

SECONDARY WASTEWATER TREATMENT

Presented By:-

Versha Dabash

Ayush Govil

Shankar Seetaraman

Kriti Singhal

Rishaw kumar

(Btech+Mtech) 1st year

BOITECHNOLOGY

Amity University, Noida, U.P.

CONTENT :-

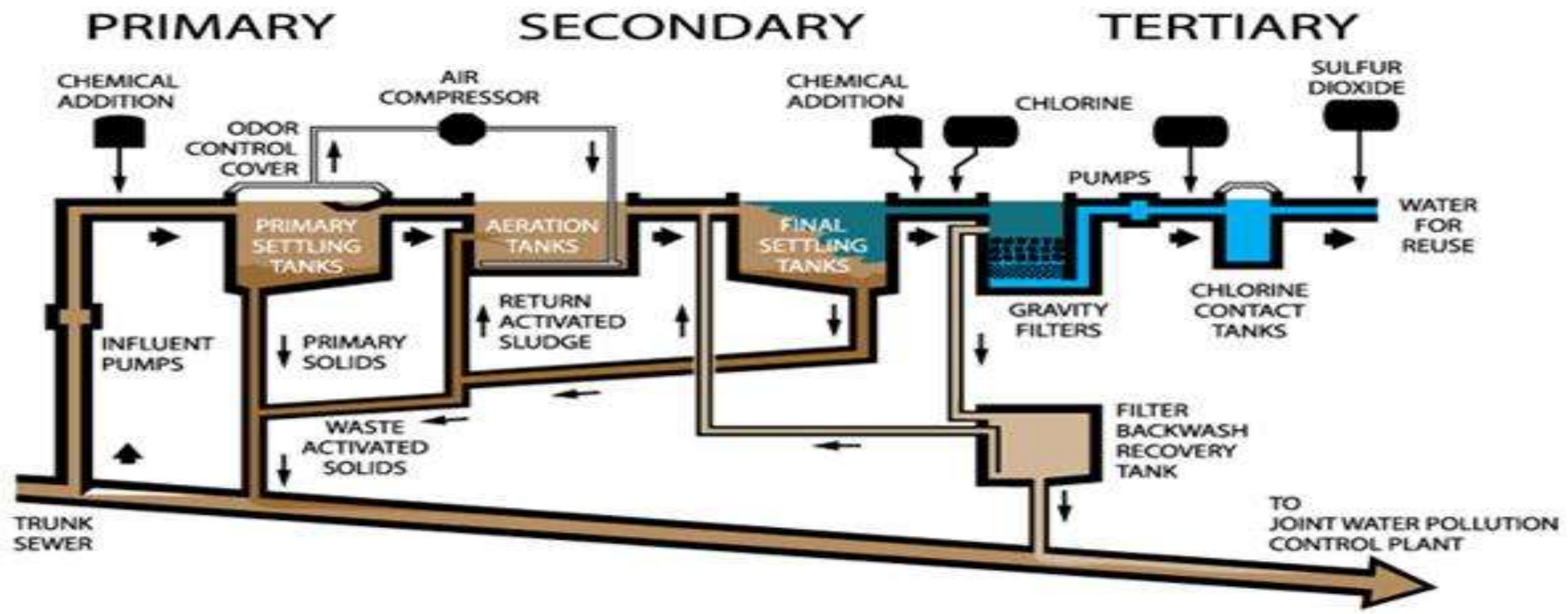
- History
- Introduction
- Sewage treatment generally involves three stages
- List of alternative secondary treatment methods
 - I. Activated sludge
 - II. Aerated lagoon
 - III. Aerobic granulation
 - IV. Constructed wetland
 - V. Membrane bioreactor
 - VI. Rotating biological contactor
 - VII. Trickling filter

