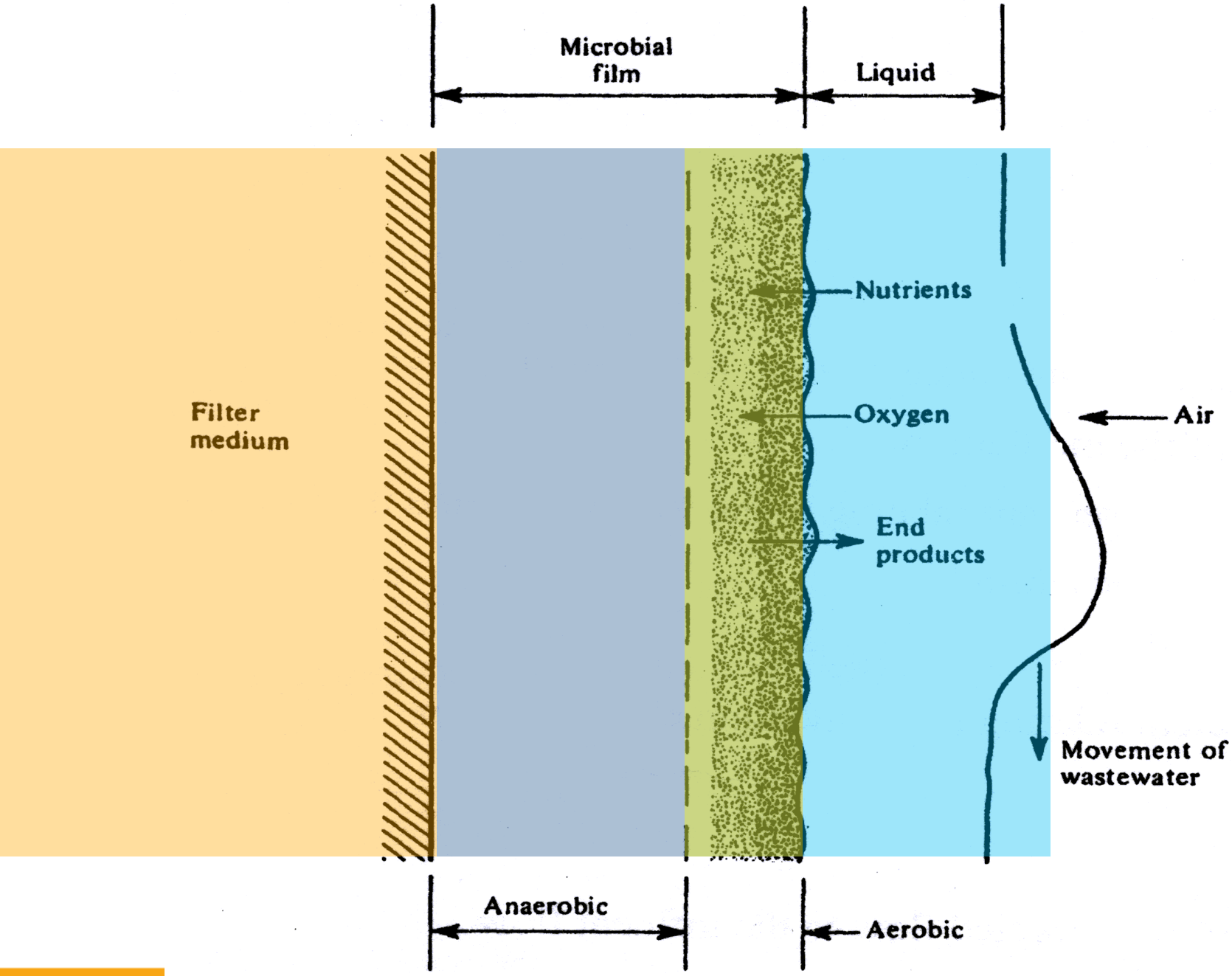
ATTACHED GROWTH/ FIXED FILM

Microorganisms developed and grow on medium

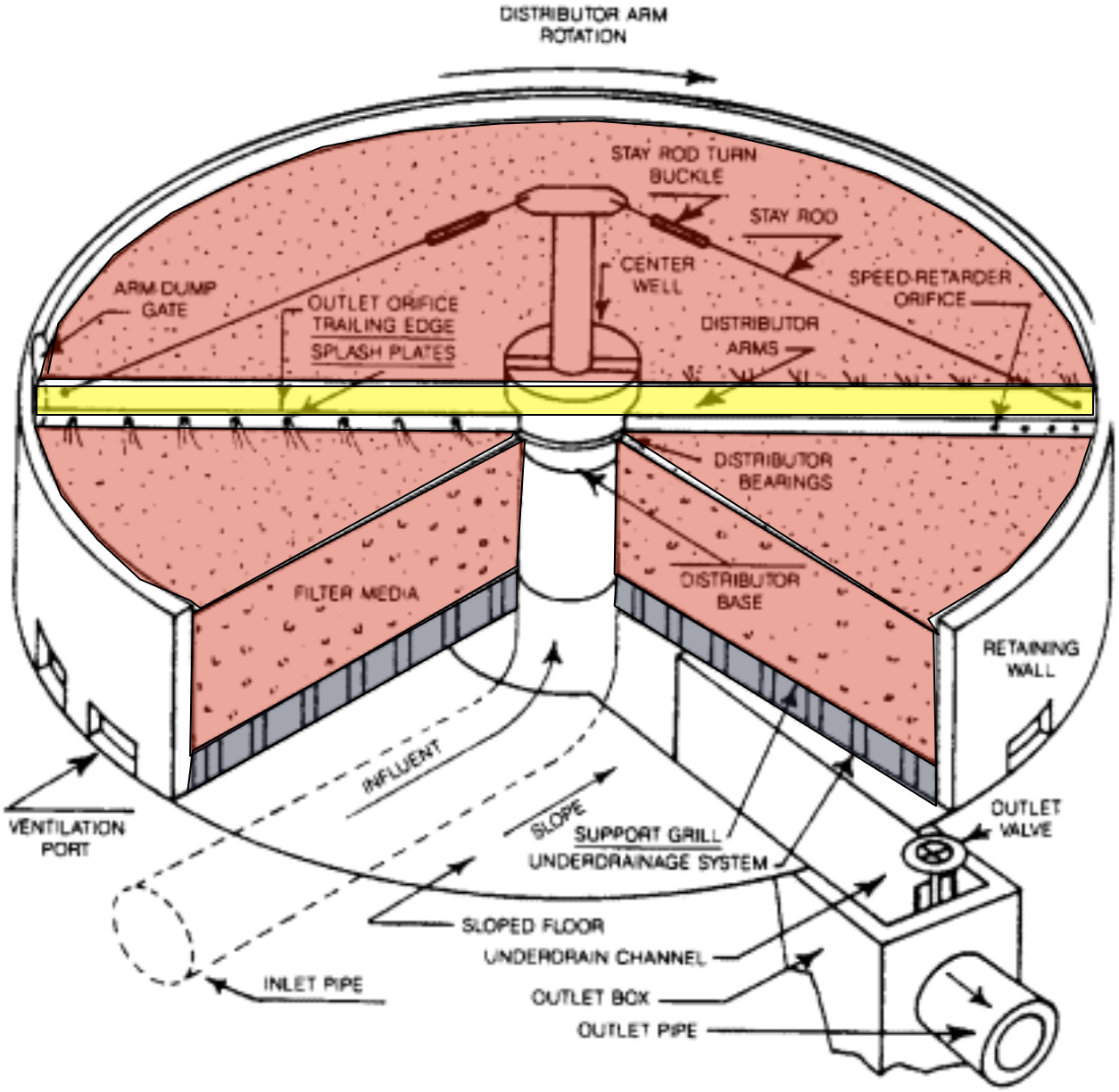
eg.

Trickling filter, Bio tower,
Rotating Biological Contactor


Suspended growth


Microbial film
Liquid
Filter medium
Nutrients
Oxygen
Air
End products
Movement of wastewater
Anaerobic
Aerobic

Trickling Filter


DISTRIBUTOR ARM ROTATION
STAY ROD TURN BUCKLE
STAY ROD
CENTER WELL
SPEED-RETARDER ORIFICE
ARM DUMP GATE
OUTLET ORIFICE TRAILING EDGE SPLASH PLATES
DISTRIBUTOR ARMS
DISTRIBUTOR BEARINGS
DISTRIBUTOR BASE
FILTER MEDIA
RETAINING WALL
INFLUENT
SLOPE
SUPPORT GRILL
UNDERDRAINAGE SYSTEM
OUTLET VALVE
VENTILATION PORT
SLOPED FLOOR
UNDERDRAIN CHANNEL
INLET PIPE
OUTLET BOX
OUTLET PIPE


