

Course: GENERAL MICROBIOLOGY

Introduction to Sewage treatment

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Treatment of liquid waste

Liquid waste
(Solids – carbon, nitrogen and phosphorus)
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Sewage Agriculture waste Industrial effluent

➤ House hold water (Kitchen, Bathroom and Toilet)

➤ Agricultural and industrial wastes

Let out into river, lake and oceans

THE SOLUTION TO POLLUTION IS DILUTION

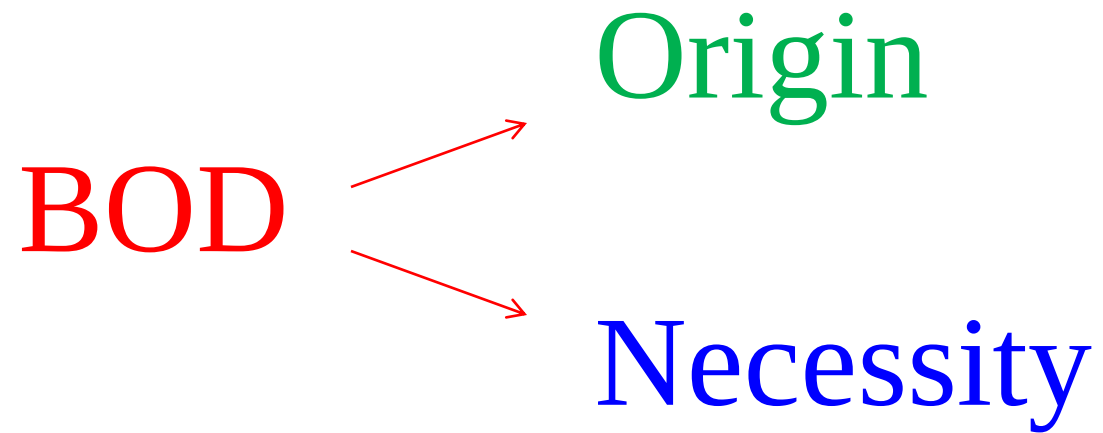
Water body serves for

1. Drinking
2. House hold use
3. Industry
4. Irrigation
5. Fish and shell fish production
6. Swimming
7. Boating and other recreational purposes

A continuous flow is capable of self-purification system

Main aim is the following to
remove

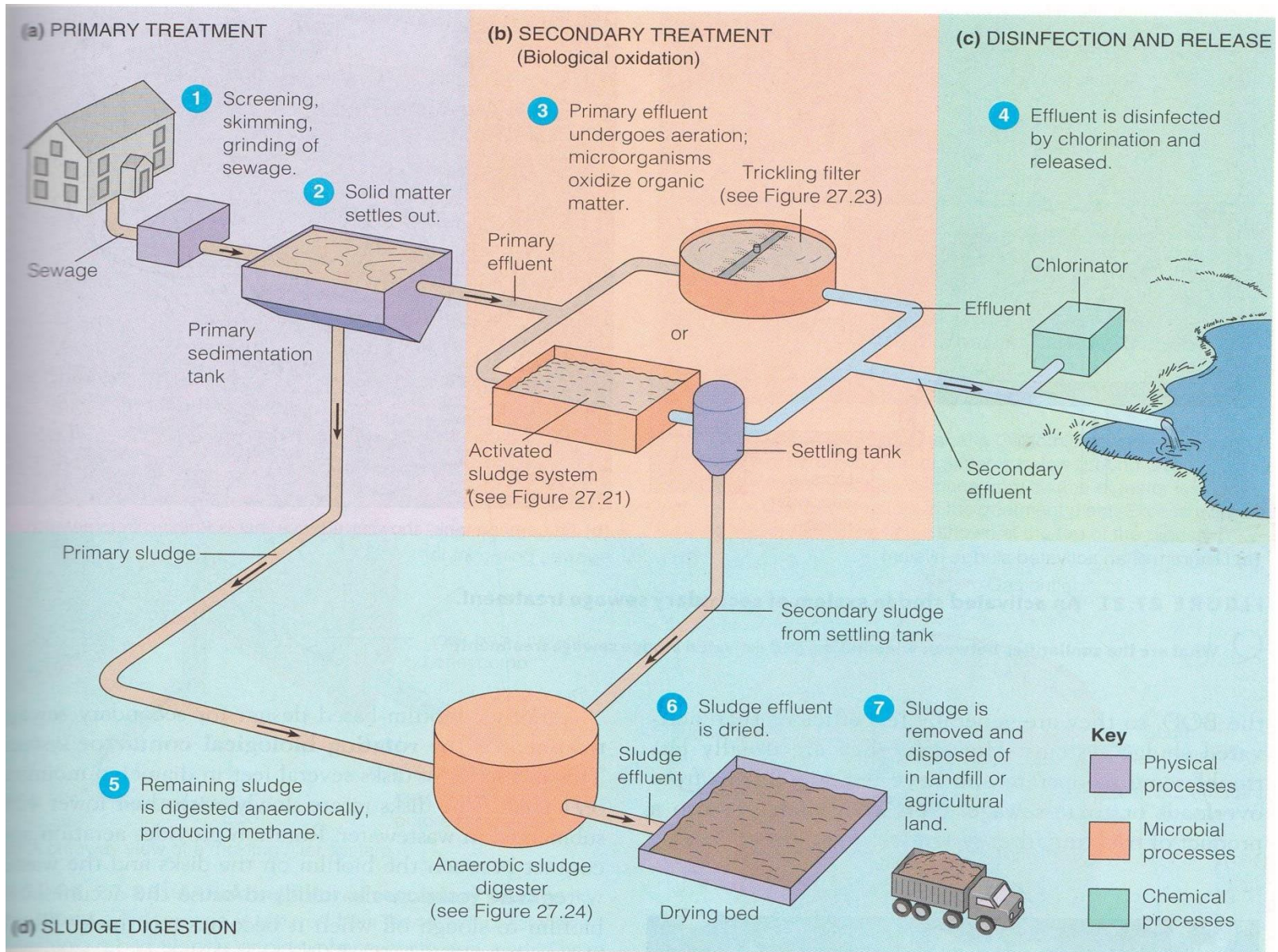
- a) Organic matter
- b) Human pathogens
- c) Toxic chemical

