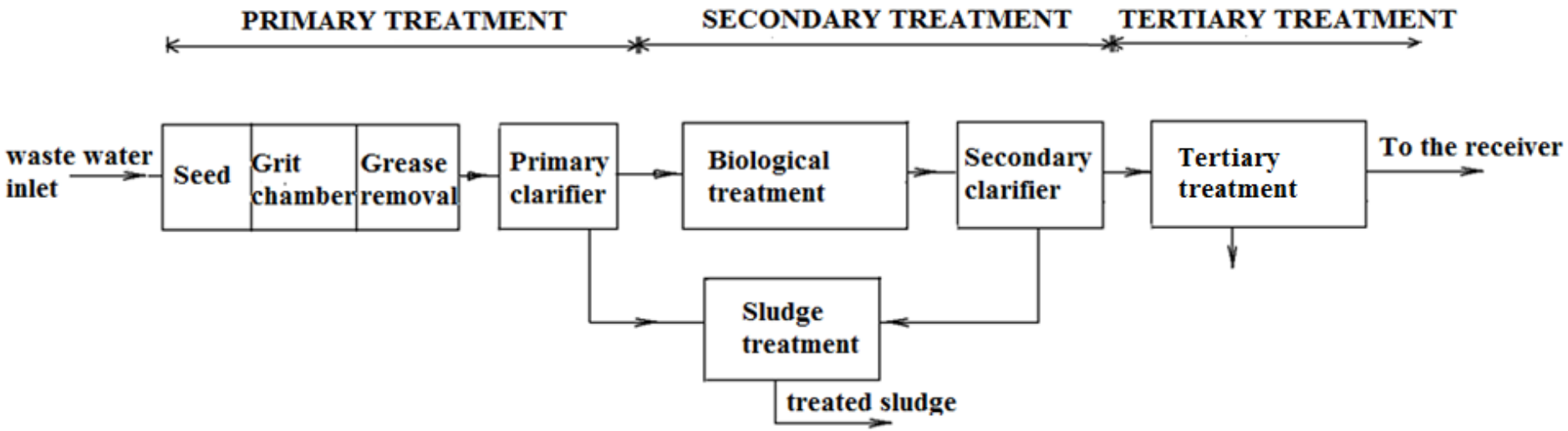
DEPARTMENT OF BUILDING SERVICES AND PROCESS ENGINEERING

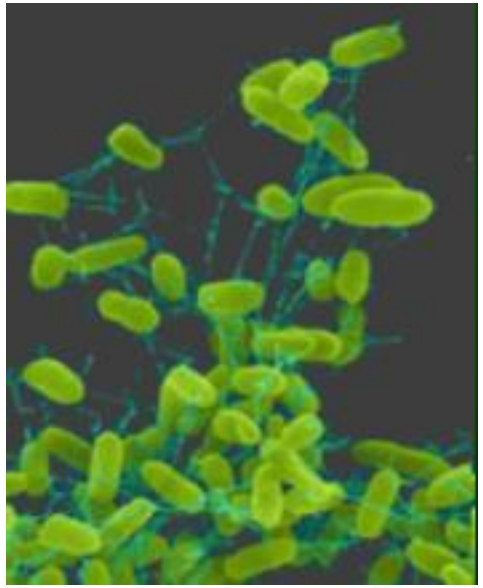
Wastewater Management II.

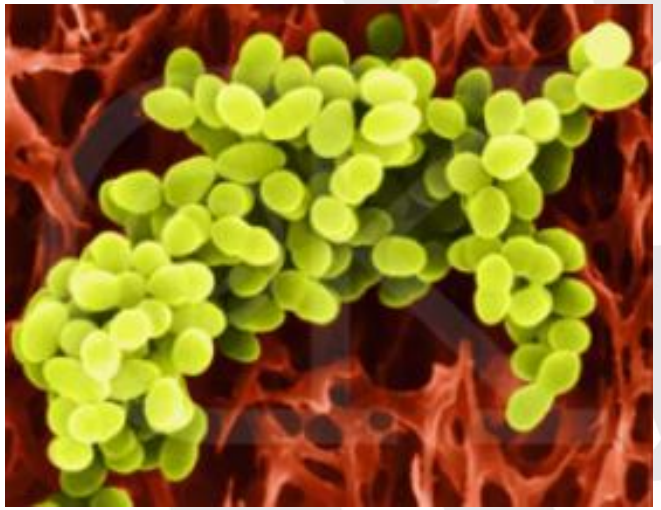
Biological Wastewater Treatment

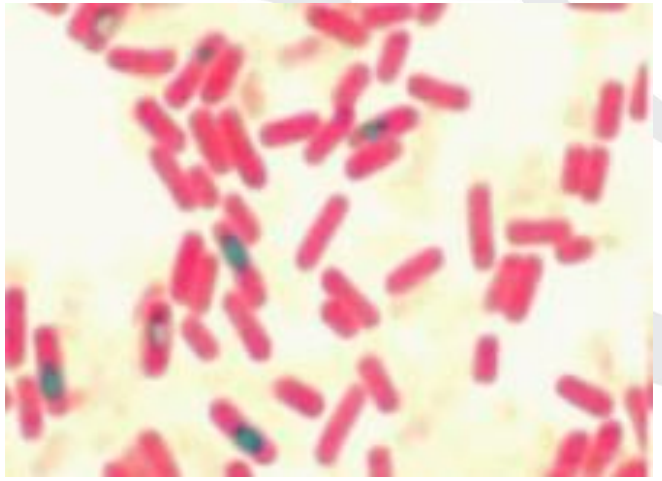
Generalized layout of a wastewater treatment plant



Micro-organisms







Biological Wastewater Treatment

Based on oxygen consumption:

