Wastewater Engineering
Lecture - 6

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Wastewater Treatment

- Preliminary Treatment
- Primary Treatment

Introduction

- Wastewater treatment consists of applying known technology to improve or upgrade the quality of a wastewater.

- Wastewater treatment involves collecting the wastewater in a centralized or decentralized location **(Wastewater Treatment Plant)** and subjecting the wastewater to various treatment processes.

- The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed off without causing danger to human health or unacceptable damage to the natural environment

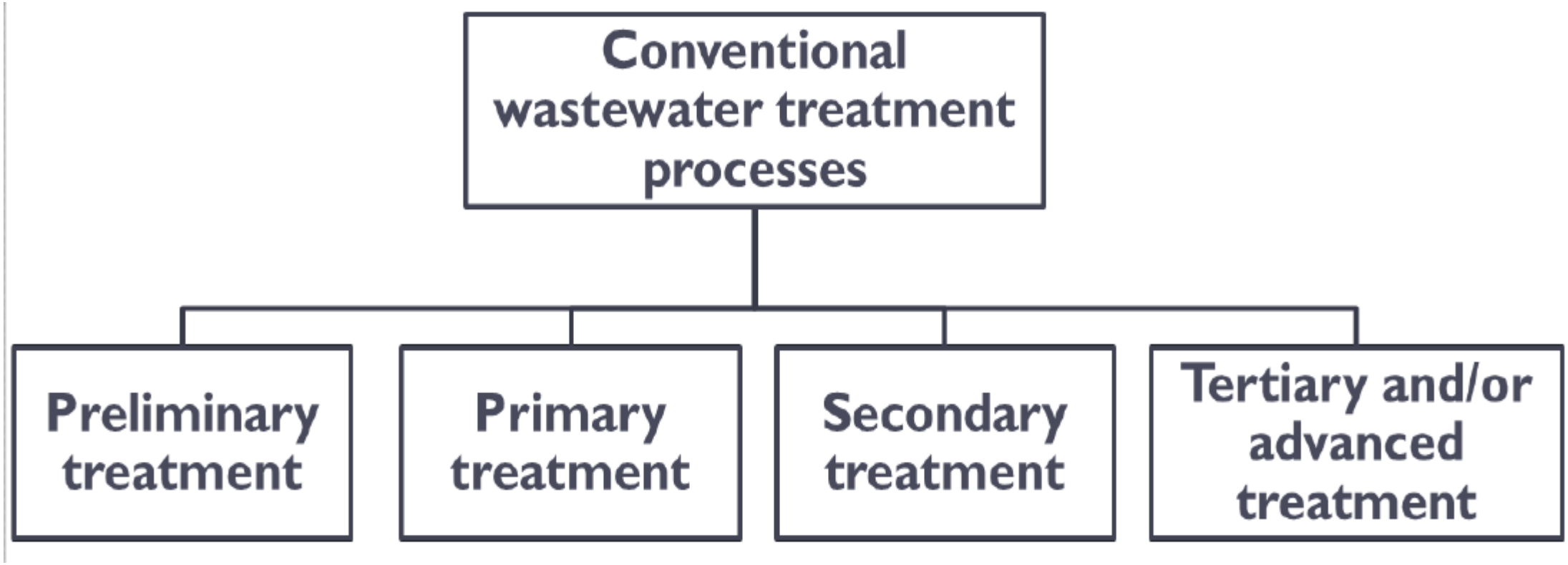
Introduction

- With the current emphasis on environmental health, water and soil pollution issues, there is an increasing awareness of the need to dispose off generated wastewaters safely and beneficially.

- Wastewater if properly treated, is an important resource and can be used for various purposes including irrigation, lawn watering, car washing, flushing toilets and landscaping etc.

- Wastewater treatment can also generate biogas as final product which is a potential source of energy.

Wastewater Treatment Processes



Wastewater Treatment Processes

- Conventional wastewater treatment consists of a combination of physical, chemical and biological processes and operations to remove solids, organic matter and nutrients from wastewater.

- General terms used to describe different degrees of treatment, in order of increasing treatment level, are preliminary, primary, secondary, and tertiary and/or advanced wastewater treatment.

- In some countries, disinfection to remove pathogens sometimes follows the last treatment step

Preliminary Wastewater Treatment

- The objective of preliminary treatment is the removal of coarse solids, inorganic compounds and fats / grease before the wastewater enters into the primary sedimentation tank.

- Preliminary treatment operations typically include coarse screening, grit removal, oil & grease removal and, in some cases, comminution of large objects.

- Preliminary treatment is done by the use of screens, grit chamber, comminutors and skimming tanks / floatation tanks.

1) Screens

- Screens are provided for the removal of coarse solids such as pieces of woods, plastics, papers, rags, leaves, roots, etc.

