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TITLE: WASTEWATER TREATMENT AND REUSE

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Abstract

Wastewater is dirty, used water that goes down the drains & toilets of homes, schools, business & factories. Wastewater is collected in networks of pipes called "Sewers". Firstly, the wastes in wastewater is dangerous & can threaten the health of humans & environment. These dangerous wastes must be taken out of the water & treated and disposed off safely. Secondly, Water is a precious resource and must be returned to the natural water cycle. This paper reviewed researches on wastewater treatment processes, the methods employed in these researches are aerobic, anaerobic or the combination of both methods. The BOD, COD, TSS concentration of Sewage ranges from 180 -200 mg/L , 280 -340 mg/L & 150 to 200 mg/L respectively .The treated sewage can be reused for various purpose like cooling water make up, gardening , landscape development , toilet flushing, road washing etc. thus leading towards water conservation. The paper presents the importance and the necessity to increase the efficiency of cleaning process of the residual waters from waste industry. The various methods of treatment of the residual wastewaters, in order to find the best condition and parameters treatment process.

Index Terms: *BOD, COD, Reuse, Sewage, TSS, Grey water, Black water, Activated sludge process.*

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1. INTRODUCTION

Waste water is liquid waste discharged by domestic residences, commercial properties, industry, agriculture, which often contains some contaminants that result from the mixing of wastewater from different sources. The wastewater can be classed as sanitary, commercial, industrial, agricultural or surface runoff based on its origin. The term wastewater and Sewage needs to be separated. The water which is contaminated with feces or urine is called sewage. The sewage generates from residence, hospitals, offices, industries etc. Sewage includes domestic, municipal, or industrial liquid waste products disposed off, usually via a pipe or sewer (sanitary or combined), Domestic sewage contains a wide variety of dissolved and suspended impurities and is the primary source of pathogens (disease-causing microorganisms) and putrescible organic substances. Harmful bacteria and disease-causing pathogens & this waste doesn't break down and decompose in water fast called "Black Water" and the wastewater that comes from clothes washers, bathtubs, showers, dishwashers, and sinks called "Grey Water". Although grey water contains less than 10% of nitrogen found in black water, grey water has a higher level of un-reacted organic material readily available to micro-organisms and therefore decomposes much faster than black water.

2. Materials and Methodology:

In this research paper the treatment technologies adopted for treating sewage are as follows:

I. Aerobic Process
II. Anaerobic Process

2.1 Aerobic Process

Aerobic treatment is a biological process that uses oxygen to break down organic matter and remove other pollutants like nitrogen and phosphorus. The oxygen is supplied by nature surface aeration and by algal photosynthesis. It converts the organic matter into carbon dioxide and new biomass. The sewage containing organic material is a necessary food for aerobic pollutant like bacteria which stabilize putrisible matter by oxidizing it and release CO_2 which is taken up by the algal

for their growth. Algal produced more algal cells and oxygen which helps in maintaining the aerobic condition of the pond. These treatment plants treat the sewage with digestion of organic matter or sewage using an 'Aerobic Activated Sludge' process, which takes place in an oxygen enriched environment process using anaerobic digestion, which can be in the order of 70 to 90 days, depending on temperature.

Aerobic digestion has two main phases within the treatment cycle:

I. Aerobic digestion is called Activated Sludge which is formed through aeration of the incoming sewage where it is mixed with the previously grown deposit of so called humus known as a bacterial biomass, where digestion of nutrients and Ammonite takes place.

II. The bacterial biomass quite readily flocculates and settles in a quiet zone where the solids are retained after settling and the clear water is removed by decanting. The settled solids stay within the system to become mixed with the new incoming sewage to be digested and oxidised through continuous never ending cycles of aeration in an oxygen enriched environment within the treatment system.

Fig-1Aerobic wastewater treatment

2.2 Anaerobic Process

In this type of treatment system or two-stage treatment system, two individual totally different processes are used which do not complement each other but rather are at opposite ends of the biological chain.

I. The Primary process is septic and Anaerobic.

II. The Secondary process is Aerobic.

Anaerobic digestion takes place where organic matter is allowed to putrefy through acid fermentation in a septic tank. This process takes several months as compared to the aerobic process, which takes several hours. The septic processed developed sulphur compounds, which is food for sulphur seeking microorganisms. This process also produces odorous smells when the effluent is discharged. Effective operation requires a balance between step 1 and step 2, because the methane producers are sensitive to the concentration of volatile acids. Sludge or solid built-up is much less in this system because some quantity of waste is used by the anaerobic biosystem as source of energy and in the synthesis of new bacterial cells. If the contents of anaerobic pond are in the black colour, it indicates proper functioning of the pond. The process is somewhat attended by septic odours and the effluent will be only partially purified. The obnoxious odours are the results of the reduction of sulphate compounds to hydrogen sulphide, by the acid producing bacteria. At high concentration, H_2S attacks painted surface and is deleterious if inhaled for an extended period. The long term solution of this problem is to limit the concentration of sulphate in the influent.

