

DESIGN OF SEWAGE TREATMENT PLANT UNITS FOR ST. JOHN COLLEGE CAMPUS

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ABSTRACT

Waste water is water that has adverse effects on environments. The sewage from campus has been identified which tends to water pollution. Sewage is water carried waste, in solution or suspension that is intended to remove from community. As it is more than 99% water and characterized by rate of flow its physical, chemical and biological factors. The Biochemical Oxidation Demand (BOD), Chemical Oxygen Demand (COD), chlorine content, Total Dissolved Solids (TDS) concentration of sewage ranges from 30-200 mg/liters, 280-900 mg/liters, 200-500 mg/liters, 500-2000 mg/liters. The treatment procedure has been developed to treat sewage and reuse the water for various purposes like water to gardening, toilet flushing, farming and other requirements for Aldel technical campus, Palghar.

Keywords - *wastewater*, *sludge*, *BOD*, *COD*, *Reuse*, *sewage*, *TDS*.

I. INTRODUCTION

Sewage treatment is a process of removing contaminants from waste water, primarily from household sewage. It includes physical, chemical and biological process to remove these contaminants and produced environmentally safer treated waste water.

Sewage is carried waste, in form of solution or suspension that is intend to be remove from community. Most of them recognize it as domestic or municipal water waste. It is more than 99% water and is characterized by volume or rate of flow, physical condition, chemical and toxic constituents. It consist

mostly of grey water, black water, soaps and detergents and toilet papers.

The principle purpose of project to improve water supply and sanitation is to improve health. On the other hand, the mere provision of water and sanitation infrastructure will not, in itself, improve health. To get maximum benefit out of an improved water supply and sanitation infrastructure, people need to be supported with information that will enhance education. Treatment plant reduce pollutants in waste water to a level nature can handle. It would be pertinent to point out that even the civic infrastructure of our college campus are finding it increasingly difficult to cope of with the pollution load that is being generated and discharged into underground sewerage systems. Hence it is mandated that respective components must build their localized waste water and sewage treatment facilities and reuse at least a part of their waste water for gardening, farming and toilet flushing etc. To achieve sustainable water supply and sanitation development requires effective complementary inputs such as community participation, community capacity building and community training.

II. LITERATURE SURVEY

In this paper, he gave procedure for various treatment process such as preliminary treatment, primary settling, secondary treatment and tertiary treatment. He studied that preliminary treatment consist of solely in separating the floating materials like tree branches, papers, pieces of rags, wood etc. and heavy settleable inorganic solid. The process under this is screening, grit chamber and

skimming tank. Primary treatment consists of removing large suspended organic solids. It is usually accomplished by sedimentation on settling basin. Secondary treatment is carried out either aerobic or anaerobic conditions for organic matter. Tertiary treatment is to provide a final treatment to raise the effluent quality before it is discharged to receiving environment [7]. In this paper they survey manorial qualities. He concluded that sewage were normal to marginally alkaline in response and contained abnormal state fundamental tones, especially in winter, bicarbonate and chloride ions were at toxic levels. Despite the fact the sewage effluents and slugged were rich in nutrients the toxicity levels [1]. He planned numerous procedures and worked by keeping in mind the end goal to imitate the normal treatment procedure to diminish the contamination burden to a level that nature can deal with in such manner, exceptional consideration is important to survey the natural effects of existing waste water treatment offices [4]. They studied that in this paper earth is divided into the lithosphere or land masses and the hydrosphere or the oceans, lakes, streams and underground waters. The hydrosphere includes the entire aquatic environment. Our world both lithosphere and hydrosphere is shaped by varying life forms. Permanent forms of life create organic matter and in combination with inorganic materials help establish soil. Plants cover the land and reduce the potential for soil erosion – the nature and rate of erosion affects the distribution of materials on the surface of the Earth. Two environments, biotic (living environment or community) and abiotic (non living environment), combine to form an ecosystem. Gas collection from sludge digestion tank. From the sludge digestion tank various gases are collected such as methane (CH₄), carbon-dioxide and hydrogen sulphide (H₂S). The main combustion constituent in gas is methane i.e. 60%-70%. Sludge gas having 70% methane has a fuel value. This gas can be used for following purposes: For heating the plants of digester, buildings, incinerators and hot water supply. For plant power production-pumping, air and gas compressors. For gas supply to small factories and institutions. Motor fuel for municipal cars and trucks [8].

III. PROPOSED WORK

Sewage treatment is process of removing contaminants from waste water and household sewage, both runoff and domestic. It includes physical, chemical and biological process to remove contaminants. Its objectives is to produce a treated effluents and solid waste or sludge suitable for discharge or reuse back into the environment. This material is often inadvertently contaminated with many toxic organic inorganic compounds. Sewage implies the collection of waste water from occupied area and conveying them to some point of disposal. The liquid wastes will require treatment before they are discharge into water body. If it is disposed off without treatment, it would in danger the public health or cause offensive conditions.

A. Treatment of sewage

The treatment of sewage consist of many complex functions. Treatment processes are often classified as:

- 1) Preliminary treatment
- 2) Primary treatment
- 3) Secondary treatment
- 4) Tertiary treatment

1) Preliminary treatment :

- Screening – To remove floating papers, rags, clothes.
- Grit chamber – To remove grit and sand.
- Skimming tank – To remove oil and grease.

