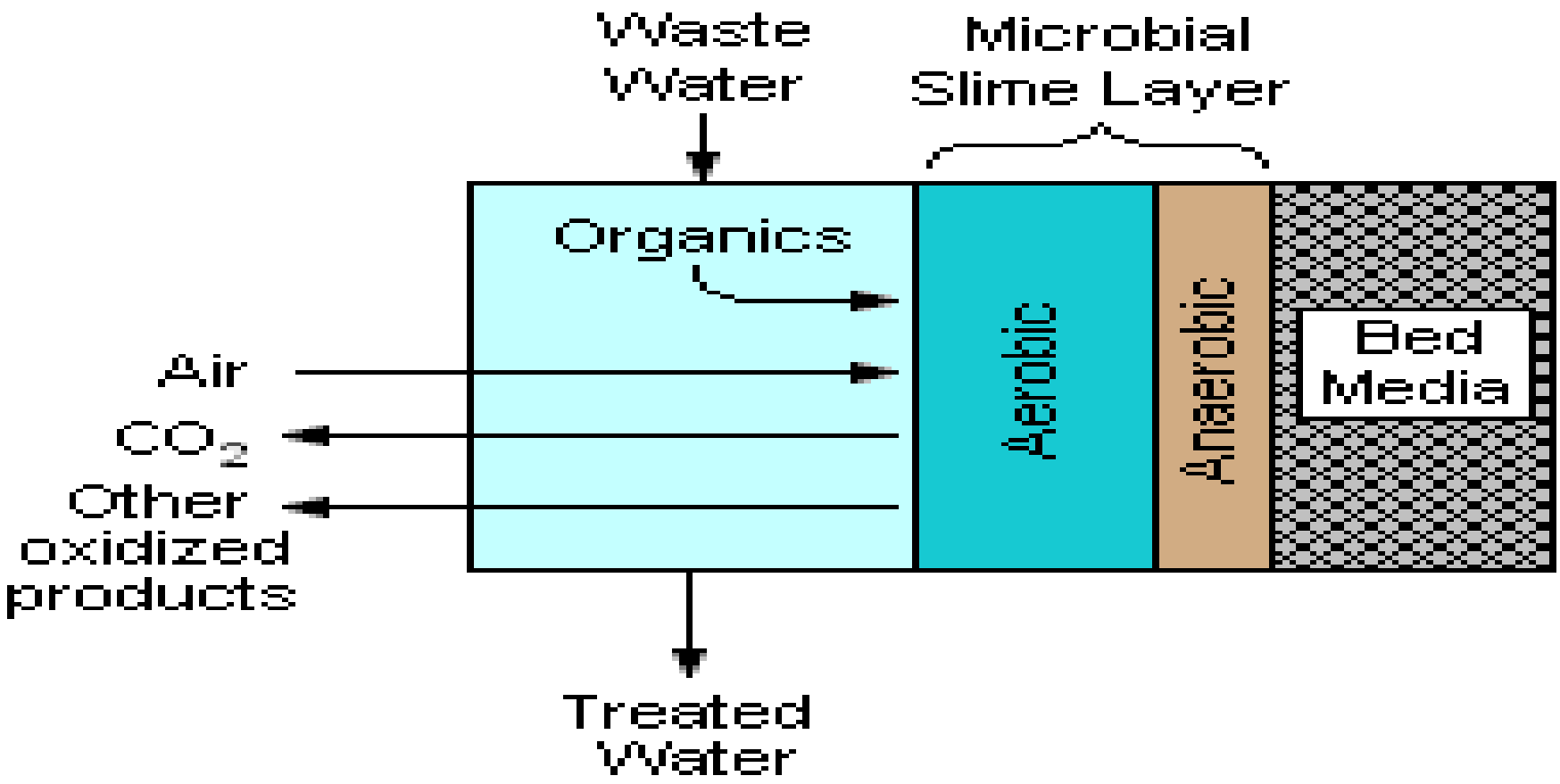
TRICKLING FILTERS
by
Dr. Moazzam Ali Khan

