JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Application of Optimum Dosage of Microbes Solution for Dairy Wastewater

[1]Abhijit Garad, [2]Nikhil Gurav
[1]Assistant Professor, [2] Assistant Professor
[1]Department of Civil Engineering,
[1]Dhole Patil College of Engineering, Pune, India

Abstract: The aim of this study was to investigate the efficiency of stabilization tank with effective microbe solution for the treatment of waste water of dairy industry. Dairy industry waste water is generally have fats, lactose, whey proteins, nutrients which lead play important role to increase the biological oxygen demand (BOD) of water. With milk components also wastewater contain detergents and sanitizing agentswhich are result of cleaning process increase the concentration of chemical oxygen demand (COD). The treatment methods of actual ETP of selected dairy were studied. The char- acterization of selected dairy waste water was done. The Stabilization tank stabilizes waste water, reduces the organic content and removes pathogens from waste water. And the effective microbe solution increases the microbial growth of dairy waste water. The stabilization tank and effective microbes solution was found to be effective to reduce the BOD and COD. The efficiency was achieved by BOD and COD by 80percent and 70 percent respectively.

Index Terms **- (COD, BOD, and Waste water, Stabilization Tank, EM Solution and ETP)**

I. INTRODUCTION

Dairy technology has been defined as that branch of dairy science, which deals with processing of milk and the manufacture of milk products on an industrial scale. The dairy industry waste water is primarily generated from the cleaning and washing operations in the milk processing plants. It is estimated that about 2 percent of the total milk processed is wasted into drains. The waste water generated from milk processing can be separated into two groups- first group concerns waste water having high flow rates and the second concerns the effluents produced in small milk transformation units (cheese production for instance). Dairy industriesare involved in the manufacturing of various types of milk products such as fluid milk, butter, cheese, condensed milk, flavored milk, I milk powder, ice cream etc. The dairy industry is one of the most pollinating of industries, not only in terms of the volume of effluent generated, but also in terms of its characteristics as well.Dairy effluent contains soluble organic, suspended solids, trace organics.

The major pollutants in waste water discharges from milk based food industry are organic matter, suspended solids, pH, nitrogen, phosphorus, and fats. The organic substances in dairy waste water come from primarily the milk and milk products wastes. The current techniques are very costly and uneconomical. This project is an attempt to give primary treatment to dairy waste water in a specially designed stabilization tank which will help reduce the further treatment used. Thus by using the stabilization tank we can treat the waste water by natural process of settlement. In the stabilization tank we have used the vertical baffles and gave up-down movement to water flow with specific detention time and stable flow rate. There is no addition of any chemicals and no use of any mechanism. Selection of the sampling in dairy industry is very important since it gives an idea of the source and types of pollutants present in the waste water. The aim of the study is to reduce the organic matter, odour naturally and save the cost of treatment process. According to my analysis Stabilization Tank Technique gives the positive result with economy.

II. HISTORY OF DAIRY WASTE

1. **Eran Friedler et al (2003) (9)**, “Simulation model of waste water Stabilization Reservoirs” In this paper they describe the model combines hydraulic, hydrological, physicochemical, and biological processes occurring in SRs. It enables to predict the quality of effluent withdrawn from SRs for agricultural irrigation as a function of operational regime, inflow quality (sewage of various degree of treatment), thermal regime, physical structure of the reservoir, and weather conditions.
2. **P.M. Ndegwa, et al (2007) (18)**,” Stabilization of dairy waste water using limited-aeration treatments in batch reactors”, In this paper Experiments were conducted to study bio-stabilization of dairy waste water using limited-aeration treatment. The following process parameters were examined during the treatment process: (1) oxidation–reduction status; (2) degradation of chemical oxygen demand (COD) and total volatile solids (TVS); (3) kinetics of bio-stabilization; and (4) loss of ammonia
3. **Aditya Patel, et al (2016) (1)**, “Performance and Evaluation Study of Dairy Waste water”. They studied the treatments to treat waste water such that fats removal, equalization tank, USAB digester, aeration tank and clarifier.

