DESIGN OF SEWAGE TREATMENT PLANT (STP) FOR WAGHOLI CITY PUNE MAHARTASHTRA

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Abstract– Wastewater treatment is a process used to remove contaminants from wastewater or sewage and convert it into an effluent that can be returned to the water cycle with acceptable impact on the environment, or reused for various purposes (called water reclamation). The treatment process takes place in a wastewater treatment plant (WWTP), also referred to as a Water Resource Recovery Facility (WRRF) or a Sewage Treatment Plant (STP) in the case of domestic wastewater. Pollutants in wastewater are removed, converted or broken down during the treatment process.

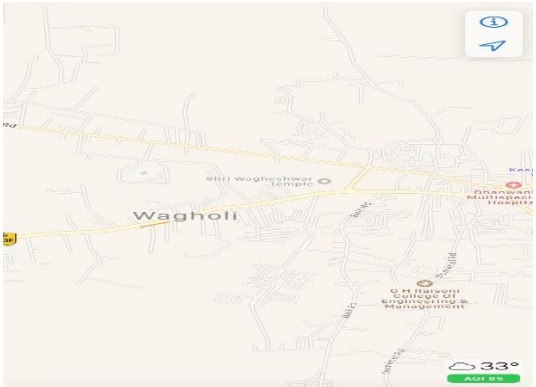
The main objective of this project is carried out to design of sewage treatment plant for a Wagholi city municipality, because it has a developing place due to steady increasing population, which in a results excess of sewage is produced. To avoid this problem, to construct the sewage treatment plant. This project focus on sewage generation in wagholi city considering the population of next 30 years.

Keywords - Physicochemical parameters; sewage treatment plant; wastewater collection; designing.

1) INTRODUCTION

The objective in wastewater treatment is to provide a low- cost process that is reliable meeting effluent quality standards. The contaminants in wastewater are removed by physical, chemical, and biological means. The individual methods usually are classified as physical unit operations, chemical unit processes, and biological unit processes. These operations and processes occur in a variety of combinations in treatment systems, it has been found advantageous to study their scientific basis separately because the principle involved do not change. Traditional design procedures for wastewater treatment systems attempt to minimize total capital cost by considering steady state concepts for unit processes and design guidelines. Sewage treatment is the process of removing contaminants from waste water primarily from house hold sewage. Physical, Chemical & Biological process are used to reduce contaminants & produce treated waste water that is safe for environment. A by-product of sewage treatment is usually semi solid waste or slurry called as sewage sludge. The sludge has to under-go further treatment before being suitable for disposal or application to land. Sewage can be treated close to where the sewage is created, which may be called as decentralized system. The treatment process has a series of treating units which are categorized under primary treatment, secondary treatment & tertiary treatment. The primary treatment removes suspended & floating solids of raw sewage. It includes screening to trap solid objects & sedimentation by gravity to remove suspended solid. Primary treatment can reduce the BOD of the incoming waste water by 20-30 % & TSS by some 50-60 %. Primary treatment is the first stage of the sewage treatment. The secondary treatment removes the dissolved organic matter that escapes primary treatment. Secondary treatment is typically performed by indigenous, waterborne micro-organisms in the managed habitat. It requires a separation process to remove micro –organisms from treated water prior to tertiary treatment. The tertiary treatment is sometimes defined as anything more than primary & secondary treatment in order to allow ejection into highly sensitive ecosystem. The tertiary treatment can remove more than 99% of all the impurities from sewage.

2) Location Of Area



3) LITERATURE REVIEW

Pramod sambhaji patil et.al.(2016) studied on design of sewage treatment plant for dhule city . Some treatment units are designed like screens, grit chamber, storage tank, settling tank, aeration tank and skimming tank. The effluent can also be used for artificial recharge of ground water, flushing, foam control, fire protection, lawn sprinkling .

Murthy polasa et.al (2014) reviewed about design of sewage treatment plant for gated community. In this project three types of treatment unit operations are conducted. Like physical, chemical and biological processes. By increasing the detention time of sewage in each treatment unit increases the efficiency of removal unwanted impurities .

M. Aswathy et al.(2017) studied on analysis and design of sewage treatment plant of apartment in Chennai. This project is studied that domestic and commercial waste and removes the material with possess harm from generated public. To produce an environmental sewage fluid waste stream and solid waste suitable from disposal of use.