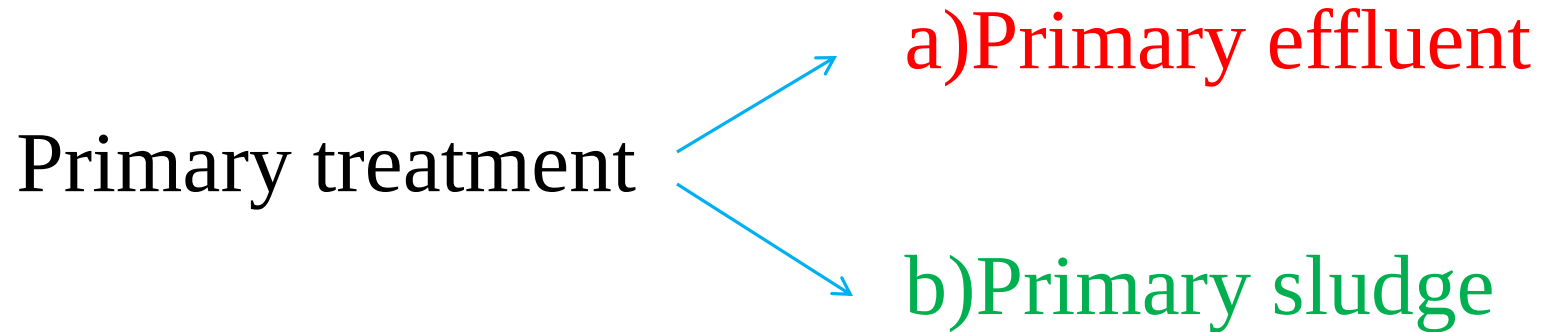


Treatment

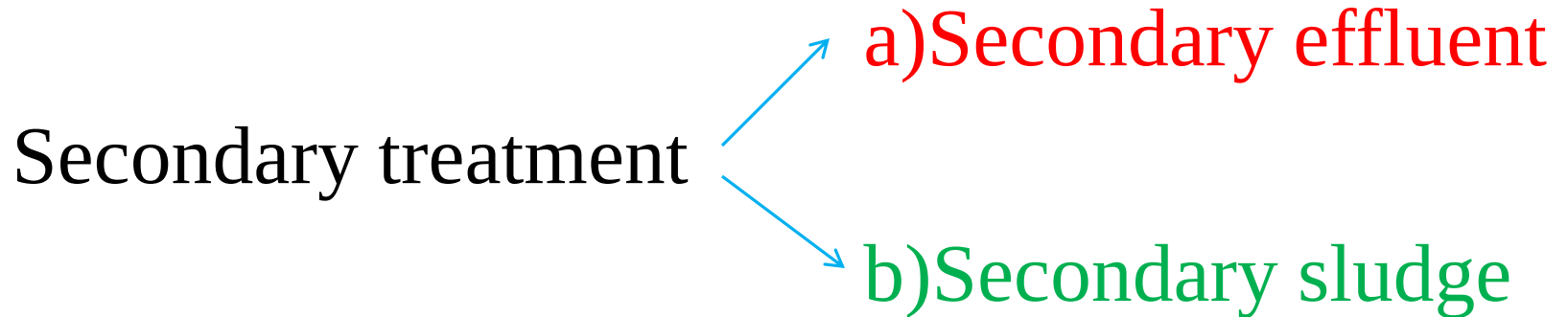
1. Primary sewage treatment – Rely on physical
(settling) (to lower BOD)
2. Secondary sewage treatment – Rely on biological
(Microbial oxidation or
biodegradation)
3. Tertiary sewage treatment - Rely on chemical