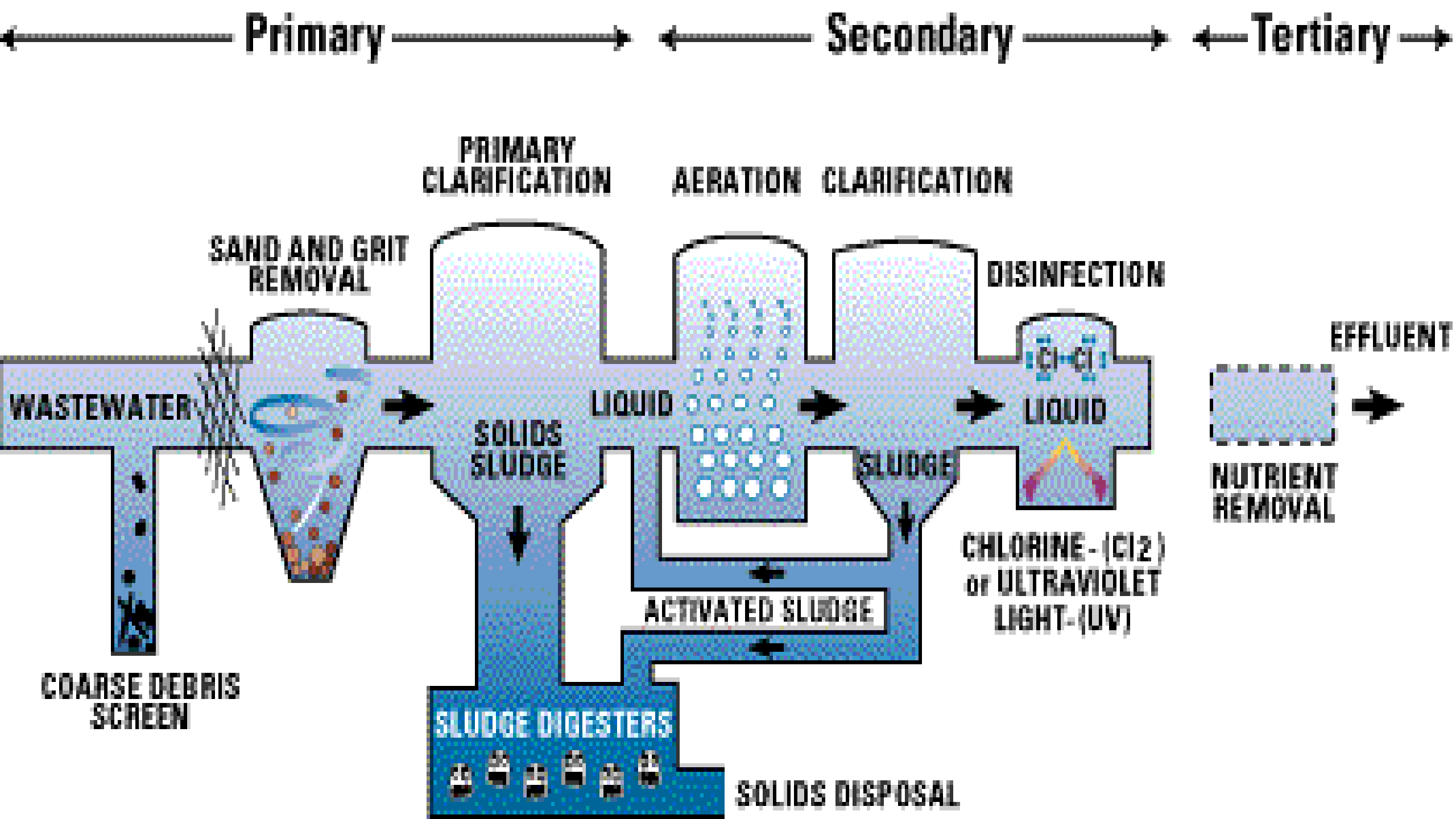
HISTORY

- Basic sewer systems were used for waste removal in ancient Mesopotamia , where vertical shafts carried the waste away into cesspools. Similar systems existed in the Indus Valley civilization in modern day India and in Ancient Crete and Greece.
- In the Middle Ages the sewer systems built by the Romans fell into disuse and waste was collected into cesspools that were periodically emptied by workers known as 'rakers' who would often sell it as fertilizer to farmers outside the city.
- Modern sewage systems were first built in the mid-nineteenth century as a reaction to the exacerbation of sanitary conditions brought on by heavy industrialization and urbanization.

❖ Sewage treatment generally involves three stages

- > Primary
- > Secondary
- > Tertiary Treatment





INTRODUCTION

- Secondary treatment is designed to substantially degrade the biological content of the sewage which are derived from human waste, food waste, soaps and detergent.
- Secondary wastewater treatment is a biological process done either by aerobic digestion which include processes such as trickling filters, RBC, aerobic granulation or anaerobic processes such as constructed wetlands, aerated lagoon and membrane bio reactor.

AEROBIC DIGESTION ANEROBIC DIGESTION

- ACTIVATED SLUDGE

- TRICKLING FILTER

- ROTATING BIOLOGICAL CONTACTOR

- AEROBIC GRANULATION

- Constructed Wetland

- Aerated lagoon

- Membrane Bioreactor

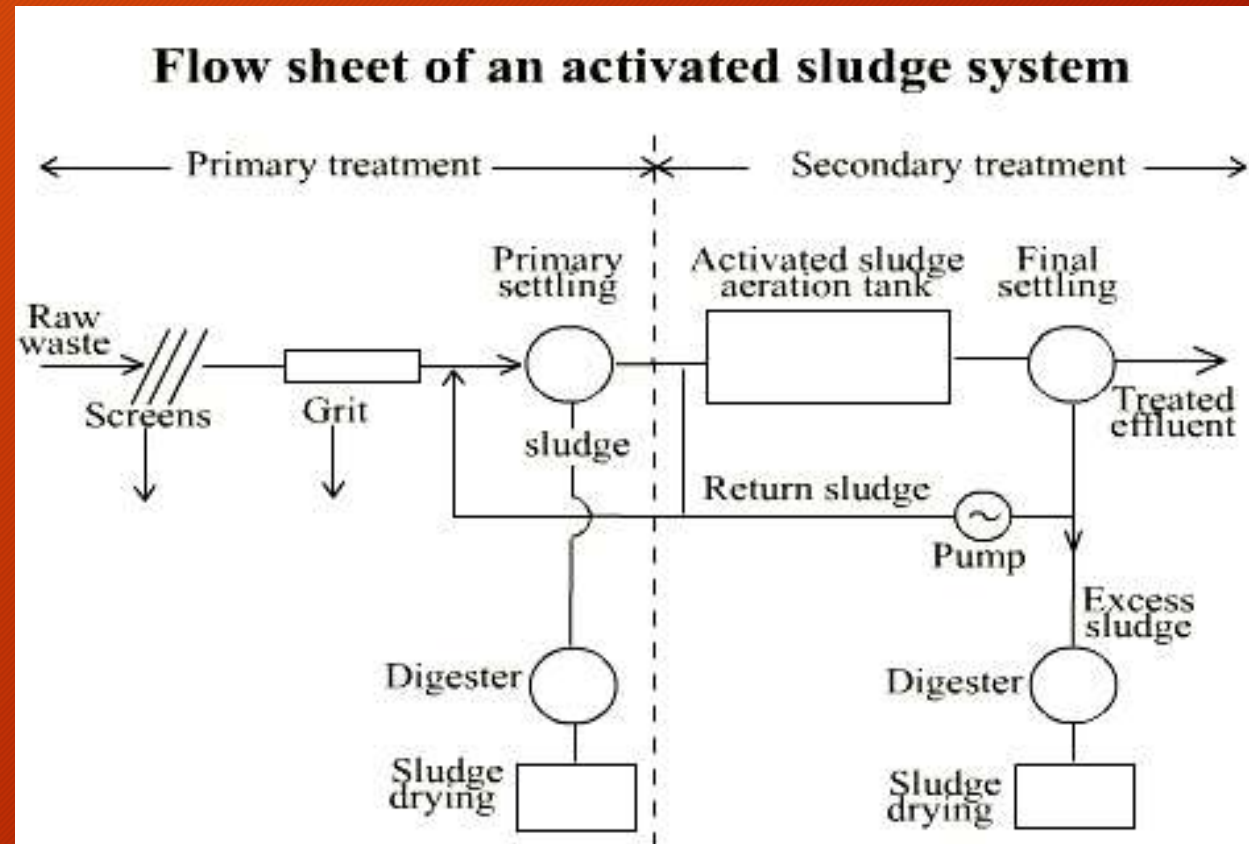
Some secondary treatment methods include a secondary clarifier to settle out and separate biological floc or filter material grown in the secondary treatment bioreactor.