Rotary distributor
Uniform hydraulic load on filter surface

Filter medium

Provides **surface** for **biological growth** and **voids for passage of liquid and air**

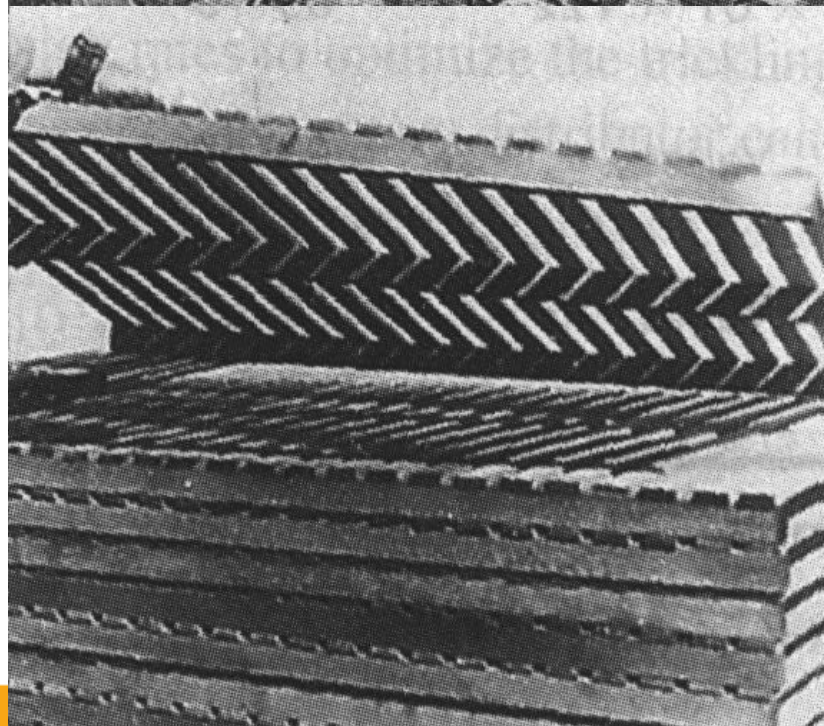
Medium commonly used:
crushed stone, slag

