UNIT-IV

# Waste Water Treatment of Industries

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**Read this article to learn about the waste water treatment of industries.**

**The treatment schemes of waste waters of dairy, distillery, tannery, sugar and antibiotic industries are briefly described hereunder.**

**1. Waste Water Treatment for Dairies:**

Dairy waste water is polluted at various stages by the activities of dairy operation. This has to be appropriately treated before being discharged. This is essential to avoid water pollution. A schematic representation of dairy waste water treatment is depicted in Fig. 57.19, and briefly described below.

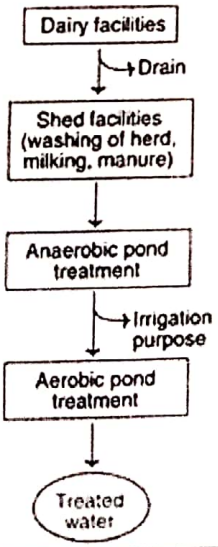


*Fig. 57.19 : A diagrammatic representation of dairy waste water treatment.*

The processing of dairy waste water is carried out by a two-stage pond system. The treatment is first done in an anaerobic pond, and then in an aerobic pond. The treated water coming out of the anaerobic pond is rich in nutrients, hence

is useful for irrigation purposes. At the end of the two-stage treatment, about 95% of the BOD material is removed from the waste water.

### 2. Waste Water Treatment for Distiller:

The waste water from distilleries mostly consists of dissolved $O_2$ and organic wastes (predominantly fermented starches and organic nitrogen). The treatment is carried out by a two-stage bacterial oxidation in anaerobic reactors. The complex organic wastes are first degraded to organic molecules (acids, aldehydes, alcohols, ketones etc.). These molecules are further oxidized to smaller organic ($CH_4$) and inorganic ($CO_2$, $NH_3$, $H_2S$, $H_2O$) compounds (Fig. 57.20).

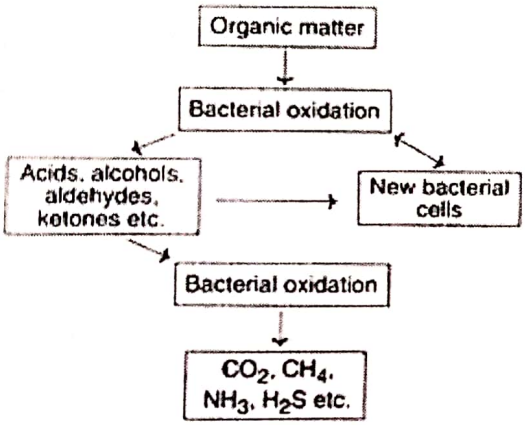


*Fig. 57.20 : A diagrammatic representation of distillery organic waste water treatment.*

The products formed in the first stage of bacterial oxidation will promote the growth and multiplication of new bacterial cells. This is advantageous for more efficient bacterial oxidation.

### 3. Waste Water Treatment for Tannery:



Tanneries are industries involved in the processing of animal skins. For the transformation of skins to leathers, a large number of chemicals, dyes, tanning agents etc., are used. Tannery waste water poses a serious environmental threat since many of the ingredients have low biodegradability. The treatment process is carried out in two phases (Fig. 57.21).

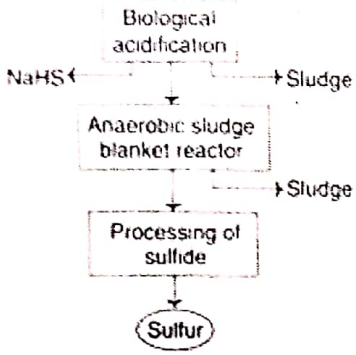


*Fig. 57.21 : A diagrammatic representation of tannery waste water treatment.*

**Phase I:**

This phase involves biological acidification and production of sulfides from sulfates present in the waste water. The sulfide recovered in the form of sodium hydrogen sulfide is reused in tanneries.

**Phase II:**

This is carried out in an anaerobic sludge blanket reactor. In this phase, the organic acids are converted into gases. The left over sulfide from phase I is converted into solution, and processed to produce sulfur which will be useful in chemical industries.

With the two phase systems for waste water treatment of tanneries, it is possible to remove 20% of chemical oxygen demand (COD) and 90% of the sulfur compounds. Sometimes, additional aerobic bioreactors are used to remove more COD.

### 4. Waste Water Treatment for Sugar Industry:

The waste water from sugar industries contains high COD materials which are biodegradable. The treatment process is comparable to that described for waste water treatment of distillery (Fig. 57.20).

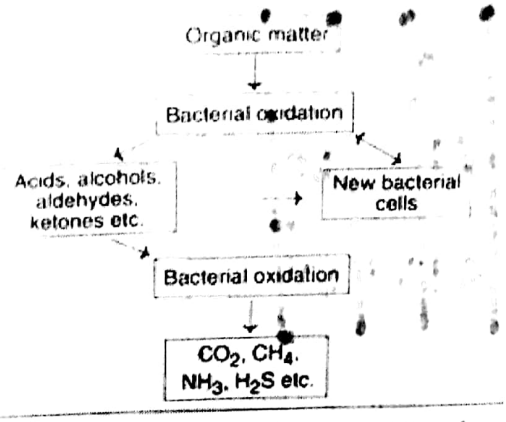


*Fig. 57.20 : A diagrammatic representation of distillery organic waste water treatment.*

## 5. Treatment of Antibiotics in Waste Water:

There is a widespread use of antibiotics in human healthcare, animal husbandry and agriculture. In addition, the drug and antibiotic industries also directly contribute to pollution. Antibiotic pollution has become a major environmental threat. This is mostly due to the development of antibiotic resistance by the pathogenic bacteria. The conventional waste water treatment processes are ineffective in removing the antibiotics.



Special tertiary treatment processes are required to remove the antibiotic pollutants. The treatment involves the degradation of target molecules by oxidation, exposure to ultraviolet light etc. Some pharmaceutical industries have introduced a new technique namely membrane filtration to remove even trace amounts of antibiotics from the waste water.