They found some variations in the values pH and TDS. We can decrease TDS values by using the ammonium hydroxide in influent waste water of the plant. As pH values are acidic so we have to normalize pH and to make it basic we need to buffer. Nitric acid could be used to buffer the pH.

4. **Brijesh Goel, et al (2017) (7)**, "Studies on Effluent Treatment Plant for Dairy Industry and their Effects". In this paper they studied the characterization of dairy industry waste water. And the working of Effluent Treatment Plant of dairy industry is also studied. Effluent from dairy industries was treated by Up Flow Sludge Blanket type anaerobic digester. The performance of ETP is evaluated by parameters COD, BOD, Oil and Grease, pH, TSS.
5. **Preeti Birwal et al (2017) (21)**, "Advanced Technologies for Dairy Effluent Treatment". In the Paper They studied the various Treatment of dairy waste water. They studied that it is possible to reduce BOD and COD and other constituents from waste water with the help of activated carbon, packed bed filters, electro coagulation, reverse osmosis technique, bio-films technique. These methods give efficient results to dairy waste water

III. METHODOLOGY

3.1 DETAILS OF STUDY AREA

The Selected Dairy industry in the local and branded district level co-operative organization registered in 1960, involved in processing milk and milk products. The representatives of milk producing farmers based in rural, encompassing almost the entire Pune. The main plant is equipped with modern Pasteurizer, Homogenizer, Cream separator, Ghee processing, automatic packing of milk and milk products, Quality testing devices and well equipped laboratory. The company has an installed processing capacity of 2 lakh litters per day. Dairy process milk and milk products like Pasteurized/ Homogenized-Cow milk, Tanned milk, Double tanned milk, Standardized Milk, Full morn milk, Cow and Buffalo Cream and Ghee, Shrikhand, Antrakhand, Malai Paneer, Dahi, Flavored Milk, Lassi, JeeraTak, Table Butter. Milk Powder, Softy Ice cream, Pedha and Khava. The company has also planned to introduce Sterilized milk in 200 ml bottle and hard ice-cream with different flavours in different pack sizes.

3.2 ACTUAL ETP PLANT IN SELECTED DAIRY

The main plant is equipped with modern Pasteurizer, Homogenizer, Cream separator, Ghee processing, automatic packing of milk and milk products, Quality testing devices and well equipped laboratory. The company has an installed processing capacity of 2 lakh litters per day. Dairy process milk and milk products like Pasteurized/ Homogenized-Cow milk, Tanned.

3.3 CONCEPT OF STABILIZATION TANK

Waste stabilization ponds are the ponds design and built for waste water treatment to reduce the organic content and remove pathogens from waste water. They are manmade depressions confine by earthen structures. Waste water enters on one side of the waste stabilization pond and exits on the other side as effluent, after spending several days in the pond, during which treatment processes takes place. Waste stabilization ponds involve natural treatment processes which take time because removal rates are slow.

3.4 MATERIAL AND EXPERIMENTAL SETUP

For detail study, we have worked on lab scale reactor. Reactor setup maintained in such a way that, it will reach as close as possible to the real time situation and values of inlet and outlet effluent according to standard values. It is nothing but small scale model of actual reactor that we are going to design.

Experimental setup consists of following items to design the lab scale reactor model.

1) Reactor-stabilization tank
2) Plastic sheets (baffle walls)
3) Inlet and outlet arrangements
4) Pipes and valves
5) Holding container
6) Outlet water container

Reactor-stabilization tank

Photo of Pipe Fitting Required For the setup

Photo of GP-Silicon and M-Seal Epoxy Compounds

Final Setup of the model

One container (plastic tank) of 30 liters is provided as an inlet holding tank. Inlet of tank is provided with flow controlling valve to control flow as per our requirements. Valve is followed by half inch plastic pipes to carry waste water from inlet of tank to reactor. The effluent outlet is collected in the second plastic unit of tank.