High surface area per unit volume

Low in cost

High durability

High porosity



Underdrain system

Support the media

Transport the treated **wastewater** and the **sloughed biomass**

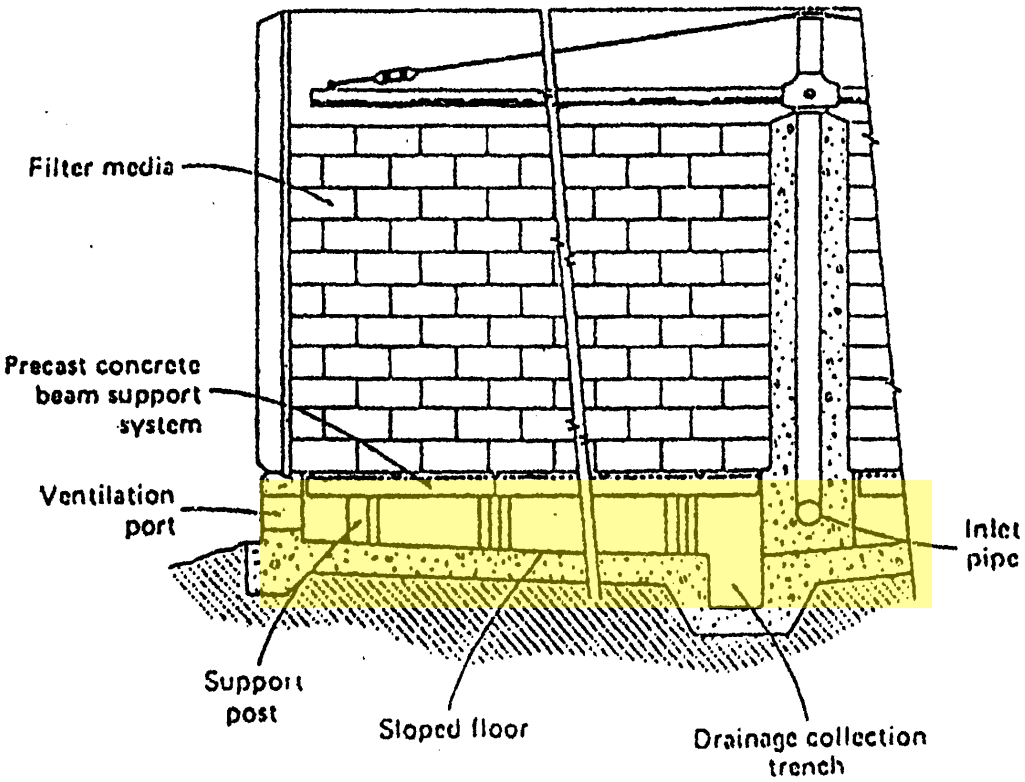
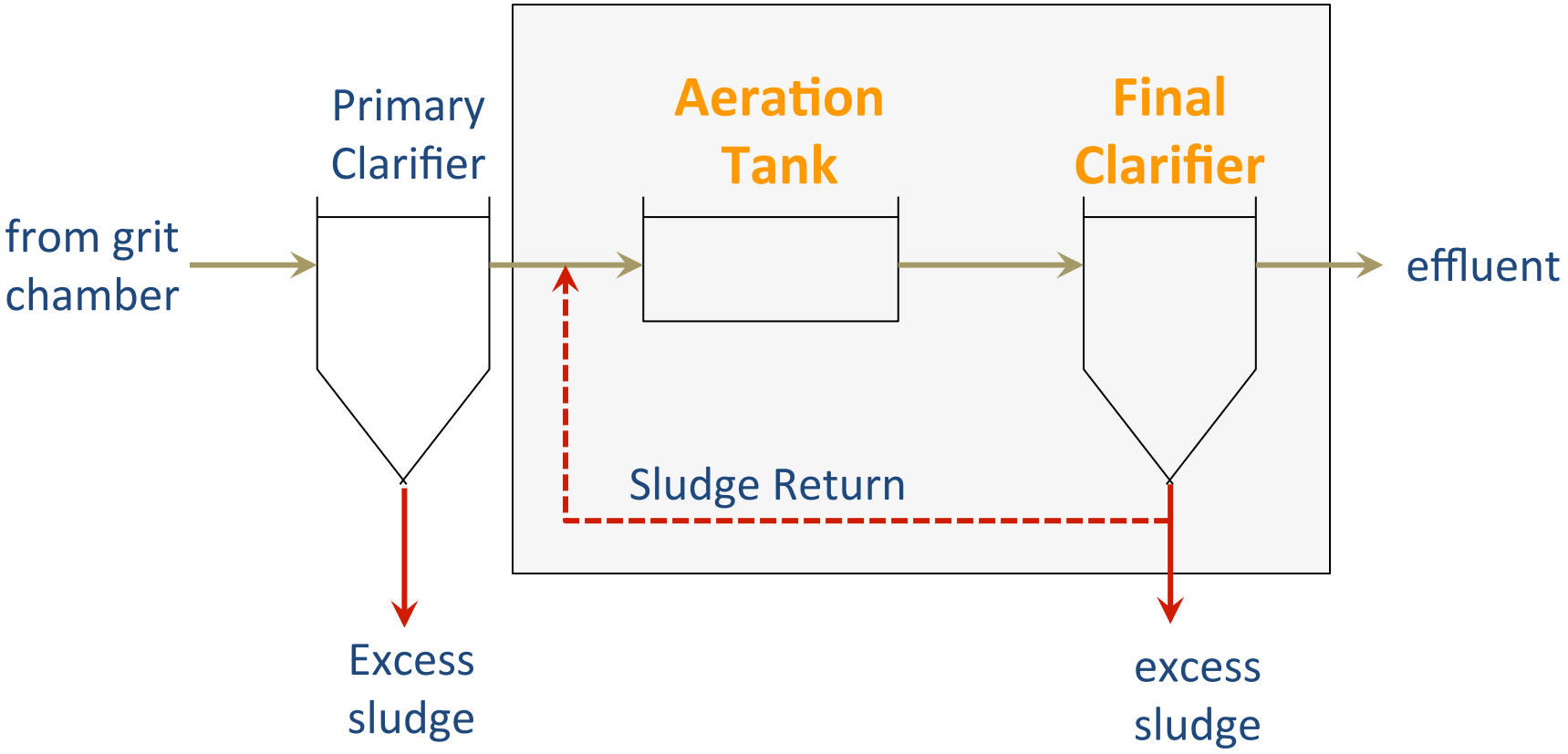
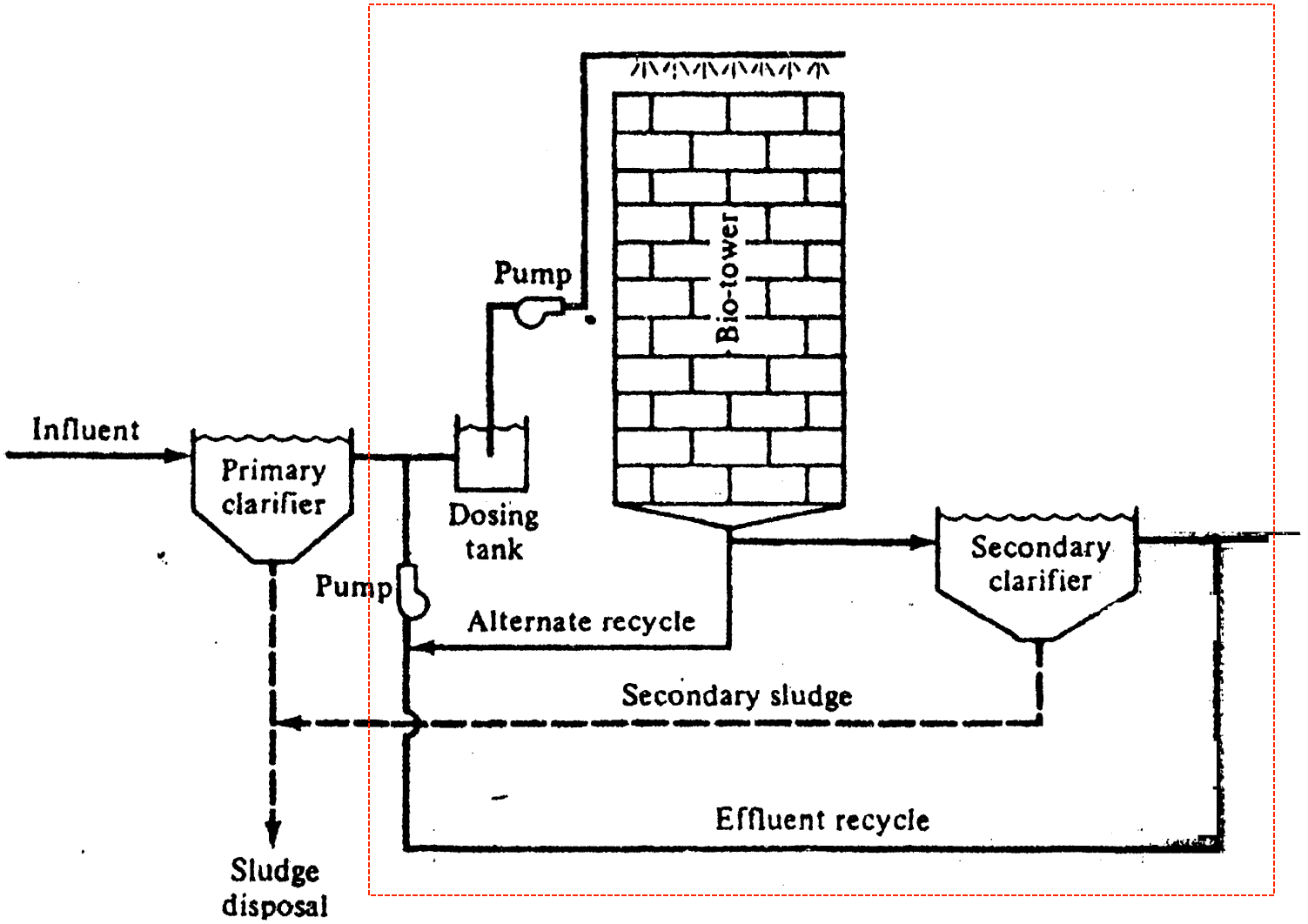