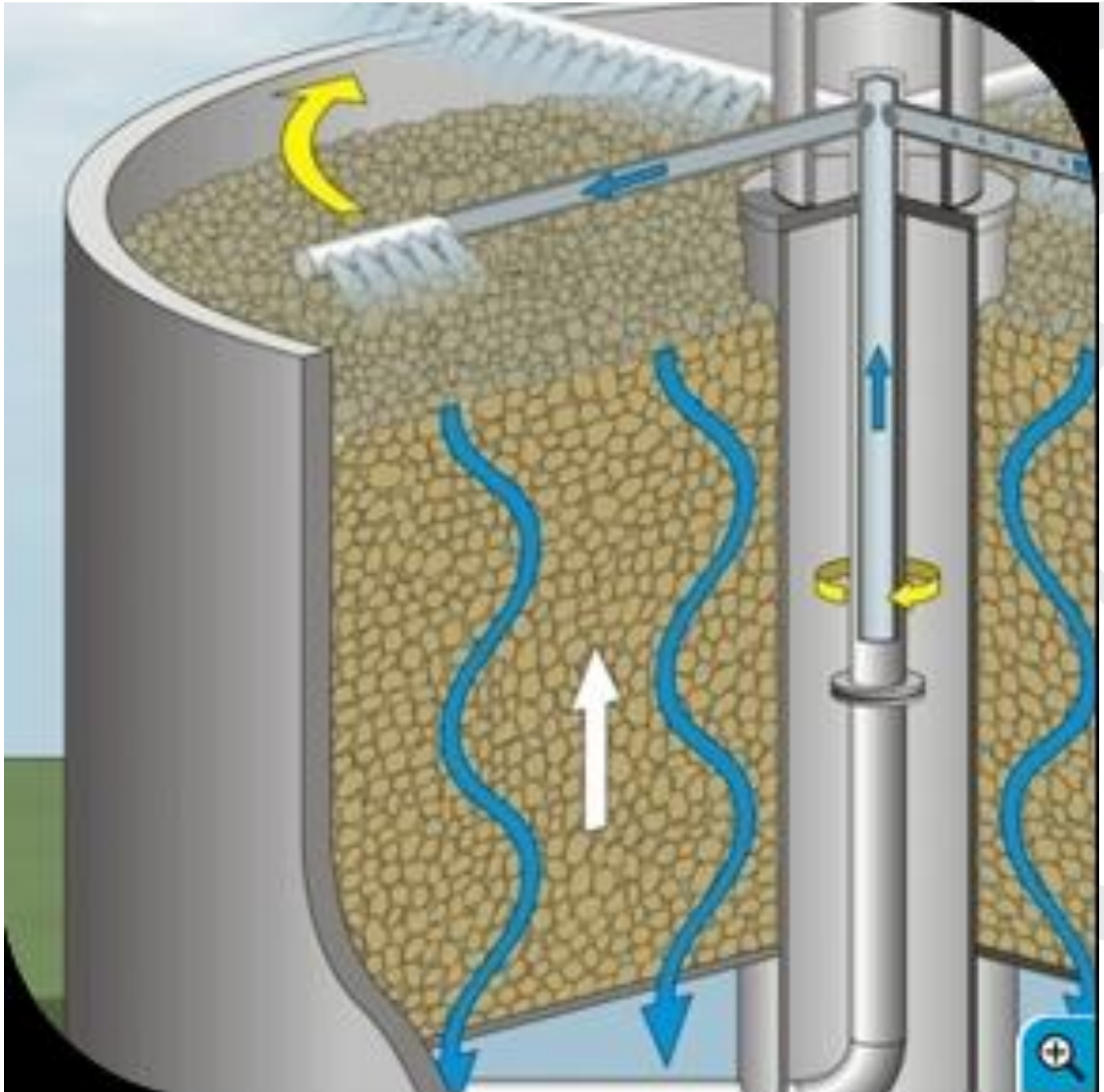
- Aerobic
- Anaerobic

Biological Wastewater Treatment

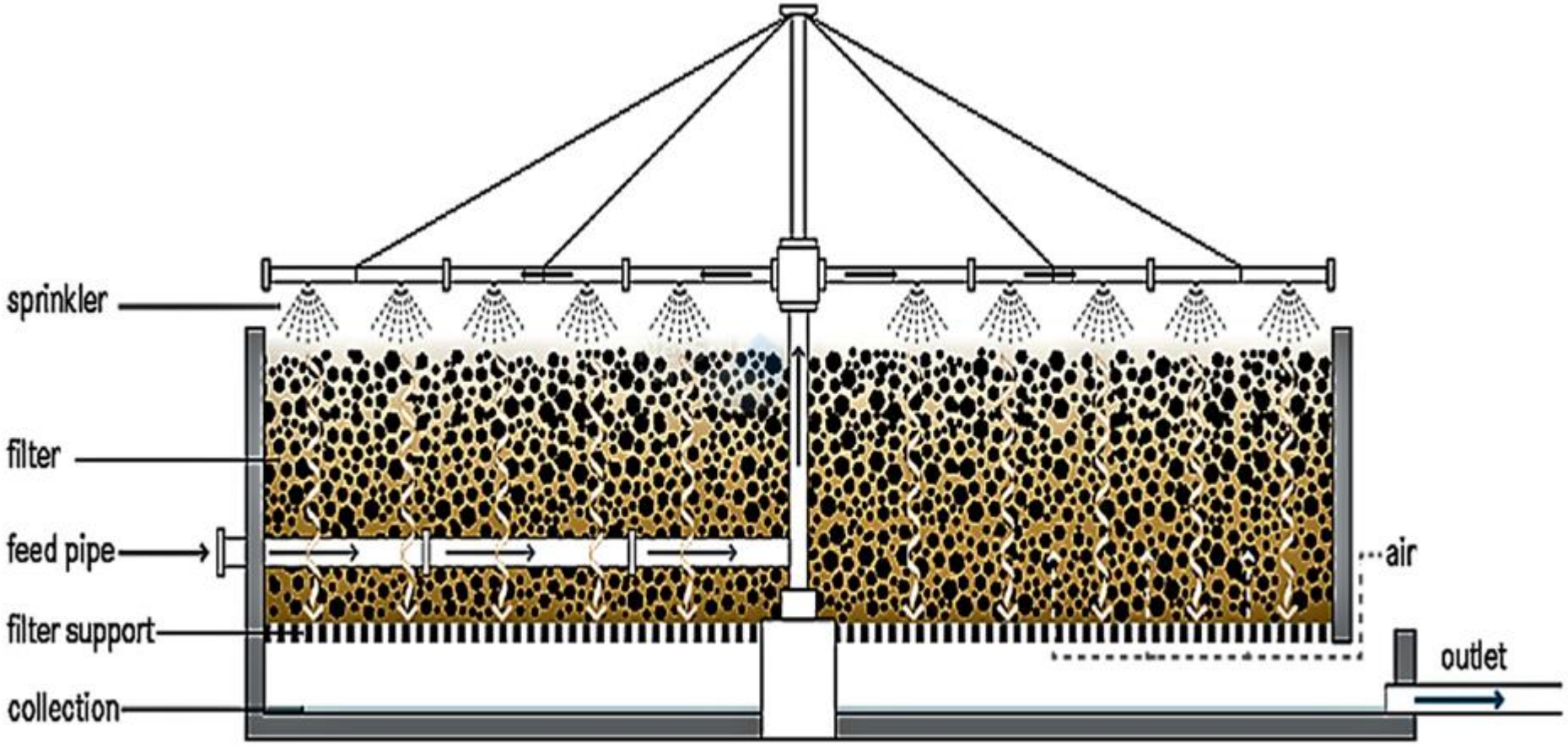
Based on microorganisms' growth:

- Biofilm (attached growth, fixed film) processes:
  - Trickling filter
  - Rotating Biological Contactor (RBC)
- Activated sludge (suspended growth) treatment

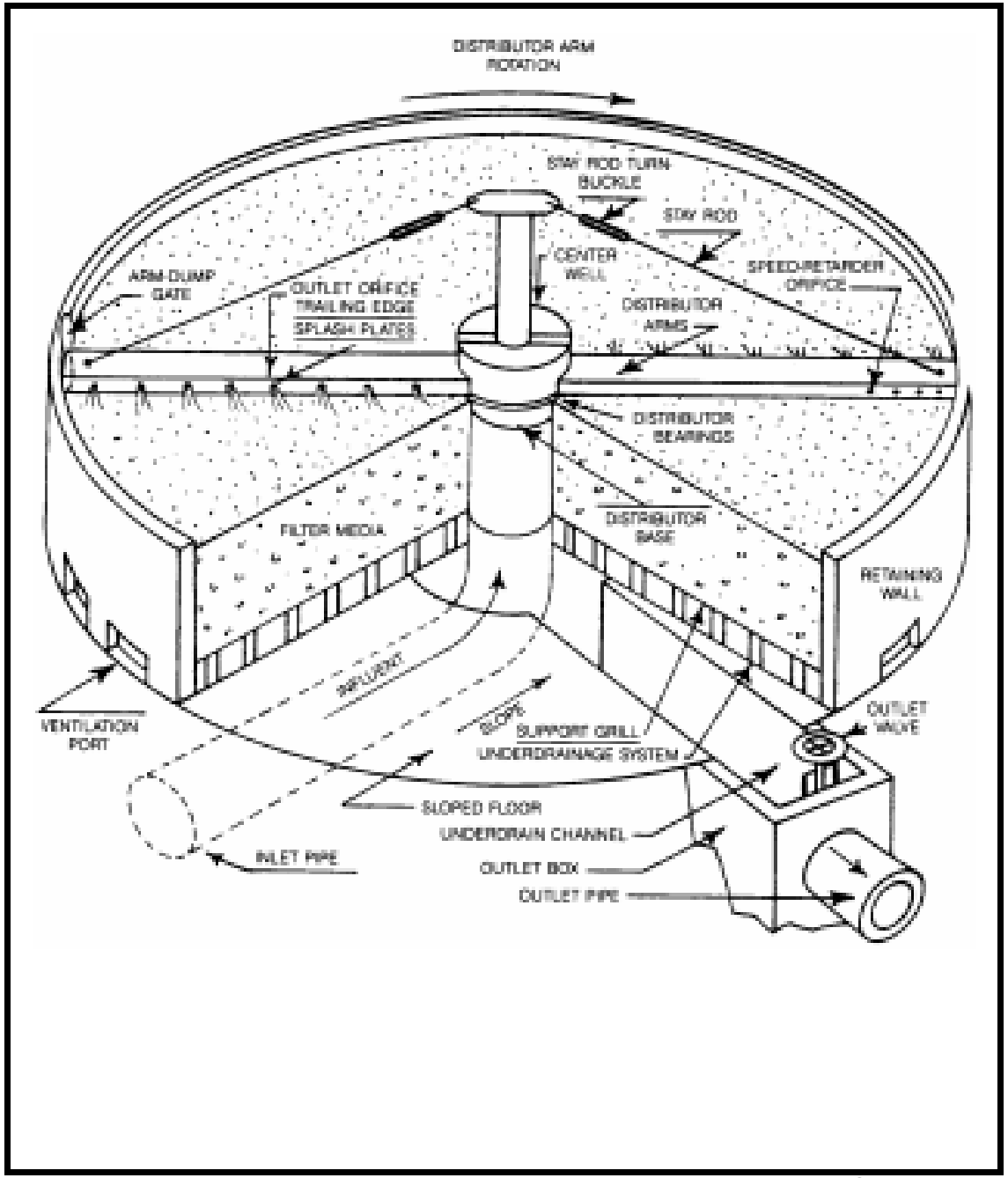
Biological Wastewater Treatment Trickling filter



Biological Wastewater Treatment
Trickling filter



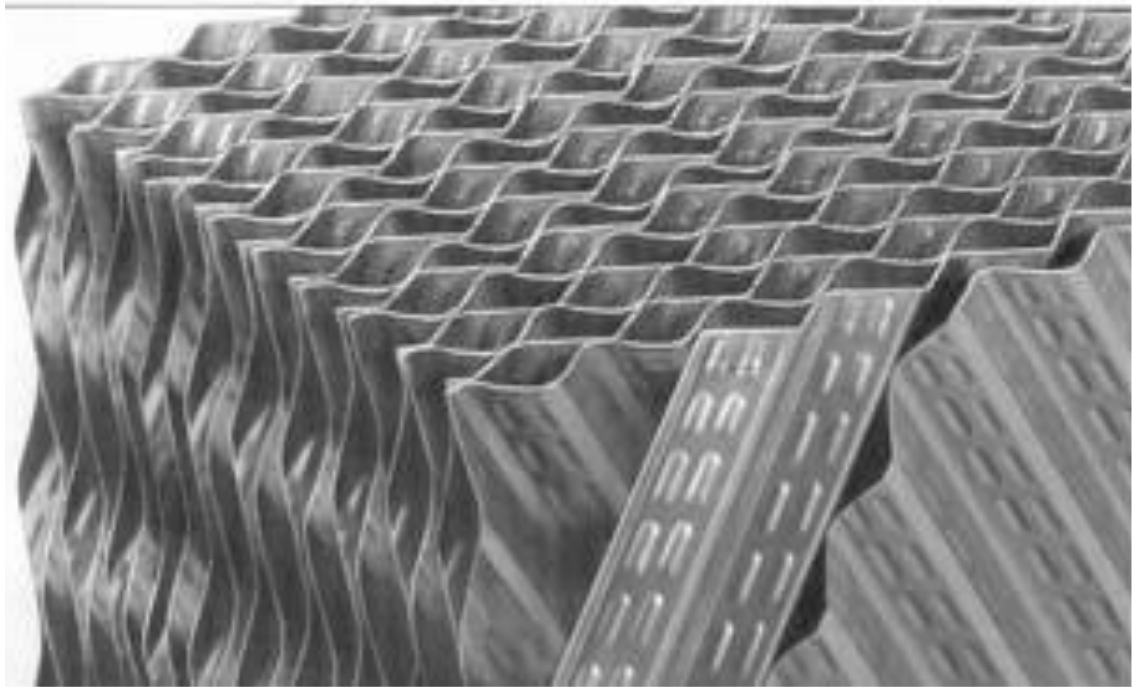
Biological Wastewater Treatment
Trickling filter



Source: Metcalf & Eddy, Inc. and Tchobonaglous, 1998.

