

TRICKLING FILTER

What is Trickling Filter

Trickling Filter also known as **percolating** or **sprinkling** filter is like a well having depth up to about 2m and filled with some granular media. The **sewage** is sprinkled over the media which percolates through filter media and is collected through the under-drainage system.

A modern trickling filter consists of a bed of highly permeable media to which micro-organisms are attached and sewage percolates or trickles down and hence the name "**Trickling Filter**". The filter media consists of rocks varying in size from 25-100mm. The depth of rock varies from 0.9-2.5m averaging 1.8m. A rotating arm (distributor arm) is provided to evenly distribute sewage. The air is also provided through under-drainage system from ventilation of filter.

Working Mechanism of Trickling Filter

The settled sewage from primary sedimentation tank is sprinkled intermittently over the filter bed when sewage trickles down, a microbial layer develops on the surface of rock which is called slime layer which is mostly consist of bacteria. (Oxidation of the organic matter is carried out under aerobic conditions. A bacterial film is formed around the particles of the filtering media and for the existence of this film oxygen is supplied by the intermittent working of the filter and by the provision of the suitable ventilation facilities in the body of the filter). The sewage is oxidized by the bacteria producing effluent in the form of water, gases and new cells.

Classification of Trickling Filters

1. Conventional trickling filter or ordinary trickling filter or standard rate or low rates trickling filter.
2. High rate or high capacity trickling filters

1. Low Rate Filters

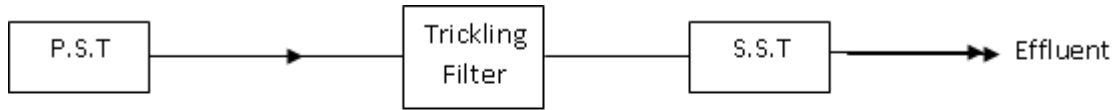
They are also known as standard rate or conventional rate filters. The settled sewage is applied to the filter bed and after trickling through it, passes through the final sedimentation tank for removal of most of the stabilized solids.

2. High Rate Filters

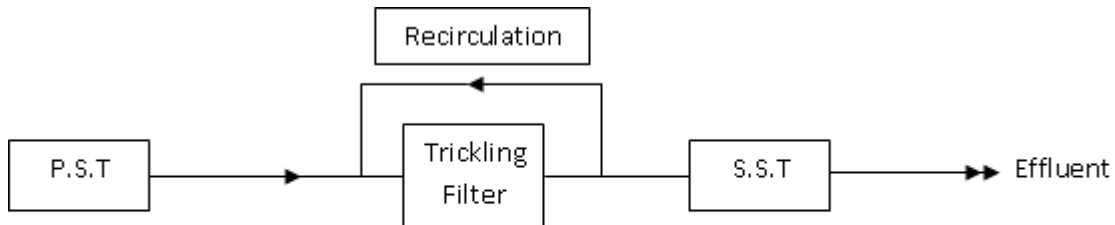
In case of high rate trickling filters the settled sewage is applied at much higher rate than for the low rate filter. The high rate filters of modern advancements also function on the same lines and having the same construction detail but with the difference that provision is made in them for recirculation of sewage through the filter by pumping a part of the filter effluent to the primary settling tank (or the dosing tank of trickling filter) and re-passing it through filter.

