Advantages

1-Low operational and maintenance cost.

2- Lagoons provide effective treatment with minimal threat to the environment.

3-Work well in clay soils where conventional subsurface on-site absorption fields will not work.

Disadvantages

1- Lagoons must be constructed in clay soil or be lined to prevent leakage.

2- May overflow occasionally during extended periods of heavy rainfall.

3- If there are extended periods of overcast windless days, a rare occasion in Oklahoma, offensive odors may occur for a brief time. Lagoons usually recover rapidly if this occurs.

4- Can not be installed on a small lot. Takes up a relatively large space for only one use.

5- Lagoons are not aesthetically acceptable to some people. Some people consider lagoons unsightly and unsafe.

6- As with any other open body of water, there is some potential danger. Although lagoons are required to be fenced, this does not always prevent access by people or pets.

Oxidation ponds, also called lagoons or stabilization ponds, are large, shallow ponds designed to treat wastewater through the interaction of sunlight, bacteria, and algae. Algae grow using energy from the sun and carbon dioxide and inorganic compounds released by bacteria in water. During the process of photosynthesis, the algae release oxygen needed by aerobic bacteria.anbottom region, consisting of anaerobic bacteria, without the presence of dissolved oxygen. Under methanogenic conditions, the major products are carbon dioxide and methane

So, In **oxidation pond** we do all the process naturally and it requires longer time to regenerate the water. the area needed is also much more as compared with other process.