List of alternative secondary treatment methods :

- Activated Sludge**
- Aerated Lagoon**
- Aerobic Granulation**
- Constructed Wetland**
- Membrane Bioreactor**
- Rotating Biological contactor**
- Trickling Filter**

ACTIVATED SLUDGE

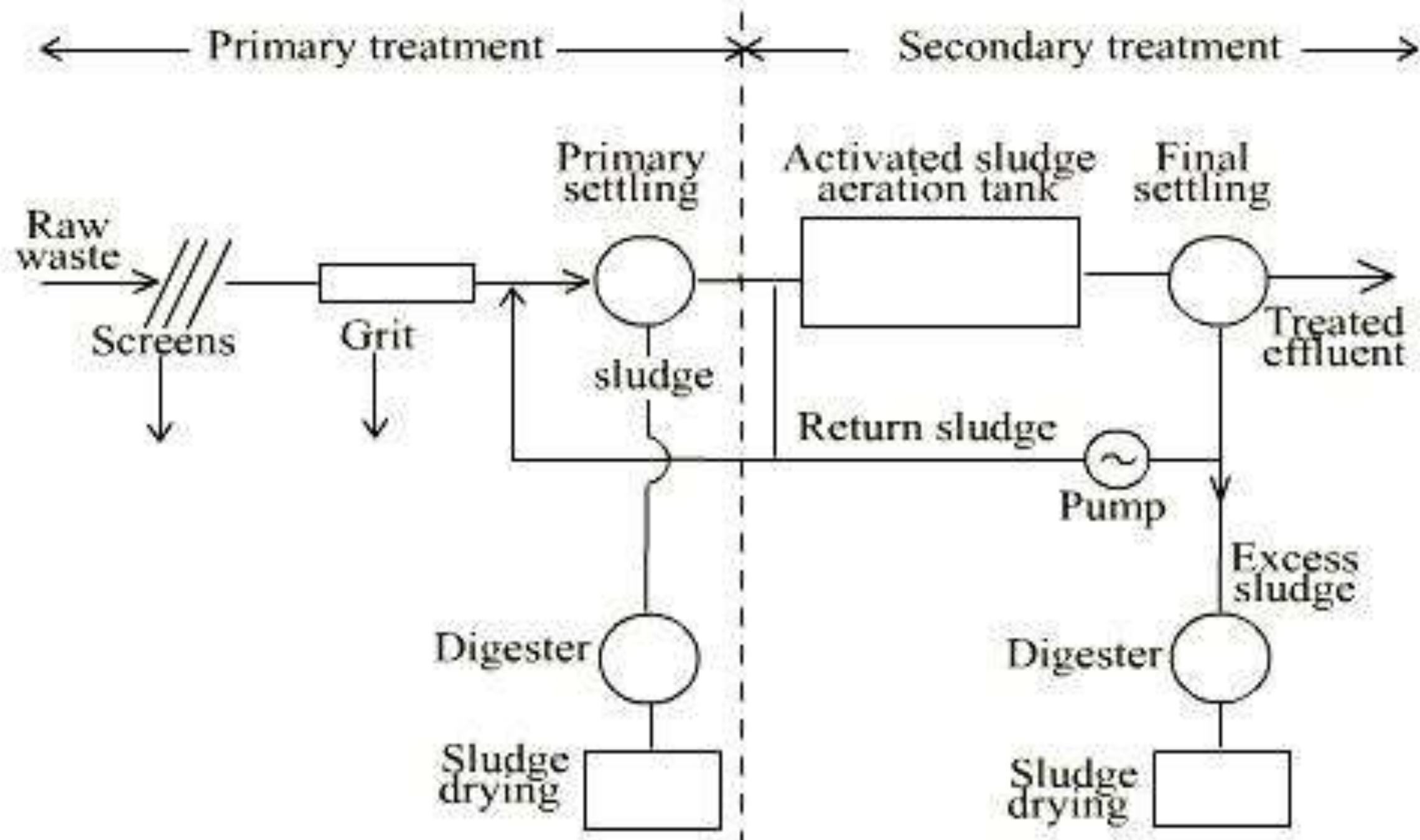
- Activated sludge is a process for treating sewage and industrial wastewaters using air and a biological floc composed of bacteria and protozoa.



