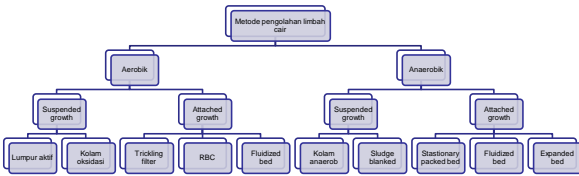


Metode pengolahan (Woodard, 2001)



Microbes and Biological Treatment

- Both the aerobic and anaerobic processes depend on microorganisms to provide the functional basis for the treatment processes which include carbon oxidation, nitrification and denitrification, acidogenesis, and methanogenesis.
- Bacteria are the micro-organisms of principal interest and the bulk of these would be the heterotrophs — organisms which use organic carbon for cell synthesis

Microbes and Biological Treatment

- Although treatment processes are generally identified as aerobic and anaerobic, the bacteria in the “aerobic” processes are in fact largely facultative
- The anaerobic processes in contrast depend on many obligate anaerobes and these can only thrive in the absence of molecular oxygen.
- Many bacteria species common and important to wastewater treatment belong to the cocci or spherical shaped bacteria and the bacilli or rod-shaped bacteria.

Microbes and Biological Treatment

- A biological reactor would have a community of bacteria made up of a mixed culture.
- Bacteria cells in the population secrete a slime layer which is made up of various organic polymers

Microbes and Biological Treatment

- It is believed this slime layer is the key to microbial flocculation allowing the cells to agglomerate, forming more settleable floc particles and hence resulting in more effective gravity liquid-solids separation in the clarifiers.
- Fungi tend to compete better than bacteria at lower pH and nutrient deficiency conditions

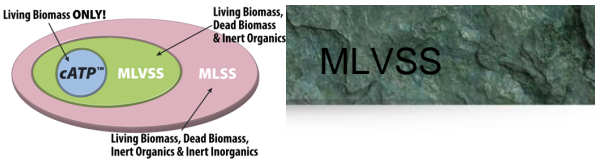
MLVSS

- The size of the culture in a reactor is an important design consideration as it is determined by the amount of pollutants which has to be converted when treating the wastewater.
- This is typically represented by the amount of organic suspended material in the mixed liquor of a reactor or the mixed liquor volatile suspended solids (MLVSS).

MLVSS

- It is assumed that the organic suspended material is largely made up of microbes.
- The loading on a reactor is typically defined as the mass of substrate applied on unit mass of MLVSS over a defined period of time (eg. 0.3 kg BOD5 kg⁻¹ MLVSS d⁻¹).





- The MLVSS is therefore an important parameter to monitor when operating a bioprocess to ensure an adequate population of microorganisms is retained in the reactor to perform the necessary functions and the process does not become overloaded
- For operators who become familiar with their plants and wastewater, an alternative to the MLVSS is the MLSS

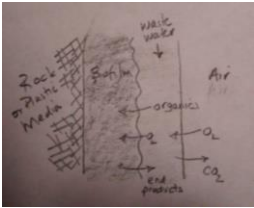


Microbial Culture

- The microbial culture considers the bulk of the pollutants in a wastewater as substrates
- These substrates would be metabolized and the metabolic reactions involved are very largely enzymes driven
- As the bacteria metabolizes the organic substrates, they reproduce by binary cell division
- Enzyme activity in the metabolic reactions is dependant on environmental factors



Biofilm Schematic



- Outer portion of biofilm aerobic
- If film gets too thick then inner portion can go anaerobic
- When microorganisms near media surface die, lose ability to cling to surface and biofilm sloughed off
- New biofilm grows