methods to remove
nitrogen and phosphorus
(Expensive technique)
(Inorganic compounds)

Sewage treatment overview





- Removes 40-60% of suspended solids
- Reduce 25-35% of BOD



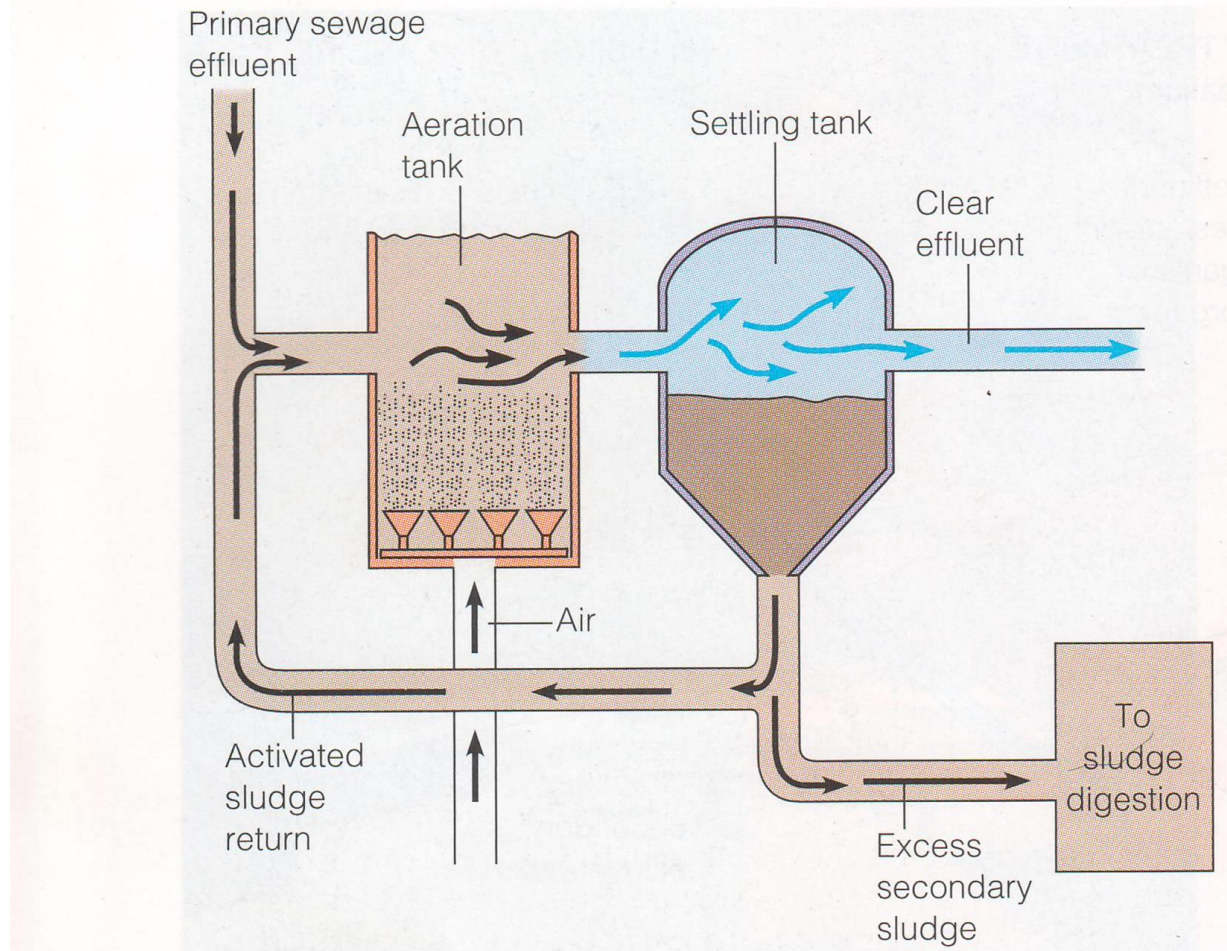
1. Activated sludge-Remove 75-95% of BOD
2. Trickling filters-Remove 80-85% of BOD