AERATED LAGOON

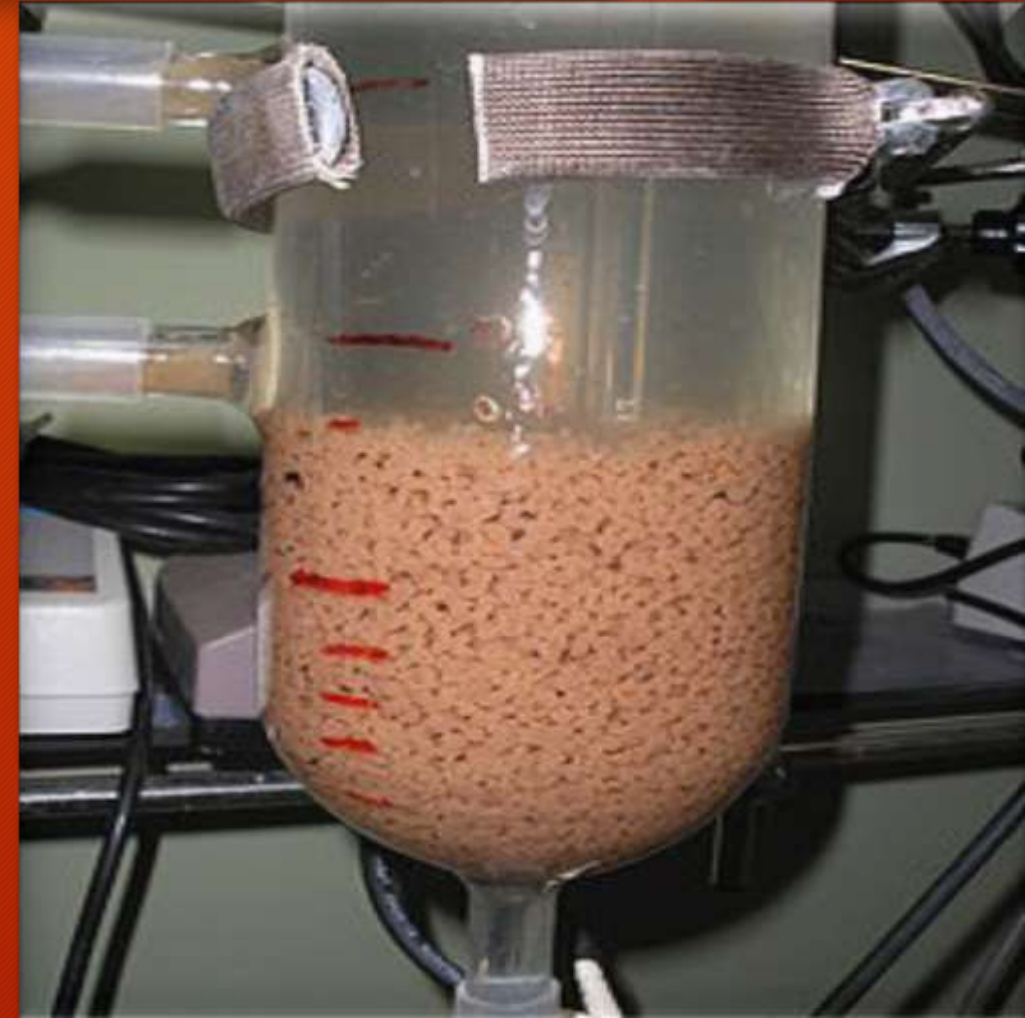
- An aerated lagoon or aerated basin is a holding and/or treatment pond provided with artificial aeration to promote the biological oxidation of waste waters.
- There are many other biological processes for treatment of wastewaters, for example activated sludge, trickling filters, rotating biological contactors and biofilters.
- They all have in common the use of oxygen (or air) and microbial action to biotreat the pollutants in wastewaters.





Aerobic Granulation

- The biological treatment of wastewater in the sewage treatment plant is often accomplished using conventional activated sludge systems.
- These systems generally require large surface areas for treatment and biomass separation units due to the generally poor settling properties of the sludge.
- In recent years, new technologies have been developed to improve settlability. The use of **aerobic granular sludge technology** is one of them.





ray process

Glatt process technology



ADVANTAGES

- STABILITY AND FLEXIBILITY
- LOW ENERGY REQUIREMENTS
- REDUCED FOOTPRINT
- GOOD BIOMASS RETENTION
- PRESENCE OF AEROBIC AND ANOXIC ZONES INSIDE THE GRANULES.
- REDUCED INVESTMENT AND OPERATIONAL COST

DISADVANTAGES

- REQUIRE LARGE AREA
- DEAL WITH LARGE NUMBER OF CONVERSION PROCESSES
- REQUIRE SEPRATE TANK FOR CLEAN EFFLUENT
- SLUDGES FROM MUNICIPAL WASTEWATER TREATMENT PLANT NEED DIFFERENT STEPS TO DEWATER BEFORE PROCESSED

CONSTRUCTED WETLAND

- A **constructed wetland** is an artificial wetland created as a new or restored habitat for native and migratory wildlife, for anthropogenic discharge.
- Natural wetlands act as a bio filter, removing sediments and pollutants such as heavy metals from the water.
- Constructed wetlands can be designed to emulate these features.







