SEWAGE TREATMENT PLANT

(WASTE WATER TREATMENT)

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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.

Keywords: Effluent, Coagulation, Chlorination.

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 semisolid 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

OBJECTIVES There are three main objectives in sewage treatment: • Removal of floatable and postponed particles • Removal of BOD (Biochemical oxygen demand) • Removal of micro-organic which may be the cause of dangerous diseases

DOMESTIC WASTE WATER CHARACTERISTIC
The main reason for designing of sewage treatment plant or building sewer in the cities is domestic wastewater.
The waste water characteristic is divided into two parts: • Physical characteristic Chemical or industrial characteristic

a) PHYSICAL CHARACTERISTIC Physically waste water can be judge in these three distinct standards (color, temperature, and weight) The color waste water which has been produced early is gray, however, as time Goes by it changes to black the reason why is suspended solid which cannot dissolve or settled in the waste water. In addition, the solids increase the weight of the wastewater which has been measured 1,000,000 grams in one cubic meter in the waste.

b) CHEMICAL OR INDUSTRIAL CHARACTERISTIC During the chemical waste, water characteristic is more complicated than explaining the attributes of the physical. There is a lot of different chemical element in waste water which makes the exact chemical measurement impossible. however the experts in the field divided the wastewater chemicals into generals groups of the compound for making the measurements easier; for example polyphosphates, orthophosphates and organic phosphate are all being considered under a major group called "Total Phosphorus (as P). Mono-hydrogen phosphate ($HPO4^{2-}$) is usually determined to be phosphorus in waste water. Its existence in order to prevent the reduction of eutrophication and this process put to use through chemical precipitation, using the three compound methods given below: • Using ferric chloride: $Fecl3 + HPO4^{-2} = FePO4 + H+ + 3CL-$ • Using Alum: $Al2(SO4)3 + 2HPO4^{2-} = 2ALPO4 + 2H+ + 3SO4^{2-}$ • Using Lime: $5Ca(OH)2 + 3HPO4^{2-} = Ca5(PO4)3OH + 3H2O + 6(0H)-$ The ph value of domestic wastewater is estimated between 6.5 to 8.5. Further, In above-mentioned precipitation reaction alum & ferric chloride reduces the pH while lime increases the pH to maintained balance between equations.

SWAGETREATMENT PROCEDURE
UNIT PROCESS OF TREATMENT AS we know there are lot of pollutant and waste in the wastewater such as pathogens, coarse solids, salts and inorganic particles etc. these pollutants are harmful to both ecosystem (land & water) For removing this pollutant we use a different method. The one which we are using is unit operation in sewage treatment. The primary objective of this treatment is a reduction in water pollution. From starting till the end of
the treatment process which can be disposed or reused as a product of reduction process (chemical, physical or biological).

a. CHEMICAL UNIT PROCESSES It is playing a vital role in the advanced cleansing reaction in waste water components such processes are used while. The physical & biological process acting simultaneously. There different chemical process acting such as precipitation, coagulation, neutralization, oxidation, reduction and ion-exchange that may be added during the procedure of purification.

b. PHYSICAL UNIT PROCESSES There is some treatment method which cleanses the waste water by using the physical forces
DESIGN OF SEWAGE TREATMENT PLANT In the order to ascertain the effluent quality requirement, a designer is encouraged to liaise with EPD by submitting the following information, prior to design of STP; • Block and location plans of site • Maximum number of persons(resident and non-resident) to served • Presence of shops, restaurants or other service trades • Possibility of the need for future extensions to the plant • Proposed location of discharge All the element of STP should be open to views as far as possible for easy operation and maintenance. Mechanical equipment which is critical to the functioning of the STP should be provided with online standby units. Entrance to the STP should be by a proper door without the use of steps or ladders and accessible by a vehicle. An exit should be provided as far as possible for the emergency purpose at the opposite end of the plant room. Due consideration should be given to the possible initial low flow condition before the full population is achieved. Excessive quantities of grease and oil may cause malfunction of an STP. In such cases, the arrangement should be made where practicable for grease and oil to be removed at source. A properly design a grease trap should be provided where restaurants or garages are to be served by the STP. Swimming pool filter backwash, if any should be discharged to the STP for treatment. The design of STP should take into account in the flow and loadings of such wastewater. Pool water itself should, however, be drained to the storm water system such as flocculation, flotation, mixing, filtration, screening, and gas transfer.

c. BIOLOGICAL UINT PROCESSES In these 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-based material in the sewers, also the primary goal of this treatment is to reduce biological element in wastewater.

