

Filtration

Process of filtration forms the most important stage in the purification of water.

• it usually consists in allowing water to pass through a thick layer of sand.

Four action takes place when filtration occur

1. Mechanical Straining
2. Sedimentation
3. Biological metabolism
4. Electrolytic changes

Classification of filter

1. Slow Sand filter
2. Rapid Sand filter
3. Pressure filter.

Difference b/w Slow Sand and Rapid Sand filter

| Term NO. | Slow sand filter | Rapid gravity filters |
|------------------------|---|---|
| 1. Pre-treatment | Effluents either from plain sedimentation with out any treatment are generally fed into them. | Coagulation, flocculation and sedimentation must |
| 2. Base material | Gravel base support the sand. • 3 to 65 mm size • 30 to 75 cm depth | Distribute the wash water uniformly • 3 to 40 mm size • 60 to 90 cm depth |
| 3. filter sand | size - 0.2 to 0.4 mm $C_u = 1.8$ to 3.0 | size - 0.35 to 0.55 $C_u = 1.2$ to 1.8 |
| 4. Rate of filtration. | 100 to 200 lit (50 to 60 ML/Ha/day) | 3000 to 6000 lit/sqm (1500 to 3000 ML/Ha/day) |
| Efficiency | Removal of bacteria 98 to 99 % | less efficient (80 to 90%) |
| Post treatment | Almost pure water obtained | Disinfection must |

- Pressure filters → Pressure developed may vary 3 to 7 kg/cm² on head of water (3 to 7 kg/cm²)
- Cleaning is carried out by back washing
- Rate of filtration - 2 to 5 times more than rapid gravity filters (highest among all three) 6000 to 15000 l/hr/m²
- Least efficient in removal of bacteria and turbidity.

Advantage :-

Sedimentation and coagulation tank are ~~for~~ avoided.

Filter Troubles :-

1. Cracking and clogging of filter bed → Surface cracking and clogging are usually caused by rapid accumulation of solid on the top surface fine media
2. Air binding → Due to release of dissolved air and gases from water this problem arises.

(4) Sand intrusion \rightarrow this may occur due to deposition of sticky gelatinous material.

this can be minimized by carbonating the influent

(5) Jetting and sand boils \rightarrow

Result during backwashing. Similar to quicksand. Jetting can be minimized by surface wash or air scour in advance of bed fluidization

(6) Sand leakage \rightarrow

Sand leakage or downward migration and escape of fine particles result when layers of smallest gravel are displaced during backwashing.