ADVANTAGES

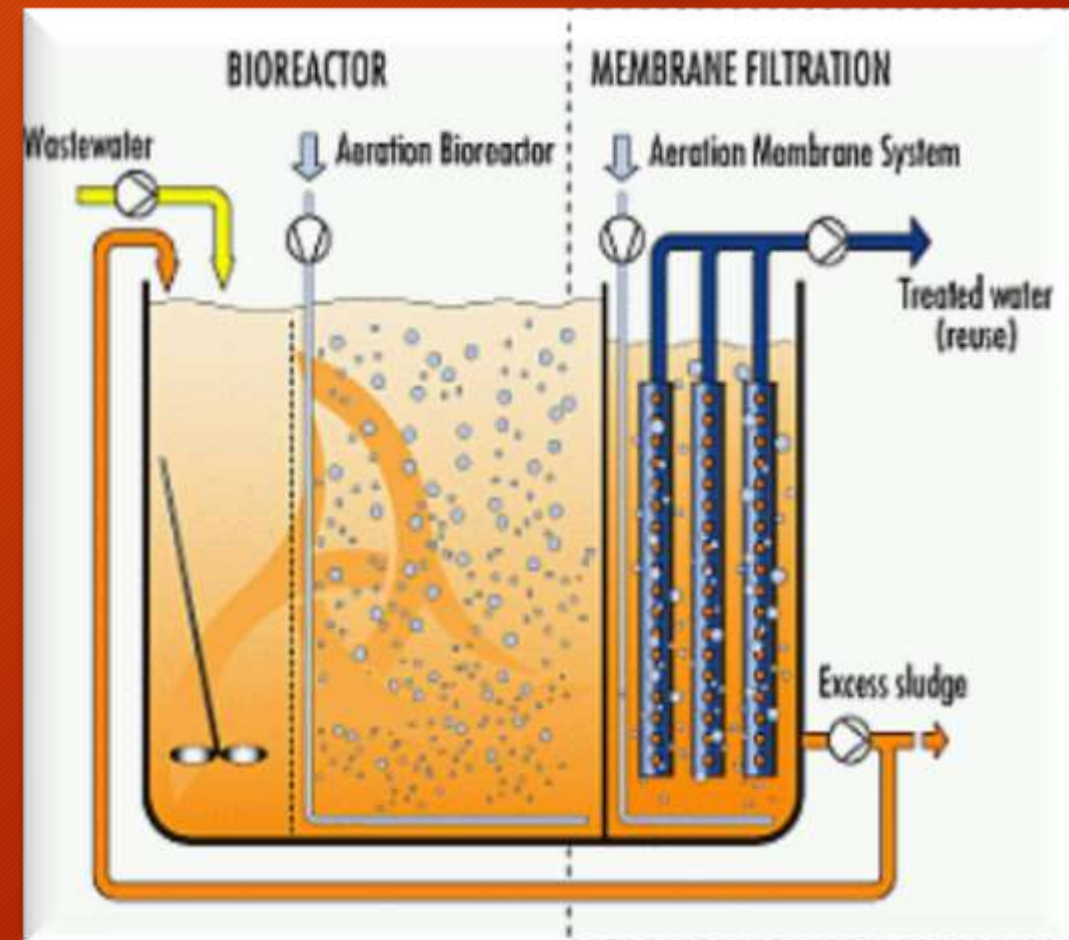
- RELATIVELY INEXPENSIVE TO CONSTRUCT AND OPERATE
- EFFECTIVE ,RELIABLE AND ECOLOGICALLY SOUND
- TOLERATE BOTH GREAT AND SMALL VOLUMES OF WATER
- INCORPORATE PRODUCTIVE USES
- AESTHETICALLY PLEASING AND PROVIDE HABITAT FOR WILDLIFE

