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Study Of Septic Tank Using Micro-Be

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Abstract:- Study was made on the treatment of water from septic tank using a technology named Micro-be. BOD and COD tests were conducted before and after installation of Micro-be. As a result of Micro-be treatment COD reduced to 82.5% of the initial value and BOD to 79.4% of the initial value.

Keywords:- Bioaugmentation, Denitrification, Micro-be.

I. INTRODUCTION

About 97% of earth water is saline and only 3% is fresh out of which only 1% is readily available for human consumption. The overall amount of water on our planet has remained the same for 2 billion years. A quarter of the world's population is without safe drinking water. One in five does not have access to safe drinking water. According to U.N around the world a child dies from water related disease, every 15seconds.The increasing pollution and overexploitation of surface and ground water over the past decades has resulted in water scarcity in some regions. Wastewater is increasing significantly and in the absence of proper measures for treatment and management, the existing freshwater reserves are being polluted. Increased urbanization is driving an increase in per capita water consumption in towns and cities. Urbanization is also driving a change in consumption patterns and increased demand for water intensive agricultural crops and industrial products.

A lot of wastewater is produced as a result of many industrial and domestic activities. Most of this wastewater reaches groundwater which is a major source of drinking water resulting in their contamination. Septic tanks are widely used for sludge disposal in semi-urban areas like small group of houses, institutional buildings, hostels and isolated buildings. Hence wastewaters coming from septic tanks play a major role on ground water contamination. A minimum of 30m separation is ideal between the drinking water source and location of soakpit for houses. But limited availability of land space due to urbanization this distance is not being met now a day's hence treatment is becoming an area of great concern.

II. SEPTIC TANK

A septic tank treats domestic sewage that is; the outlets from basins, baths, W.C.s, showers, sinks and other domestic appliances. In septic tanks the solids in the sewage settle to the bottom to form sludge. Relatively clear liquid is left which forms a layer of scum on its surface. Bacteria feed on this liquid and digest some of the matter in it. The liquid then either passes into another settlement tank before passing to a watercourse or is discharged underground through a network of pipes to filter through the soil in a soak away system. The solids that build up at the bottom of the tank need to be removed about once in a year

Septic tanks can be block/brick built or made with glass reinforced plastic (GRP). Access covers should be of durable quality to resist corrosion and must be secured to prevent easy removal. Septic tanks should prevent leakage of the contents and ingress of subsoil water and should be ventilated. Ventilation should be kept away from buildings. Septic tanks are normally divider internally into compartments. This allows the new effluent to settle and be digested before it is passed into the outlet. Also it means that the route from inlet to outlet is not direct, thus ensuring that liquid circulates before reaching the outlet, giving more time for digestion. To ensure that the scum on top of the liquid neither impedes influent nor escapes as effluent, both inlet and outlet pipes should be fitted with a tee.

Sewage is allowed to rest in the septic tank for about 16 to 48 hours. The process of digestion in the septic tank is done by bacteria. Over a long period the intrinsic bacteria biodegrade the solids. The intrinsic bacteria are basically anaerobic, lives and survive without air/oxygen. They are basically intestinal bacteria and

generate slime like material called "mucalpolysaceride". This protects the bacteria from external sources. The process of breaking down the organic matter in sewage is called anaerobic digestion since it is largely outside the presence of air. The digestion reduces the amount of sludge and makes the contents of the septic tank less smelly. Normally it would take about two months to break down all the sludge in the tank so a normally used septic tank will only partially break down the contents. The biodegradation of organic and inorganic is not always complete. This leaves some (sometimes large) sludge lying at the bottom of the tank resulting in lower treatment time for fresh effluent, consequently resulting in more sludge, a self defeating cycle, causing filling up of septic tank.

The concept is that effluent from the building should enter the tank at one end, be retained in the tank for a period and discharged at the opposite end to enter the soakpit. The septic tank soon fills and as more effluent enters it automatically displaces the same amount out into the soakpit. The process of anaerobic decomposition occurs in the tank which reduces the amount of solid matter and provides some treatment of the waste. The soakpit, or percolation trench, is a method of discharging the tank effluent into surrounding soil. The effluent from a septic tank is by no means fit for discharge into water course. A large number of Gases and all not so good smelling are generated within the system, such as Ammonia, Hydrogen Sulphide, and Methane etc.

