Research Article

A Study of Dairy Effluent on the basis of do Value and a Comparative Analysis of CETP With Respect to other Plants and Possible Load Reduction Methods

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ABSTRACT
This research was investigated to determine the DO value of the Dairy effluent and provide plant wise comparison with respect to common effluent treatment plant of Amul Diary. For determination of which plants play crucial role for generating effluent having high load and how to reduce DO load in common effluent treatment plant. Because In any dairy plant the Quantity and characteristics of effluent is depending upon the extent of production activities, pasteurization to several milk products.

Keywords: DO, Effluent, Effluent Treatment Plant, load characteristics.

1.0 INTRODUCTION

Water resources are most often affected by industrial pollution. Pollution caused by industrial and dairy effluents is a serious concern in throughout the world. Dairy effluent has high organic loads as milk is its basic constituent with high levels of chemical oxygen demand, biological oxygen demand, oil & grease and nitrogen and phosphorous content[1]. The DO determination measures the amount of dissolved (or free) oxygen present in water or wastewater. Aerobic bacteria and aquatic life such as fish must have DO to survive. Aerobic wastewater treatment processes use aerobic and facultative bacteria to break down the organic compounds found in wastewater into more stable products that will not harm the receiving waters. Wastewater treatment facilities such as lagoons or ponds, trickling filters and activated sludge plants depend on these aerobic bacteria to treat sewage. The same type of aerobic wastewater treatment process occurs naturally in streams and ponds if organic matter is present, turning these bodies of water into “aerobic wastewater treatment plants.” If sufficient oxygen is not naturally supplied through wind and turbulence to replace the depleted oxygen, the body of water will develop a low DO and become anaerobic (or septic). The results of septic water bodies include fish kills and anaerobic odors. If the amount of free or DO present in the wastewater process becomes too low, the aerobic bacteria that normally treat the sewage will die. The process will not operate efficiently and septic conditions will occur. The DO test is used to monitor the process to ensure that there is enough dissolved oxygen present to keep the process from becoming septic. Generally dairy effluent having DO ranging from 8-27 ppm[2].

2.0 Experimental Methodology

Dairy wastewater was obtained from the every plants of Amul Dairy Anand, Gujrat, India. Dissolved oxygen (DO) levels in natural wastewaters are dependent on the physical, chemical and biochemical activities prevailing in the water body. The analysis of DO is key test in water pollution control activities and waste treatment process control. The quality of water is improved by various techniques and equipment and aided by instrumentation; the Winkler (or iodometric) test remains most precise and

reliable titrimetric procedure for DO analysis. The test based on addition of divalent manganese solution, followed by strong alkali to the water sample in a glass stoppered bottle. DO present in the sample rapidly oxidizes in equivalent amount of the dispersed divalent manganous hydroxide precipitate to hydroxides of higher valency states. In the presence of iodide ions and upon acidification, the oxidized manganese reverts to the divalent state, with the liberation of iodine equivalent to the original DO content in the sample. The iodine is then titrated with standard sodium thiosulphate solution.

2.1 Reagents used

1. Manganese sulphate solution (MnSO4.4H2O)
2. Alkali-iodide azide reagent
3. Conc-Sulphuric acid (36N)
4. Starch indicator
5. Standard sodium thiosulphate solution (0.025N)

2.2 Procedure

1. Add 1 ml of manganese sulphate solution and 1 ml of alkali-iodide azide reagent to the 10 ml sample taken in the bottle, well below the surface of the liquid. (The pipette should be dipped inside the sample while adding the above two reagents.)
2. Stopper with care to exclude air bubbles and mix by inverting the bottle at least 15 times.
3. When the precipitate settles, leaving a clear supernatant above the manganese hydroxide floc, shake again.
4. After 2 minutes of settling, carefully remove the stopper, immediately add 3 ml concentrated sulphuric acid by allowing the acid to run down the neck of the bottle.
5. Restopper and mix by gentle inversion until dissolution is complete.
6. Measure solution from the bottle to an Erlenmeyer flask. As 1 ml of each of manganese sulphate and azide reagent has been added titrate with 0.025N sodium thiosulphate solution to a pale straw colour.
7. Add 1-2 ml starch solution and continue the titration to the first disappearance of the blue colour and note down the volume of sodium thiosulphate solution added (BR), which gives directly the DO in mg/L^3.