N. S. Ramya et al.(2015) reviewed on design of sewage treatment plant and characteristics of sewage. The growing environmental pollution need for decontaminating water results in the study of characterization of waste water especially domestic sewage. The waste water leads to developing and implementing new treatment techniques to control nitrogen and other priority pollutants.

Chakar bhushan et.al. (2017) reviewed about design of sewage treatment plant for lohegaon village, pune. These project studied that social and environmental pollution issue due to sewage is disposed in some part of village and directly sewage drain in open land. It is used for recharging subsurface water level at lohegaon and used for irrigation purpose.

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4) FACTORS AFFECTING SELECTION AND DESIGN OF SEWAGE/ WASTEWATER TREATMENT SYSTEMS

A. Engineering factors

- Design period, stage wise population to be served and expected sewage flow and fluctuations.
- Topography of the area to be served, its slope and terrain; tentative sites available for the treatment plant, pumping stations, and disposal works.
- Available hydraulic head in the system up to high flood level in case of disposal into a river or high tide level in case of coastal discharges,
- Groundwater depth and its seasonal fluctuations affecting construction, sewer infiltration.
- Soil bearing capacity and type of strata to be met in construction and on-site disposal facilities, including the possibilities of segregating sludge and sewage and reuse or recycling of sludge water within the households.

B. Environmental factors

- Surface water, groundwater and coastal water quality where wastewater has to be disposed of after treatment.
- Odor and mosquito nuisance which affects land values, public health, and well-being, and Public health considerations by meeting the requirements laid down by the regulatory agencies for effluent discharge standards, permissible levels of microbial and helminths quality requirements and control of nutrients, toxic and accumulative substances in the food chain.

C. Process consideration

- Wastewater flow and characteristics
- Degree of treatment required
- Performance characteristics
- Availability of land, power requirements, equipment and skilled staff for handling and maintenance.

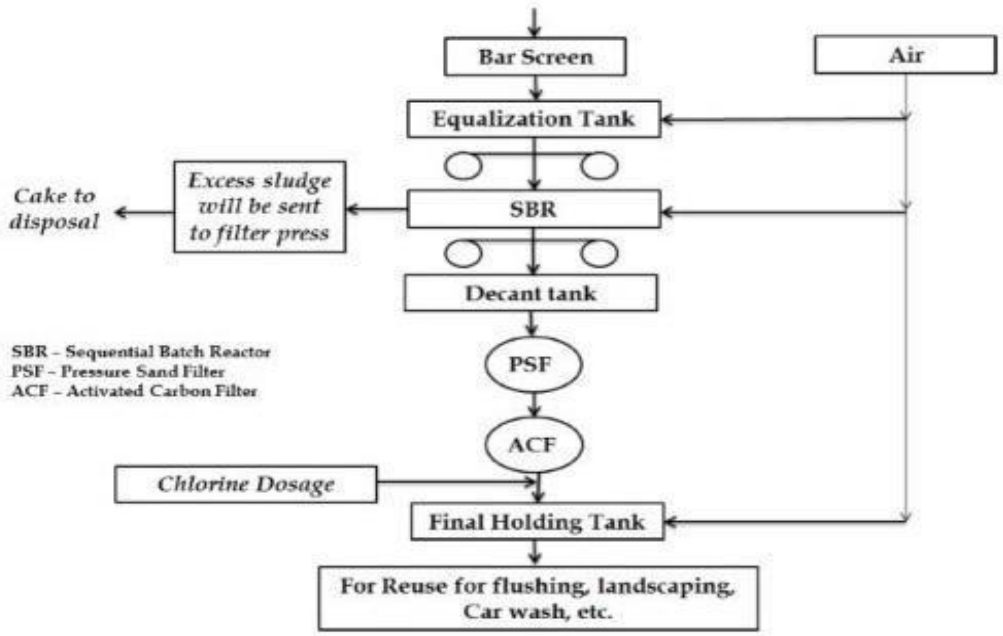
D. Cost consideration

- Capital costs for land, construction, equipment etc.

•Operating costs including staff, chemicals, fuels and electricity, transport, maintenance, and repairs etc.

