WASTE WATER TREATMENT

While the foremost necessity is prevention, setting up effluent treatment plants (ETP) or sewage treatment plant (STP) and treating wastewater (it is also known as effluent) through these can reduce the pollution load in the recipient water. The treated effluent can be reused for either gardening or cooling purposes wherever possible. Wastewater treatment is a process, wherein the contaminants are removed from wastewater as well as household sewage, to produce waste stream or solid waste suitable for discharge or reuse.

Wastewater treatment methods are categorized into three sub-divisions, physical, chemical and biological.

1. **Effluent Treatment Plants (ETP):**

Effluent Treatment Plants or (ETPs) are used by industry to treat industrial wastewater also known as effluent in order to remove any toxic and non toxic materials or chemicals from it such as high amount of organics, debris, dirt, grit, metals, nutrients, drugs, dyes, polymers etc. The ETP plants use evaporation and drying methods, and other auxiliary techniques such as centrifuging, filtration, incineration for chemical processing and effluent treatment

2. **Sewage Treatment Plants (STP):**

Sewage treatment, or domestic wastewater treatment, is the process of removing contaminants from wastewater and household sewage. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. The objective of treatment plant is to produce a treated effluent and a solid waste also called sludge suitable for discharge or reuse back into the environment. Before starting the treatment, process effluent is pre-treated to remove large objects that can damage or clog the pumps and skimmers of primary treatment clarifiers, for example, trash, tree limbs, leaves, etc. Pre-treatment may include Grit

removal in which, a sand or grit channel or chamber where the velocity of the incoming wastewater is carefully controlled to allow sand, grit and stones to settle.

Primary Treatment: In the primary sedimentation stage, sewage flows through large tanks, commonly called “primary clarifiers” or “primary sedimentation tanks”. The tanks are large enough that sludge can settle and floating material such as grease and oils can rise to the surface and be removed. The settled down waste is pumped to further sludge treatment stages. Secondary Treatment: Secondary treatment is designed to substantially degrade the biological content of the sewage which is derived from human waste, food waste, soaps and detergent. The majority of municipal plants treat the settled sewage liquor using aerobic biological processes. There are a number of ways in which this is done. In all these methods, the bacteria and protozoa consume biodegradable soluble organic contaminants (e.g. sugars, fats, organic short- chain carbon m molecules, etc.). Secondary treatment systems are classified as fixed-film or Suspended- growth. Fixed-film or attached growth system treatment process including trickling filter and rotating biological contactors where the biomass grows on media and the sewage passes over its surface. In suspended-growth systems, such as activated sludge, the biomass is well mixed with the sewage and can be operated in a smaller space than fixed-film systems that treat the same amount of water. However, fixed-film systems are more able to cope with drastic changes in the amount of biological material and can provide higher removal rates for organic material and suspended solids than suspended growth systems.

Activated Sludge: In general, activated sludge plants encompass a variety of mechanisms and processes that use dissolved oxygen to promote the growth of biological flocs that substantially removes organic material. The process traps particulate material and can, under ideal conditions, convert ammonia to nitrite and nitrate and ultimately to nitrogen gas. The general arrangement of an activated sludge process for removing organic pollution includes: An aeration tank where air (or oxygen) is injected in the mixed liquor. This is followed by a settling

tank (usually referred to as "final clarifier" or "secondary settling tank") to allow the biological flocs (the sludge) to settle, thus separating the biological sludge from the clear treated water.

Trickling filters:

A trickling filter is a type of wastewater treatment system. It consists of a fixed bed of rocks, coke, gravel, slag, polyurethane foam, sphagnum peat moss, ceramic, or plastic media over which sewage or other wastewater flows downward and causes a layer of microbial slime (biofilm) to grow, covering the bed of media. Aerobic conditions are maintained by splashing, diffusion, and either by forced-air flowing through the bed or natural convection of air if the filter medium is porous. Passage of the waste water over the fixed bed provides dissolved oxygen to microorganisms forming the bio-film layer, is used for the biochemical oxidation of the organic compounds and releases carbon dioxide gas, water and other oxidized end products. As the bio-film layer thickens, it eventually slips off into the liquid flow and subsequently forms part of the secondary sludge. Typically, a trickling filter is followed by a clarifier or sedimentation tank for the separation and removal of the film which slipped off. Other filters utilizing higher-density media such as sand, foam and peat moss do not produce a sludge that must be removed, but require forced air blowers and backwashing or an enclosed anaerobic environment.