Activated sludge

Activated sludge - (4-8 hrs) Aeration tank and settling tank	Sludge from primary treatment, enhance the microbial numbers thereby increasing oxidation process.
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(Bulking is a problem due to filamentous bacteria and cause local pollution)

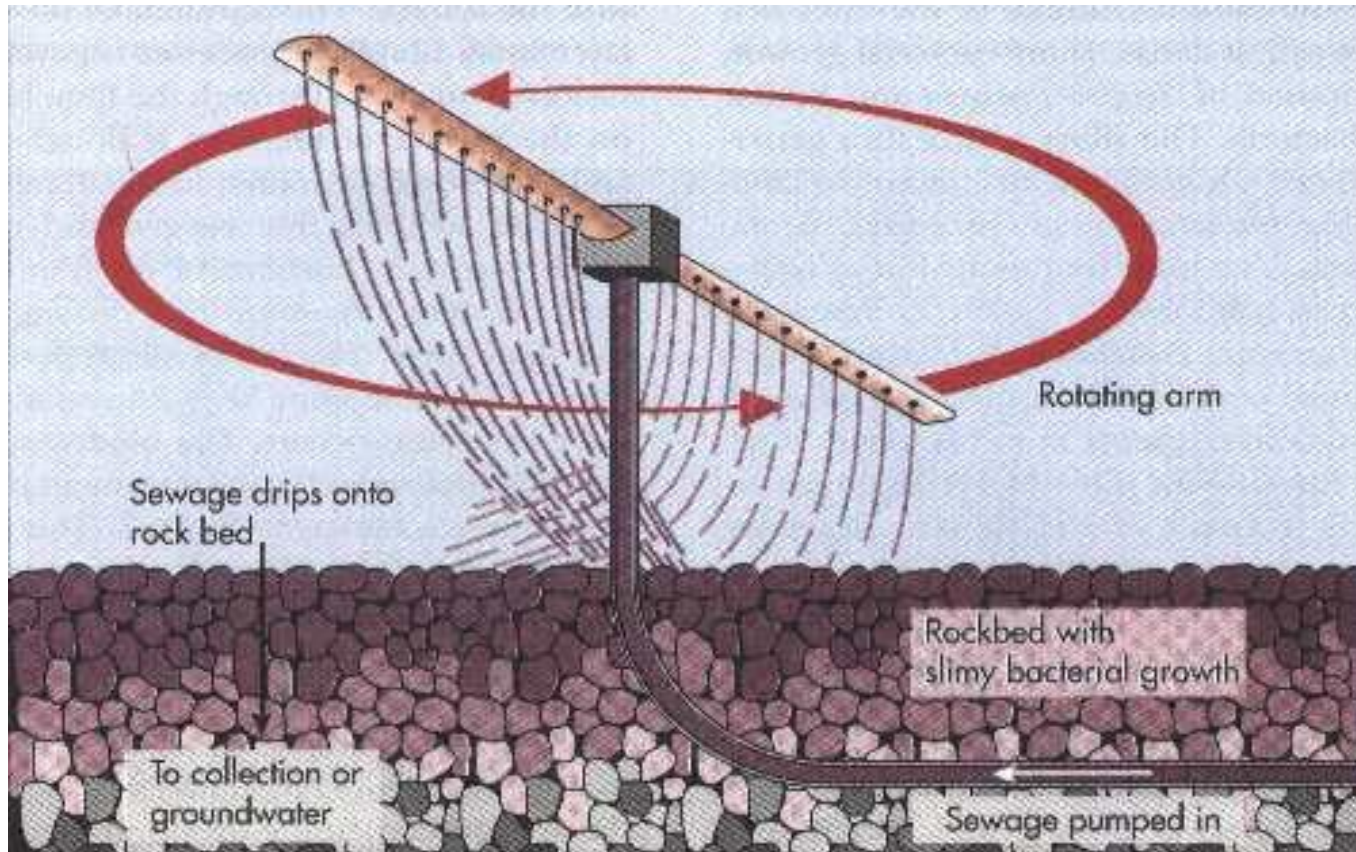
Activated sludge



Trickling filter

Trickling filters - Biofilm or primary film slowly
(Bed of rocks or molded plastics) oxidized the organic matter.