ÉP GET DEPARTMENT OF BUILDING SERVICES AND PROCESS ENGINEERING

Immobile support media



Immobile support media

Motor Actuated Rotary Distributor (MARD)

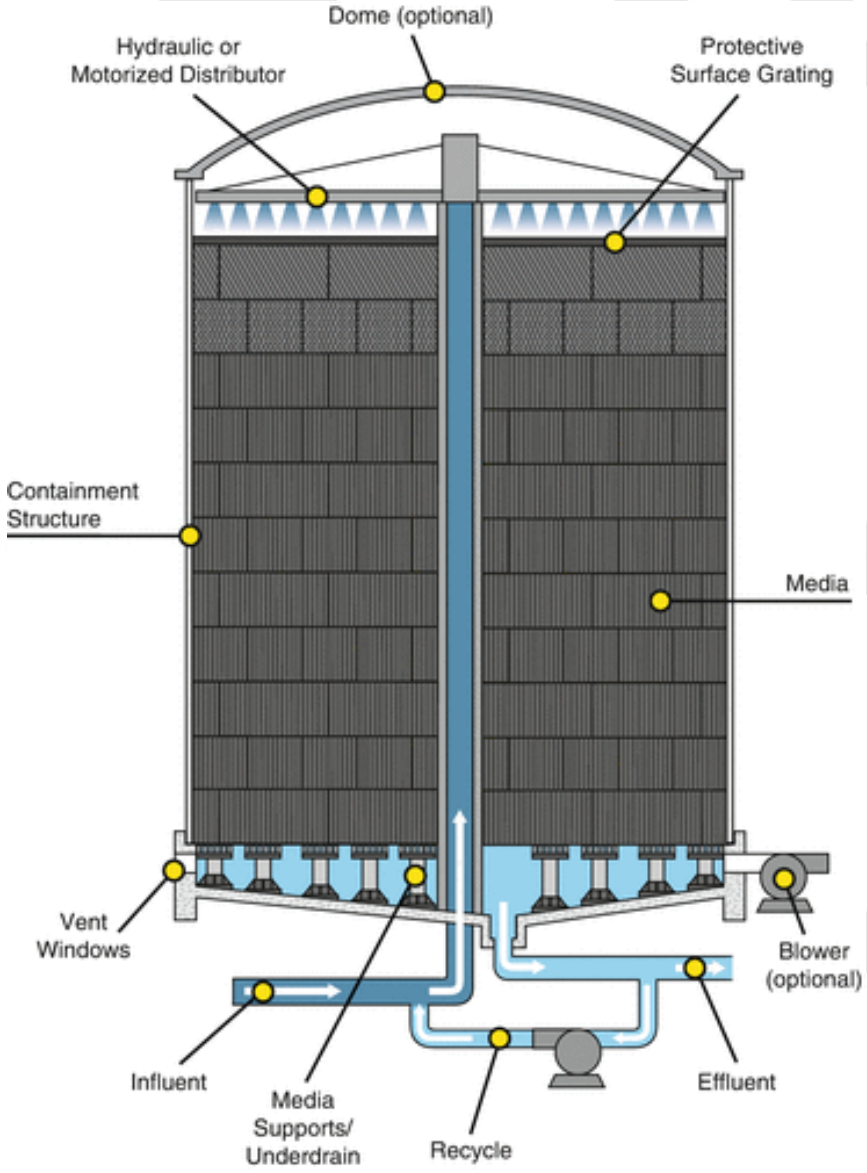
Biological Wastewater Treatment
Trickling filter

Biological Wastewater Treatment
Trickling filter

Biological Wastewater Treatment
Trickling filter

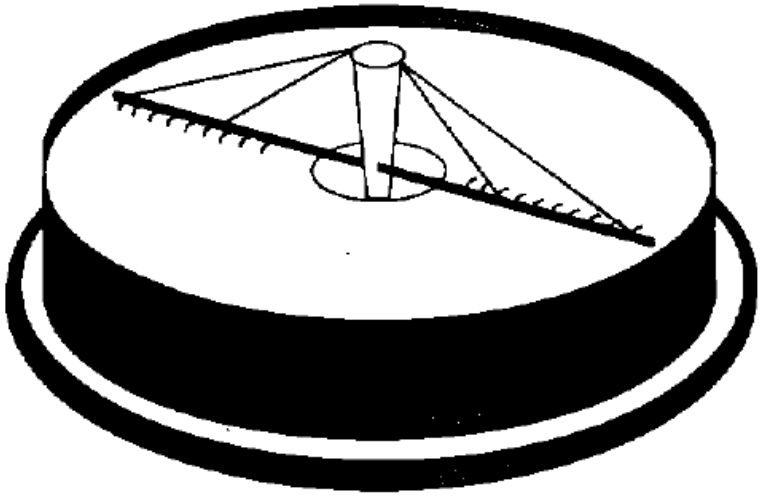
DEPARTMENT OF BUILDING SERVICES AND PROCESS ENGINEERING

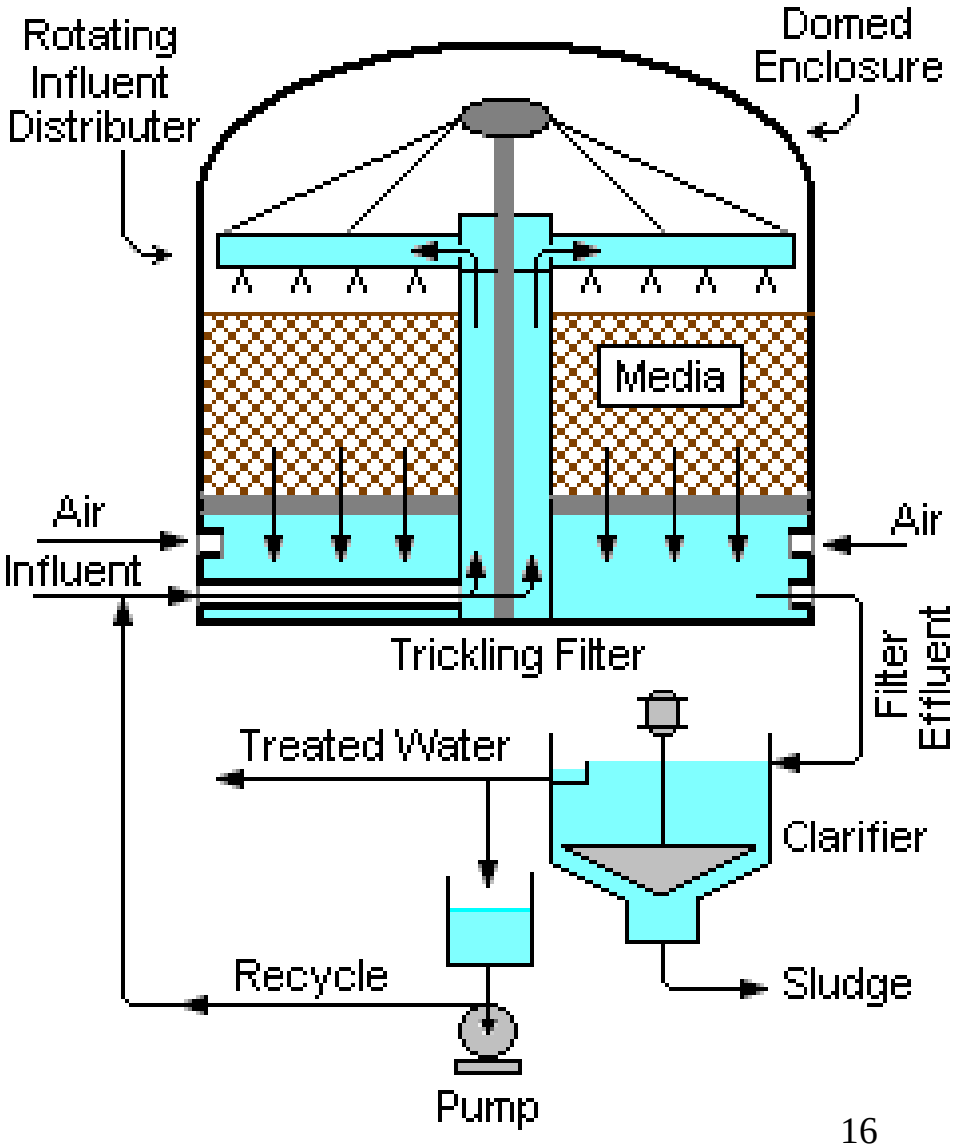
Biological Wastewater Treatment
Trickling filter



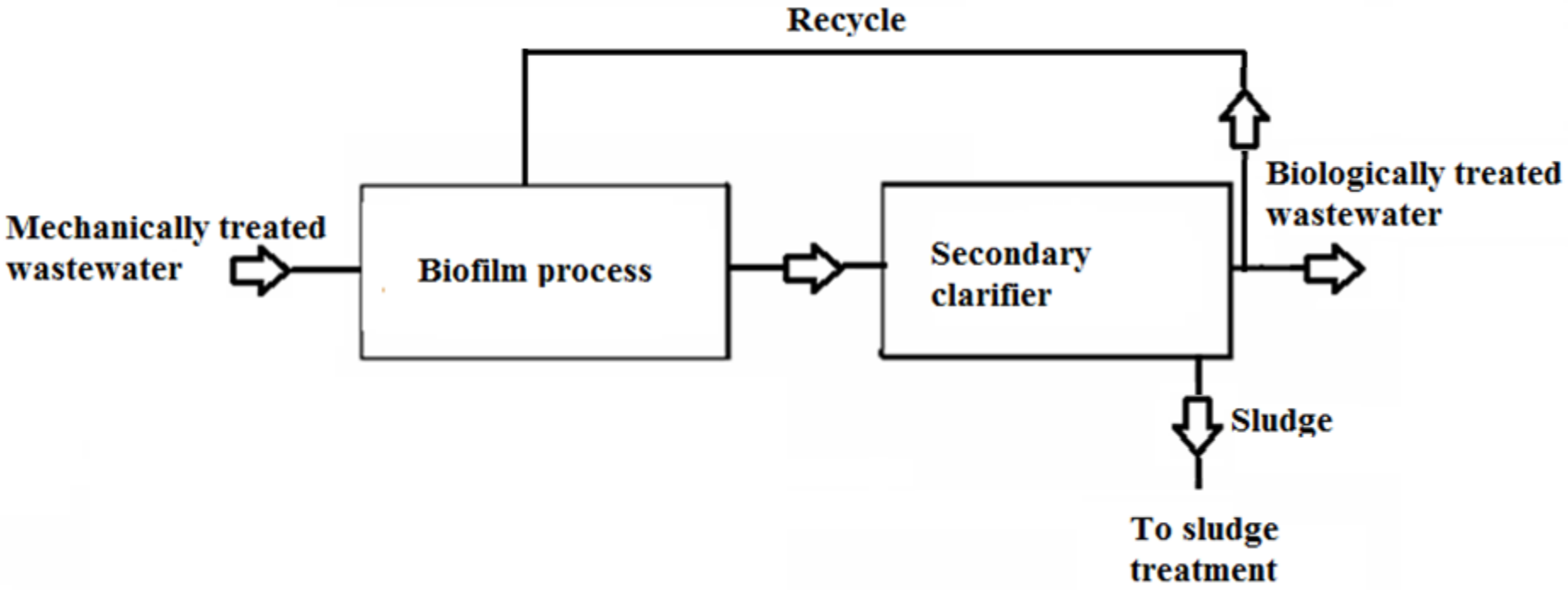
Biological Wastewater Treatment

Trickling filter (fixed film process)