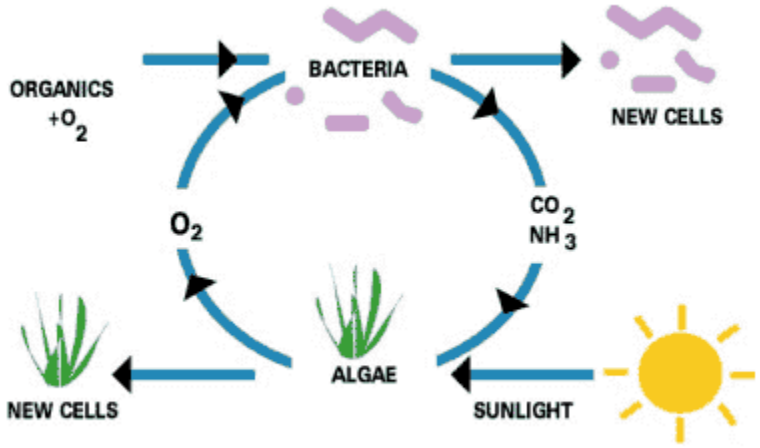
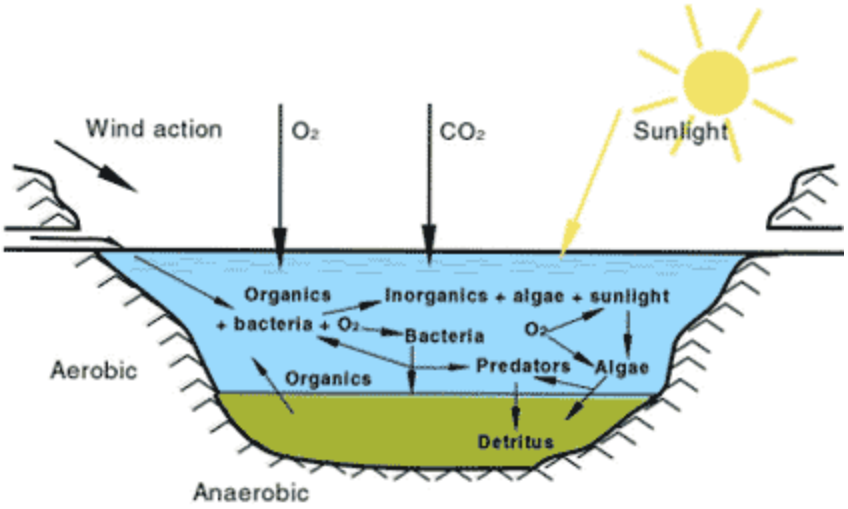
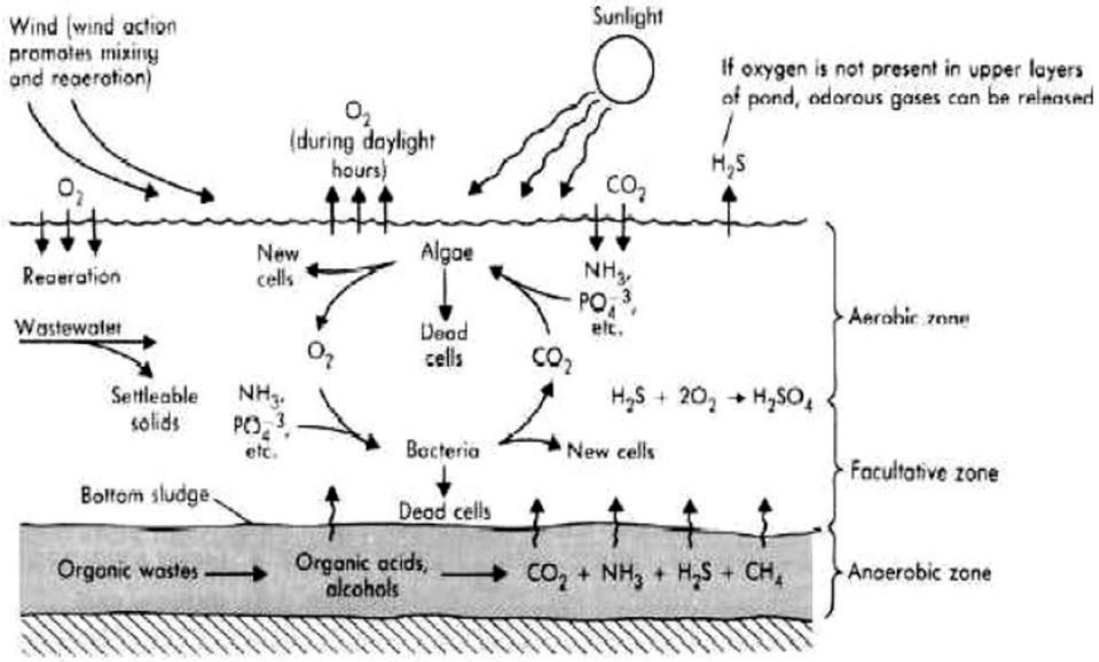
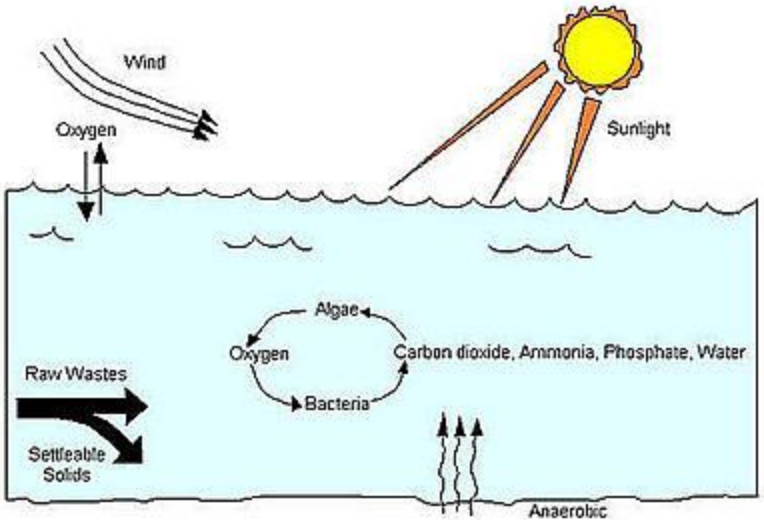
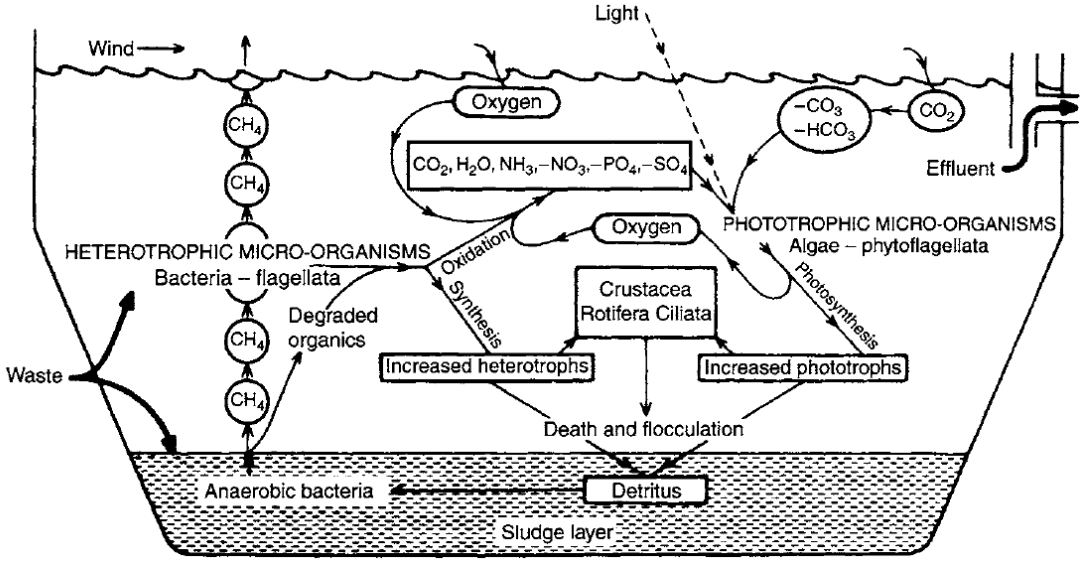


