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Seewage Treatment Plant

A. Shruthi, S. Manasa, A.Shivaleela, Bodasu Sandeep, Kalyani Adepu

Assistant Professor, Assistant Professor, Student, Student, Student

Civil Engineering, Kommuri Pratap Reddy Institute of Technology, Hyderabad, India.

Abstract: A sewage treatment plant is quite necessary to receive the domestic and commercial waste and removes the materials which pose harm for general public. Its objective is to produce an environmentally-safe fluid waste stream (or treated effluent) and a solid waste (or treated sludge) suitable for disposal or reuse (usually as farm fertilizer). The growing environmental pollution needs for decontaminating waste water result in the study of characterization of waste water, especially domestic sewage. In the past, domestic waste water treatment was mainly confined to organic carbon removal. Recently, increasing pollution in the waste water leads to developing and implementing new treatment techniques to control nitrogen and other priority pollutants. Sewage Treatment Plant is a facility designed to receive the waste from domestic, commercial and industrial sources and to remove materials that damage water quality and compromise public health and safety when discharged into water receiving systems. It includes physical, chemical, and biological processes to remove various contaminants depending on its constituents. Using advanced technology it is now possible to re-use sewage effluent for drinking water. Sewage / waste water treatment consist of different processes which protect the environment & human through cleansing the water pollutant. In history people used difference method of treatment for purification of water which get advance by advancement in technological world.

I. INTRODUCTION

Sewage treatment is the process of removing contaminants from wastewater, primarily from household sewage. It includes physical, chemical, and biological processes to remove these contaminants and produce environmentally safe treated wastewater (or treated effluent). A by-product of sewage treatment is usually a semi-solid waste or slurry, called sewage sludge that has to undergo further treatment before being suitable for disposal or land application. As time goes by, there will be population growth for which the government would have to provide more useable water for society. Sewage treatment plant uses chemical, physical, and biological processes to cleanse sewage in order to protect the environment and public health. Sewage treatment is a modern practice, while ancient Romans used to create sewers for removing the foul smell of the used water nowadays, the main reason for constructed sewage is to remove or decrease the dangerous pollutants such as nutrients, carbon inorganic, and organic elements

II. SEEWAGE TREATMENT PLANT

Waste Water treatment is a process which removes and eliminates contaminants from wastewater. It thus converts it into an effluent that can be returned to the water cycle. Once back in the water cycle, the effluent creates an acceptable impact on the environment. It is also possible to reuse it. This process is called water reclamation. The treatment process takes place in a wastewater treatment plant. There are several kinds of wastewater which are treated at the appropriate type of wastewater treatment plant. For domestic wastewater the treatment plant is called a Sewage Treatment.

III. OBJECTIVES

- The purpose of waste water treatment is to remove contaminant from water so that the treated water can meet the acceptable quality standard.
- The quality standard usually depends whether the water will be reused or discharged into river.
- Before disposing of sewage into river or land, sewage has to be treated to make it safe and to make it harmless.
- Methods of waste water treatment depends on composition of waste water and required quality for treated water.

IV. STAGES OF SEWAGE TREATMENT

The different stages used in the process of treatment are

- Preliminary
- Primary
- Secondary
- Advanced waste water (tertiary)

4.1 Preliminary treatment

The objective of preliminary treatment is removal of coarse solids and other large materials often found in raw waste water. Removal of these materials is necessary to enhance the operation and maintenance of subsequent treatment units. Preliminary treatment operations typically include coarse screening, grit removal and, in some cases, comminution of large objects. This process decreases the wastewater BOD, by approximately 15 to 30% and the devices which are being used during this treatment are grit chamber and comminutor.

Screening

To remove the floating, particles, rags, clothes, plastics, and materials to prevent damage and clogging of downstreams equipment, piping, and appurtenances. These waste water treatment plants use both coarse screens and fine screens.

Coarse screens : coarse screens remove large solids, rags, and their debris from waste, and typically have openings of 6mm (0.25in) or larger.

Fine screens : Fine screens are typically used to remove materials that may create operation and maintenance problems in downstream processes, particularly in systems that lack primary treatment. Typical opening sizes for fine screens are 1.5 to 6mm (0.06 to 0.25). Very fine screens with openings of 0.2 to 1.5mm can reduce suspended solids.

4.2 Primary treatment

The objective of primary treatment is the removal of settleable organic and inorganic solids by sedimentation, and the removal of materials that will float by skimming. Approximately 25 to 50% of the incoming biochemical oxygen demand (BOD₅), 50 to 70% of the total suspended solids (SS), and 65% of the oil and grease are removed during primary treatment. Some organic nitrogen, organic phosphorus, and heavy metals associated with solids are also removed during primary sedimentation but colloidal and dissolved constituents are not affected. The effluent from primary sedimentation units is referred to as primary effluent.