Analysis of reactor inlet and reactor outlet was done based on selected parameters, which can be done in college lab and listed below:

1) pH
2) Color
3) Odour
4) Total suspended solids (TSS)
5) Total Dissolved solids (TDS)
6) Bio-Chemical Oxygen Demand (BOD)
7) Chemical Oxygen Demand (COD)
8) Oil and Grease

Analysis has been done in three phases:

Phase 1:

In this phase the Dairy waste water is treated regularly without any modification.Five days' detention time is required to follow the process.

Phase 2:

In this stage there was addition of Em-1 solution. This was combined outlet to check the possibility of future enhancement in removal of BOD, COD, TSS, and Oil.

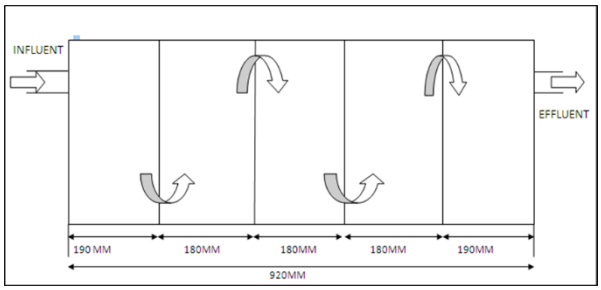
Phase 3:

In order to increase BOD and COD reduction further one addition step was carried out by Introducing stabilization tank with EM-1 solution.

IV. PROCEDURE

The output of entire project work depends on the selected detention time of flow of stable flow of water through the main storage container to chamber with respective to detention time of settlement of waste water in stabilization tank. Then analysis of inlet and outlet effluent with proper intervals of days. The feed stock for the Stabilization tank was collected from dairy industry and were analyzed immediately after collection (within @ 1hr). The performance parameters such as pH, solids, COD, BOD, Turbidity and Odour.

The prepared model of stabilization tank works on the basis of settlement where the particles having specific density more than water will settle down and their up0down movement. In model reactor, 4 number of baffle walls are provided to guide the flow. The arrangement of baffle wall is vertical over and under, so the water will flow from top to bottom of reactor. The tank basically consists of four numbers of baffle walls which convert it in the form of 5 chambers. The capacity of tank is 125 liters and the detention time is for 5 days. So the daily feeding dose is of 25 liters of dairy waste water. The dairy waste water which is fed first goes to the holding tank. Then it goes to the first chamber with the maintained flow rate of 1.04 liters/hr. The outlet comes after five days with considerable reduction in the pollution parameters. The results obtained from this system are highly satisfied while comparing with standard results.



Cross-section of Stabilization Tank

Reactor dosing is the major factors on which special attention is required. In this work, reactor efficiency is checked for different dosage and detention times. Initially we started dosing after every day. This means that we had to feed the

React or every day. This detention time is maintained by controlling the flow of inlet tank with the help of valve. Thus the full tank we required 5 days. Required flow per day detention time is calculated by simple calculation as follows:

125 liters in 5 days

Per day Flow =125L / 5day

=25L / day

Per hour flow =1.04L / 24hr

V. Result and Discussion

The characteristics of the waste water like physical, chemical, and biological were carried out of row as well as treated waste to check for effectiveness of the treatment suggested. The result and Discussion is to state your interpretation and opinions, they explain the implication of your findings, and make suggestion for future research. Main function of result and discussion is to answer the question posed in the introduction, and satisfaction of objectives. It also explains how the result supports the answers and, how the answers fit in existing work. The result and Discussion are the heart of the any Work.

5.1 Cost Analysis

Dairy ETP capacity =3 lakh liters/day

Dairy outlet of effluent =1.5-2.0 lakh liters /day Treatment method = Activated Sludge Process (ASP) Electricity cost=

90,000-1, 50,000/-month

Chemical cost =50,000/-month Water cost= 1to 1.5 lakh /month

Maintenance and labor cost = 50,000/-month

VI. Conclusion

In the present study, lab scale model was setup in the laboratory. Following were the major investigation of this study;

In comparison with other waste water treatment technologies, Stabilization Tank has the advantage of very low operating cost.

