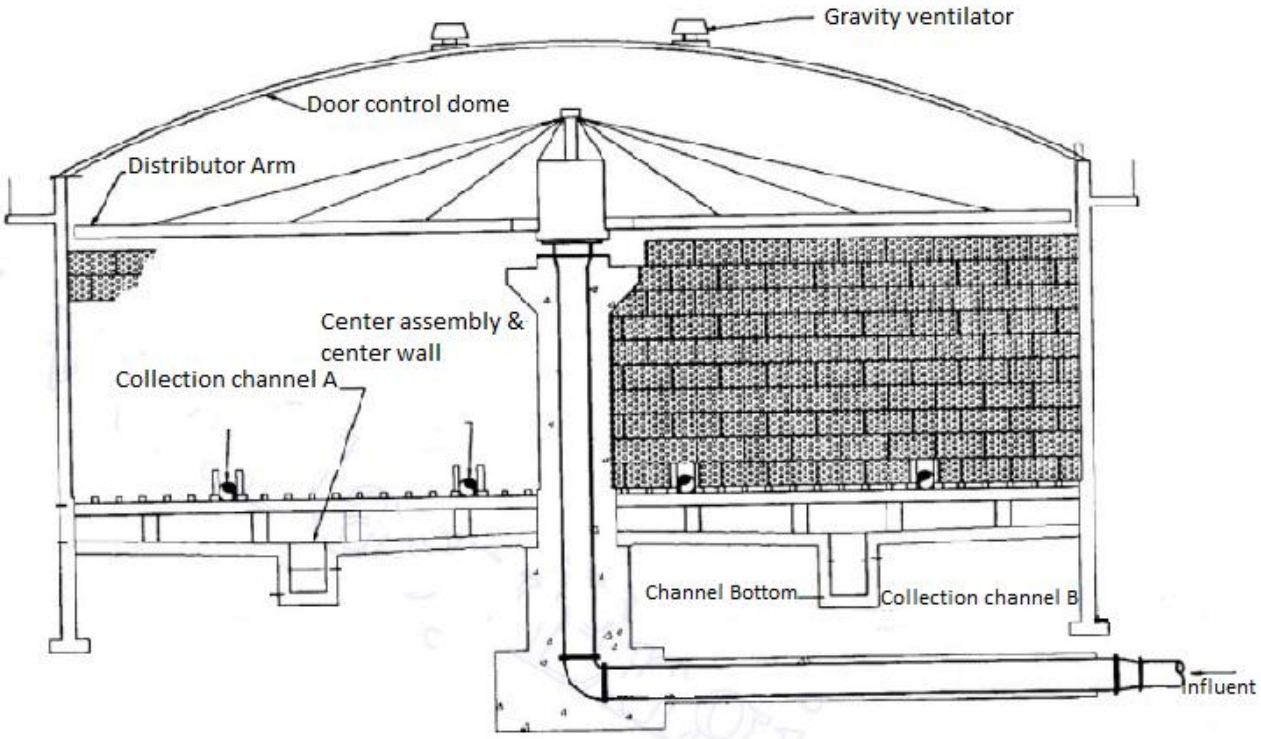
Trickling Filters:

Trickling filter is an attached growth process i.e. process in which microorganisms responsible for treatment are attached to an inert packing material. Packing material used in attached growth processes include rock, gravel, slag, sand, redwood, and a wide range of plastic and other synthetic materials.

Process Description

1. The wastewater in trickling filter is distributed over the top area of a vessel containing non-submerged packing material.
2. Air circulation in the void space, by either natural draft or blowers, provides oxygen for the microorganisms growing as an attached biofilm.
3. During operation the organic material present in the wastewater is metabolized by the biomass attached to the medium. The biological slime grows in thickness as the organic matter abstracted from t he f lowing wastewater is synthesized into new cellular material.
4. The thickness of the aerobic layer is limited by the depth of penetration of oxygen into the microbial layer.
5. The micro-organisms near the medium face enter the endogenous phase as the substrate is metabolised before it can reach the micro-organisms near the medium face as a result of increased thickness of the slim layer and lose their ability to cling to the media surface. The liquid then washes the slime of the medium and a new slime layer starts to grow. This phenomenon of losing the slime layer is called sloughing.
6. The sloughed off film and treated wastewater are collected by an under drainage which also allows circulation of air through filter. The collected liquid is passed to a settling tank used for solid- liquid separation.



Types of Filters

Trickling filters are classified as high rate or low rate, based on the organic and hydraulic loading applied to the unit.

S.No	Design Feature	Low Rate Filter	High Rate Filter
1.	Hydraulic loading, $m^3/m^2.d$	1 - 4	10 - 40
2.	Organic loading,kg BOD / $m^3.d$	0.08 - 0.32	0.32 - 1.0
3.	Depth, m.	1.8 - 3.0	0.9 - 2.5
4.	Recirculation ratio	0	0.5 - 3.0 (domestic wastewater) upto 8 for strong industrial wastewater.

1. The hydraulic loading rate is the total flow including recirculation applied on unit area of the filter in a day, while the organic loading rate is the 5 day 20°C BOD, excluding the BOD of the recircular, applied per unit volume in a day.
2. Recirculation is generally not adopted in low rate filters.
3. A well operated low rate trickling filter in combination with secondary settling tank may remove 75 t o 90% BOD and produce highly nitrified effluent It is suitable for treatment of low t o medium strength domestic wastewaters.

4.The high rate trickling filter, single stage or two stage are recommended for medium to relatively high strength domestic and industrial wastewater. The BOD removal efficiency is around 7 5t o 90% but the effluent is only partially nitrified.
5. Single stage unit consists of a primary settling tank filter, secondary settling tank and facilities for recirculation of the effluent. Two stage filters consist of two filters in series with a primary settling tank, an intermediate settling tank which may be omitted in certain cases and a final settling tank.