Sedimentation tank

The most common method for primary treatment is the primary sedimentation tank (also called the primary settling basin). It is a vessel in which solids settle out of water by gravity. The settleable solids are pumped away (as sludge), while oils float to the top and are skimmed off. Sedimentation tanks can also be adapted for secondary and tertiary processes, and can also be used to treat drinking water.

4.3 Secondary treatment

The secondary treatment phase is a crucial part of the wastewater treatment process because it further purifies water to remove more waste following the primary phase. After the primary treatment phase removes suspended solids using physical processes and gravity, secondary treatment systems use biological. Secondary treatment removes over 90% of the remaining suspended solids from water.

Trickling filter:

Trickling filters involve the use of a bed of porous material, such as rocks or plastic media, over which wastewater is distributed. Microorganisms grow as a slimy film, called biofilm, on the surface of the media. As wastewater trickles down through the filter, the biofilm degrades the organic pollutants.

Aeration:

Aeration helps prevent unwanted contamination in water storage facilities and can encourage the growth of beneficial aerobic bacteria in systems designed to encourage the natural breakdown of organic materials through controlled decomposition.

In wastewater treatment plants, sewage is channeled into sealed aeration tank, which can be placed indoors or outdoors. Air (or oxygen) is pumped into the tank to generate an activated sludge process, through which organic compounds are broken down and digested, before being removed from the wastewater by sedimentation and filtration. The separated organic matter or sludge is circulated into a holding basin, and some is then recirculated back into the aeration tank. Fluid waste and aerated water goes into a clarifier

4.4 Advanced waste water (tertiary)

Tertiary wastewater treatment often works by using a combination of physical and chemical processes to remove harmful microbiological contaminants from wastewater. The process usually involves filtration followed by additional disinfecting treatment. In some cases, tertiary treatment may also use other specialized treatments like lagoon storage, biological nutrient removal, and nitrogen and phosphorus removal.

Filtration

This is a process of removing suspended particles from wastewater. It could be by straining, sedimentation, flocculation, or surface capture mechanism. This process is very important because it allows the reuse of the same water thereby reducing the overall waste.

The wastewater flows through a filter that is made from layers of sand and gravel. By collecting the impurities in the water, this filtration process enhances disinfection. There are different methods of filtration like gravity, hot, and vacuum filtration. All these help in removing solid particles either from the waste or gaseous fluids.

Chlorination:

After the water has been filtered, water treatment plants may add one or more chemical disinfectants (such as chlorine, chloramine, or chlorine dioxide) to kill any remaining parasites, bacteria, or virus. To assure the treated wastewater is virtually free of bacteria, ultraviolet disinfection is used after the filtration step. The ultraviolet treatment process kills remaining bacteria to levels within our discharge permit.

V. ADVANTAGES OF SEWAGE TREATMENT PLANT

- **Environmental Protection:** Removes pollutants, improves water quality, and prevents contamination of natural water bodies.
- **Public Health:** Reduces waterborne diseases and improves overall hygiene.
- **Resource Recovery:** Generates energy (biogas) and recycles nutrients (nitrogen, phosphorus).
- **Regulatory Compliance:** Helps meet environmental standards for wastewater discharge.
- **Community Benefits:** Enhances aesthetics, creates jobs, and supports sustainable development goals
- **Labour-saving:** Traditionally sewage was removed and collected manually. Nowadays, sewage is extracted, organized, and transported using technology and can be handled by minimum workers. In addition, modern Sewage Treatment Plants can treat massive amounts of sewage, reducing the long work hours.
- **Fertilizer Production:** The sludge gathered for treatment carries a colossal amount of biodegradable matter, nitrogen, and phosphorous. Therefore, when the sludge is treated with the sludge drying method, it leads to biodegradable fertilizer. This fertilizer is suitable for agricultural and gardening use.

SEWAGE TREATMENT PROCEDURE

process treatment

There are lot of pollutant and waste in the waste water such as pathogens, coarse solids, salts and inorganic particles etc. these pollutants are harmful to both ecosystem (Land & water) For removing this pollutants we use a different method. The one which we are using is unit operation in sewage treatment. The primary objective of this treatment is reduction in water pollution.

Chemical unit process

It is playing a vital role in the advanced cleansing reaction in waste water components. There are different chemical process acting such as precipitation, coagulation, neutralization, oxidation, reduction and ion exchange that may be added during the procedure of purification.

Physical unit process

There is some treatment method which cleanses the waste water by using the physical forces such, flotation, mixing, filtration, screening & gas transfer.

Biological unit process

In this process the break down of grease/ oil, suspended solid, organic matter, nitrogen and phosphorus by bacteria which grow naturally in the biological reactor. The bacteria consumes the carbon waste material in the sewers also the primary goal of this treatment is to reduce biological element in waste water

MODEL OF SEWAGE TREATMENT PLANT



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