Trickling filters

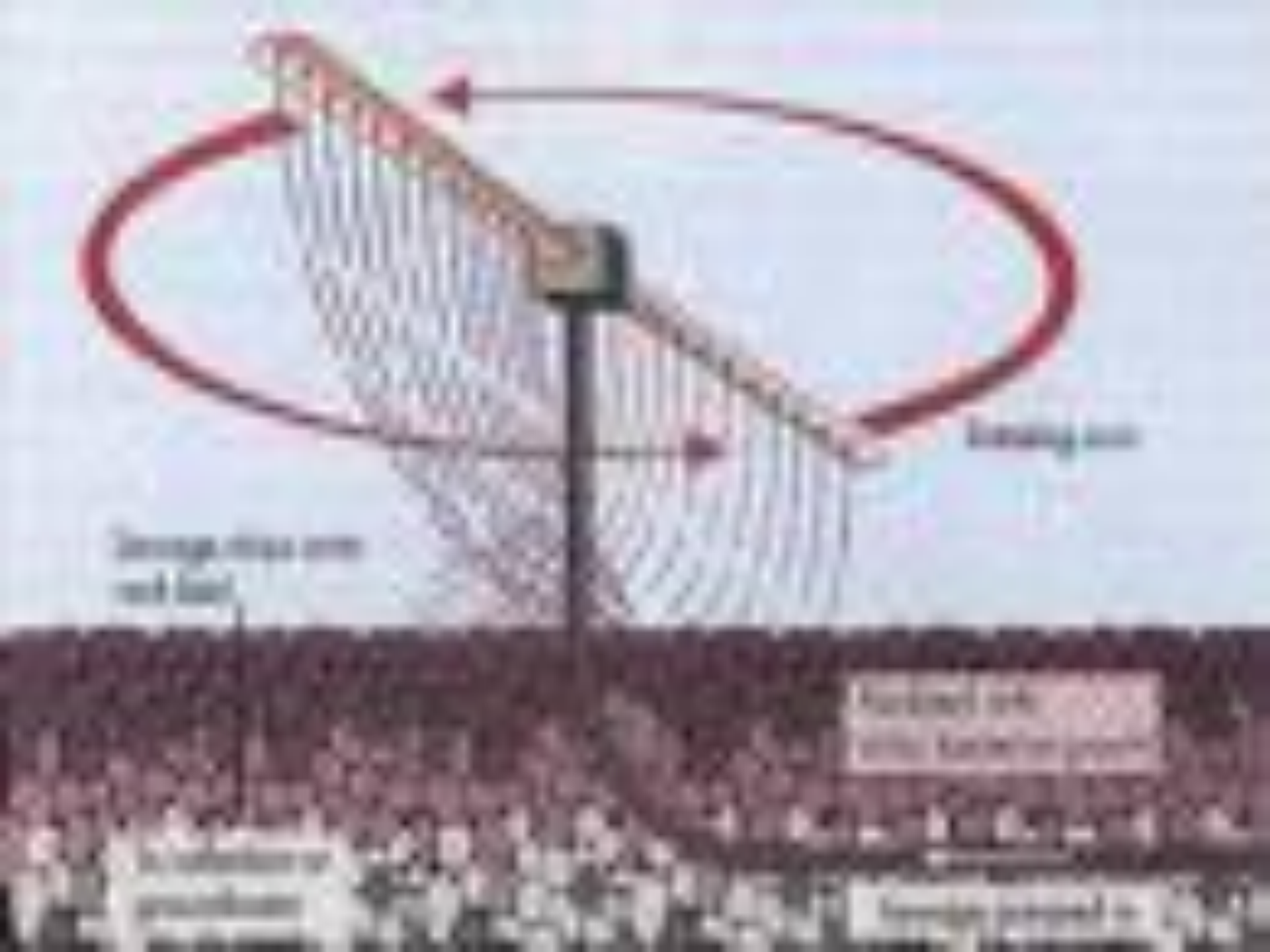
- Trickling filter is an ***attached growth process*** i.e. process in which microorganisms responsible for treatment are attached to an inert packing material.
- Packing material used in attached growth processes include rock, gravel, slag, sand, redwood, and a wide range of plastic and other synthetic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

Flow Sheet of Trickling Filter



Process Description

- The wastewater in trickling filter is distributed over the top area of a vessel containing non-submerged packing material.
- Air circulation in the void space, by either natural draft or blowers, provides oxygen for the microorganisms growing as an attached biofilm.
- During operation, the organic material present in the wastewater is metabolised by the biomass attached to the medium.
- The biological slime grows in thickness as the organic matter abstracted from the flowing wastewater is synthesized into new cellular material.