2.3 Calculations

DO=BR*8*N of Na2S2O3 Solution*1000/vol of sample-(Vol of $MnSO_4$+vol of alkali KI).

Where,

BR = Burette reading

N of $Na_2S_2O_3$ Solution=0.025N

The following table shows a DO value of common ETP, Ghee plant and Butter plant.

Table 1: Common ETP

S. No.	Common ETP Sample	Date of Taken	DO (ppm)
1	Effluent Water	14/10/11	10.0
2		15/10/11	10.0
3		16/10/11	7.5
4		17/10/11	8.7
5		18/10/11	7.5
6		19/10/11	12.5
7		20/10/11	7.5

Table 2: Ghee Plant

S. No.	Ghee Plant Sample	Date of Sample taken	DO (ppm)
1	Effluent Water	14/10/11	27.5
2		15/10/11	25.9
3		16/10/11	28.0
4		17/10/11	24.0
5		18/10/11	25.3
6		19/10/11	21.2
7		20/10/11	23.5

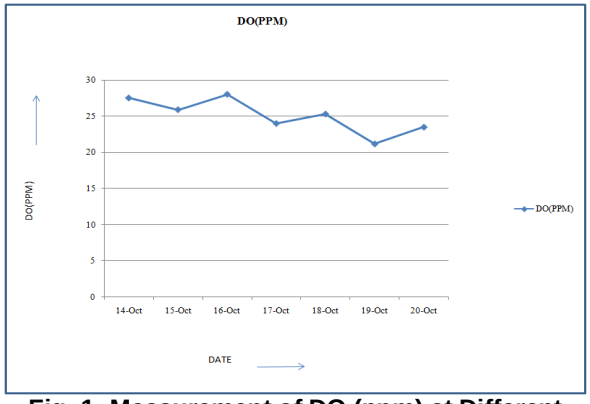

Fig. 1: Measurement of DO (ppm) at Different Day from Ghee plant

Table 3: Butter plant

S. No.	Butter Plant Sample	Date of Sample Taken	DO (ppm)
1	Effluent Water	14/10/11	23.5
2		15/10/11	21.9
3		16/10/11	24.3
4		17/10/11	20.3
5		18/10/11	22.3
6		19/10/11	21.2
7		20/10/11	20.5

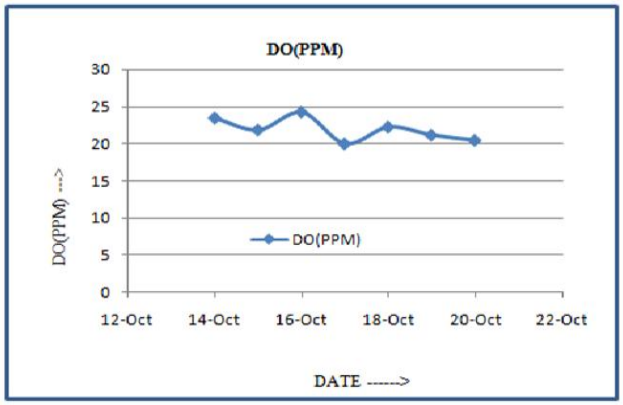

Fig. 2: Measurement of DO (ppm) at Different Day from Butter plant

2.4 Load Reduction

It has been reported that ghee plant and butter plant having high fat content so, during the cleaning in place (CIP) hot water is used and then it is treated with cold water to solidify the ghee and butter. And finally by layer sepration method ghee and butter are seprated and water is discharge in to ETP.

3.0 CONCLUSION

The DO load in the common effluent treatment plant is around 10-12 ppm. It is because of Ghee plant and Butter plant. Because the DO load in both of the plants is high compare to other plants. Ghee plant contain high fat content and Butter plant also having high fat content.so,both plants are playing crucial role in generating effluent having high DO load.

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