Figure 18: Symbiotic relationship between bacteria and algae in a wastewater


Wind action
O_2
CO_2
Sunlight
Organics
+ bacteria + O_2
Inorganics + algae + sunlight
Bacteria
O_2
Aerobic
Organics
Predators
Algae
Detritus
Anaerobic


Wind (wind action promotes mixing and reaeration)
Sunlight
If oxygen is not present in upper layers of pond, odorous gases can be released
O_2 (during daylight hours)
H_2S
O_2
CO_2
Reaeration
New cells
Algae
NH_3, PO_4^{-3}, etc.
Aerobic zone
Wastewater
Dead cells
O_2
CO_2
Settleable solids
NH_3, PO_4^{-3}, etc.
$H_2S + 2O_2 \rightarrow H_2SO_4$
Bacteria
New cells
Facultative zone
Bottom sludge
Dead cells
Organic wastes
Organic acids, alcohols
$CO_2 + NH_3 + H_2S + CH_4$
Anaerobic zone





3- Aerobic granulation

Aerobic granulation involves cell-to-cell adhesion that includes

biological, physical and chemical phenomena and aerobic granules are formed through self-immobilization of microorganisms without any carrier material under aerobic or alternative aerobic–anaerobic conditions

. Bacterial aggregation is of two types:

(1) Auto aggregation: Cell-to-cell interaction of genetically iden-

tical strain; and

(2) Co-aggregation: Cell-to-cell adherence between genetically

distinct bacterial partners.

The formation of aerobic granules consists of five stages:

microbes' multiplication phase, floc appearance phase, floc cohe-

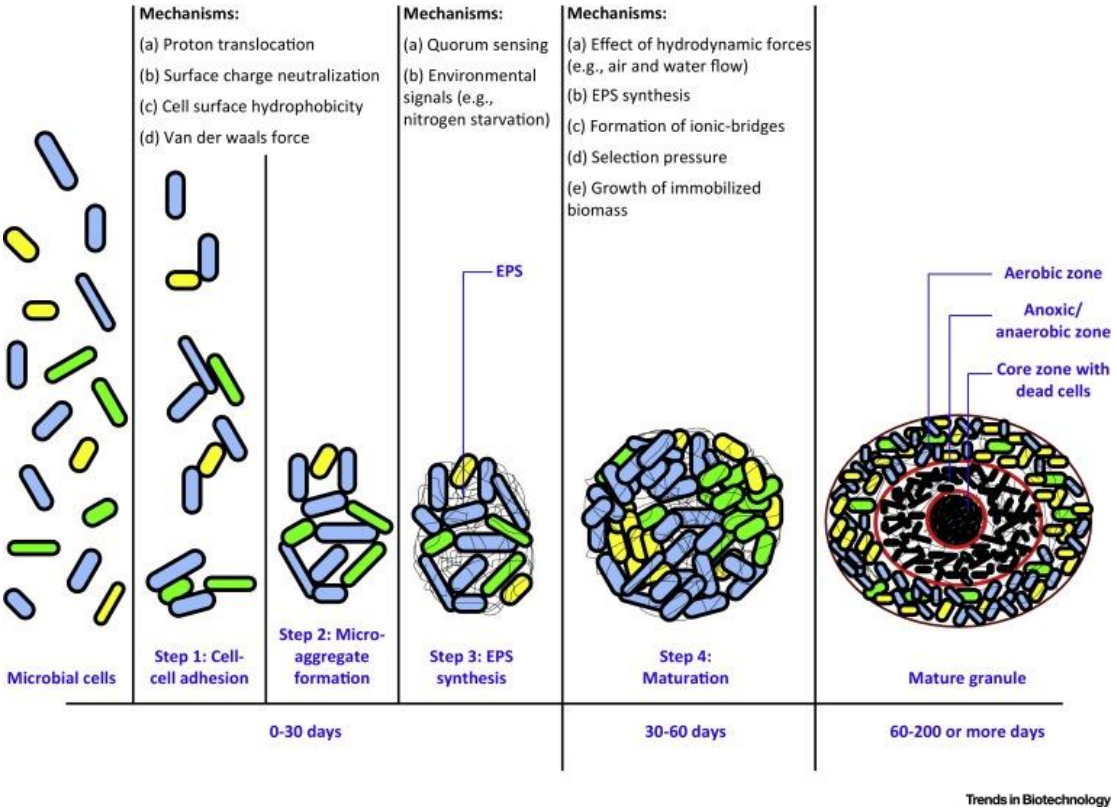
sion phase, mature floc phase and aerobic granule phase The granules thus formed are com-pact and strong with very high degradation efficiency Although aerobic granular technology would be a novel and

pronounced bio technique for wastewater treatment, the mechanisms behind the formation of aerobic granules was not yet understood, because bacteria would prefer a dispersed rather than aggregated state. Hence, there should be an initiating force that can bring bacteria together and, further, make them aggregate.

