

Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (First Year)

Subject: Botany

Paper Code: BOG 101

Paper Title: Environmental Biotechnology

Unit: Microbiology of waste water treatment

Module Name: Aerobic process – Oxidation Pond and Oxidation Ditch

Module No: 11

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Notes

Oxidation ponds and oxidation ditch are another two types of aerobic processes of secondary waste water treatment.

Oxidation pond is also known as Stabilization ponds. It is constructed deep in the ground i.e. it is made up of earthen material. Sunlight and microorganisms like bacteria, fungi and algae form the major components of oxidation ponds.

Oxidation pond is based on the principle that cooperative interaction between algae, bacteria and fungi converts the biodegradable organic matter into harmless compounds. The microorganisms use oxygen released by the algae to oxidize the biodegradable organic matter. The algae in turn, utilize the inorganic compounds released during the oxidation process.

Working: first through the inlet system, the industrial or domestic waste water influents into the oxidation pond.

The microorganisms present in the oxidation pond like bacteria and fungi decompose the biodegradable organic matter and release carbon dioxide, ammonia, and nitrates. These inorganic compounds are utilised by algae. The algae photosynthesizes in the presence of sunlight and produces oxygen. This oxygen is in turn used up by the aerobic microorganisms to breakdown more waste and achieves a reduction in BOD level.

In this system, aeration is also carried out by wind action. The treated water is released out through the outlet system. It is thus clear that the algae and the aerobic microorganisms live in a relationship and work co-operatively to fulfil each other's requirements.

Advantages

- Easy to construct i.e. does not require sophisticated equipment and labour.
- Has a low maintenance cost.
- It is capable of handling varying waste water types such as industrial, municipal.
- It can reduce the BOD up to 90% naturally

Disadvantages

- Requires a large land area for its set up.
- Sometimes may give a foul smell and may serve as a mosquito breeding ground if not maintained properly..
- The effluent may seep into ground water thus polluting ground water.

Oxidation ditch is an extended aeration system. It is a huge oval tank resembling a race track. The ditch is built on the ground surface and is lined with an impermeable lining.

Oxidation ditch is based on the principle that waste water is brought in contact with the aerobic microbes in the ditch and retained within it for sufficient amount of time in an aerobic condition. The sludge from the waste water is separated and the water is preceded for further treatment.

We will now see the general overview of the working of oxidation ditch. The waste water enters through the inlet. Aeration of waste water is done by the aerators. The microbes act on the degradable waste in the waste water. The sludge is removed and the water is preceded for further treatment.

There are two types of oxidation ditches. One consists of a secondary clarifier and it's known as continuous flow type and the other does not consist of a secondary clarifier and is known as intermittent flow type.

In continuous flow type, either waste water after treatment or even raw sewage may directly pass through the bar screen and enter the oxidation ditch. The aeration is done by aerators or surface rotors. These rotors supply oxygen to the

tank and also maintain a continuous flow of the waste water in the oxidation ditch. After sufficient retention time, the waste water is transferred to a secondary clarifier or sedimentation tank where the sludge is separated and the effluent is preceded for further treatment.

In intermittent flow type, either raw sewage or waste water after primary treatment may pass through the bar screen and enter the oxidation ditch there too, the aeration is done by the aerators. After a while the influent is stopped and the waste water remains suspended in the oxidation ditch for predetermined periods by stopping the rotors. This is done because in intermittent flow type and additional clarifier is absent. Therefore, the ditch itself is used for settling. The effluent is withdrawn from the outlet and is preceded for further treatment. Excess sludge is removed from the ditch using a sludge trap.

Advantages

- No primary treatment of waste water is required.
- It can remove more than 98% of BOD
- Can remove more than 90% of suspended solids

Disadvantages

- Skilled labour is required in this technique.
- Power consumption of aerators is high.