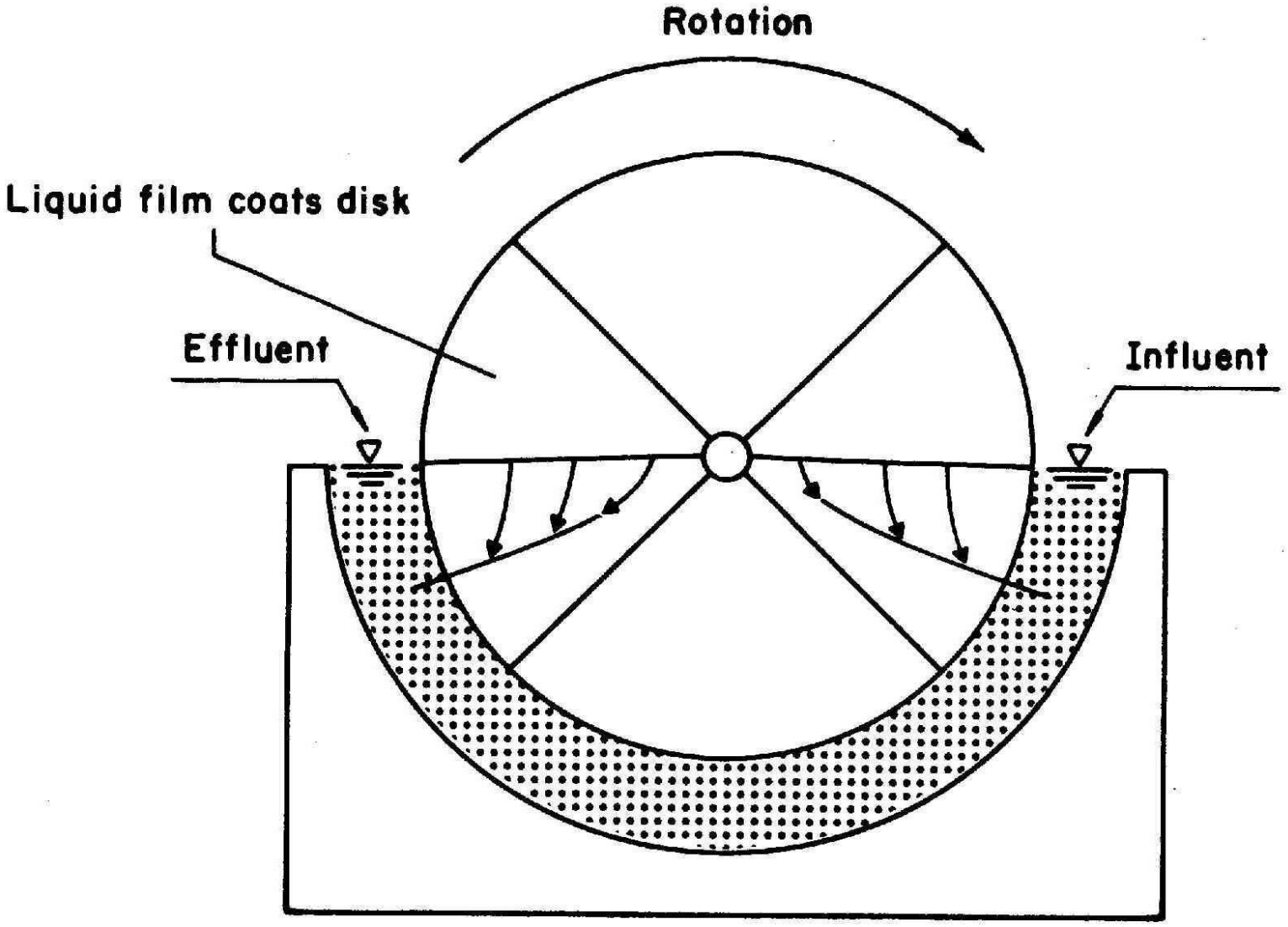


Generalized layout of a biofilm (fixed film) process

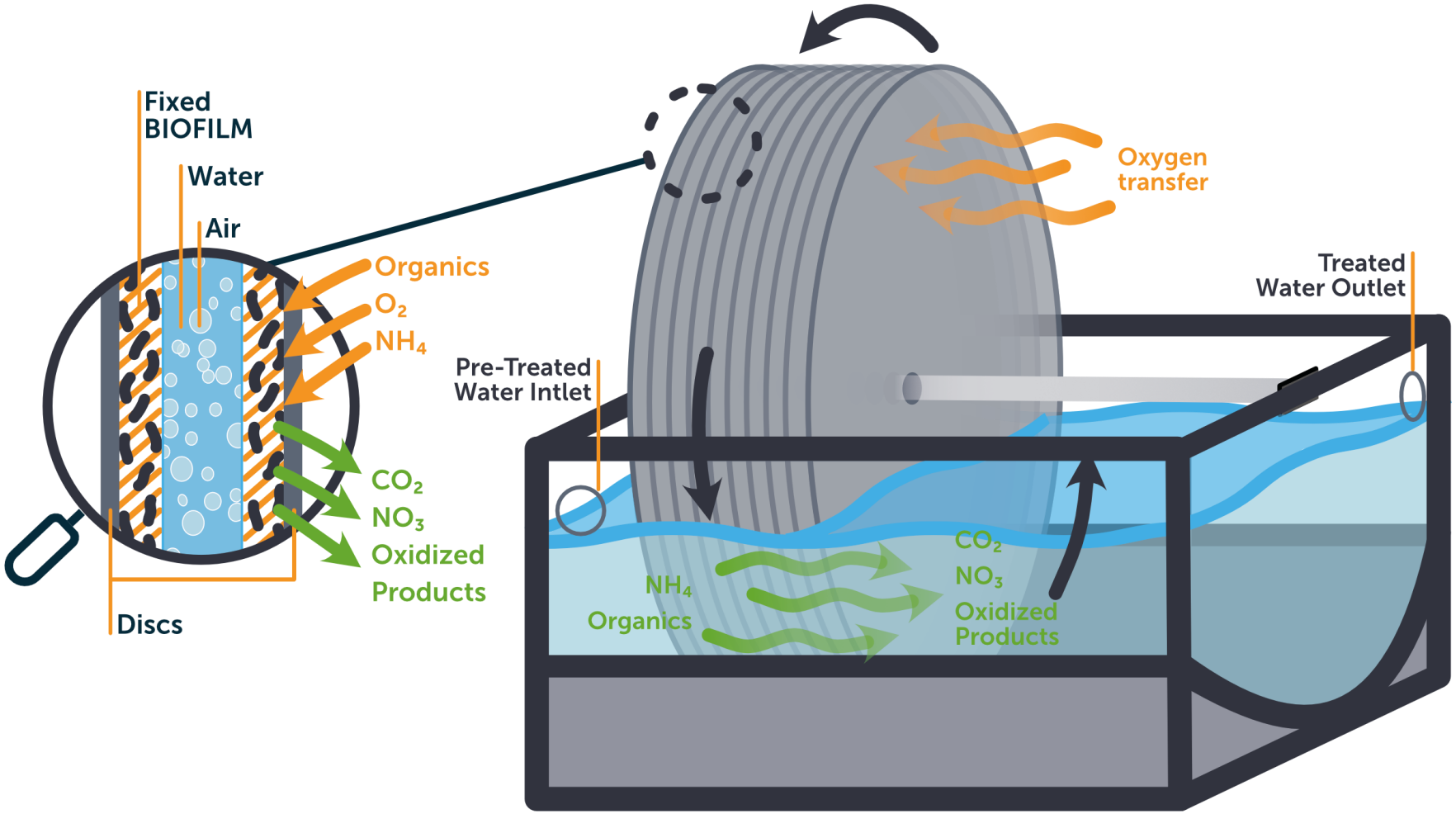


Biological Wastewater Treatment

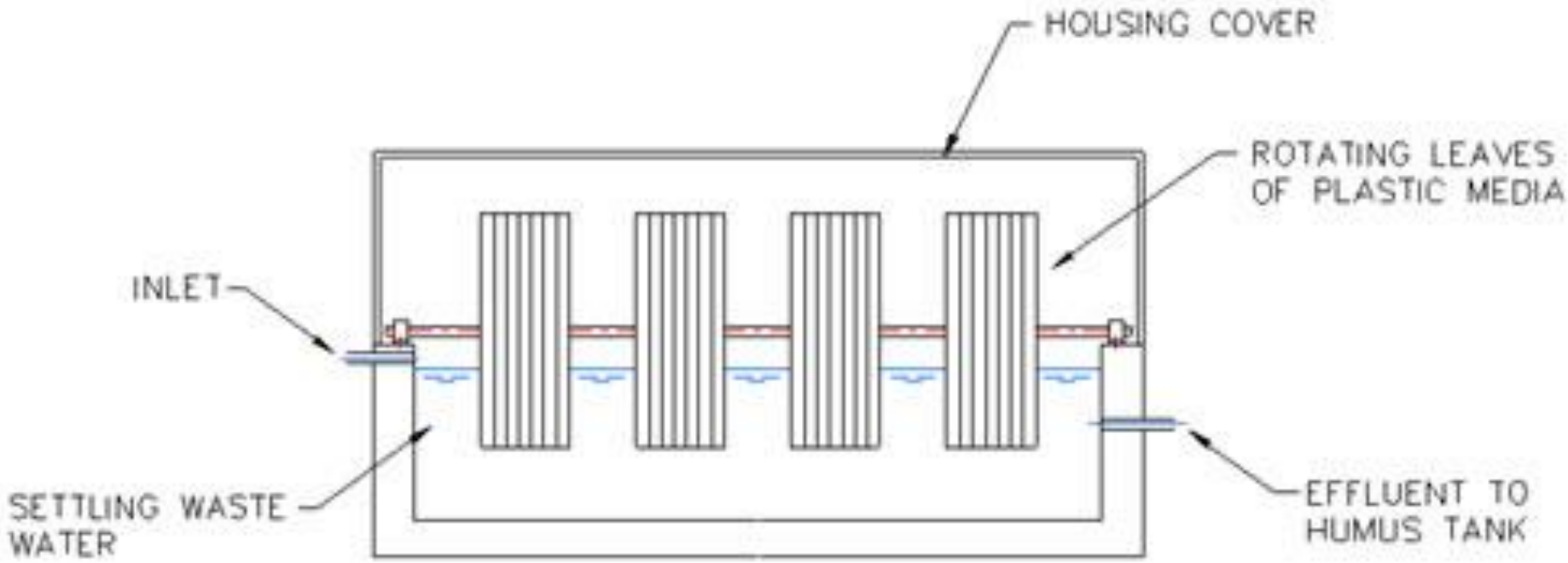
Rotating Biological Contactor (fixed film process)



