of ion exchange, Internal carbonate, phosphate, Calgon conditioning or by mechanical hard scrubbing methods

2. Sludge:

It is Loose, slim, non-adherent precipitate formed due to salts like MgSO_4 , MgCl_2 .

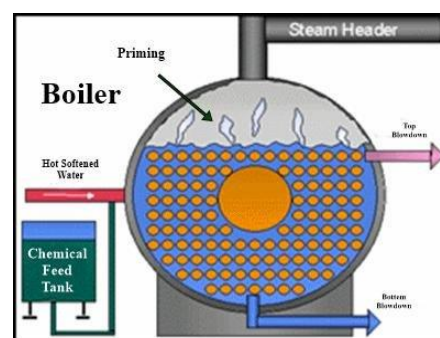
Due to poor conductance of heat, they decrease the boiler efficiency to lesser extent and causing choking in the pipelines. It can be prevented by periodical replacement of concentrated hard water by fresh water. This process is known as “blow down” method or by acid treatment.



3. Priming:

Due to rapid boiling, the steam may carry some water droplets along with it. This is called wet steam. The process of wet steam production is called Priming. Priming is a condition in the boiler of a steam in which water is carried over into the steam delivery. It may be caused by impurities in the water, which foams up as it boils. Due to too high water level priming can be taken place.

Causes of Priming: 1) Improper design of boiler 2) High water level 3) High velocity of steam 4) Uneven boiling.



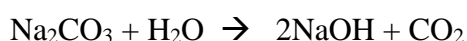
4. Foaming:

Formation of stable bubbles on the surface of water is called Foaming. Dissolved substances like alkaline impurities, oil when present in water forms soaps like substances results in the formation of foaming.

By using anti foaming agents like castor oil, sodium aluminates etc. Or using coagulants, we can prevent foaming.

5. Caustic Embrittlement:

The process in which materials of boiler becomes brittle due to formation of caustic substances. As water evaporates in boiler, concentration of sodium carbonates increases. Sodium carbonates undergo hydrolysis to give sodium hydroxide which causes caustic Embrittlement.



Caustic Embrittlement can be prevented by using softening agent; we can use sodium phosphate instead of sodium carbonate.