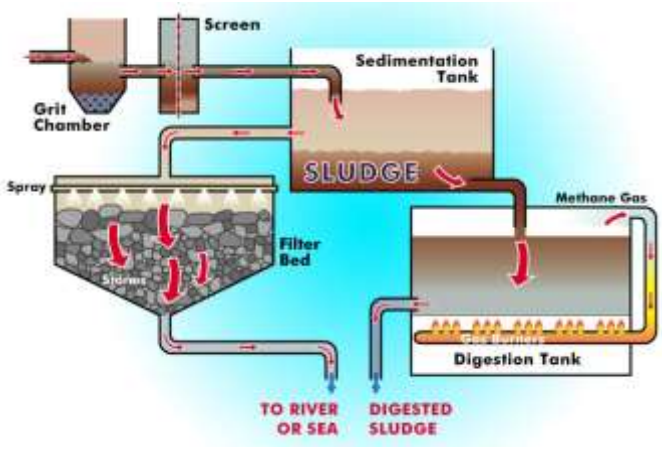

Fig-2 Anaerobic wastewater treatment

3. PROCESS USED

Now, let's see, how to remove the settling solids from the wastewater. As stated above there are two methods for treatment of wastewater. Out of which we have adopted the anaerobic method. We had treated the wastewater by anaerobic process of 10 days duration. We had tested the parameters such as pH, temperature, Chemical oxygen demand (COD), Biochemical oxygen demand (BOD), Dissolved oxygen (DO), Total solids (TS) before storing the wastewater in the anaerobic treatment process for 10 days and after the anaerobic process the wastewater was tested again. The BOD test is performed for the period of 5 days by using Wrinkles method. COD test is performed for 2hours by tritrimetric method. DO is performed to check the quantity of dissolved oxygen in the waste water. The pH test was conducted on pH meter to check the pH of wastewater. The TS is performed by weight balance method. The results of the parameters tested were then compared

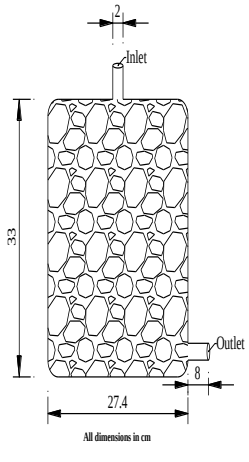

Fig: Anaerobic process model

Fig-3: Anaerobic Process

This is the model for anaerobic process for the treatment of wastewater. The model is made up of steel material. It has an inlet as well as an outlet. The height of model is 33cm, its outer diameter is 27.4cm whereas the inner diameter is of 27.2cm. The capacity of model is of 18 litres. The model is filled with the pieces of bricks. The size of pieces of bricks is 2.0cm to 3.0cm. These bricks are stored in the model so that they can absorb the organic matter present in the wastewater. The wastewater is then pored in the model through the inlet and then the inlet as well as the outlet is sealed. The wastewater is kept in the model for 10 days. During these 10 days the anaerobic process is carried out.

3.1 Following are the Result

Sr. No.	Parameters	Inlet reading	Outlet reading	Permissible Limits for irrigation.	Efficiency (%)
1.	Total Solids	728.2(mg/L)	696.6(mg/L)	500 - 2000(mg/L)	4.33
2.	Dissolved Oxygen	2.56(mg/L)	2.26(mg/L)	>2(mg/L)	-
3.	Biochemical Oxygen Demand	60(mg/L)	42(mg/L)	<100(mg/L)	30
4.	Chemical Oxygen Demand	288(mg/L)	64(mg/L)	<250(mg/L)	77.77
5.	pH	8.20	7.15	5.5-9.0	-
6.	Temperature	23.5°C	20.3°C	-	-

Table -1 Result of Anaerobic Treatment Model

Specific Estimation Conducted:
Following estimations were conducted:

- pH
- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Total Suspended Solids (TSS)
- Temperature

4. CONCLUSION

Results of this study indicates that anaerobic treatment is a effective method for removal or decomposition of organic matter from wastewater. It was found that the anaerobic Process was more effective then aerobic process. The efficiency of the parameters tested were quite surprising.

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