- Screens are two types i.e. coarse screens and fine screens depending upon the opening size.

- In coarse screens, spacing is upto 75 mm between bars to prevent entry of large debris in to the intake structure.

Coarse Screen

1) Screens

- Fine screens are located behind coarse screen / bar rack.
- Openings in Fine screen may vary from 10 to 13 µm.
- They are used to prevent entry of small debris such as sticks, bark, leaves, and even fish

Fine Screen

2) Grit Chamber

- **Grit chambers** are long narrow tanks that are designed to slow down the flow so that solids such as sand, and eggshells will settle out of the water.

- **Grit** causes excessive wear and tear on pumps and other plant equipment.

- Grit also reduces performance of treatment plants so there entry needs to be minimized .

Grit Chamber

3) Comminutors

- Comminutors are shredding devices used to grind up coarse solids to a uniform size between 6 and 20 mm, without removing from the flow.
- These devices serve two purposes. First they screen coarse objects and then grind the screeings.
- They are installed before grit chambers.

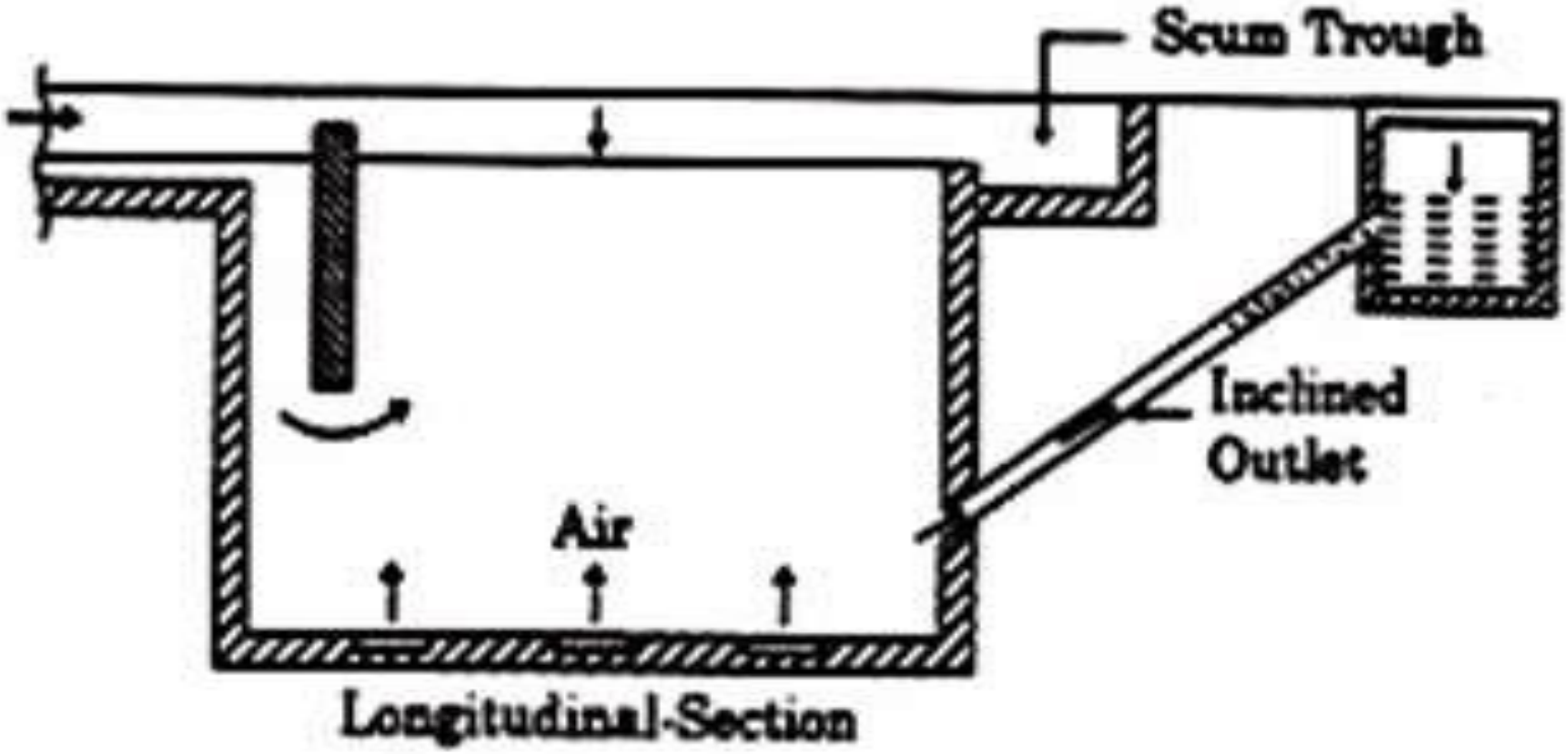
Comminutor

4) Skimming Tanks

- skimming tank is a chamber so arranged that the floating matter like oil, fat, grease etc., rise and floats on the surface of the wastewater (Sewage) until removed.