Recirculation of High Rate Trickling Filters

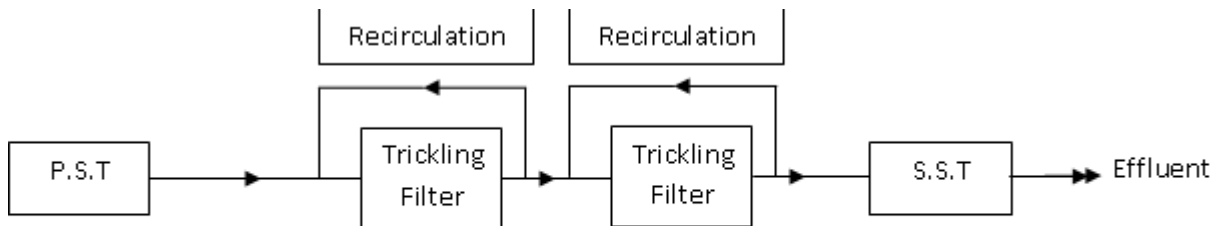
To increase the load rate of trickling filter the sewage is an essential and important feature of high rate filters. The recirculation consists in returning portion of the treated or partly treated sewage to the treatment process (i.e. filter).



Low Rate/Standard Trickling Filter (No Recirculation)



Single Stage High Rate Trickling Filter



Two Stage High Rate Trickling Filter

Advantages of Recirculation

1. It allows contains dosage regardless of fluctuating in sewage flow and thus keeps the bed working.
2. It dilutes the influent with better quality water and this making it fresh and reduces odor.
3. It maintains a uniform rate of organic and hydraulic loading.
4. It provides longer contact of the applied sewage with the bacterial film on the contact media and accelerating the biological oxidation process.
5. It increases the efficiency by reducing the BOD load generally.

Comparison of Standard Rate Trickling Filter SRTF and High Rate Trickling Filter HRTF

S. No	Parameters	S R T F	H R T F
1	Hydraulic loading rate (m^3/m^3 -day)	1-4	10-40
2	Organic loading rate (kg of 80D/ m^3 -day)	0.08-0.32	0.32-1
3	Depth of filter	1.5-3m	1-2m
4	Recirculation ratio	Generally zero	1-2
5	Dosing Interval	3-10 minutes Intermittent	> 15 seconds Continuous
6	Cost of operation	More	Less
7	Effluent quality	Highly nitrified	Nitrified up to nitrate stage
8	Water requirements	Less	More
9	Land requirement	More	Less
10	Size of filter media	25-100 mm	30-60 mm

Advantages and Disadvantages of Trickling Filter

Advantages of Trickling Filter

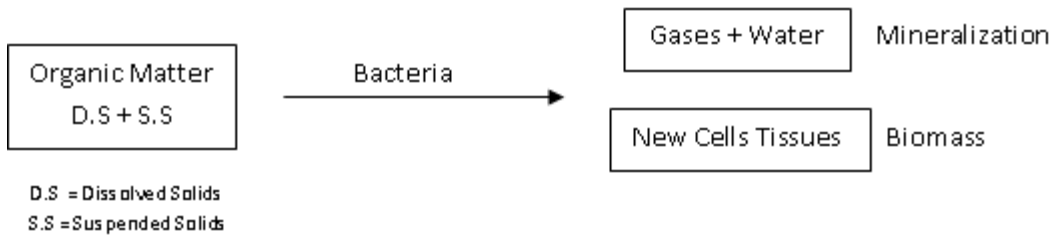
- Rate of Filter loading is high as required less land areas and smaller quantities of filter media for their installations.
- Effluent obtained from the trickling filter is sufficient stabilized.
- Working of Trickling filter is simple and does not require any skilled supervision.
- They are flexible in operation.
- They are self cleaning
- Mechanical wear and tear is small as they contain less mechanical equipment.

Disadvantages of Trickling Filter

- The beds loss through these filters is high.
- Construction cost is high
- These filters cannot treat raw sewage and primary sedimentation is must.
- Fly nuisance and odor nuisance may prevail.

The **secondary wastewater** treatment is required to remove the soluble and colloidal organic matters which remain after primary treatment. As it is mostly biological process also called biological treatment.

In the treatment the bacteria present in sewage and other micro-organisms are allowed to use the organic matters as their food and oxidize them to stable compounds like water gases (CO_2 , NH_3 , CH_4 , H_2S etc) and new cells. The process may occur naturally at slow rate or biological treatment is done to increase the rate of reaction by having large number of organisms in a small container.



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