Trickling filter



Oxidation ponds (Stabilization ponds)

Encourage the growth of heterotrophic bacteria by means of growing algae

Septic tank

Anaerobic digestion and seepage of water thru perforated holes

Tertiary treatment

1. Precipitating phosphorus with alum
2. Nitrogen is converted to ammonia
3. Carbon filters is used to filter others

Sludge digestion

- Anaerobic sludge digestion in anaerobic sludge digester
- Encourage the growth of anaerobic bacteria like CH_4 producing bacteria and aerobic bacteria is completely excluded
- The end products during anaerobic digestion is CH_4 and CO_2

- CH_4 is used as fuel for heating the digester
- Excess CH_4 is sold to nearby power plant to produce electricity

Steps in anaerobic digestion

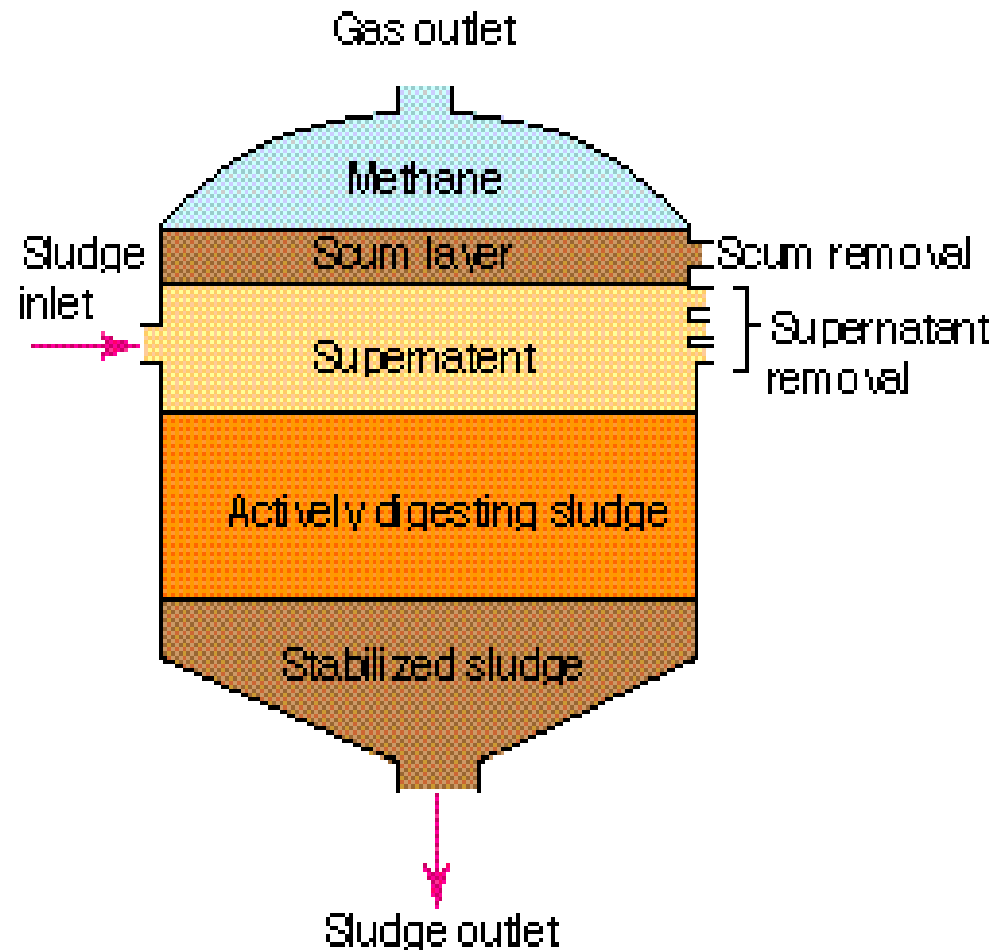
1. Production of CO_2 and organic acids from anaerobic fermentation by anaerobe and facultation.
2. Organic acids are metabolized to form H_2 and CO_2 as well as organic acids such as acetic acids. These products used as a raw material for third stage

3. Methane producing bacteria produce CH₄ from the products in second stage



Other CH₄ producing microbes split acetic acid (CH₃COOH) to CH₄ and CO₂

Sludge digester



Thank you