CHAPTER-V
SIGNIFICANCE OF
EFFLUENT TREATMENT
PLANT (ETP)
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In the present study, an effort has been made to introduce a working model in the treatment of wastes of Aurangabad industrial area and city sewage. The methods mentioned in, *may* not be effective cent percent, but can give a clue to go accordingly for the treatment of waste effluent.

Taking in to consideration of daily generation of wastes, either through industries or minucipal waste, has become mandatory to have certain methods to be used in treating these effluents, sense of modelling has been famous by putting various treatment methods for the waste effluents of various types. The methods may varied and specific for each types of effluents. In view of this, following methods for the treatment of waste may be used and beneficial in raising up the potability of water and also less expensive.

The purpose of waste water treatment is to remove the contaminants from water so that the treated water can meet the acceptability of quality standards. It is usually depend upon whether water will be reused or discharged into a receiving stream. Available wastewater treatment processes can be broadly classified as physical, chemical or biological types. These processes, which consist of a series of unit operations, are applied in different combinations and sequences,
depending upon the prevailing situations of effluent concentration, composition and condition and specification of the effluent.

Physical processes are based on exploitation of the physical properties of the contaminants and are generally the simplest forms of treatments. These principally, comprise screening, sedimentation, flotation and filtration. Chemical processes utilize the chemical properties of the impurity of the added reagents, commonly used chemical processes are precipitation, coagulation and disinfection. Other physical and chemical processes such as air stripping, carbon adsorption, oxidation and reduction, ion exchange and membrane processes the reverse osmosis and electrodialysis are also important in certain particular uses. Biological processes utilize biochemical reactions. Typical examples are biological filtration and the activated sludge process.

The disposal of waste water is of widespread national concern. Industrial activities generate a large number and variety of waste products which are generally discharged into water streams. The nature of industrial wastes depends upon the industrial processes in which they originate. The problem of adequately handling industrial waste is more complex and much more difficult than sewage, because industrial waste vary in nature from relatively clean rinse water to waste liquous than that are heavily laden with organic or mineral matter or with corrosive, poisonous, inflammable or explosive substances. Some industrial waste
are so objectionable that they should not be added to the public sewage system; as it would be safe to discharge them into a separate drain or directly into a natural body of water such as stream, lake, river etc. Some industrial waste adhere to sewage and clog them, acid, H₂O etc. destroy cement concrete and metals, hot wastes may cause cracking of tiles and concrete. In addition to immediate danger to human beings, some poisonous chemicals may also interfere with biological treatment processes by killing the micro-organisms that normally populate in receiving waters. Inflammable or explosive substances may endanger to the structure through which sewage flows. Toxic gases and vapours create hazards to workmen and operators of sewage works, when permitted to enter the public sewage system, the industrial wastes has become a part of sanitary sewage to be treated before release in.

Although some of the industrial wastes are known since antiquity, many of them are quite recent. As the technology develops, newer types of wastes are found. Increasingly, stringent Federal State, and local regulations have been enacted potability on limiting the pollution of streams, lakes and rivers.

The great variety of chemical wastes produced in factories, forces a specific treatment in many instances. Some general practices are in use in many fields, and one such practice is that of storing or lagooning wastes. This practice serves many purpose. For example, in factories
having acid as well as basic wastes, reduces the cost of neutralization. In plants, having waste water containing large amount of organic material (e.g. some paper mills), decreases the suspended matter and resulted in reduction of the BOD. The use of fluctuating agent, such as FeSO₄ or dum to remove suspended solids, and addition of aeration to improve BOD is common in many industries.

A general problem in all industries is the disposal of waste by water softening treatment. Lime sludge may be lagooned and settled or it may be dewatered and calcified for reuse. An activated sludge process is used to treat the wastes, when industry uses raw materials of complicated organic matter. This process can be successfully employed to wastes from tanneries, meat packing plants, milk processing plants, rendering plants etc. Tannery wastes may be treated by floculation and sedimentation or filtration. Brewery wastes are subjected to trickling filters to reduce BOD and remove most of the suspended solids. Processing of wastes from large chemical plants, however, exceedingly, complex because of the variety of chemicals used. In such cases, equilization of acid and basic waters, storage of brine for high water disposal, and other general practices are followed, but it is more advantageous to treat the wastes at the source, with a view to recover valuable materials as by-products. In recent years, increasing emphasis on industrial waste treatment has been given to the recover of useful by products. Fermentation wastes, after
evaporation and drying, are being sold as animal food. Chromium and other metals have been recovered from electroplating procedures by making use an ion exchanger. Ferrous sulphate has also been recovered from pickling operations.

In general, it should be noted that, no commercial or industrial product is as important as the environment. Moreover, it is now possible to convert industrial wastes into profitable products and every efforts should be made to make profitable use of industrial wastes in order to save environment as well as the money. For example, tannery wastes can be used for the production of leather boards, the banana steam can be used for the preparation of hand made paper, sugar cane waste can be used to produce industrial wax and so on.

The waste water treatment processes are generally grouped according to the waste quality, expected to produce. These process are usually grouped as the primary treatment, the secondary treatment, and the tertiary or the advanced waste treatment.

Primary treatment removes identifiable suspended solids and floating matter. Secondary treatment, help in biological treatment and also to organic matter soluble or the colloidal form. Advanced waste treatment may involve physical, chemical or biological processes or their various combination depending on the impurities to be removed. These processes are employed to remove residual, soluble, non-biological
organic compounds, including surfactants, inorganic nutrients and salts, trace contaminants of various types and dissolved inorganic salts. The advanced waste treatment processes are expensive, and are used only when waste water is required to be of high quality treatment so that the treated water can be reclaimed and put to some other forms of direct reuse.