STAGES OF TREATMENT The different stages used in the process of treatment are: .) Preliminary .) Primary .) Secondary .) Advanced wastewater (tertiary)

PRELIMINARY WASTEWATER TREATMENT The objective is to remove the large materials like coarse solids which are being frequently seen in wastewater preliminary treatment procedure usually contain grit removal, coarse screening, and communication 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 communicator. The objective is to remove the large materials like coarse solids which are being frequently seen in wastewater preliminary treatment procedure usually contain grit removal, coarse screening, and communication 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 communicator.

PRIMARY WASTEWATER TREATMENT In this treatment, the main objective is to remove the solid particle by sedimentation. In solids component such as phosphorous These waste which is collected from sedimentation process known as Primary effluent.

PRIMARY WASTEWATER TREATMENT In this Primary treatment, devices are used such as sedimentation tank and clarifiers and Anaerobic Digester.

SECONDARY WASTEWATER TREATMENT This treatment used after the primary treatment which completes the cleansing process. In this treatment removal biodegradable, colloidal or organic matter and aerobic biological Secondary treatment process will decompose organic matter by bacteria. In some time bacteria act as a treatment reactor and may consist of oxidation ponds, aerated tanks, rotating biological contactors and trickling filters.

TERTIARY TREATMENT OR ADVANCED WASTEWATER TREATMENT In this treatment, the main objective is to remove constitutes particle which cannot remove by secondary treatment. Tertiary treatment removes such as Toxic substance, Organic substance, and solid particles.
In this tertiary process, procedure wastewater treatment stages schematically. By chemical, biological or both combination treatment which remove nitrogen and phosphorus. Also done other treatment like as sedimentation, chemical coagulation, filtration and flocculation decreases the water toxicity.

DESIGN PARAMETER The designer should give a reasonable estimate of population and a detailed breakdown of the total flow rate in the calculation. The design peak flow arriving at the STP as a proportion of dry weather flow (DWF) shall be taken as: .) 6 DWF for population equal to or under 1 1000 .) 4 DWF for population over population over 1000 but not less than that based on 1000 population Either the STP can be designed for the above peak flow rate or it can be to cater for a peak flow of 3DWF, excess flow over 3DWF being equalized in an equalization tank. In the latter case, the feed pumps must be sized accurately to avoid excessive peak flow rate production. Equalized tanks should be designed to hold the excess flow for a period of two hours only the tank volume above the duty pump cut-in level should be considered as effective equalization volume. Air ejectors should be provided to prevent septicity of sewage. Primary sedimentation tanks shall be designed for .) Maximum surface loading of 40m3 /m2 /d at peak flow .) Maximum retention time of 2 hours at peak flow .) Maximum were loading of 250m3 /m/d at peak flow

PRACTICAL DESIGN AND INSTALLATION A portable submersible pump should be provided in order to allow flexibility in operation. This pump can be to recycle the plant effluent to maintain the STP in a working condition when the incoming flow is low. General headroom of 3m should be maintained for enclosed or underground STP with artificial ventilation. This may be reduced to 2.5 m at localized points e.g., under beams. For enclosed STP a minimum air volume of 14 m3 should be provided. Artificial ventilation should be provided with not less than 10 air changes per hour. Ventilation exhaust pipes should be carried up to a height not less than 1 m above the roof of the building at which the STP is located. Access walkways of minimum 0.75 m clear width should be maintained within the STP for access to all areas requiring maintenance and operation. Walkways should have safety rails (preferably stainless steel) and toe boards. Walks ways should be laid to a 1:25 cross fall to prevent

ponding if of solid construction and they should not be obstructed by crossing pipework. Where levels, vary, staircases should be provided and not cat ladders or step irons

All tanks should be provided with stainless steel ladders or step irons for access. Mild steel should not be used. Step irons should be spaced at 300 mm/cc horizontally and 250 mm/cc vertically. If a tank has to be covered stainless steel or aluminum alloy open mesh flooring should be used (aluminum should however not be used in chlorination facilities located in confined space). Open mesh flooring should be designed for 5kPA uniformly distributed the load. Provision of an emergency bypass to the STP is not allowed under normal circumstances. Fresh water taps for hoses and hand washing should be provided in the STP. Electrical distributor boards and controls panels should be installed in a location not liable to flooding. Panels should have a dehumidifying heater. Mechanical screens should be the ststictyoe or the type having the rakes moving in the bar opening and not on the bar. Either manual or channel should have a high-level overflow into the standby screen channel so that the flow diverts automatically through the stand by the screen in case duty the one is blocked. The pump should be designed to limit the pump start to not more than 10 times per hours.

TREATMENT OF STP THROUGH FLOTATION TANK I. SEWERAGE SYSTEM A sewerage system is used to receive the wastages which have been released from the domestic and industrial sources and after collection of these sources then treatment procedure is applied and finally releases the left pollutant into the environment. Some factors are used before designing a sewerage system.