FIGURE 10-35
Typical underdrain system for tower filter.

Activated Sludge



Trickling Filter



Operation

Recycle flow (**not biomass!**)

Operated in series

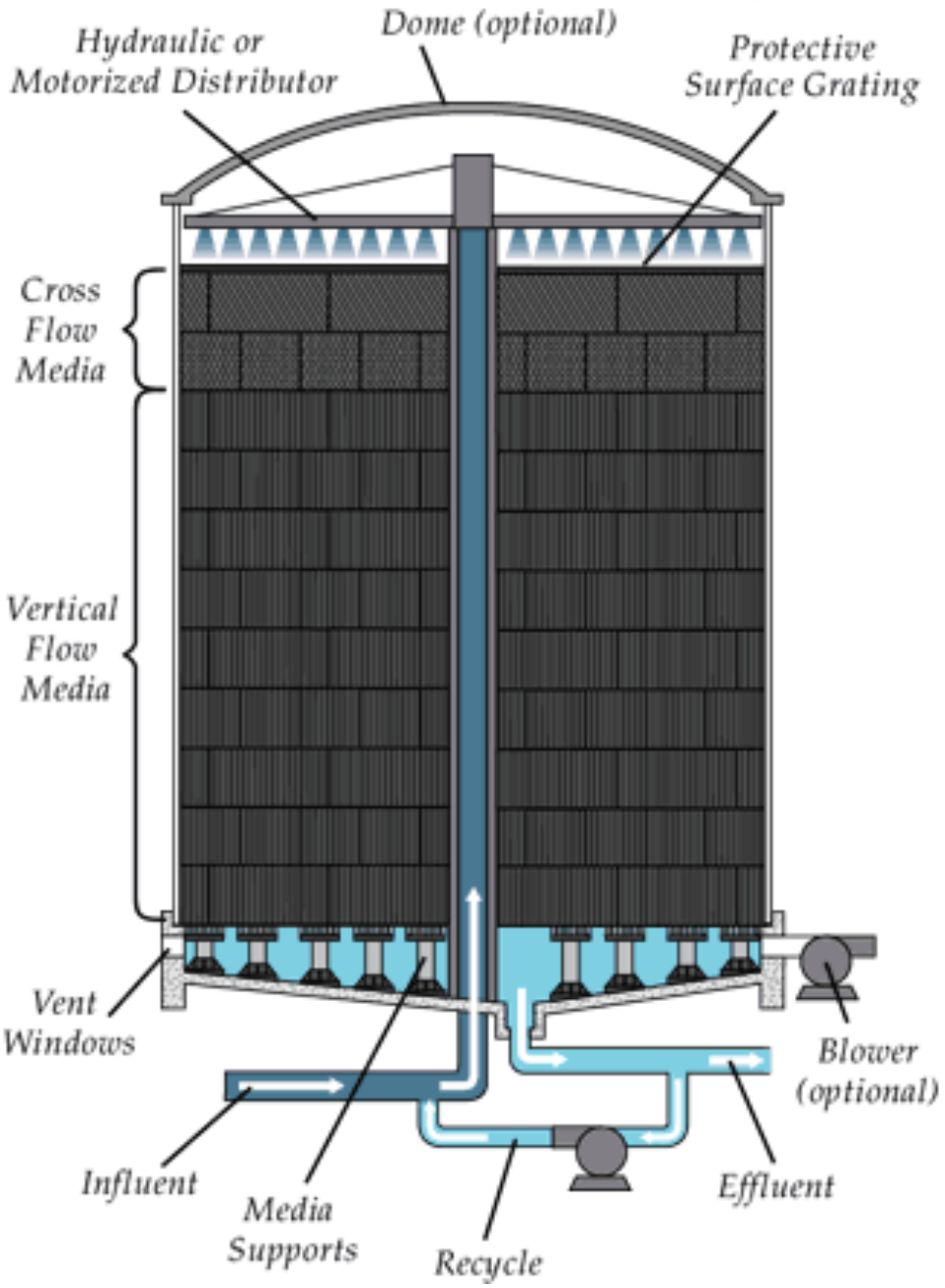
Followed by a secondary clarifier

Disadvantages

Large land requirement

Variations in effluent quality

Odor problems, filter flies



Bio-towers

(essentially **deep** trickling filters)