**PRIMARY TREATMENT:**

The primary treatment involves a pretreatment step and a sedimentation step where the waste water is pretreated to remove large floating and suspended solids could interfere with the normal operation of subsequent treatment processes. The pre-treatment operation may also include flow measurement, sometime pre-chlorination to prevent and odour that may emanate during subsequent processes.

Pre-treatment consist of screening and grit removal. Screens of various sizes and shapes are used depending on the nature of solids to be removed and cleaning is done either manually or mechanically. Fixed bar screens are also the most common type of screens used in domestic waste water treatment facilities. Bar screens are made up of parallel metal bars and have opertures in the range 20-60 mm for coarse screens and 10-20 mm, and medium screens. Zinc screen also employed, to remove large solids in order to avoid cloggings.
Methods of disposal include survival, incineration, grinding and digestion. To avoid the disposal problem, some treatment plants use a device known as a comminution instead of a screen. The comminutor grinds large solids which can then be satisfactorily handled in the sedimentation tank. After screening, waste water enters in a grit chamber for the removal of inorganic grit, consisting of sand, gravel, cinders and pebbles. Grit chambers are generally designed as long chambers and the velocity of waste flow is reduced to 30 cm/sec., which allows settling of the grit material. The grit can be removed by scrapers. When comminutors are used in place of bar screens, they are generally placed after the grit chamber.

SECONDARY TREATMENT

Since, much of the organic material present in waste water may be colloidal or dissolved, the primary treatment process are largely ineffective in removing it. This organic material still replace a high demand for oxygen which must be reduced further so that the effluent may be rendered suitable for discharge into the water bodies.

Biological or secondary treatment, as it is commonly referred to, is very similar in concept to the natural biodegradation of organic matter by aerobic bacteria. In biological treatment, oxygen is supplied to
the bacteria consumed under controlled conditions so that most of the BOD is removed in the treatment plant rather than in the water course. Thus, the principal requirement of a biological waste treatment process is presence of an adequate amount of bacteria that feed on the organic material present in waste water.

Two of the most commonly systems used for biological treatment, are the activated sludge system and biological film system. In the activated sludge system, the waste water is brought into contact with a diverse group of microorganisms in the form of a floculent suspension in a aerated tank. Whereas, the biological film systems also known as tricking filters, the waste water is brought into contact with a mixed microbial population in the form of a film of slime attached to the surface of a solid support medium. In both cases the organic matter is metabolized to a more stable inorganic forms. However, the activated sludge process is gaining popularity and is preferably used in biological film system because of reliability and suitability for handling of large volumes of waste water, and high degree of treatment achieved.

ADVANCED WASTEWATER TREATMENT

The effluent from a typical secondary treatment plant, if still contains 20-40 mg/l suspended solids and 20-40 mg/l BOD, may be objectionable in some streams. Suspended solids in addition contribute
B.O.D. to be settled on the stream bed and inhibit certain forms of aquatic life by reducing the dissolve oxygen.

The recent trend towards the formulation of regulations for the discharge of specific compounds and increased emphasis on recovery of valuables from industrial waste water, have created the need for treatment beyond the conventional secondary treatment stage. Advance treatment processes are expensive at the present level of their development, but it is needed in a particular situation, therefore, be assessed in the light of the circumstances relevant to situation. A wide variety of methods are used in advanced waste treatment.

**ADVANCED BIOLOGICAL SYSTEMS:**

New biological methods are being investigated for waste water treatment. The use of shallow pond or lagoons has proved to be effective for the treatment of domestic waste water. These pond are classified in to four main types.

**(1) Anaerobic ponds:**

These ponds are maintained anerobic condition by applying BOD load that exceeds oxygen production from phytosynthesis. Anaerobic ponds are usually employed as pretreatment ponds for the treatment of high strength of waste waters where the reduction in waste
strength is important than the effluent quality. Effluents of anerobic ponds require additional treatment before they are discharged into a water bodies.

Biological pond system are traditionally designed on the basis of average liquid detention time and organic loading per unit surface area or both. The advantages of the biological pond systems are their simplicity of operation and low costs. Their advantages includes potential odour problems, extensive land area requirement and the adverse effects of seasonal weather.

(ii) *Aerobic ponds:*

Waste water containing organic impurities are purified by the action of aerobic bacteria and algae. Oxygen is supplied by natural diffusion across the pond surface, by algal photosynthesis. Aerobic conditions are maintained throughout the depth of the pond for all the time.

(iii) *Aerated pond:*

These are similar to the activated sludge process unit where oxygen is supplied with mechanical aerators installed on floats or on a permanent base. The basic difference between the aerated ponds, lagoons and the activated sludge systems, is the recycling of the sludge and provided in the latter as a means of controlling the solids in the
aerator. In aerated ponds, no recycle of the sludge is provided and the
digested material leaves out the system. The concentration of solids in
this case, is much lower than that in the activated sludge system.

(iv) Facultative Ponds:

This is most frequently used system as encountered types. These
ponds have an aerobic upper zone and anaerobic lower zone. The or-
ganic waste enters at one end of the pond and the suspended solids set-
tles on the bottom. At the bottom, an anaerobic layer develops and the
settled sludge is degraded by anaerobic organisms to produce \( \text{CO}_2 \), \( \text{NH}_3 \),
and \( \text{CH}_4 \). In the upper zone, degradation of the waste takes place through
the aerobic bacteria. A facultative zone exists between these two zones,
which is generally variable. It can be acted as either aerobic or annerobic
type so that the growth of facultative organisms may be favoured.