ENVIRONMENTAL FACTORS These factors consider to the environmental conditions like- Surface water, Ground water, and other disturbance factors like- insects affects the land values and public health.

ENGINEERING FACTORS These factors related to those engineers who are experts in the field of environmental engineering and prevent from any critical phenomenon related to the environmental engineering like risks of segregating, reuse or recycling of the sewage, sewage penetration, bearing capacity of the soil, the topography of the site, and hydraulic calculations especially for the coastal discharge.

COST CONSIDERATION These factors related to the cost of treatment of sewage system. The financial analyzer should be appointing for the cost consideration. The work of the analyzer including the project which consists of the maintenance, fuel, repair, staff, the cost for equipment, land cost, and construction cost.

PROCESS CONSIDERATION In the process consideration need of that thing or people which related to the process operation like – skilled staff, the requirement of equipment, land availability. These process operation also used in design of sewerage system .

II. DISPOSAL AND RE-USED It is the final procedure of sewage treatment plant, which pleases the economic and scientific goals and procedures. Two main group are considered in disposal system, the first where they are situated and the second one is this how they function Onsite and Offside (Public used) re-used system. Onsite this disposal used a land filling where excavated land is filled with the disposal and covered it with the soil. Where the minimum pollutant is present like- the only couple of house in a wide geometric range the disposal also dispose of. Offsite or public system all the sewage is collected in an area here the residential building was not built or people was not living in the wide range area. Then the sewage is collected and disposes of through it.

SUMMARY The main objective of sewage treatment is to protect the environment; social economic and public health from the pollutants. This treatment based or depends on the (Primary, Preliminary, Secondary or Tertiary treatment). The nature of defined as this is essential for designing a suitable process and operation. The treatment process should be designed and constructed under scientific circumstances and factors. In summary, treatment of wastewater as that result patient which suffering of infection diseases. In India, the amount of waste which being produced increased increase too, and the government of India should provide the

most beneficial environment for engineers to design a proper sewage treatment as taking places in the various field. The imperative factors of wastewater treatment are its capability to create a system proficient in making vast changes and this can be observed through assessing the fact being that every 30 seconds a child dies child from the usage of polluted water.

CONCLUSION For the primary treatment of domestic and municipal sewage anaerobic ponds are suitable. In a low energy requirement, they are easily maintained. For secondary & tertiary municipal sewage treatment constructed wetland because wetlands are eco-friendly. When the same biochemical & physical process occurs in a more natural environment instead of reactor tanks & basins, the resulting system often consumes less energy is more reliable require less operation & maintenance & as a result costs less. The constructed wetlands, incorporator natural biochemical process which is time & temperature depended both systems followed anaerobic ponds such as "Jamaica "is suitable subtropical region the sewage treatment plant as the design is expected to meet the effluent standard required by NEPA .

REFERENCES 1. Regis G, Bidoia ED (2001) Electrolytic treatment of an effluent of a chemical industry for monitoring toxicity by Saccharomyces cerevisiae. Salusvita 20:53-60. 2. Chung K, Kircovsky L, Kirkov A, Purcell WP (1997) Review of mutagenicity of monocyclic aromatic amines: quantitative structure-activity relationships. Mutat Res 387:1-16 3. Benigni R, Passerini L (2002) Carcinogenicity of the aromatic amines: from structure-activity relationships to mechanisms of action and risk assessment. Mutat Res 511:191-206. 4. Saracco G, Solarino L, Specchia V, Maja M (2001) Electrolytic abatement of biorefractory organics by combining bulk and electrode oxidation processes. Chem Eng Sci 56:1571-1578. 5. Azzam MO, Al-Tarazi M, Tahboub Y (2000) Anodic destruction of 4-chlorophenol solution. J Hazard Mater B 75:99-113. 6. Polcaro AM, Palmas S, Renoldi F, Mascia M (2000) Three-dimensional electrodes for the electrochemical combustion of organic pollutants. Electrochim Acta 46:389-394. 7. Sakakibara Y, Nakayama T (2001) a novel multi-electrode system for electrolytic and biological water treatments: electric charge transfer and application to denitrifi cation. Water Res 35:768-778. 8. Feng YJ, Li XY (2003) Electro-catalytic oxidation of phenol on several metal-oxide electrodes in aqueous solution. Water Res 37:2399-2407. 9. Israilides CJ, Vlyssides AG, Mourafeti VN, Karvouni G (1997) Olive oil wastewater treatment with the use of an electrolysis system. Bioresour Technol 61:163-170. 10. Moraes PB, Bertazzoli R (2005) Electro-degradation of landfi ll leachate in a flow electrochemical reactor. Chemosphere 58:41-46.