Biological Wastewater Treatment
Rotating Biological Contactor

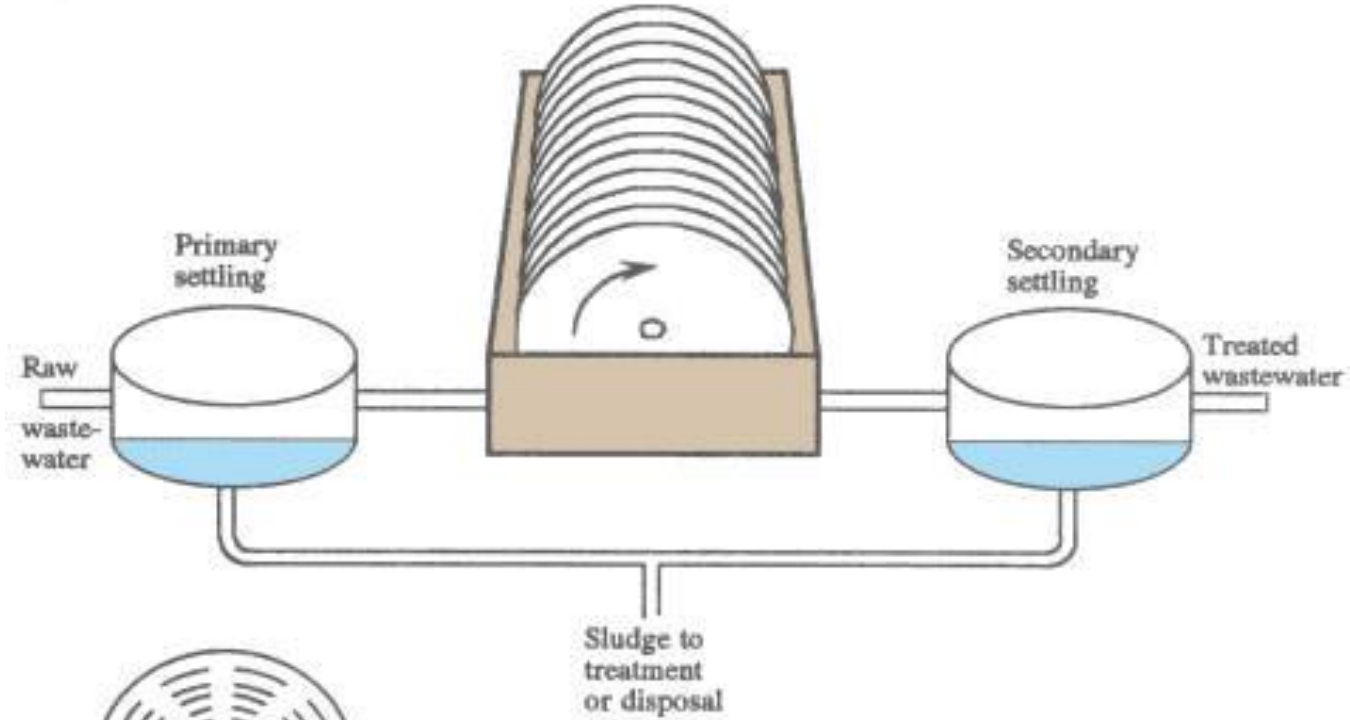


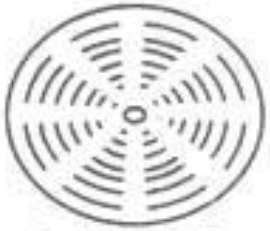
Biological Wastewater Treatment
Rotating Biological Contactor



MODULAR TYPE OF ROTATING BIOLOGICAL CONTACTOR

Biological Wastewater Treatment
Rotating Biological Contactor





Detail of a disk

Disk (made of high density polyethylene)

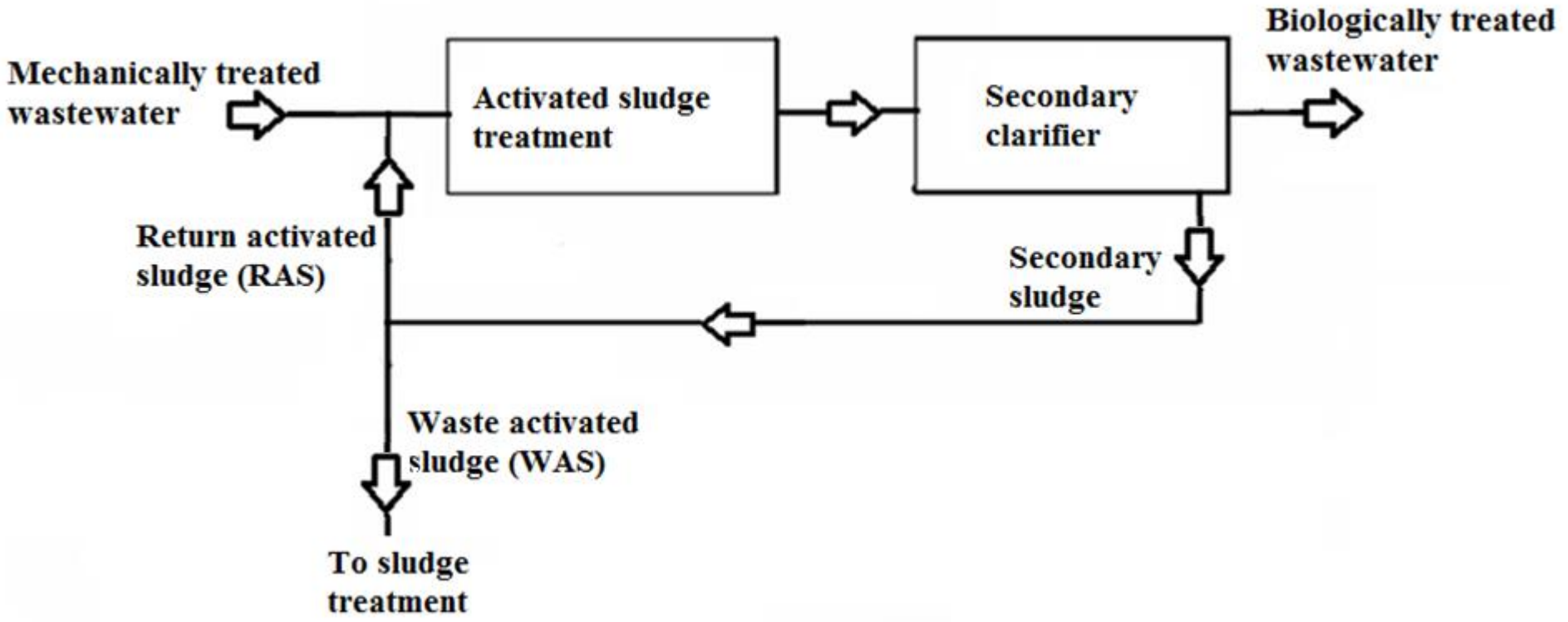
Biological Wastewater Treatment
Rotating Biological Contactor

Biological Wastewater Treatment
Rotating Biological Contactor

Biological Wastewater Treatment
Rotating Biological Contactor

Suspended growth treatment (Activated Sludge System)

The most common suspended growth process used for municipal wastewater treatment



Suspended growth treatment
(Activated Sludge System)

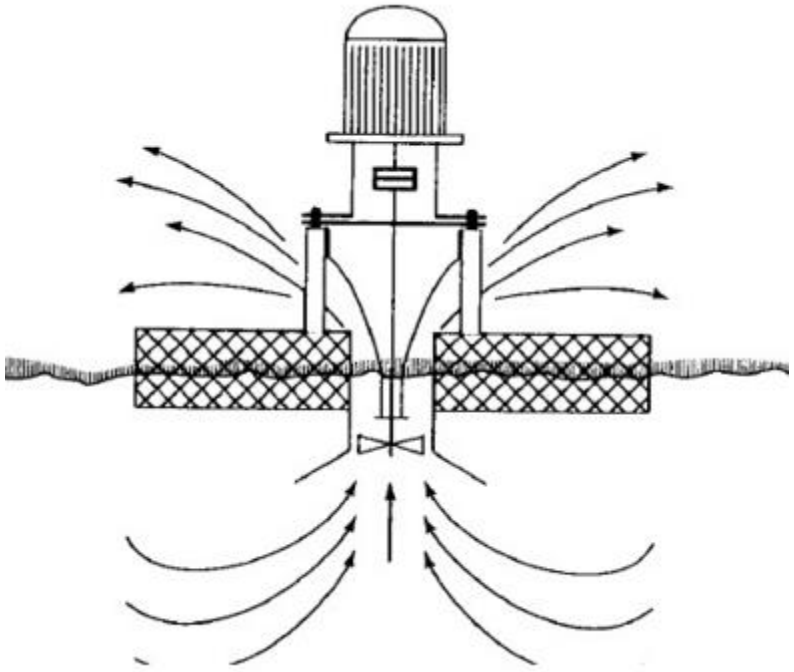
Activated treatment plants mainly comprise:

- an aeration tank where the water to be purified is brought into contact with the purifying bacteria mass.
- a clarifier where the purified water is separated from the bacterial culture.
- a recirculation arrangement used to return biological sludge collected from the clarifier to the aeration tank.
- a mechanism for supplying oxygen.
- a mixing arrangement for this tank in order to ensure the best possible contact between the bacteria cells and their nutrient, to encourage the widespread diffusion of oxygen to those areas requiring oxygen and to prevent the formation of deposits. Quite frequently, the same arrangement is used for aeration and mixing.