Advantages of TFs

- Simplicity of operation
- Resistance to shock loads
- Low sludge yield
- Low power requirements

Disadvantages of TFs

- Relatively low BOD removal (85%)
- High suspended solids in the effluent (20 -30 mg/L)
- Little operational control

Some limitations

- As with all biological treatment, it requires stable, consistent operating conditions.
- It isn't suitable for highly chlorinated organics, aliphatics, amines, and aromatic compounds.
- Heavy metals and organic chemicals may kill the microorganisms. Heavy metals and non-biodegradable organics may also concentrate in the sludge.
- Hydrogen sulfide gas may also be release

Problem of Odors

- Since the trickling filter is an aerobic process, no serious odors should exist.
- If foul odors are present, anaerobic conditions are the most likely cause.
- Anaerobic conditions usually predominate next to the media surface.
- If the surface of the slime growth is aerobic, odors should be minimal.
- If odors are present, corrective action should be taken immediately or the condition could get worse.

Corrective Measures

- Try to maintain aerobic condition in the collection system and in the primary treatment units.
- Check the ventilation of the filter for clogging and stoppages.
- Check the underdrain system for clogging and stoppages.
- Increase recirculation rate; this usually provides added oxygen to the filter and may increase sloughing.
- Keep wastewater in filter; do not allow it to splash on exposed surfaces, weeds, or grass.
- Add odor-masking agents.

Corrective Measures

- Pre-chlorination at primary tank influent or at the dosing tank. The dose used is not sufficient to produce residual chlorine but only to destroy the odors.
- Chlorination to a residual of less than 0.5 mg/L normally does not interfere with the activity of the living organisms and thus does not affect the purification obtained by the operation of a trickling filter.
- However, chlorination of a trickling filter influent cannot be used until after the filter has been in active operation.

Problem of Ponding

- **Ponding** is normally the result of: (a) excessive organic loading without a corresponding higher recirculation rate, (b) use of media which is too small, (c) clogging of underdrain system, (d) non-uniform media size or breaking up of media, and (e) trash or debris in filter voids.
- **Ponding** can cause odors and decrease filter efficiency.

Elimination of Ponding

- Spraying the surface with high pressure water hose.
- Stirring or agitating ponding area with stick, rake, etc.
- Dousing the filter with chlorine. Applying chlorine to a ponding filter by chlorinating at the dosing tank to produce a residual of about one to two mg/L at the nozzles may help reduce ponding.
- Obviously, if ponding is caused by the size of the media, chlorination will be of no benefit. If the ponding is caused by overloading, chlorination may be of temporary benefit. If ponding was caused by excessive growths, this deteriorating condition will usually not return until conditions, such as temperature, that caused the excessive growth are repeated.
- Flooding filter and keeping the media submerged for approximately 24 hours will sometimes cause the growth to slough. Growths become anaerobic and tend to release from media.
- Shutting off the flow to the filter. The growths will die and tend to be flushed out when the unit is put back into service.

Synthetic Media

- Synthetic media in a trickling filter system results in a greater surface area available for biological growth per cubic foot of filter volume.
- Because of the low weight of synthetic media, filters can be built 40 ft and higher.
- The result is the ability to handle greater loadings

Objectives of Trickling Filter Recirculation

- Reduce strength of filter influent
- Maintain constant wetting rate
- Dilute toxic wastes
- Increase air flow

Trickling Filters

Rotating Biological Contactors

- Rotating biological contactors,commonly referred to as RBC's, are less prevalent than trickling filters.
- However, RBC's produce a high quality effluent and wastewater operators should be familiar with them

Rotating Biological Contactors

- The RBC is a fixed media filter in which the microorganisms are housed on a series of large discs.
- These discs are supported on a single shaft which is slowly rotated through the wastewater by an air driven motor.
- The RBC is covered by a removable fiberglass housing which has access portals at each end.

Rotating Biological Contactors

- The discs are covered with a thick coating of slime.
- This slime is the microorganisms, both aerobic and anaerobic, which treat the wastewater.
- RBC's act much like a trickling filter in that the contactors perform well at removing BOD.