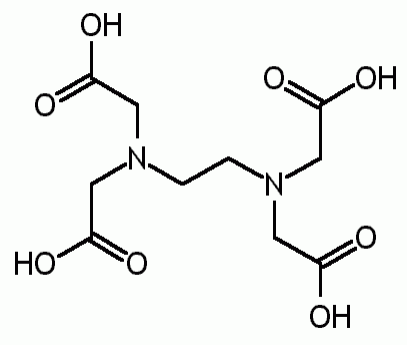
Ethylene diamine tetra acetic acid (EDTA)



EDTA Complex with Manganese

Priming

- When a boiler is steaming rapidly some particles of the liquid water are carried along- with the steam. Its called priming.
  - Presence of large amount of dissolved solids
  - Sudden boiling
  - Improper boiler design

Foaming

- It is the production of persistent foam or bubbles in boilers, which do not break easily. It is due to the presence of oil. Priming and foaming occur together

Priming can be avoided by

Fitting mechanical steam purifier
avoid rapid change in steaming rate

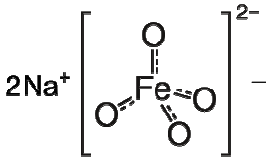
Foaming can be avoided by

adding anti foaming agent like castor oil
Removing oil from boiler water by adding compounds like sodium aluminate

Caustic Embrittlement

- Its a kind of boiler corrosion, caused by using highly alkaline water in the boiler

$$Na_2CO_3 + H_2O \longrightarrow NaOH + CO_2$$



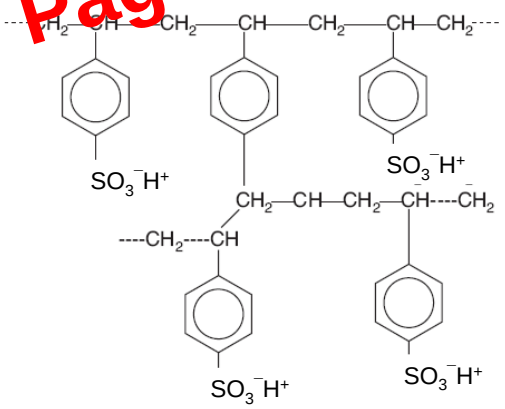
This causes embrittlement of boiler parts particularly stressed parts (bends, joints, rivets, etc.)

Sodium Ferrate

\+ | Iron at stressed parts | Conc. NaOH solution | Dil. NaOH solution | Iron at plane surfaces | —

Ion-exchange

- Ion-exchange resins are soluble, cross-linked, long chain organic polymers with a microporous structure and the functional groups attached to the groups are responsible for the ion-exchanging properties.



cation exchange resin

Styrene-divinyl benzene copolymers, which on sulphonation or carboxylation, become capable to exchange their hydrogen ions with the cations in the water

2. Sodium Aluminate ($NaAlO_2$)

treating water having no alkalinity (pH <7)

$$NaAlO_2 + 2H_2O \longrightarrow Al(OH)_3 \downarrow + NaOH$$

Gelationous flocculant

$$MgSO_4 + 2NaOH \longrightarrow Mg(OH)_2 \downarrow + Na_2SO_4$$

3. Copperas or Ferrous sulphate [$FeSO_4 . 7H_2O$]

$$FeSO_4 + Mg(HCO_3)_2 \longrightarrow Fe(OH)_2 \downarrow + MgCO_3 + CO_2 + H_2O$$

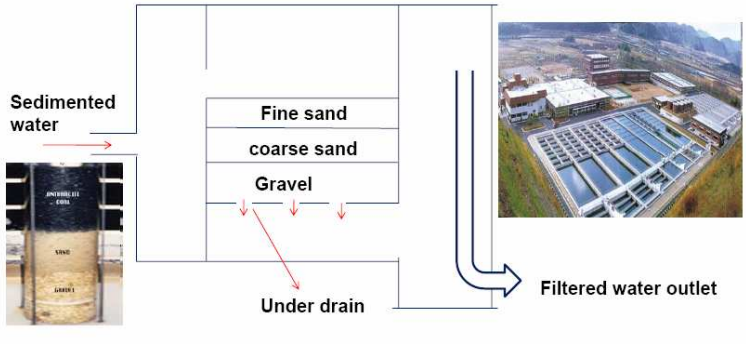
$$4Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 4Fe(OH)_3 \downarrow$$

dissolved oxygen — ferric hydroxide

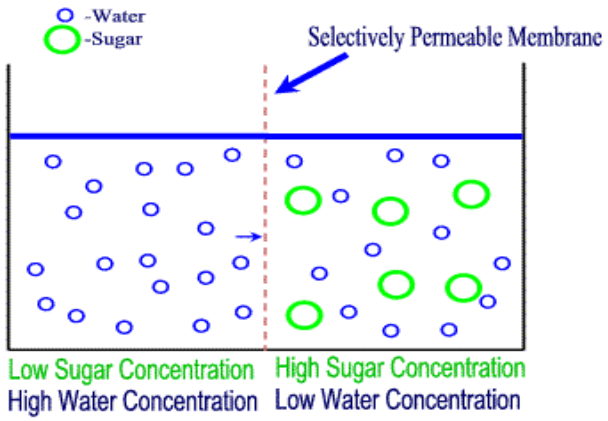
Above pH = 8.5, if alkalinity is not present, lime should be added

Filtration

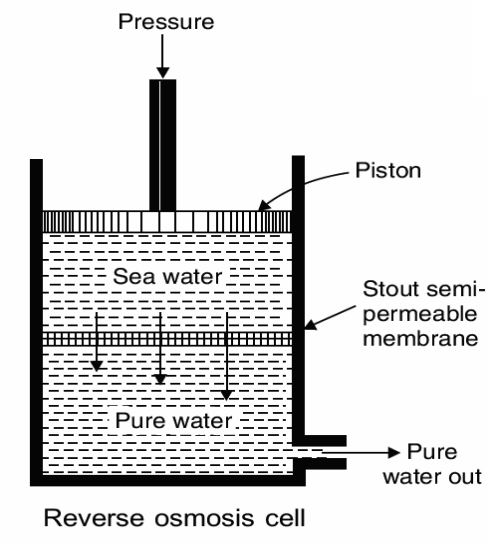
A process of removing colloidal matter and most of the bacteria,micro-organisms etc., by passing water through a bed of fine sand and other proper sized granular materials



Osmosis



Reverse Osmosis



- **Super filtration**
- **15-40 kg cm^2**

- **Cellulose acetate**
- **Polysulfone**
- **Polysulfone amide**
- **Polyamide**
- **Poly-acrylonitrile**

Advantages

- Removes colloidal silica
- Long life
- Can be replaced within few minutes