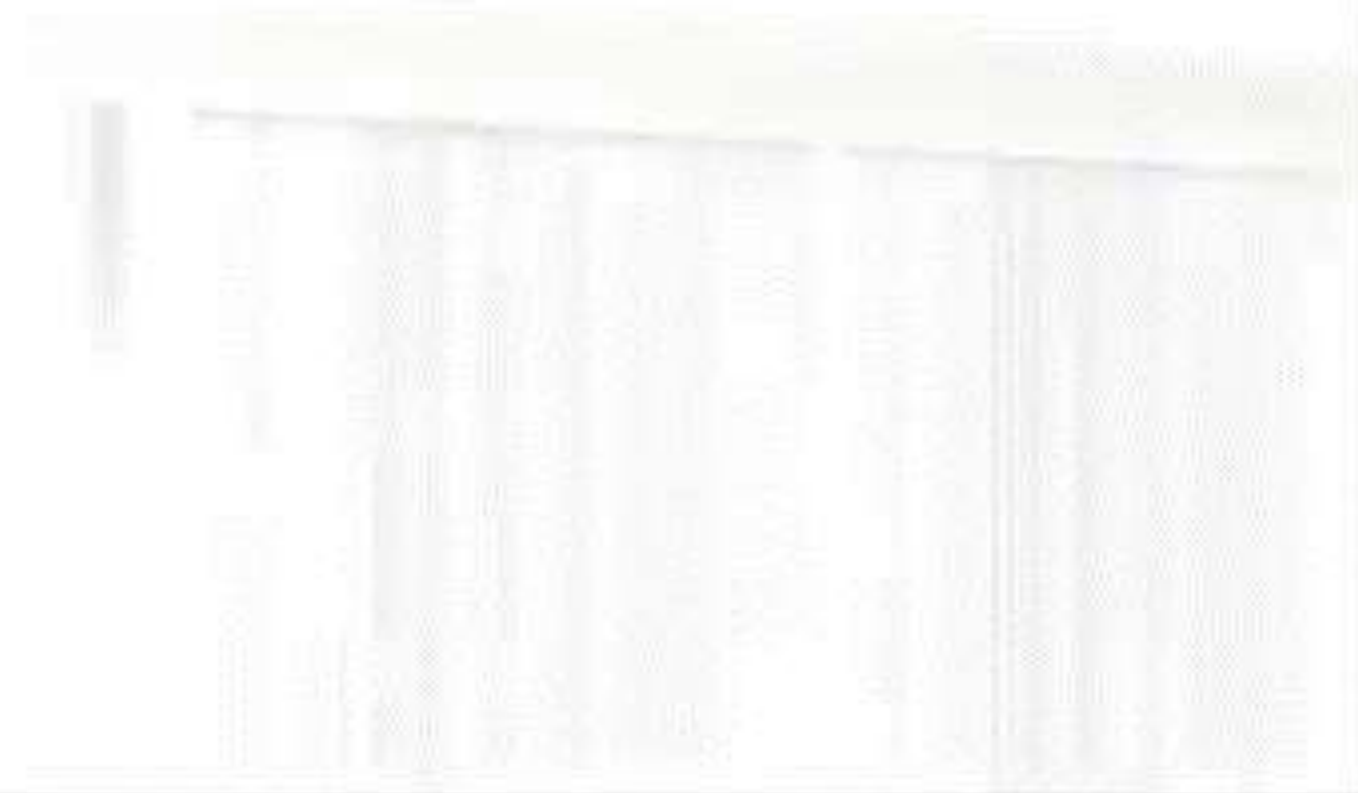
DISADVANTAGES

- REQUIRE LARGE LAND AREA
- EXPOSE THE ODOR OF THE WATER STREAM IF INPROPER DESIGN
- BIOLOGICAL PROCESSES ARE NOT WELL UNDERSTOOD
- NUTRIENT REMOVAL TAKE PLACE MAINLY DURING THE GROWING SEASONS
- ORGANISM DIE IN WATER AND RELEASE THERE NUTRIENT IN SYSTEM

MEMBRANE BIOREACTOR

- Membrane bioreactor (MBR) is the combination of a membrane process like microfiltration or ultrafiltration with a suspended growth bioreactor.
- It is widely used for municipal and industrial wastewater treatment with plant sizes up to 80,000 population equivalent (i.e. 48 million litres per day).





ADVANTAGES

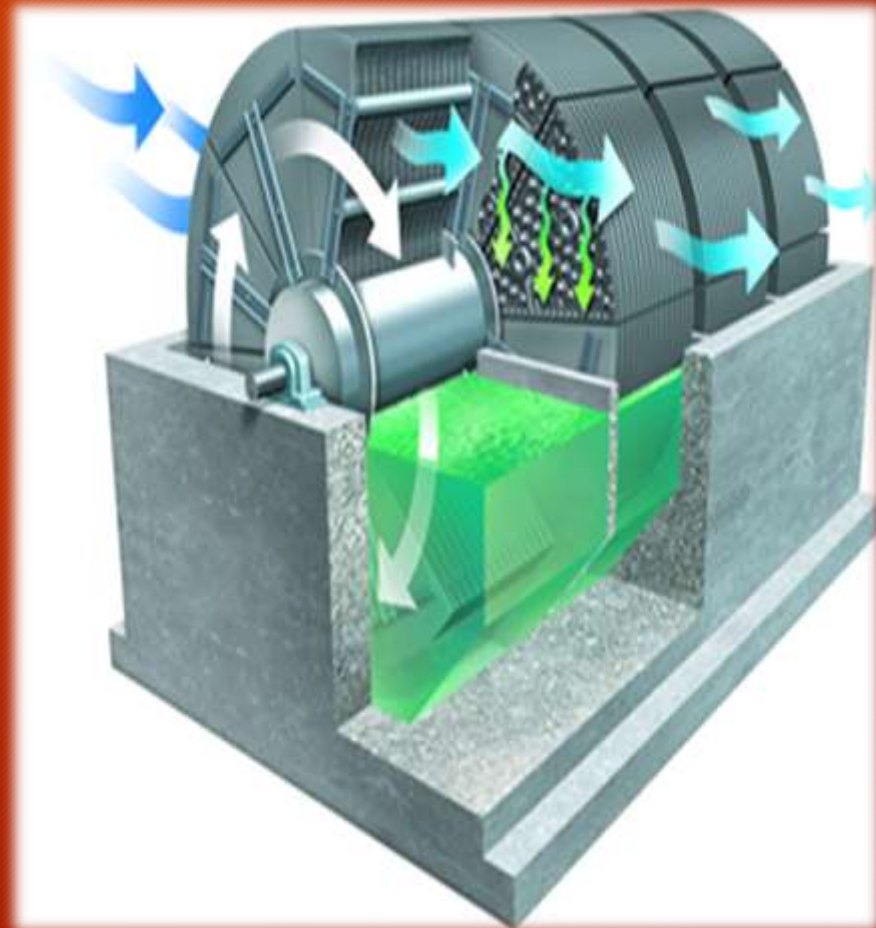
- Compact
- High effluent quality
- High volumetric load possible
- High rate of degradation
- Possible to convert from existing conventional active sludge purification