5) METHODOLOGY

Flow chart for STP



Sewage treatment is the process of removing organic and inorganic matter present in wastewater and household sewage, both runoff (effluents) and domestic. It consists of physical, chemical, and biological treatment processes to remove physical, chemical and biological parameters which are present in waste water. Its main aim is to produce a treated effluent and sludge which are suitable for discharge without any adverse effects on the environment also the treated water or effluent is used for irrigation, industrial purposes. The sludge consists of many toxic organic and inorganic compounds. Sewage means the collection of wastewaters from all the areas of city that is domestic sewage and conveying them to some point of disposal. The liquid wastes or the sewage will require treatment before they are discharged into the near water body that is Nagavali River or otherwise disposal of untreated water will results to endangering the public health and also causing adverse effects on aquatic life.

Sewerage is the process of collection, treatment and ultimately disposal of the sewage. Sewage is liquid, which consists of any one means liquid waste origins from urinals, latrines, bath rooms, kitchens, commercial building or institutional buildings. Storm sewage is a liquid flowing in sewer during a period of rainfall and results in reduce the concentration of influent.

Treatment of sewage

The sewage treatment consists of many processes to remove different parameters present in waste water. The degree of treatment depends upon the characteristics of the raw sewage or influent and the required effluent characteristics. Sewage treatment processes are classified as:

1. Preliminary treatment

2. Primary treatment

3. Secondary treatment

4. Tertiary treatment

Screens and grit chamber

The purpose of screens is to remove large floating material and coarse solids from wastewater. Screens regularly comprise of wedge wire. It is done in two stages. In the first stage also called coarse screening, the measure of the opening is 20 mm to 30 mm. It catches the large articles. In the second stage called fine screening the openings differ between 1.5 mm to 6.4 mm. The cross segment range of the screens is commonly 1 m2. For a daily flow rate 22.2 MLD feed of waste water the pollutants removed this stage are almost 0.2 MLD. At the point when the head loss over the tank exceeds 0.6 M. The screens should be cleaned. Grit removal chambers are the sedimentation tanks placed before the fine screen to remove inorganic particles having specific gravity 2.65 like sand, egg shells and other non-putrescible materials may damage pumps due to abrasion. The grit basin is intended to scour the lighter particles while the heavier grit particles remain settled down [13].

Primary sedimentation

Sedimentation is the process of removing solid particles heavier than water by gravity settling i.e., the particle size less than 0.2 mm and specific gravity 2.65. In wastewater treatment, sedimentation is used to remove both inorganic and organic materials which are settle able in continuous-flow conditions [14]. The sedimentation tank comprises of a tank with 2 settling pipes where solid waste settles down. Baffles are provided to improve the settling process. At this stage the removal percentage of suspended solids are 60% to 65% and BOD from sewage is 30% to 35% [15]. Skimmers are used to remove the floating impurities like grease and oil on the water surface during sedimentation.

Biological treatment

The biological unit process of sewage is a secondary treatment in which colloids and dissolved solids of sewage, from primary sedimentation. The attached growth process, i.e., trickling filter, the microorganisms containing aerobes remain attached with filter media [16]. The effective size of the particle of filter media is of plastic material 25 cm to 75 cm, with a filter depth commonly 2 M to 3 M. The larger stones of size 8 cm to 10 cm placed in 15 cm to 20 cm thick and small size stones 2.5 cm at the base. 30% to 35% of BOD is removed from sedimentation, in this reactor, nearly 90% of sewage is removed [17].

Sludge digestion

The solids sediment from different units might be dried and disposed off. It also involves the treatment of highly concentrated wastes in the absence of oxygen by anaerobic bacteria. Sludge thickening used at medium to large plants is gravity thickening, dissolved air flotation, and centrifugation. Sludge dewatering is also known as sludge drying in which sand bed consists of a coarse sand 15 cm to 25 cm in depth. The drying period is 10-15 days and moisture content is 60% to 70% in sludge cake [18].

6) CONCLUSION

The ultimate goal of wastewater treatment is the protection of the environment in a manner commensurate with public health and socio-economic concerns. Based on the nature of wastewater, it is suggested whether primary, secondary and tertiary treatment will be carried out before final disposal.The results obtained from the study suggest that the conventional activated sludge has low degree of flexibility and treatment efficiency: however, the attached growth technologies are remarkably superior in pollutant elimination even of low HRT from residential waste water.

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