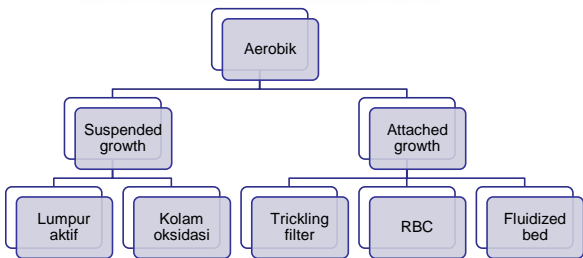


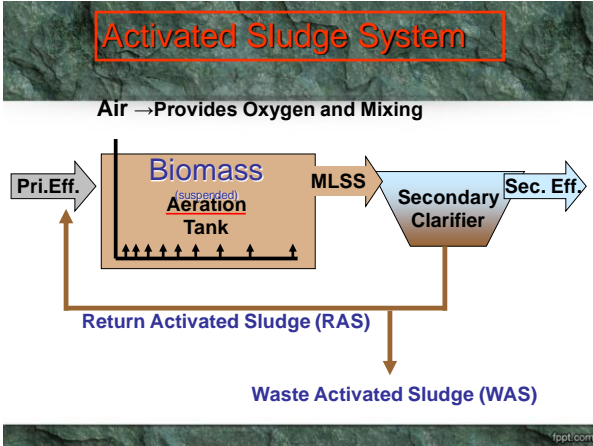
Outline

- 1. Pendahuluan
- 2. Pengolahan Secara Aerob
- 3. Pengolahan secara an-aerob



Metode pengolahan (Woodard, 2001)





Activated Sludge

Suspended Growth, Biological Treatment

Need favorable conditions for growth and for separation from the water

Biological solids are used over and over

Growth rate produces about 0.7 lbs of biological solids per lb BOD removed

Trickling Filters

- Use tables of HLR and OLR to determine Volume and Area.
- Check both at both high and low values of range
- Use Eckenfelder or Velz equation to determine effluent concentration (C_e)

Trickling Filters



- A bed of highly permeable medium to which microorganisms attach
- Wastewater trickled through medium (rotating arm or sprinkler system) to maintain aerobic environment
- Underdrain collects treated wastewater and detached film (ventilation system if needed)
- Settling tank needed (often effluent (not sludge) recycled to trickling filter)





Outline

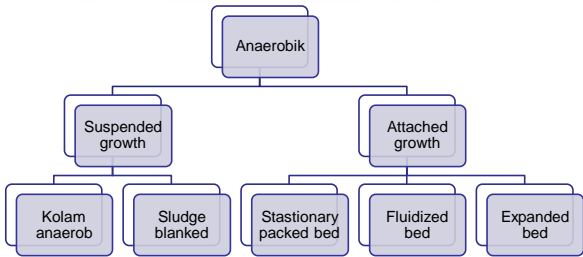
1. Pendahuluan

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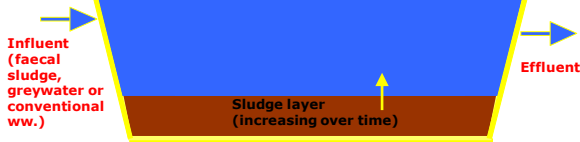


Metode pengolahan (Woodard, 2001)



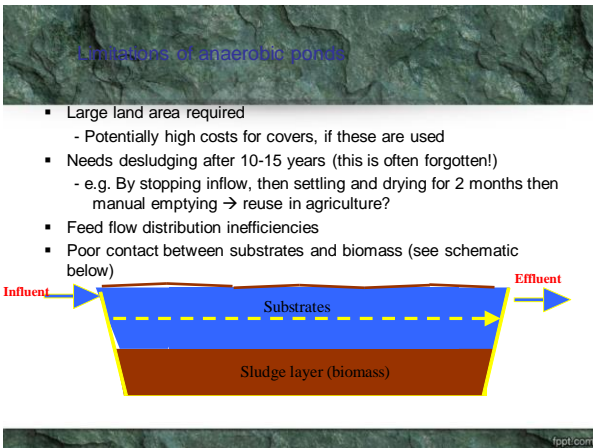
Anaerobic ponds

- Also called lagoons (in the US) or waste stabilisation ponds
- Low-rate anaerobic process (e.g. 1 – 2 kgCOD/m³/d)
- Solids settling and anaerobic decomposition
- Depth: 5-10 m
- Could be covered for odour control and gas collection (but most of them are not covered)
- Usually several ponds in series (last pond: aerobic maturation pond with algae; pathogen kill by sunlight)



This slide was provided by Peter van der Steen (UNESCO-INS) ppt.com





Upflow Anaerobic Sludge Blanket

- In the upflow anaerobic sludge blanket (UASB) type of reactor, the gas/solid/liquid separation system is integrated into the vessel (Fig. 8.6).
- This reactor can only be used if large, dense, readily settleable particles are formed – a granular sludge which allows high concentrations of suspended solids between 20 g/L MLSS and 30 g/L MLSS



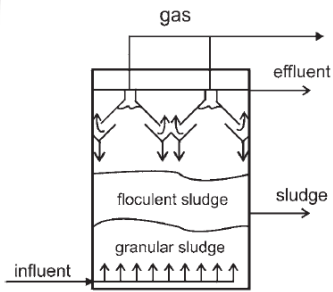


Fig. 8.6



Industrial Wastewater Treatment

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