Aerobic granules are a type of sludge that can self-immobilize flocs and microorganisms into spherical and strong compact structures. The aerobic granular sludge usually is cultivated in SBR (sequencing batch reactor) and applied successfully as a wastewater treatment for high strength wastewater, toxic wastewater and domestic wastewater.

Aerobic granular sludge reactors for the treatment of wastewater containing particulate organic matter (X_S)

Reduced selection pressure for fast-settling biomass



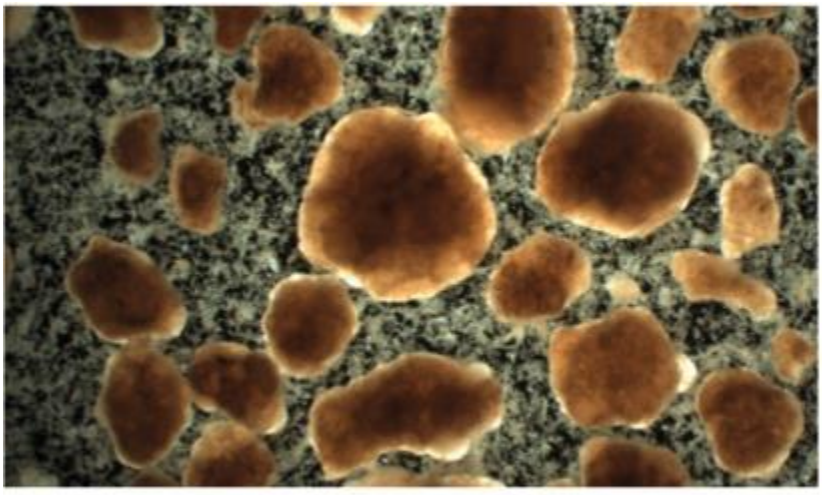
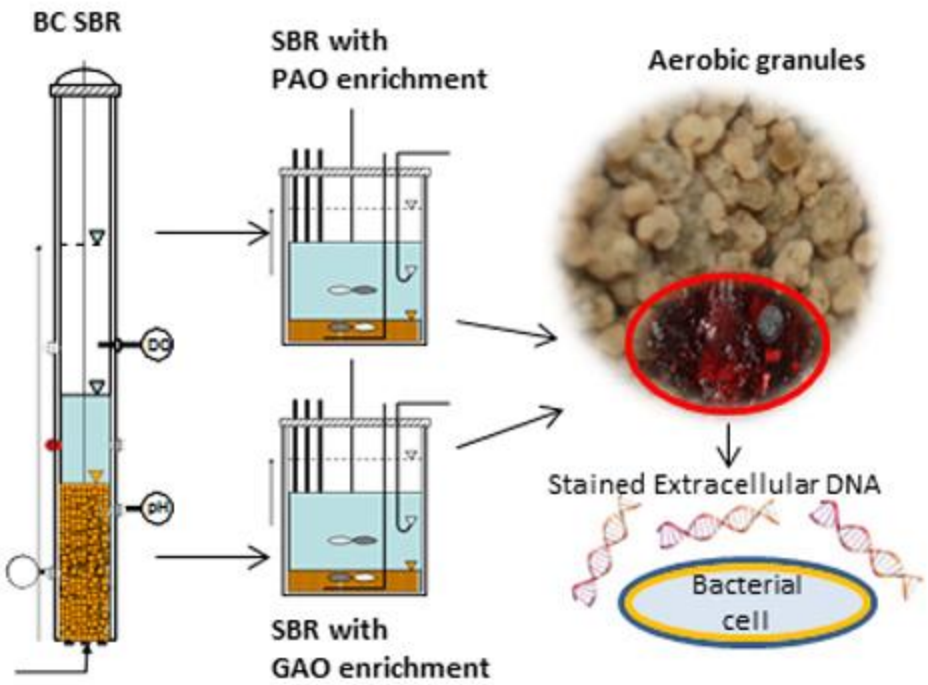


Figure 6

Aerobic granules – Ede WWTP


BC SBR
SBR with
PAO enrichment
Aerobic granules
DO
pH
Stained Extracellular DNA
Bacterial
cell
SBR with
GAO enrichment