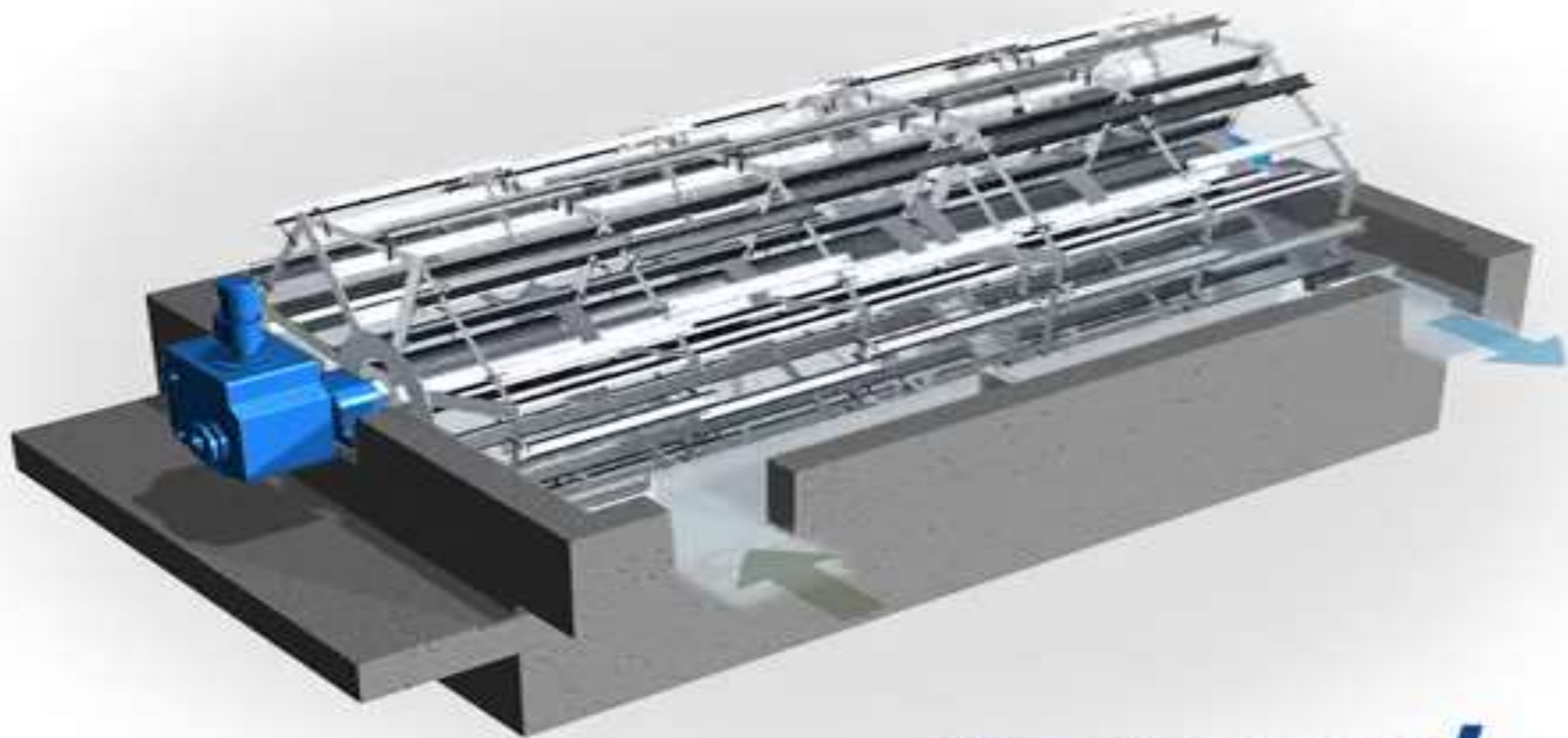
DISADVANTAGES

- Aeration limitations
- Stress on sludge in external MBR
- Membrane pollution
- Cost price

ROTATING BIOLOGICAL CONTACTOR

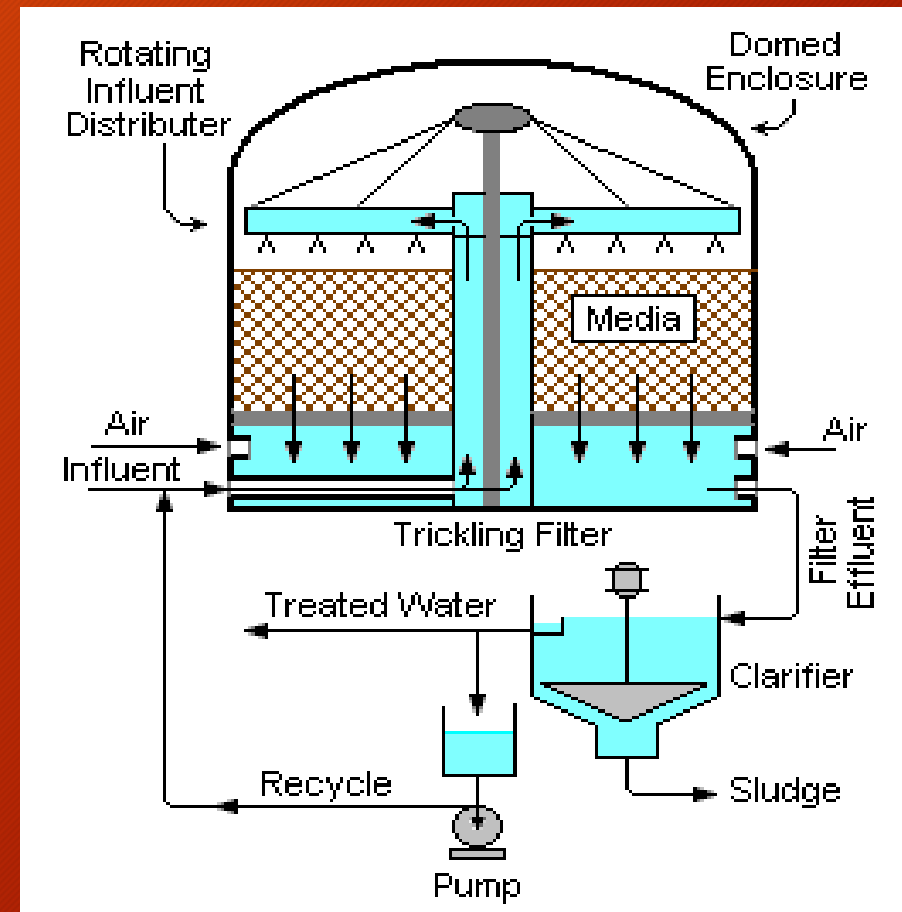
- A rotating biological contactor or RBC is a biological treatment process used in the treatment of wastewater following primary treatment.
- The primary treatment process removes the grit and other solids through a screening process followed by a period of settlement.