2) Primary Treatment:

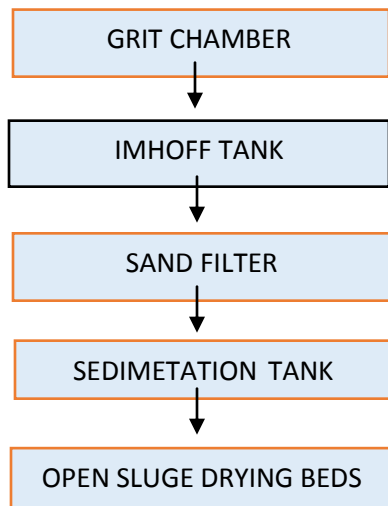
It consist of removing large suspended organic solids. It is usually accomplished by sedimentation in settling basins. The liquid effluents from primary treatment often contains large amount of suspended organic material and has a high BOD.

3) Secondary Treatment:

- Aerobic treatment
 - Filters
 - Activated sludge plant
 - Oxidation ponds and aerated lagoons
- Anaerobic treatment
 - Anaerobic lagoons
 - Septic tank/ Imhoff tanks

4) Tertiary Treatment :

The purpose of tertiary treatment is to provide a final treatment to raise the effluent quality before it is discharged to the receiving environment (sea, river, lake, ground, etc.)



B) Analysis of sewage:

The analysis of sewage test sample is to determine the nature and concentration of physical, chemical and biological parameters. The information is required for planning, designing, operation and maintenance of treatment of sewage of college campus.

1) Physical test:

1. Colour:

The colour of sewage can normally be detected by the naked eye, and it indicates the freshness of sewage.

2. Odour:

Fresh sewage is practically odourless. But, however in 3-4 hours, it becomes stale with all oxygen present in sewage being practically exhausted.

3. Temperature:

The temperature has an effect on the biological activity of bacteria present in sewage, and it also affects the solubility of gases in sewage.

4. Turbidity:

Sewage is normally turbid. The turbidity increases as sewage becomes stronger.

2) Chemical test:

1. PH:

As per IS: 3025(part 11) – Reaffirmed 2002, In chemistry, **PH** (potential of hydrogen) is a numeric scale used to specify the acidity or basicity of aqueous solution.

2. Total solids:

(As per IS:10500-1991)The total solids are quantity of suspended, dissolved and colloidal solids in the sewage and the nature may be organic or inorganic. The total solids are the important indicator of strength of sewage.

3. COD:

The amount oxygen consumed for chemical oxidation of organic matter with potassium permanganate or potassium dichromate in an acidic solution is called chemical oxygen demand.

4. BOD:

The amount of oxygen required for biochemical oxidation of the decomposable matter at specified temperature within the specified time under aerobic conditions is called as biological oxygen demand.

5. Chlorides:

Chlorides are stable and hence not a measure of degree of treatment. The normal chloride concentration in sewage is 120mg/lit.

6. Total suspended solids:

As per IS:3025 (part 16 & 17), total suspended solids is dry wet of particles trapped by a filter.

7. Hardness:

As per IS:3025 (part21) - reaffirmed 2002, hard waters are generally considered to be those water that require considerable amounts of soap to produce foam and that also produced scale in water pipes, heaters, boilers and other units in which the temperature of water is increased.

- Sewage Test:

Sr. no.	Name of Test	Result	Acceptable Range (IS:10500)	Determination
1.	PH(IS:10500-1991)	7.4	6.5 – 8.5	Pass
2.	COD(IS-3025 Part-58)	541.33mg/lit	3 – 900mg/l	Pass
3.	Total Suspended Solid(IS-3025 Part-18)	533.33mg/lit	500 – 1500mg/l	Pass
4.	BOD	198.67mg/lit	30 – 200mg/l	Pass
5.	Total Dissolved Solid(IS-3025 Part-16&17)	315mg/lit	500 – 1500mg/l	Permissible
6.	Hardness (IS-3025 Part-21)	299.09mg/lit	250mg/l	Permissible

- Data collection and identification :

No. of people in college campus:-

	Engineering	Diploma	B Ph	D Ph	MBA	HM	Junior College	School	Nursery
Total Students	1784	372	387	117	95	831	296	530	198
Teaching Staff	84	22	27	06	06	28	17	26	08
Non-Teaching	40	02	17	02	05	12	01	04	01
Admin	23	06	07	04	02	04	01	04	01

IV. CONCLUSION

- The average ranges of physical, chemical and biological characteristics of waste water quality are experimented and found out's.

➤ Dimension of grit chamber = 9m × 0.15m × 0.5m

➤ Imhoff tank =

1. Design of sedimentation tank –
Length= 11m , breadth= 3.9m
2. Design of gas vent and neutral zone –
Width = 0.9m
3. Design of digestion chamber –
Height= 6.0667m
Hence, Total height = 9.067

Overall size = 11m × 3.9m × 9.067m

- Sand filter = 4 filter units and each unit of size 14m × 7m

➤ Sedimentation tank = 18m × 7.4m × 3.5m

➤ Sludge drying bed = 15m × 22m (1 bed)

➤ SCOPE :

- The future scope of Sewage treatment plant for Aldel campus is that the treated water can be use for gardening, green belt, farming and the rest part of water can be use for toilet flushing.
- The main intention of this project is to make contribution towards solving the problems posed by contaminated water.
- Different methods for treatment of water are discussed and conditions are highlighted under plants and equipment would be build.
- The manual intents to give planners of such projects a helping hand to realize their plans and it point out the problems and risk inherent in these activities.

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