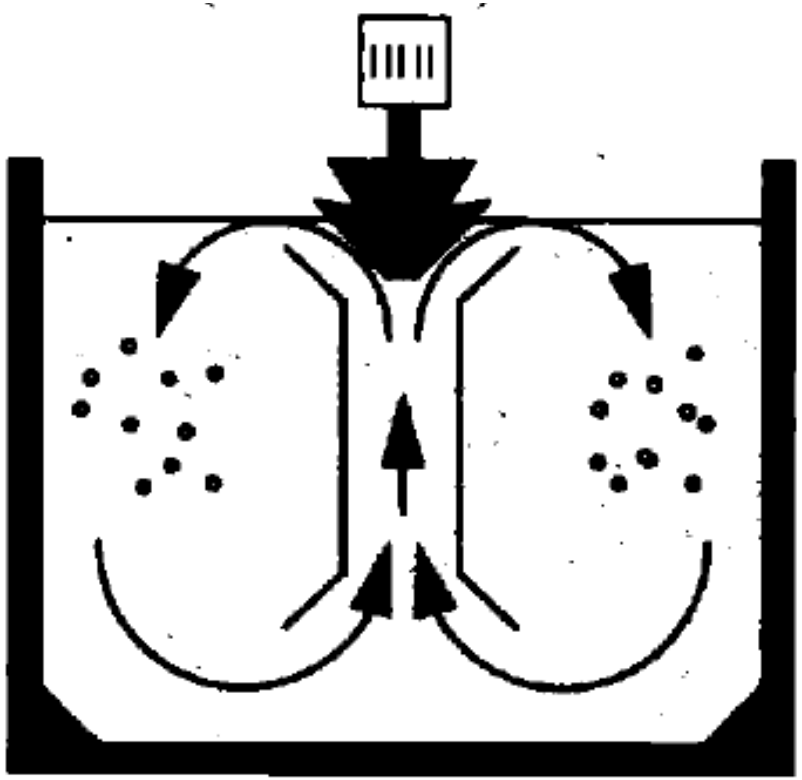
Methods of aeration

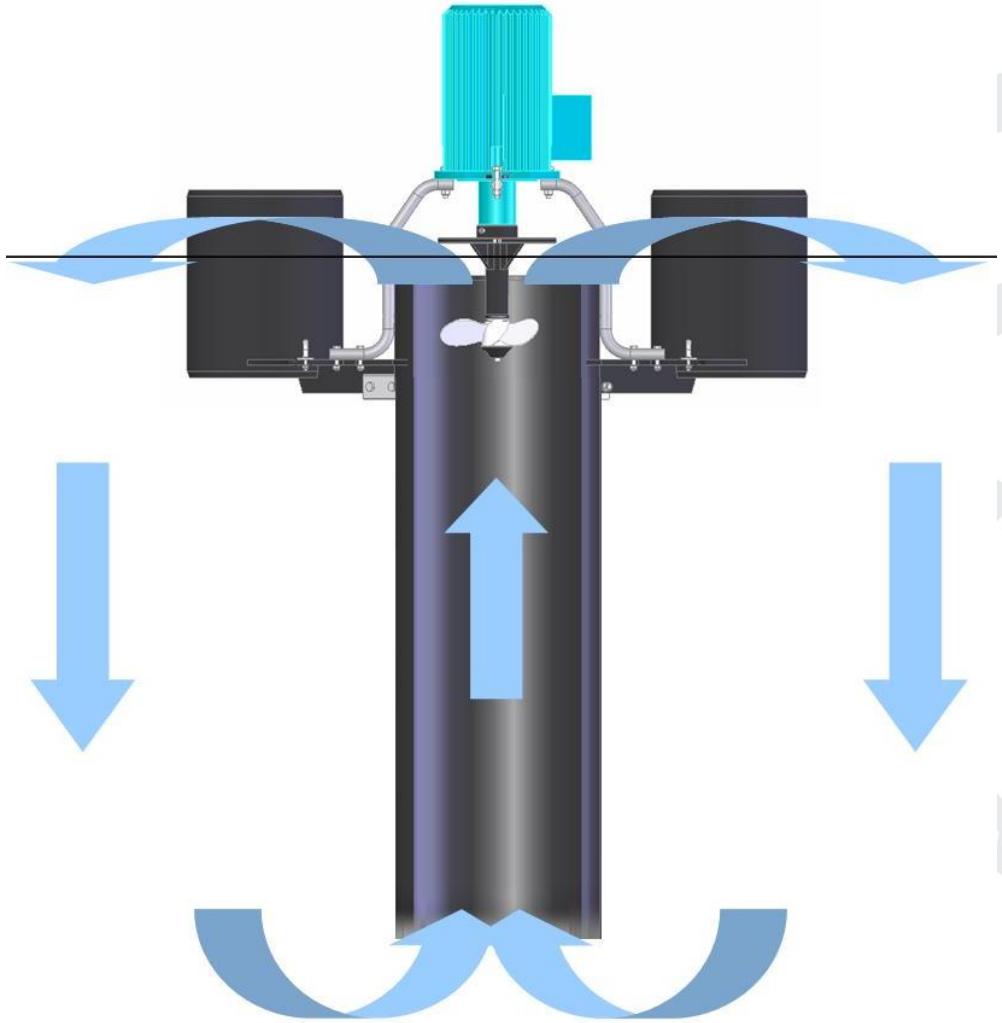
- Surface aeration
- Turbine aeration
- Diffused aeration
- Jet aeration