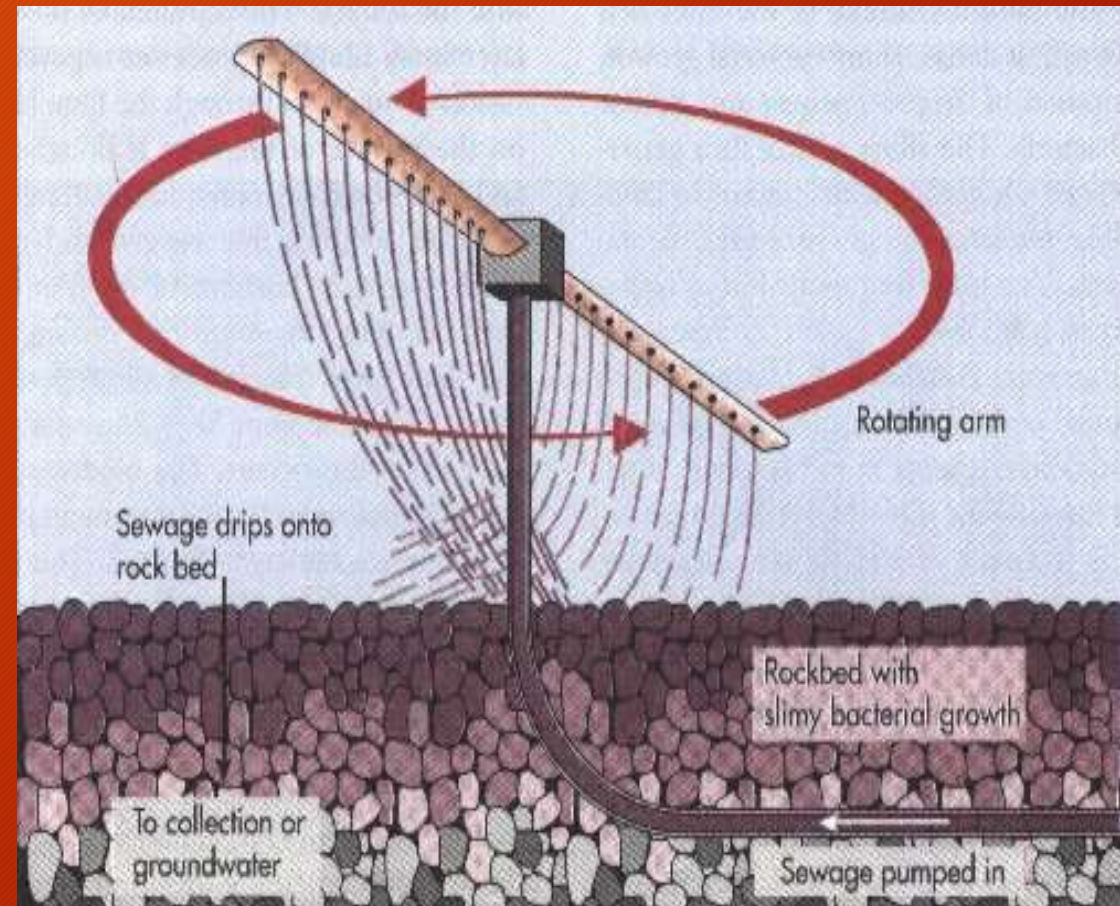


TRICKLING FILTERS

- Trickling filters enable organic material in the wastewater to be adsorbed by a population of microorganisms (aerobic, anaerobic, and facultative bacteria; fungi; algae; and protozoa) attached to the medium as a biological film or slime layer.
- The organic material is then degraded by the aerobic microorganisms in the outer part of the slime layer.



- The sewage slowly moves through the porous bed and the effluent is collected at the bottom.
- As the sewage drains through the porous bed, this microbial community absorbs and breaks down dissolved organic nutrients in the sewage; this reduces the BOD.
- The sewage may need to be re-circulated several times through the filter in order to reduce the BOD sufficiently.



ADVANTAGES

- Simple, reliable, biological process
- Low power requirement
- Moderate level of skill and technical expertise needed to manage and operate the system.

DISADVANTAGES

- Additional treatment may be needed to meet more stringent discharge standards.
- Vector and odour problems.
- Requires regular operator attention.



TERTIARY TREATMENT

- After the secondary treatment the treated effluent is sent for tertiary treatment processes.
- After which water is discharged into a natural source such as river for further purification by natural processes.

FACTS

- Asia's Largest STP is at Bharwara situated at outskirts of Lucknow Uttar Pradesh.
- It treats 340 million litres of the city's 400 million of discharge each day.



- Stickney Water Reclamation Plant in Chicago.
- Treats 5.44 Billion litres of water a day for 2.4 million residents.



- Deer Island STP in Boston produces 3mw of electricity using methane evolved from the digester.
- It also uses the sludge as fertilizers and produces 75 tons of fertilizer each day.



- Bailonggan Waste Water Treatment plant in China. Treats 528 million gallons of water each day.



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Save Water

Save Life



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Thank you

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