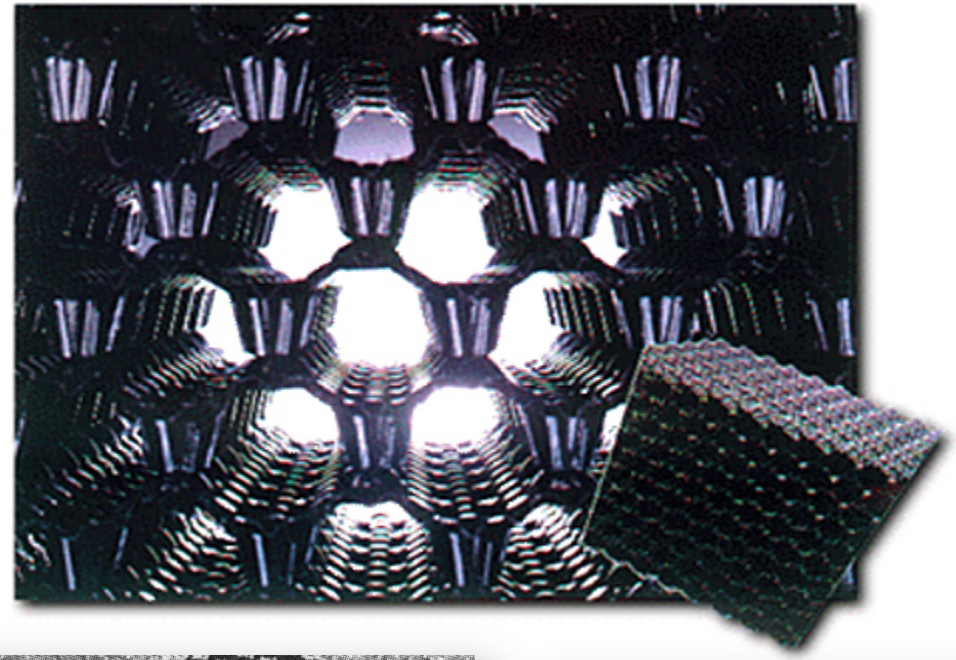
Plastic medium

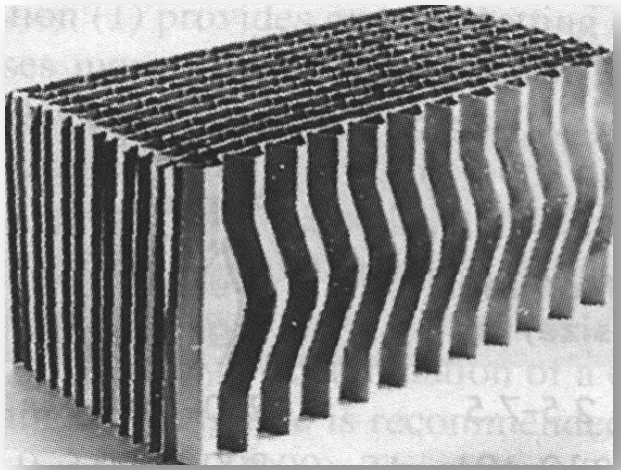
Effectively prevents **blockage**

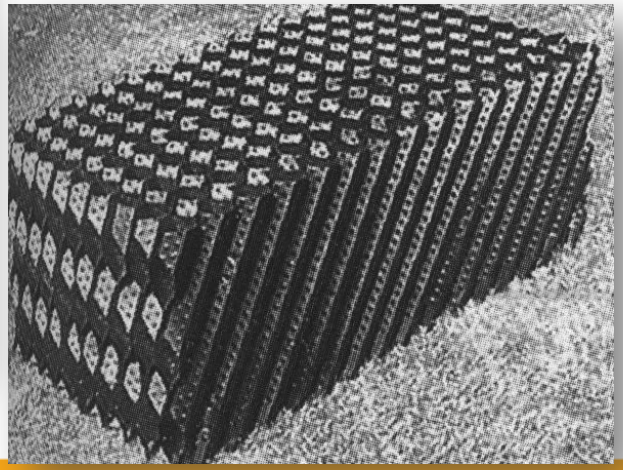
Ensures adequate **flow of air**

Deep - **small** area

Filter Media







High surface area per unit volume