Soak pits consist basically of a simple pit (generally approximately 1 m^3) receiving the effluent underground to redistribute and infiltrate it into the surrounding soil. As pretreated wastewater (at least settling is required, for example in a septic tank), greywater or stormwater percolates through the soil from the soak pit, small particles are filtered out by the soil matrix and organics are digested by micro-organisms present in the soil. The central pollution control board annual reports 2008-2009 are shown in Table1. Figure 1and Figure 2 shows the Trend of water supply, wastewater generation and treatment in class I and class II cities.

Table I: Central Pollution Control Board Annual Report 2008-2009

Category	No. of Cities	Total Water Supply (in MLD)	Wastewater Generation (in MLD)	Treatment Capacity (in MLD)
Class-I City	498	44,769.05	35,558.12	11,553.68
Class-II town	410	3,324.83	2,696.70	233.70
Total	**908**	**48,093.88**	**38,254.82**	**11,787.38**

Fig.1: Trend of water supply, wastewater generation and treatment in class I cities

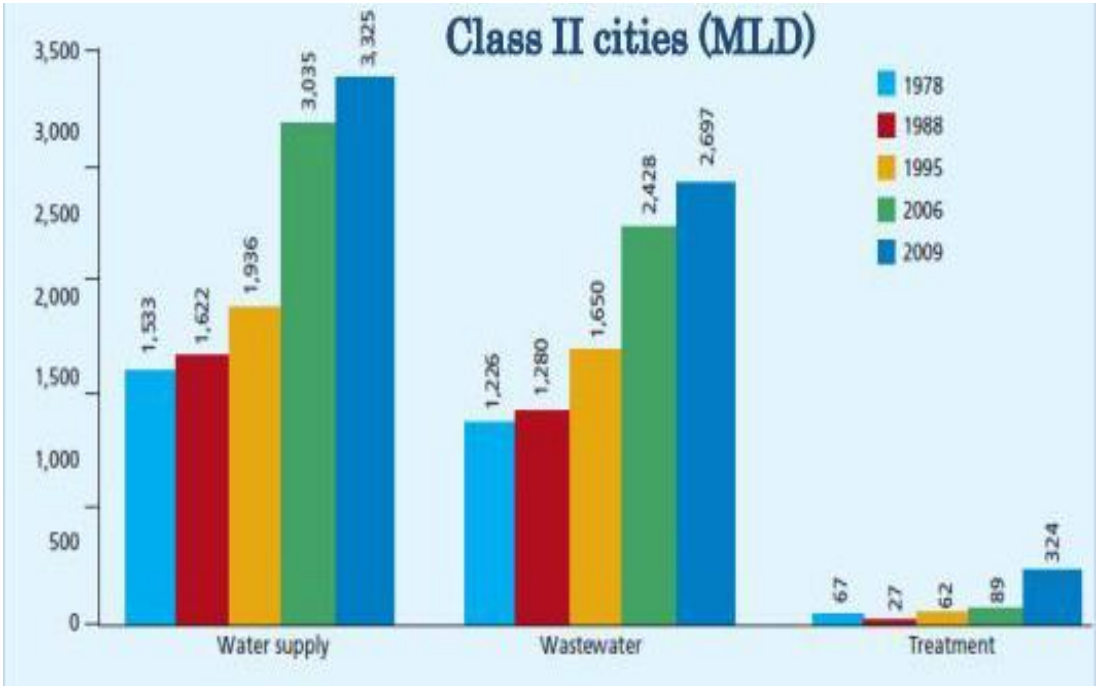

Fig.2: Trend of water supply, wastewater generation and treatment in class II cities

III. SELECTING AN AEROBIC SEPTIC TANK

Aerobic septic systems inject oxygen into sewage waste, stimulating the growth of aerobic bacteria, which break down and filter the wastewater and solids. While conventional gravity-powered septic systems (whose holding tanks depend on anaerobic bacteria) are the most popular systems in use today, there are situations in which aerobic septic systems are more appropriate alternative. Aerobic systems have a few advantages over conventional septic systems. Aerobic systems can often be paired with a smaller leaching field than a similar conventional septic system. This can substantially reduce the space required, which can be useful in lots where a large drainage is unacceptable. Aerobic systems generally produce cleaner effluent (the wastewater that is returned to nature after processing).this is useful in environment delicate locations, areas with high water tables and similar areas. Aerobic bacteria are typically broken down household waste faster than anaerobic bacteria.

