Construction Planning and Management for Sewage Treatment Plant

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Abstract- ***Users must concentrate their Sewage/Wastewater treatment process to ensure that it complies with regulatory guidelines. The main purpose of Sewage treatment process is to remove the various constituents of the polluting load: solids, organic carbon, nutrients, inorganic salts, metals, pathogens etc. Effective wastewater collection and treatment are of great importance from the standpoint of both; environmental and public health. Sewage/Wastewater treatment operations are done by various methods in order to reduce its water and organic content, and the ultimate goal of wastewater management is the protection of the environment in a manner commensurate with public health and socioeconomic concerns.***

Indexed Terms- BOD, STP, Waste Water, Wet Land Technology.

I. INTRODUCTION

Sewage/Wastewater are essentially the water supply of the community after it has been fouled by a variety of uses1. From the standpoint of sources of generation, wastewater may be defined as a combination of the liquid (or water) carrying wastes removed from residences, institutions, commercial and industrial establishments, together with such groundwater, surface water and storm water as may be present2. Generally, the wastewater discharged from domestic premises like residences, institutions and commercial establishments is termed as "Sewage/Community wastewater". It comprises of 99.9% water and 0.1% solids and is organic because it consists of carbon compounds like human waste, paper, vegetable matter etc.

II. HISTORICAL PERSPECTIVE TYPES OF FIBERS

Before the late 1800s, the general means of disposing human excrement was the outdoor privy while the major proportion of the population used to go for open defecation. Sewage treatment systems were introduced in cities after Louis Pasteur and other scientists showed that sewage borne bacteria were responsible for many infectious diseases3. The early attempts, in the 1900s, at treating sewage usually consisted of acquiring large farms and spreading the sewage over the land, where it decayed under the action of micro-organisms. It was soon found that the land became 'sick'. Later attempts included the discharge of wastewater directly into the water bodies, but it resulted in significant deterioration of the water quality of such bodies. These attempts relied heavily on the self-cleansing capacities of land and water bodies and it was soon realized that nature couldn't act as an indefinite sink. Methods of wastewater treatment were first developed in response to the adverse conditions caused by the discharge of wastewater to the environment and the concern for public health. Further, as cities became larger; limited land was available for wastewater treatment and disposal, principally by irrigation and intermittent filtration

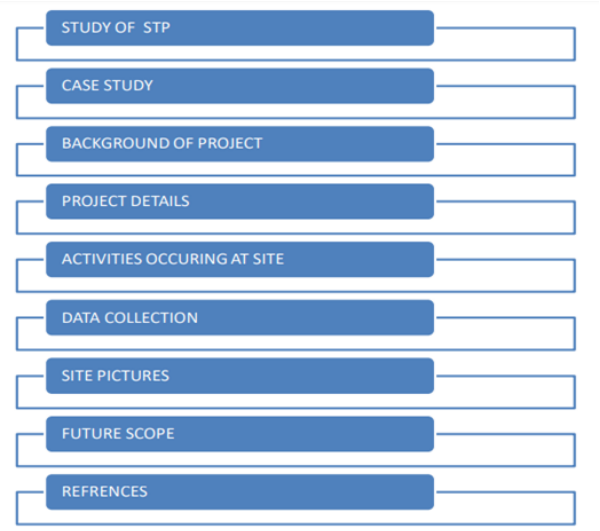
III. OBJECTIVES

- To study modern construction method and planning method for STP.
- To study cost of modern method of STP
- To compare modern method with conventional method.
- To study reuse of treated waste water and its management

IV. STUDIED LITERATURE

From the study of pervious literature, 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. The 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 sub surface water level at lohegaon (near to my college Dr D Y Patil School of Engineering & Technology, Lohgaon, Pune) and used for irrigation purpose. The 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.

V. METHODOLOGY



VI. UNIT OPERATIONS AND PROCESSES IN SEWAGE TREATMENT

The degree of treatment can be determined by comparing the influent wastewater characteristics to the required effluent wastewater characteristics after reviewing the treatment objectives and applicable regulations. 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. Although 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 principals involved do not change.

VII. PHYSICAL UNIT OPERATIONS

Treatment methods in which the application of physical forces predominates are known as physical unit operations. Screening, mixing, flocculation, sedimentation, floatation, filtration and gas transfer are examples of physical unit operations

VIII. CHEMICAL UNIT PROCESSES

Treatment methods in which the removal or conversion of contaminants is brought about by the addition of chemicals or by other chemical reactions are known as chemical unit processes. Precipitation and adsorption are the most common examples used in wastewater treatment11. In chemical precipitation, treatment is accomplished by producing a chemical precipitate that will settle. In most cases, the settled precipitate will contain both the constituents that may have reacted with the added chemicals and the constituents that were swept out of the wastewater as the precipitate settled. Adsorption involves the removal of specific compounds from the wastewater on solid surfaces using the forces of attraction between bodies.