Low in cost

High durability

High porosity

Design

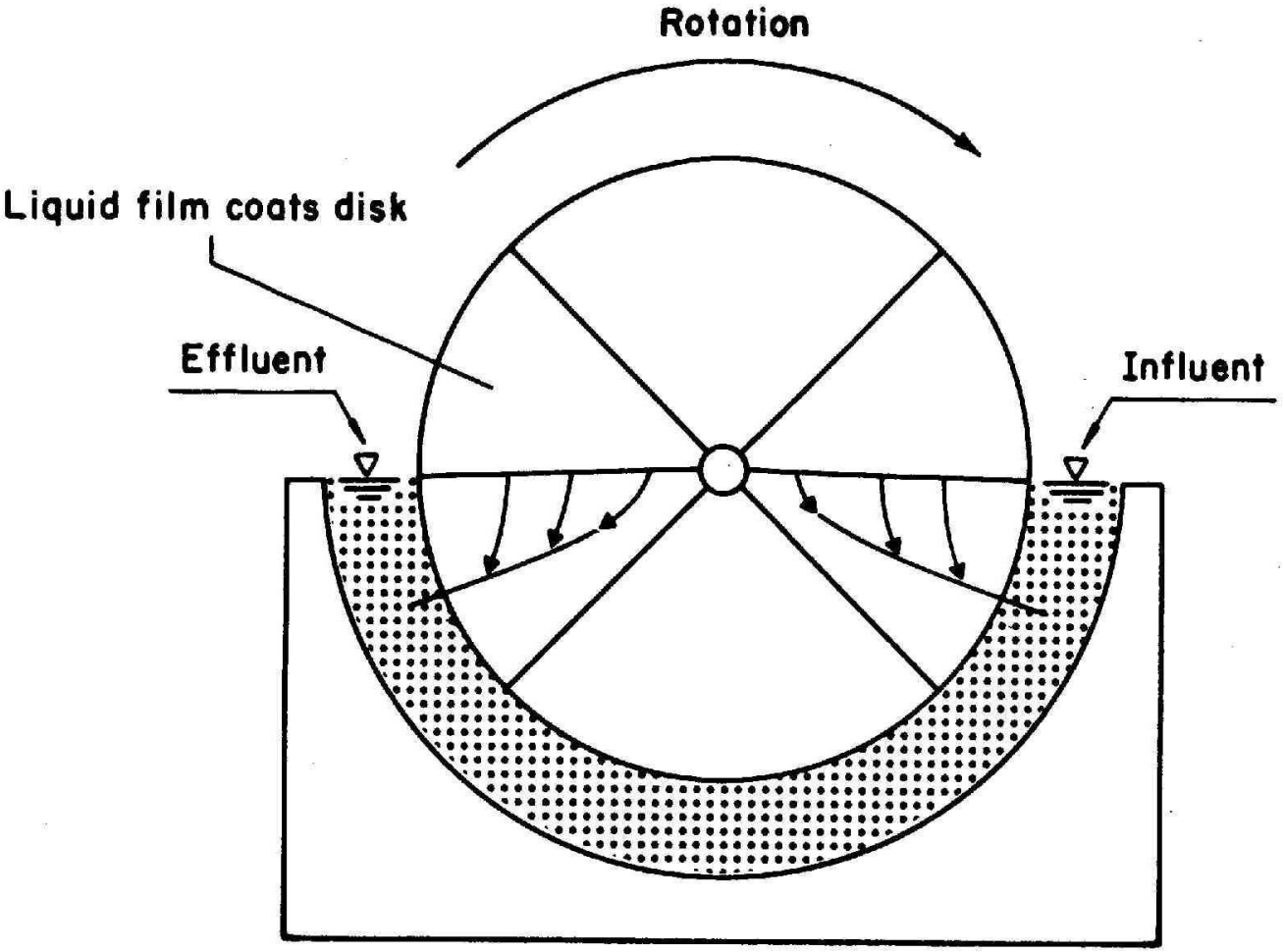
Hydraulic loading

BOD loading

Eckenfelder formula (with recirculation)

Temperature correction

Rotating Biological Contactor (RBC)


Rotation
Liquid film coats disk
Effluent
Influent