

Microbes in Sewage Management

10+2

MICROBES IN HUMAN WELFARE

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MICROBES IN SEWAGE TREATMENT

Large quantities of waste water are generated everyday in cities and towns and a major part of this waste water is human excreta. This municipal waste-water is also called sewage. Sewage contains large amounts of organic matter and microbes. Many of which are pathogenic. This cannot be discharged into the natural water bodies like rivers and streams directly. Instead, before disposal this sewage should be treated in sewage treatment plants (STPs) to decrease its polluting effect. Treatment of waste-water is done by the heterotrophic microbes naturally present in the sewage. This treatment is carried out in two stages:

Primary treatments: These involve physical removal of particles through filtration and sedimentation. These are removed in stages;

1. **Sequential filtration:** initially, floating debris is removed by sequential filtration.
- II. **Sedimentation:** Following sequential filtration, the grit (soil and small pebbles) are removed by sedimentation. All solids that settle form the primary sludge, and the supernatant forms the effluent. The effluent from the primary settling tank is taken for secondary treatment.

Secondary treatment or Biological treatment: The primary effluent is passed into large aeration tanks where it is constantly agitated mechanically and air is pumped into it. This allows vigorous growth of useful aerobic microbes into flocs.

Flocs are masses of bacteria associated with fungal filaments to form mesh like structures.

While growing, these microbes consume the major part of the organic matter in the effluent which significantly reduces the BOD (biochemical oxygen demand).

BOD is the amount of the oxygen that would be consumed if all the organic matter in one liter of water were oxidised by bacteria.

The sewage water is treated till the BOD is reduced. The BOD test measures the rate of oxygen uptake by micro-organisms in a sample of water and thus, indirectly, it is a measure of the organic matter present in the water. *The greater the BOD of waste water, more is its polluting potential.*

Once the BOD of sewage or waste water is reduced significantly, the effluent is then passed into a settling tank where the bacterial 'flocs' are allowed to sediment. This sediment is called activated sludge. A small part of the activated sludge is pumped back into the aeration tank to serve as



Figure 4 Secondary Treatment

the inoculum while the remaining part of the sludge is pumped into large tanks called anaerobic sludge digesters. In anaerobic sludge digesters, other kinds of bacteria that grow anaerobically digest the bacteria and the fungi in the sludge. During this digestion, bacteria produce a mixture of gases such as methane, hydrogen sulphide and carbon dioxide. These gases form biogas that can be used as source of energy as it is inflammable. The effluent is generally released into natural water bodies like rivers and streams. This methodology has been practiced for more than a century in almost all parts of the world. Till

date, no manmade technology has been able to rival the microbial treatment of sewage.

Due to increasing urbanisation, sewage is being produced in much larger quantities than ever before. However, the number of sewage treatment plants has not increased enough to treat such large quantities. So the untreated sewage is often discharged directly into rivers leading to their pollution and increase in water-borne diseases.

The Ministry of Environment and Forests has initiated two major plan, viz. *Ganga Action Plan* and *Yamuna Action Plan* to save these major rivers. Under these plans, it is proposed to build a large number of sewage treatment plants so that only treated sewage may be discharged in the rivers.

This class note is principally based on NCERT BIOLOGY for class 12.