

PERFORMANCE EVALUATION OF SEWAGE TREATMENT PLANT & COST-EFFECTIVE MEASURES IN TREATMENT PROCESS

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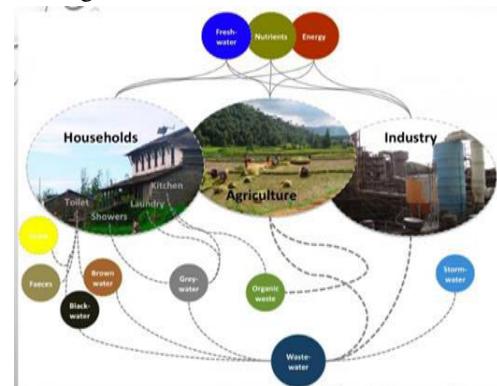
Abstract- In this project one of the Asia's biggest STP with UASB (Up flow Anaerobic Sludge Blanket) Technology in terms of Capacity (339 MLD) 226 MLD Sewage is tapped from outfall sewer Chamber. Wastewater, treated or untreated, eventually ends up in rivers, streams, lakes, and oceans. We often assume that groundwater is pure, but unfortunately, well water contaminated by sewage is a common cause of outbreaks of wastewater related diseases. Untreated wastewater can spread diseases and contaminate drinking water sources. Operational efficiency is always of at most importance in treatment facilities and this has driven innovation in the sector for quite some time. Almost 80% of water supply flows back into the ecosystem as wastewater without any treatment. Waste water samples were collected at different stages of treatment units and analysed for the major water quality parameters, such as biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total dissolved solids (TDS) and pH. The performance efficiency of each unit in treating the pollutants was calculated. Overall performance of the plant also has been estimated. The obtained results were very much useful in identification and rectification of operational and maintenance problems as well as the future expansion to be carried out in the plant to meet the increased hydraulic and organic loadings. In this process cost will be reduce by using UASB treatment process. UASB is the advanced treatment process. At fine screening by using mechanical screening to reduce the cost.

Keywords- Bod, waste water, cod.

1.Introduction

Water is the most significant resource in the world, and now is in danger due to urbanization, increasing population, inadequate rainfall, climatic change, and economic development etc. Water is required to be used efficiently due to its increasing

demand . This can be achieved by using existing sources of water with proper management and adopting both traditional and modern approach for improving efficiency such as ground water recharge, conservation of water, and reuse of waste water etc. Among all the methods, reuse of waste water has become the most important for both economic and environment reasons. Earlier wastewater after treatment was used in agricultural activities but nowadays it is intensifying its applications in urban, industrial and construction industry. The important pathways for reuse of waste water contains surface water replenishment, irrigation, ground water recharge, and industrial use.



The volume of water carried through each pathway depends on degree of water utilized for different purpose, climatic factors, watershed characteristics, quantity of direct and indirect water reuse. Also, water problems are in need of immediate assistance because of increasing environmental hazards to human health.

There are three constituents and interrelated aspects of **Wastewater treatment:**

Collection:

Collection of domestic and industrial wastewater is best achieved by a fully developed sewerage or water carriage system. The planning and design of wastewater collection facilities involves the determination of wastewater flow rates; the

hydraulic design of sewers, large conduits, and junction and diversion structures; the selection of sewer appurtenances and pumping stations.



Inlet

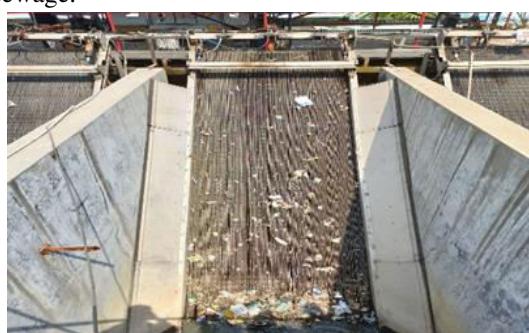
Preliminary Treatment: This is the initial stage/ first stage of wastewater treatment Which includes removal of large materials or coarse solids usually found in raw water. This treatment consists of filtering screen which helps in breaking the large objects to Prevent blockage in treatment process. Preliminary treatment stage also includes flow Measurement devices.



Coarse screen

Primary Treatment: This treatment takes place after preliminary treatment which Aims to reduce any kind of heavy solids that are settled at the bottom due to Sedimentation while light solids like oil and grease float over the surface by skimming. After removing the both floating and settled materials the remaining liquid is Discharged to next stage of treatment. The efficiency of primary treatment is to

Remove around 60% of suspended solids from sewage.



Mechanical screen

2.literature review

Literature Review based on variation of different parameters in Sewage Treatment Plant:

Dissolved Oxygen and Biochemical Oxygen Demand

1.Hassan (2015)- Conducted study on BOD, COD, and DO of sewage treatment plant, which recorded 7.78 mg/l at receiving point and 7.82 mg/l at outlet.

2. The research on water quality assessment of sewage treatment plant is conducted by vignesh (2013) which gave 3.6 ± 0.6 mg/l DO at receiving point and 5.7 ± 0.6 mg/l DO at outlet. Review based on variation in COD of Sewage Treatment Plant: Chemical Oxygen Demand

3.Durga et al. (2013)- Performed the study on treatment efficiency of algae-based waste water treatment plant which stated COD of 455.7 mg/l at receiving point and 206 mg/l at outlet.

4.Rajkumar (2016)- Performed a study on interpretation of biological method for the sewage treatment and found TSS of 755 mg/l at receiving point and 12 mg/l at outlet.

5.Durga et al. (2013)- Performed the study on treatment efficiency of algae-based waste water treatment plant which stated conductivity of 987 $\mu\text{S}/\text{cm}$ at receiving point and 1080 $\mu\text{S}/\text{cm}$ at outlet.