- It is necessary to remove the floating matter from sewage otherwise it may appear in the form of scum on the surface of the settling tanks or interfere with the activated sludge process of sewage treatment.

4) Skimming Tanks



Skimming tank / Flotation tank

Primary Wastewater Treatment

- The objective of primary treatment is the removal of settleable organic and inorganic solids by sedimentation.

- Approximately 25 to 50% of the incoming biochemical oxygen demand (BOD5), 50 to 70% of the total suspended solids (SS),are removed during primary treatment.

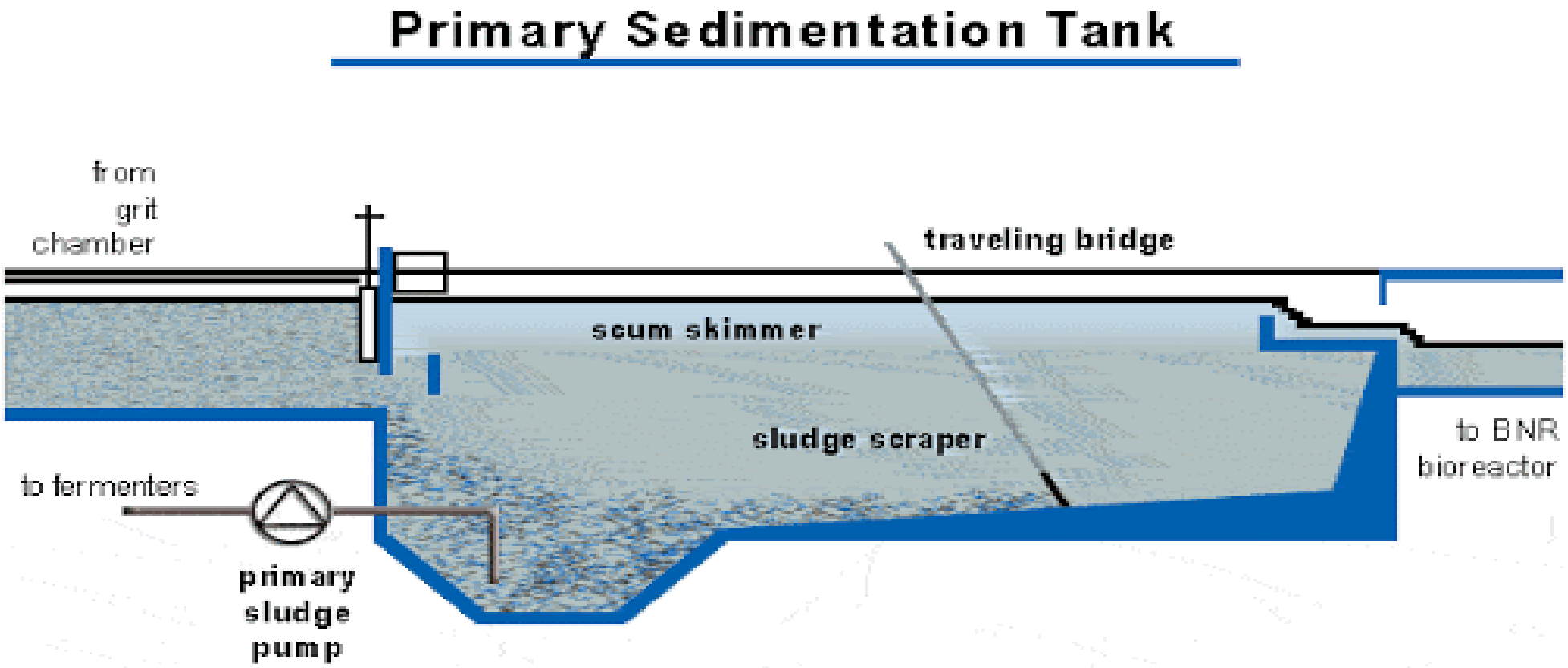
- Some organic nitrogen, organic phosphorus, and heavy metals are also removed during primary sedimentation.

Primary Wastewater Treatment

- Primary sedimentation tanks or clarifiers may be round or rectangular basins, typically 3 to 5 m deep, with hydraulic retention time between (HRT) 2 and 3 hours.

- Settled solids (primary sludge) are normally removed from the bottom of tanks by sludge rakes that scrape the sludge to a central well from which it is pumped to sludge processing units

Primary Wastewater Treatment



Thank you