Activated Sludge System
Surface aeration

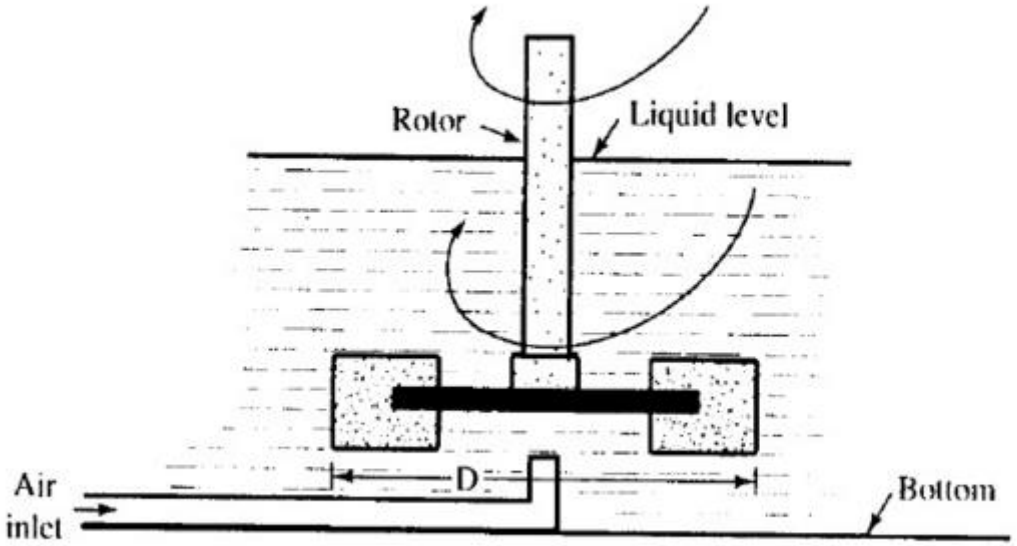


Mechanical surface aerator with draft tube

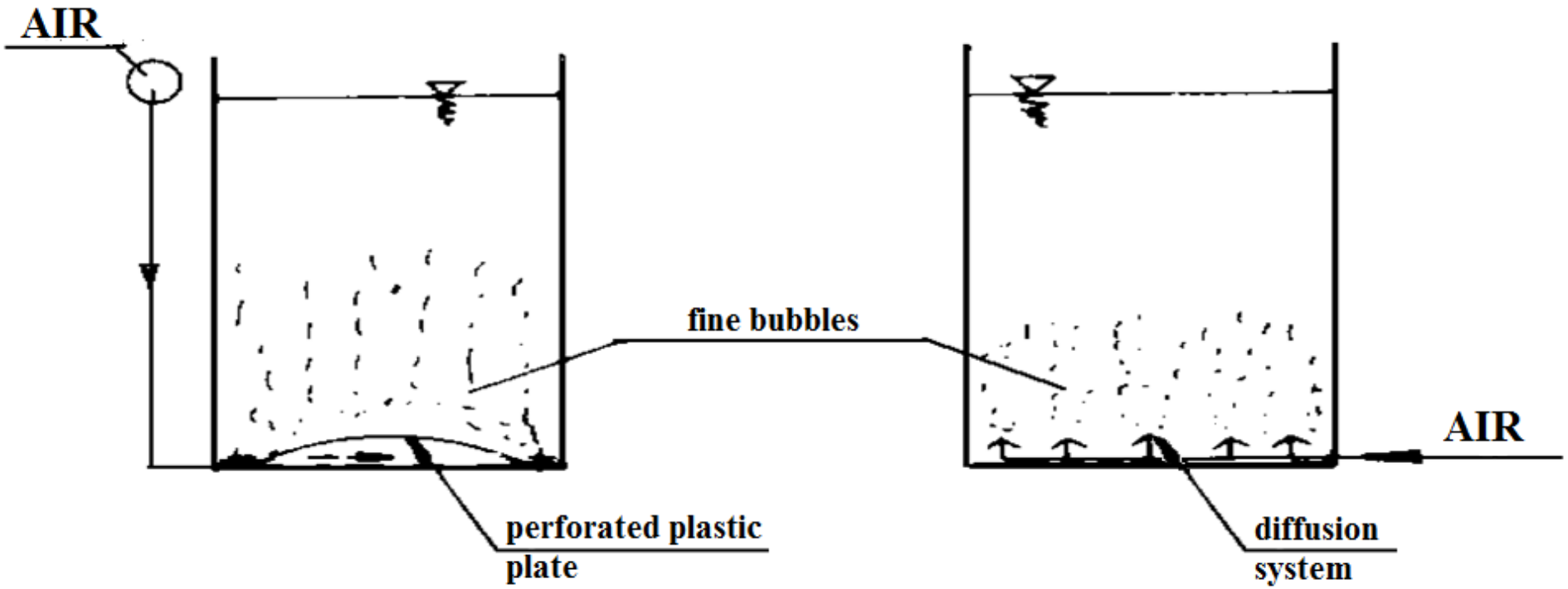




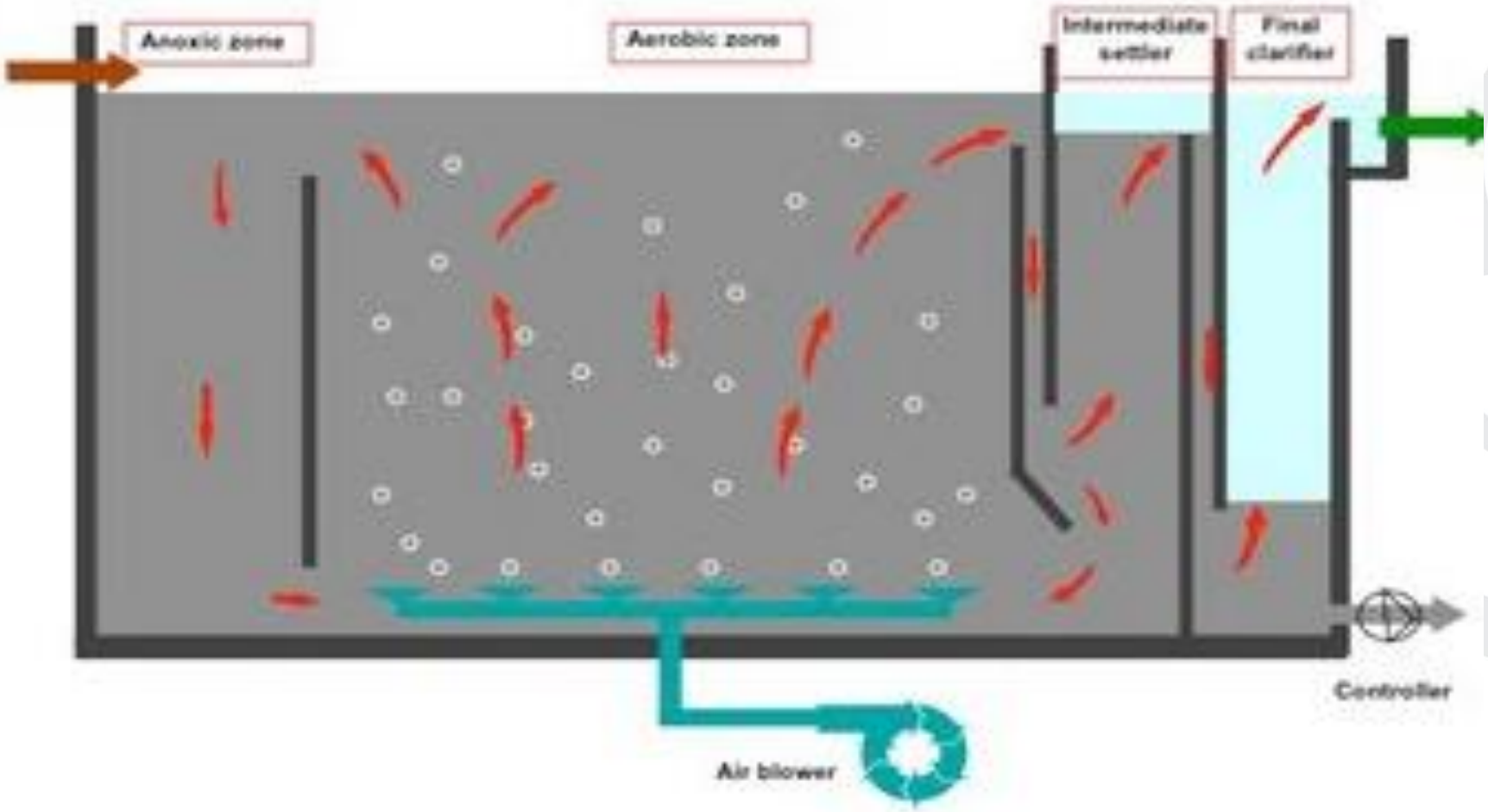
Activated Sludge System
Aeration: Turbine aeration