3.Process

Secondary Treatment: This treatment takes place after removal of floating and Settled materials from the sewage which aims at removing suspended and dissolved biological matter. Secondary sludge which is removed during secondary Sedimentation is generally mixed with primary sludge for sludge processing. This Treatment involves a separation process for removal of microorganisms from treated Water before moving to next stage of treatment. The efficiency of secondary treatment Is to remove around 90% of suspended solids from sewage.

UPFLOW ANAEROBIC SLUDGE BLANKET (UASB) REACTOR:

UASB is an anaerobic process whilst forming a blanket of granular sludge and Suspended in the tank. Wastewater flows upwards through the blanket and is processed by the Anaerobic microorganisms. The upward flow combined with the settling action of gravity Suspends the blanket with the aid of flocculants. The blanket begins to reach maturity at around 3 months. Small sludge

granules begin to form whose surface area is covered in aggregations of Bacteria. In the absence of any support matrix, the flow conditions create a selective environment in which only those microorganisms, capable of attaching to each other, survive and proliferate. Eventually the aggregates form into dense compact biofilms referred to as "granules".



UASB reactor

How does the UASB reactor Work?

Fine granular sludge blanket acts as a filter to prevent the solids in the incoming wastes to flow through as the liquid part does. So, if the hydraulic retention time (HRT) does not Change, which is limited to 1-3 days (the bigger the Reactor, the shorter time it is, because the Size costs money), the solid retention time (SRT) can be 10-30 days or more for more effective Digestion, depending on the shape of the digestion chamber. It means that the digester becomes Much more efficient without having to increase the size, which costs money. Wageningen University in the Netherlands has started to do R & D along these lines. Standing and hanging Baffles are used, with a conic separation with a small outlet at the centre will be much more effective to keep the anaerobic sludge blanket in the lower part of the digester.

This will act as a very good filter to retard the flow of solids in the wastes and prolong the solid retention time for more bacterial action. However, the digester will be more economic If the loading can be increased for a specific size of digester with the conic separation. COD

Reduction of 58% now obtained is adequate, and no attempt should be made to increase the Bacterial action at such high costs. It is better to use much cheaper open tanks and basins for More effectiveness and efficiency, as in the IF&WMS (Integrated Farming and Waste Management System). Bio-Chemical Activities in USAB Reactors Bacterial actions are in 3 Phases in the

digester and they occur IN SEQUENCE: The UASB reactors consist of:

- UASB reactors (24 in number of each size 32mts*28mts*5.8*mts liquid depth) Is the place where the separation of gas, liquid, and solid stakes place. The Reduction of BOD is 75% in the reactors.
- In this process the Whole waste is passed through the anaerobic reactor in an up-Flow mode with a hydraulic retention time (HRT) of 8.8 hrs. The up-bowing sewage itself forms millions of small particles of sludge provide a large surface area on which organic matter, undergo Biodegradation. The high solid retention time (SRT) of 33 days occurs within the unit. Excess Sludge is removed and taken to sludge pump house and pumped to Belt Press where moisture is Removed and it is formed into sludge granuleor Which are in suspension and cakes which can be used as Manure (165Cum/day).

AERATION:

Facultative Type of Aerated Lagoon:

The flow from UASB reactor will be treated in a facultative type of aerated lagoon of 1.5 days hydraulic retention time to provided aeration and settlement of suspended solids for Further treatment of the effluent from UASB reactors. This aerator provides the oxygen to be Decomposed along with water by providing huge surface area .8 Aerators of 50 HP capacity is Operated out of 30 Aerators and resulting induction of oxygen reduced the BOD load by further 75%. The detention period in FAL is 24 hrs. Sewage is then led to polishing Pond. For 12 hours Where further TSS is reduced below 50 mg/L.



Aeration work

POLISHINGPOND:

Polishing ponds are used to improve the quality of effluents from efficient UASB Reactors, so that final effluent quality becomes compatible with desired standards. The residual Organic solids

concentrations in the digested sewage are reduced. It is mainly used to improve the hygienic quality. Polishing pond with 3 baffle walls to increase the length of flow with a Detention period of 1 2hours, where any remaining suspended solids are removed.



Polishing pond

CHLORINATION SYSTEM:

Chlorination system has been given in the system in the design meet the faecal coli form Standard in case the treated water from the polishing pond doesn't meet the fecal discharge Standards. Chlorination system includes, mainly of three units namely; chlorine house, chlorine Mixing tank and chlorine contact tanks.



Chlorination house

EFFLUENT:

The water which is mixed with chlorine is free from harmful bacteria therefore Effluent is pumped out with two-dimension tube from here it will go and been contacted with musi river.



Effluent channel



Final outcome result

5.Conclusion

- Everywhere people are increasingly concerned with controlling the pollution of both surface and ground water. Ground water is the main problem, especially where cities have to rely on their own ground water for the fresh water provision.
- By using the UASB method of treatment process we can reduce the cost of sewage water treatment. In this biogas converted into electricity & generates electricity which is consumed by plant itself which will reduce the cost of electricity bill.
- By producing the electricity, we can reduce the cost of electricity consumption.
- By selling the sludge to farmers we can also earn the money and that money we can spend in the maintenance of sewage plant.
- The successful application of anaerobic digestion to the treatment of biodegradable solid waste and wastewater Sewage treatment.
- Plant when investigated for determining efficiency of treatment recorded moderate level of treatment with 90% removal of BOD. The results of both influent and effluent TDS were found to be consistent.
- Up-flow Anaerobic Sludge Blanket (UASB) process has removed the desired impurities above 90%. Evaluate technology.
- Perform a pump audit.
- By installing smart technology.

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