IV. MICRO –BE

The micro be treatment is basically an attached growth, up flow, aerobic system with bioaugmentation.

Bacteria need a media to grow on, multiply and form a Bio film. Several types of inert media can be used, including sand. The plastic media within the system has a very large surface to volume ratio. The larger the population the greater and faster will be the biodegradation. The effluent is made to move upwards into the treatment area. This is done with the help of micronized air movement. It results in total contact with bacteria becomes more. As the effluent moves out from the top, fresh effluent enters from the bottom. The effluent moving up into the septic tank contains both oxygen and Micro organisms. Air is provided from outside the septic tank by means of a diaphragm Air pump. It moves through a polymer Diffuser which creates micronized air bubbles at a pressure and moves upwards. On it's upwards movement; it sucks in the wastewater from the sides and pulls it along upwards. The oxygen transfer efficiency is about 20% if the depths of the septic tank is about 2meters.Addition of Micro Be blend of microbial culture results in better digestion of the contents, accepting shock loads, sudden temperature and pH changes, toxic compounds and prevent total nitrification within the septic tank.

A fluidized bed reactor is a type of reactor device that can be used to carry out a variety of multiphase chemical reactions. In this type of reactor a fluid is passed through a granular solid material at high enough velocities to suspend the solid and cause it to behave as though it were a fluid. The solid substrate material in the fluidized bed reactor is typically supported by a porous plate. The fluid is then forced through the distributor up through the solid material. As the fluid velocity is increased, the reactor will reach a stage where the force of the fluid on the solids is enough to balance the weight of the solid material.

V. CONCLUSIONS

The BOD reduction in a normal septic tank is in the range of 25 to 50% and in a septic tank using Micro-be is about 80%.In a normal septic tank ammonia oxidized to nitrate by nitrosomonas then to nitrate by

nitrobacter in soil. Some denitrification may occur in mixed aerobic anaerobic biomass. In a septic tank using Micro-be there would be a colony in soakpit of nitrobacter and nitrosomonas. Nitrosomanas converts ammonia to nitrite. The micro be prevents conversion of nitrite to nitrate by overwhelming nitrobacter. The microbe strips oxygen from nitrite releasing oxygen.

Along with water conservation programmes, initiatives in wastewater sector have to be encouraged and should be carried out. Micro-be is one such initiative which implements the use of attached growth, up flow, aerobic system with bioaugmentation in a septic tank. Although the initial investment is a little high and requires continuous pumping, results show that the biochemical oxygen demand can be brought down successfully within a short period and made to discharge standards. Also if further filtration is carried out it can be even made to reusable qualities which make it more attractive. Thus by keeping in mind the importance of water and major crisis likely to face regarding water issues, initiatives like this will have to be adopted in the near future.

REFERENCES

[1]. Barshied, Robert D. and Hassan M. El-Baroudi, October 1974, "Physical-Chemical Treatment of SepticTank Effluent," Journal of the Water Pollution Control Federation.

[2]. Bitton, Gabriel, 1994, "Wastewater Microbiology," John Wiley & Sons, Inc. Publication.

[3]. Bounds, T.R., February 1996, "Alternative Sewer Designs Effluent Sewer Technology Septic Tank Effluent Pump and Septic Tank Effluent Gravity Systems" Orenco Systems Inc., Sutherlin, Oregon.

[4]. Howard,J R.(1989)."Fludized Bed Technology: Principles and Applications". New York,Ny: Adam Higher.

[5]. Kreissl, J.F., 1971 "Waste Treatment for Small Flows," Paper presented to the 1971 annual meeting,

[6]. American Society of Agricultural Engineers. Washington State University, Pullman, Washington,June 27-30, 1971.

[7]. Lawrence, C.H., Nov/Dec 1973, "Septic Tank Performance," Journal of the Environmental Health,

a. Volume 36, No. 3 p. 220.

[8]. Philip, H., Maunoir, S., Rambaud, A., and Philippi, L.S., 1993. "Septic tank sludge's: accumulation rate and biochemical characteristics," proceedings of the second international specialized conference on

[9]. design and operation of small wastewater treatment plants. Trondheim, Norway.