Activated Sludge System
Aeration: Submerged air diffusion

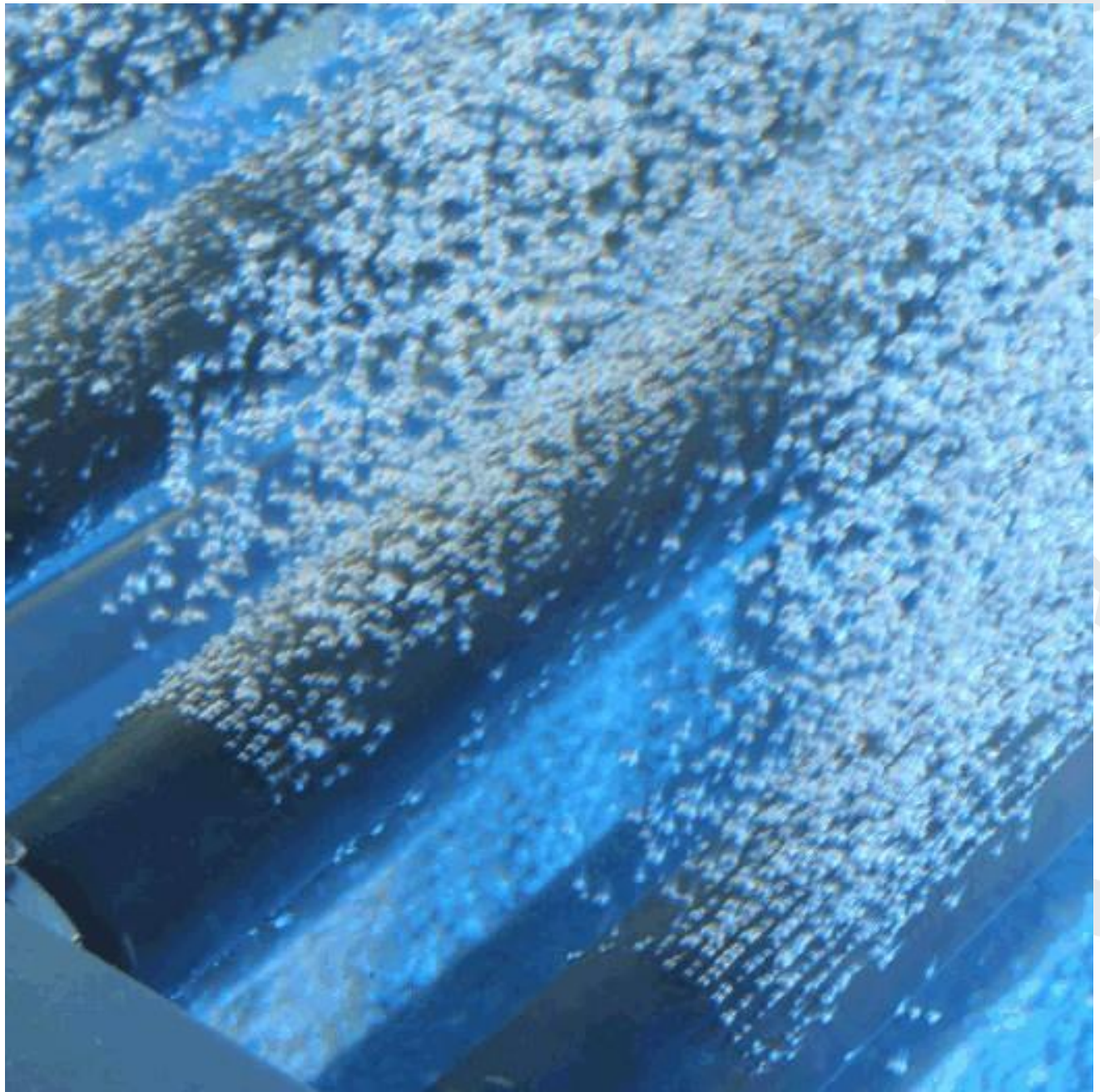


Activated Sludge System
Aeration: Submerged diffusion with air blowers



Mounting of an aeration system

Diffused air pipes



Activated Sludge System
Aeration: Submerged diffusion with air blowers

Activated Sludge System
Aeration: Submerged diffusion

Bubble diffuser

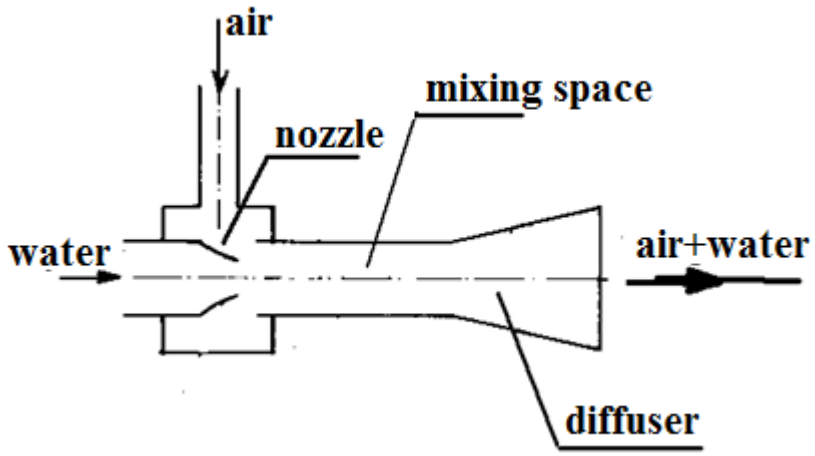
Bubble diffusers

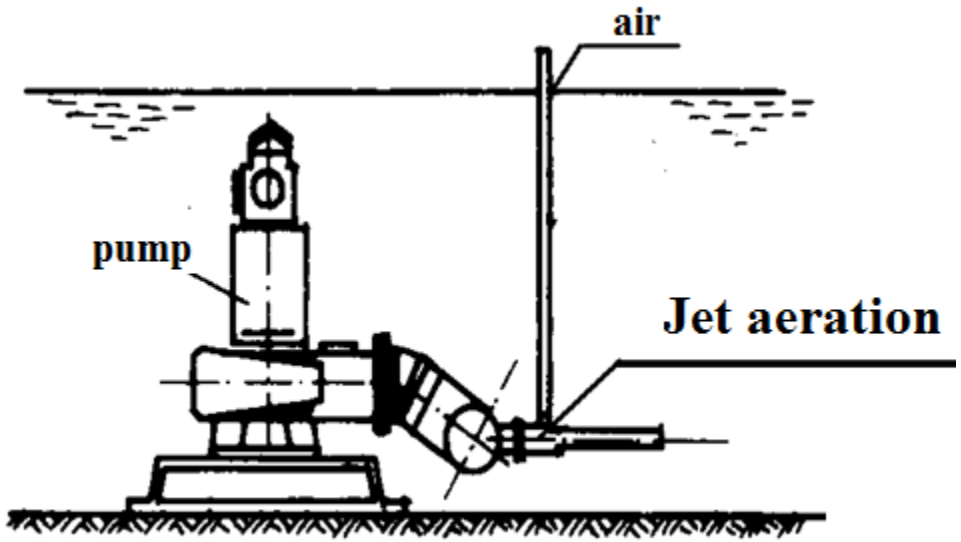
SnapCap™ coarse bubble diffuser

Aeration basin

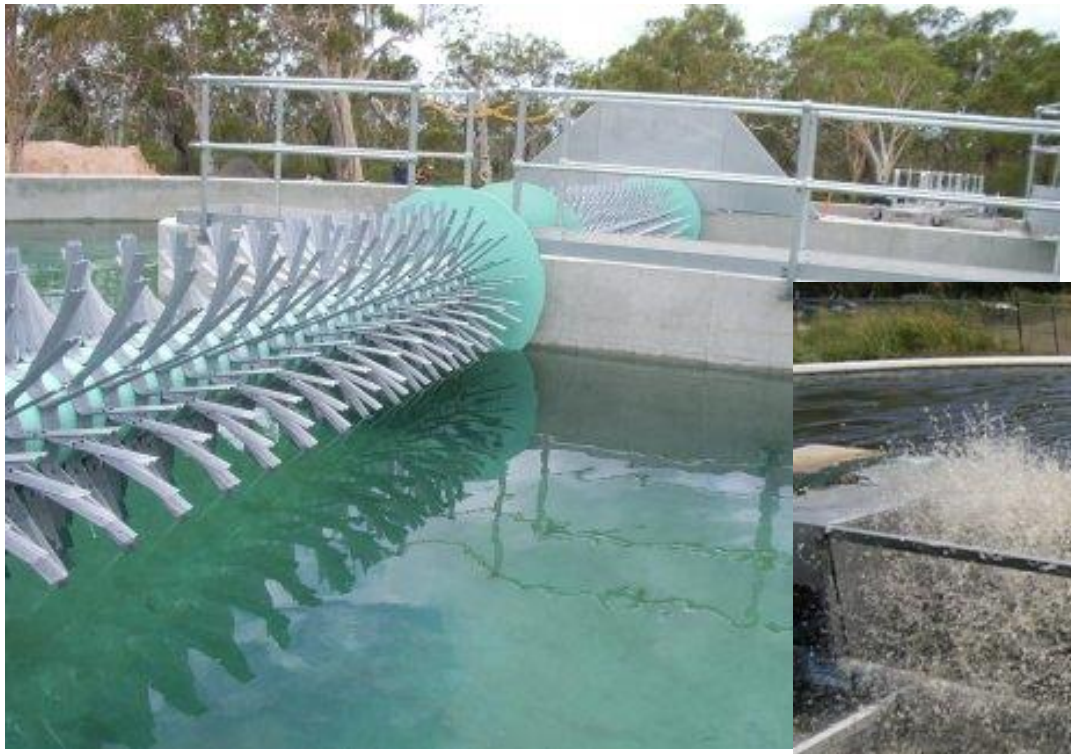
Aeration basin using a submerged grid of air diffusers

Jet aeration equipment





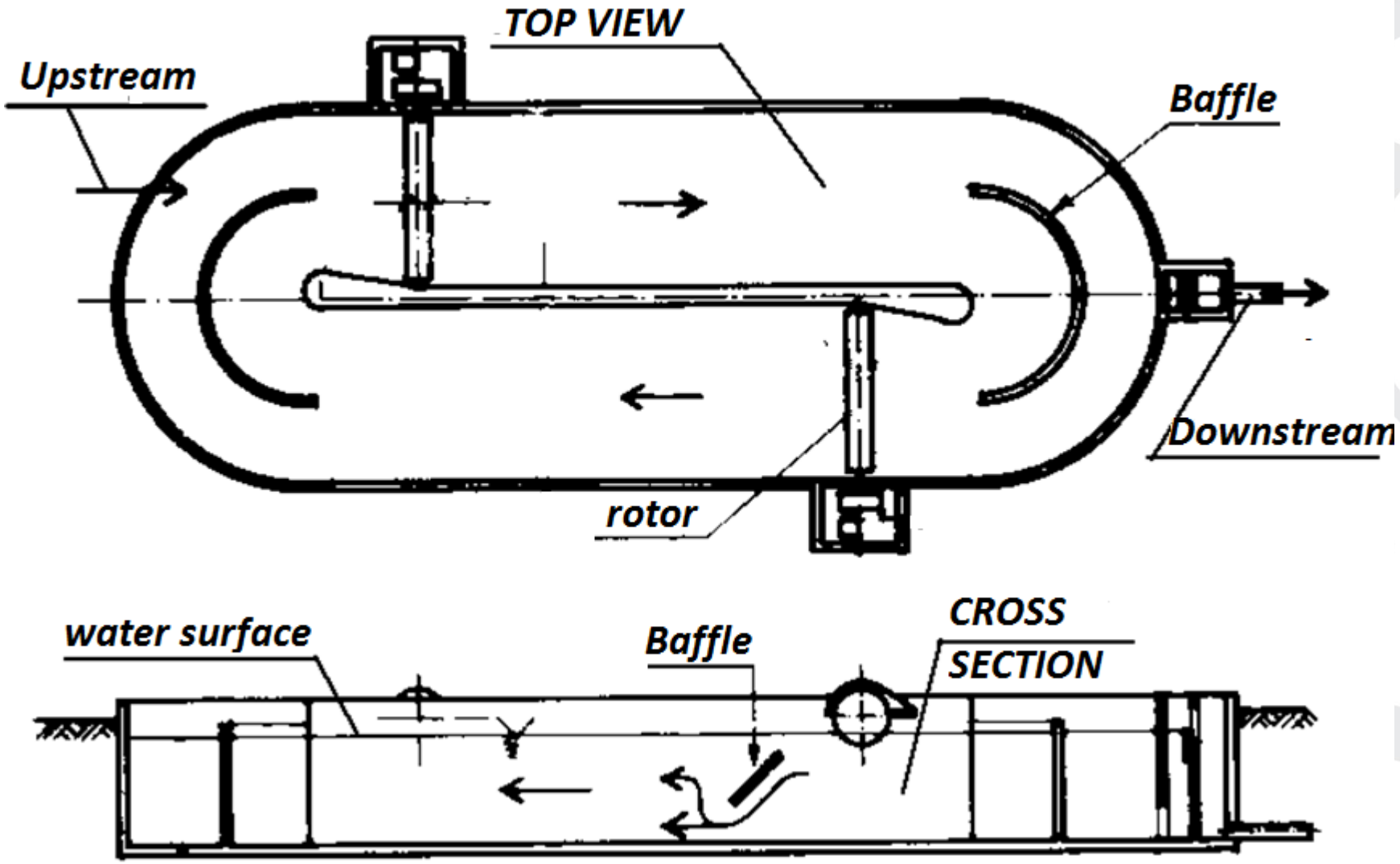
Activated Sludge System
Aeration: Rotor



Activated Sludge System
Aeration: Rotor

DEPARTMENT OF BUILDING SERVICES AND PROCESS ENGINEERING

Activated sludge system
Aeration basin



Activated sludge system
Aeration basin

Aeration basin

Aeration basin

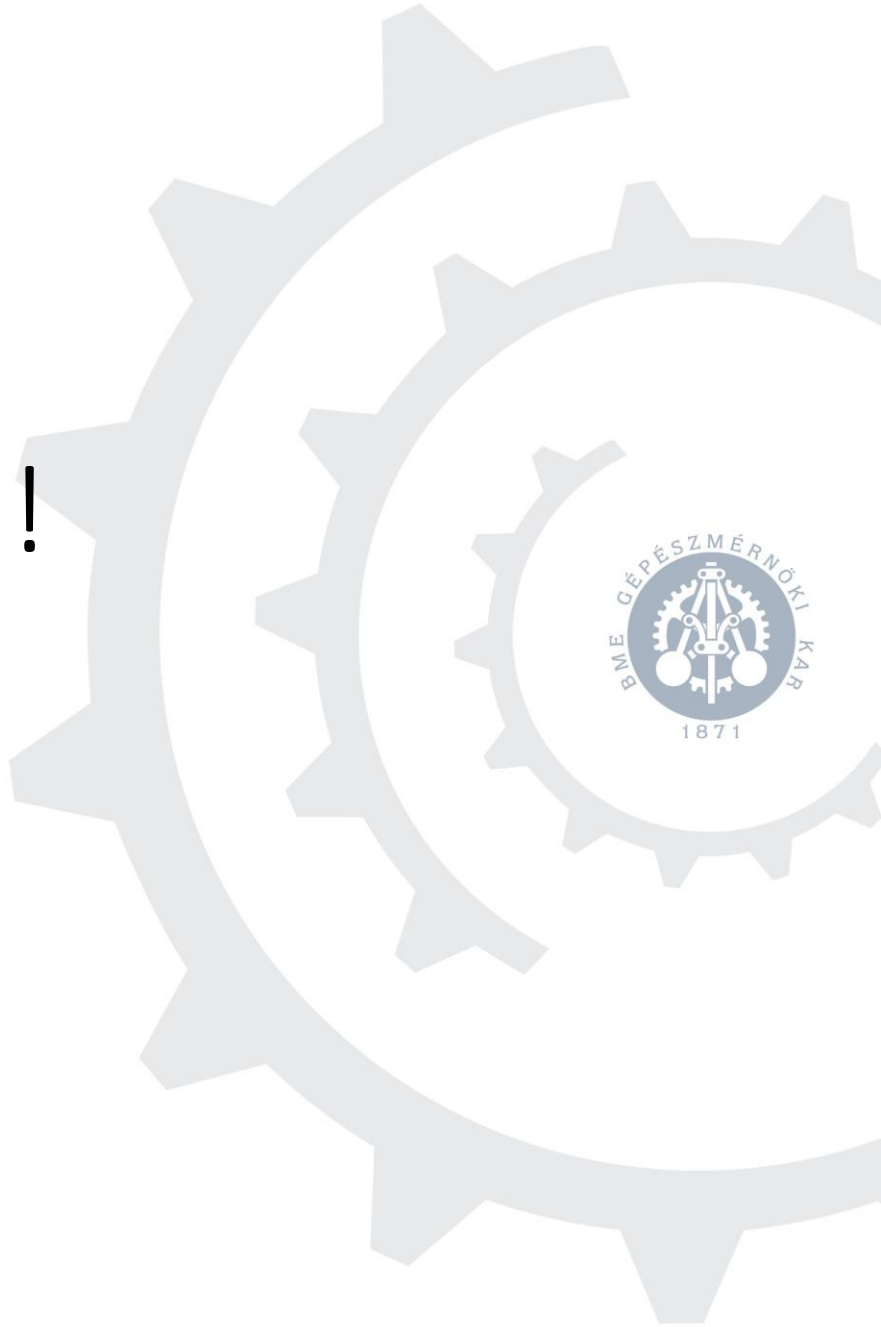
Aeration basin

Aeration basin

Activated sludge basin

Activated sludge system

Thank you for your attention!



GÉP ÉT DEPARTMENT OF BUILDING SERVICES AND PROCESS ENGINEERING