The combine treatment of stabilization tank with microbial solution gives sufficient results as, it gives efficiency of BOD is 70 to 80 percent and efficiency of COD is 60 to 70 percent.

The Stabilization Tank seems to be quite effective for treating Dairy industrial waste water with respect to COD, BOD, and Color and odour removal.

Electricity and chemicals were not required in this treatment, so it is cost effective.

1) Odour was also highly reduced, which will be bearable for people.
2) This treatment is particularly suitable for developing countries where the conventional waste water treatment plants may fail because high land cost, maintenance and electricity.
3) Stabilization Tank treatment of dairy waste water can result in significant economic and environmental benefits if recycled for agriculture and aquaculture. In conclusion it may e stated that effluent treatment need to be done chiefly due to this reason.
4) To avoid the ill effects of discharged untreated effluent into the environment.
5) To satisfy the statutory requirements of the state pollution control board and central pollution control board.
6) In realization of our commitment to the future generation to provide pollution free environment.
7) Combine treatment of stabilization tank and EM solution reduces the further load on the effluent treatment plant.
8) We concluded that, at dose of 1500 ml of EM solution we get the BOD efficiency 70 to 80 percent and COD efficiency is 60 to 70 percent.

VII. References

1. Aditya Patel., “Performance and Evaluation Study of Dairy Wastewater”, (International Research Journal of Current Engg and Tech.) 2016. ISSN: 2348-750 Volume No.4 Issue No:04
2. Agosh Verma, et al. “Physico chemical analysis of effluent from Dairy Wastewater”, 2012 ISSN 0972-768X Int. J. Chem. Sci: 10(4), 2012, 2061-2066.
3. Ambreen Lateef, “”Biological Treatment of Dairy wastewater using Acti- vated Sludge”, (National Research Journal of Current Engg and Tech.).2013.

4. Avnimelech, Y., "Modelling the accumulation of organic matter in the sedi- ment of a newly constructed reservoir", Wat. Res. 23 (10), 1327/1329 1989.
5. Banks, R.B., "some features of wind action on shallow lakes. J. Environ. Eng.", 1975 ASCE 101 (EE5), 813/82S.
6. Bharati S. Shete. ""Dairy Industry Wastewater Sources, Characteristics & its Effects on Environment", (International Research Journal of Current Engg and Tech) 2013.ISSN 2277 – 4106 Vol.3, No.5.
7. Brijesh Goel, Vishal Kumar., "Studies on Effluent Treatment Plant for Dairy Industry and their Effects",(International Research Journal of Current Engg and Tech).2017 ISSN: 2320-7051
8. Bhushan, B. and Singh, R., "Nusselt number and friction factor correlations for solar air heater duct having artificially roughened absorber plate", Solar Energy, 85, 2011, pp. 1109-1118.
9. C.M. Noorjahan., "Characterization of Dairy Effluent", (national Research Journal of Current Engg and Tech", 2004.
10. Shwetha Prasanna., "Treatment of dairy waste water using low cost adsorbents", (International Research Journal of Current Engg and Tech).ISSN 2278 – 0882 Volume 5, Issue 12, December 2016.
11. Eran Friedler. "simulation model of wastewater stabilization reservoirs", Ecological Engineering", 20 (2003) 121-145.
12. E. Menya., "Design of waste stabilization ponds for dairy processing plants in Uganda",(National Research Journal of Current Engg and Tech).2015
13. H.F. Ridgeway, H.C. Fleming, Membrane bio fouling, in: J. Mallevialle, P.E. Odendal, M.R. Wiesner (Eds.),"Water Treatment Membrane Pro- cesses",McGraw-Hill, New York, 1996, pp. 6.1–6.62.