IX. BIOLOGICAL UNIT PROCESSES

Treatment methods in which the removal of contaminants is brought about by biological activity are known as biological unit processes. Biological treatment is used primarily to remove the biodegradable organic substances (colloidal or dissolved) in wastewater6. Basically, these substances are converted into gases that can escape to the atmosphere and into biological cell tissue that can be removed by settling. Biological treatment is also used to remove nutrients (nitrogen and phosphorus) in wastewater

X. PRELIMINARY WASTEWATER TREATMENT

Preliminary wastewater treatment is the removal of such wastewater constituents that may cause maintenance or operational problems in the treatment operations, processes, and ancillary systems. It consists solely of separating the floating materials (like dead animals, tree branches, papers, pieces of rags, wood etc.) and the heavy settle able inorganic solids. It also helps in removing the oils and greases, etc. from the sewage2,4. This treatment reduces the BOD of the wastewater, by about 15 to 30%. Examples of preliminary operations are:

- Screening and combination for the removal of debris and rags.
- Grit removal for the elimination of coarse suspended matter that may cause wear or clogging of equipment and
- Floatation / skimming for the removal of oil and grease3

XI. PRIMARY WASTEWATER TREATMENT

In primary treatment, a portion of the suspended solids and organic matter is removed from the wastewater. This removal is usually accomplished by physical operations such as sedimentation in Settling Basins5. The liquid effluent from primary treatment, often contains a large amount of suspended organic materials, and has a high BOD (about 60% of original). Sometimes, the preliminary as well as primary treatments are classified together, under primary treatment7. The organic solids, which are separated out in the sedimentation tanks (in primary treatment), are often stabilized by anaerobic decomposition in a digestion tank or are incinerated. The residue is used for landfills or as a soil conditioner. The principal function of primary treatment is to act as a precursor to secondary treatment

XII. SECONDARY WASTEWATER TREATMENT

Secondary treatment involves further treatment of the effluent, coming from the primary sedimentation tank and is directed principally towards the removal of biodegradable organics and suspended solids through biological decomposition of organic matter, either under aerobic or anaerobic conditions. In these biological units, Construction Planning and Management for Sewage Treatment Plant 17 bacteria will decompose the fine organic matter, to produce a clearer effluent. The treatment reactors, in which the organic matter is decomposed (oxidized) by aerobic bacteria are known as Aerobic biological units; and may consist of:

- Filters (intermittent sand filters as well as trickling filters)
- Aeration tanks, with the feed of recycled activated sludge (i.e. the sludge, which is settled in secondary sedimentation tank, receiving effluents from the aeration tank),
- Oxidation ponds and aerated lagoons. Since all these aerobic units, generally make use of primary settled sewage; they are easily classified as secondary units.
- The treatment reactors, in which the organic matter is destroyed and stabilized by anaerobic bacteria, are known as anaerobic biological units and may consist of:
- Anaerobic lagoons, Septic tanks, Inhofe tanks, etc.

Out of these units, only anaerobic lagoons make use of primary settled sewage, and hence, only they can be classified under secondary biological units. Septic tanks and Inhofe tanks, which use raw sewage, are not classified as secondary units. The effluent from the secondary biological treatment will usually contain a little BOD (5 to 10% of the original), and may even contain several mg/L of DO. The organic solids/ sludge separated out in the primary as well as in the secondary settling tanks are disposed off by stabilizing under anaerobic conditions in a Sludge digestion tank.

XIII. TERTIARY/ ADVANCED WASTEWATER TREATMENT AND WASTEWATER RECLAMATION

Advanced wastewater treatment, also called tertiary treatment is defined as the level of treatment required beyond conventional secondary treatment to remove constituents of concern including nutrients, toxic compounds, and increased amounts of organic material and suspended solids and particularly to kill the pathogenic bacteria. In addition to the nutrient

removal processes, unit operations or processes frequently employed in advanced wastewater treatment are chemical coagulation, flocculation, and sedimentation followed by filtration and chlorination. Less used processes include ion exchange and reverse osmosis for specific ion removal or for the Construction Planning and Management for Sewage Treatment Plant 18 reduction in dissolved solids. Tertiary treatment is generally not carried out for disposal of sewage in water, but it is carried out, while using the river stream for collecting water for re-use or for water supplies for purposes like industrial cooling and groundwater recharge.

XIV. NUTRIENT REMOVAL OR CONTROL

The removal or control of nutrients in wastewater treatment is important for several reasons –

- Wastewater discharges to confined bodies of water cause or accelerate the process of eutrophication, Wastewater discharges to flowing streams tax oxygen resources for the removal of nitrogenous BOD thereby depleting the aquatic life
- Wastewater discharges when used for groundwater recharging that may be used indirectly for public water supplies could cause health problems like blue baby diseases in children.

The nutrients of principal concern are nitrogen and phosphorus and they can be removed by biological, chemical, or a combination of processes. In many cases, the nutrient removal processes are coupled with secondary treatment, for example, metal salts may be added to the aeration tank, mixed liquor for the precipitation of phosphorus in the final sedimentation tanks, or biological de-nitrification may follow an activated sludge process that produces a nitrified effluent.

XV. TOXIC WASTE TREATMENT/SPECIFIC CONTAMINANT REMOVAL

Physico-chemical treatment such as chemical coagulation, flocculation, sedimentation, and filtration reduces many toxic substances such as heavy metals. Some degree of removal is also accomplished by conventional secondary treatment. Wastewaters containing volatile organic constituents may be treated by air stripping or by carbon adsorption. Small concentrations of specific contaminants may be removed by ion exchange.

XVI. CASE STUDY

- Aurangabad Municipal Corporation as part of its strategy for infrastructure development in the City has prepared the DPR of Underground Sewerage Scheme under UIDSSMT.
- The DPR has been technically sanctioned by Maharashtra Jeevan Pradhikaran for the cost of Rs. 365.69 Cr.
- The main component of the Underground Sewerage Project is 260.12 Kms of proposed Sewerage collection Network of Pipes ranging from 150 mm to 2000 mm diameters and 60 km of main sewer network.6 Terminal Sewage Pumping Stations and One Intermediate Pumping Station at Ward No. 98.Proposed STPs at 6 different locations for the total capacity of 216 MLD.
- The STPs proposed at the locations of Kanchanwadi -161MLD, Zalta - 35 MLD, Banewadi- 30 MLD, Siddarth Garden – 4.5 MLD , Padegaon – 10 MLD, CIDCO – 15 MLD

XVII. DATA COLLECTION AND ANALYSIS OF DPR

Date:- 15/06/2019

Sr.NO	Category	Mason	Carpenter	Helper	Fitter	Helper	M/C	F/C	Total
1	Shuttering Work	0	6	9	0	0	0	0	15
2	Reinforcement Work	0	0	0	5	7	0	0	12
3	Curing	0	0	0	0	0	3	5	8
4	Concreting	1	1	2	1	2	6	9	22
	TOTAL MANPOWER	1	7	11	6	9	9	14	57

Work Done :-

Sr.no	Activity
1	SBR basin No.8 –Steel binding & Shuttering ofRetaining Wall – W3
2	Column of Primary Unit – Col. No. 22,23,29,30,34,35
3	SBR basin No. 7 – Casting of Retaining Wall haft height –W4
4	Column of Primary Unit – Shuttering of column no.24,25,27,36,38,40

- **SITE PHOTOGRAPHS**

Fig 6.1 STP Plant

Fig 6.2 STP Slab Casting

CONCLUSION

From the above discussion it can be concluded that in the developed countries much work has been done in the field of wastewater reuse system but we can't say the same about developing countries. In developing countries wastewater reuse is still in the beginning stage and much work is needed in that field. Wastewater treatment performance now a day big problem if we improve our methodology we definitely solved big problem. There are plenty of emerging technology which is making increase performance of wastewater in reused system. But we used only appropriate technology whom suitable. In Indian conditions, sequential batch reactor process is more economical and more efficient. It is a totally chemical process which is great for non-portable purpose. It needs less land but requirement of external energy source for its aeration and equalization along with chemical costs makes it costly. Constructed wetland technology for water reuse in irrigation purpose is suitable because of its good efficiency and for its benefit to green belt areas. It's totally a natural process with no use of chemicals and hence there is no need of specialized supervision to run it. Its main drawback is its bad odour which becomes a breeding place for mosquitoes, requirement of more land and it's Also a time consuming process when compared to sequential batch reactor.

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[9] Discussion: Lin et al. (2004), Arrojo et al. (2005), Bothe researcher used domestic wastewater treatment successfully with help SBR process and good effluent result give. And other V. Subbaramaiah and Indra Deo Mall (2012), also were provide successful wastewater treatment and efficiency also good. Sirianuntapiboon et al. (2005),

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