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PERFORMANCE AND EVALUATION STUDY OF DAIRY WASTE WATER

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ABSTRACT

The dairy industry is among the most polluting of the food industries in volume in regard to its large water consumption. Dairy Industries produce nearly thousands of liters of effluent waste per day. These industries discharge wastewater which is characterized by high chemical oxygen demand (C.O.D), biological oxygen demand (B.O.D), nutrients, and organic and inorganic contents. This waste with high intense foul odor pollutes ecosystem and ground water causing health hazards. Various pre-treatments methods are available to neutralize the effects.

Waste sample from dairy has been experimented on weekly basis to calculate "Suspended solid (SS), Total dissolved solid (TDS), Dissolved oxygen (DO), C.O.D, pH". Various types of procedure and methods are studied and analyzed for treatment of dairy waste.

Keywords: Suspended solids, Total Dissolved solids, C.O.D, pH, Dairy Wastewater, Effluent, Treatment.

I. INTRODUCTION

A steady rise in the demand for milk and milk products in many countries has led to advancements in veterinary science, which has subsequently led to steady growth in the production of milk per head of cattle. This has caused enormous growth of dairy industries in most countries of the world. Consequently, the amount of wastewater generated and discharged from these industries has also increased.

The dairy industry wastewaters are primarily generated from the cleaning and washing operations in the milk processing plants. It is estimated that about 2% of the total milk processed is wasted into drains. The wastewater generated from milk processing can be separated into two groups—the first group concerns wastewater having high flow rates and the second concerns the effluents produced in small milk transformation units (cheese production for instance).

Dairy industries are involved in the manufacturing of various types of milk products such as fluid milk, butter, cheese, condensed milk, flavored milk, milk powder, ice cream, etc. Typical by-products obtained include buttermilk, whey, and their derivatives. A chain of operations involving receiving and storing of raw materials, processing of raw materials into finished products, packaging and storing of finished products, and a group of other ancillary operations (e.g., heat transfer and cleaning) are examples of some of the great variety of operations performed in the dairy industries.

A heat treatment designed to kill spore-forming or vegetation pathogenic micro-organisms and to reduce the number of adventitious micro-organism to a level which will minimize the adverse effect on milk quality. The older plants batch used to do pasteurizations to 63 c for 40 min. But modern plants are high temperature short time (HTST). So it takes 72 75 c for 15 sec. Or the ultra-high temperature (UTH) which does 135-150 for 3-5sec.continously.

Dairy wastewater is characterized by high biological-oxygen demand (BOD) and chemical oxygen demand (COD) concentrations, and generally contains fats, nutrients, lactose, as well as detergents and sanitizing agents. Detergents affect the aquatic life. Due to the high pollution load of dairy wastewater, the milk-processing industries discharging untreated/partially treated wastewater cause serious environmental problems. Moreover, the Indian government has imposed very strict rules and Regulations for the effluent discharge to protect the environment. Thus, appropriate treatment methods are required so as to meet the effluent discharge standards.

II. LITERATURE REVIEW

Dairy Wastewater Treatment Common techniques for treating dairy industry wastewaters include grease traps, oil water separators

for separation of floatable solids, equalization of flow, and clarifiers to remove SS. Biological treatment consists of the aerobic and anaerobic process. Sometimes anaerobic treatment followed by aerobic treatment is employed for the reduction of soluble organic matter (BOD) and biological nutrient removal (BNR) is employed for the reduction of nitrogen and phosphorus. Sometimes chlorination of the effluent is also donefor the purpose of disinfection before reusing the water.

In dairy capacity of waste generated is 4 lakhs liter per day. Waste is treated in a daily basis procedure. The waste produced form all the products are treated with the same procedure and at same time.

Fat Removal: A common problem in dairy effluent treatment plant is precipitation of fat as a result of the lower pH & temperature in the treatment plant.

The operation of fat trap is enhanced by enhanced by ensuring that the effluent is as possible. Milk fat is a liquid at a temperature greater than 35 C and is difficult to remove in a fat trap. More fat is removed in fat trap at acidic pH values to be emulsified and there for is not removable in the fat trap.

Screening & Settling: It gives little reduction in BOD mechanically brushed & in dined screens with 1-5 mm opening typically are used to remove curd particles & large solids objects and detritus chamber or solid settling tank is incorporated to remove grit.

Activated sludge: Activated sludge system used commercially for dairy waste includes fill and draw high rate, deep shift, extended aeration & contact stabilization. Activated sludge treatment involves an aeration process followed by clarification step and a return of varying amounts of active biomass to the aeration tank.

III. ANAEROBIC TREATMENT

Many small dairy plant have used septic tank to treat dairy waste anaerobic. However the effluent quality from anaerobic processed has generally been below the required for the surface water discharge. The process is more sensitive to shock loading and low temperature than more commonly utilized aerobic processes. In an anaerobic

treatment mixed microbial population in a series of sequential relations reduces complex organic molecules such as fats and proteins to simpler structured such as amino acids, aldehydes and alcohol. Lactose is converted to lactic acid, subsequently these intermediates are fermented to hydrogen, carbon dioxide and acetic acid.

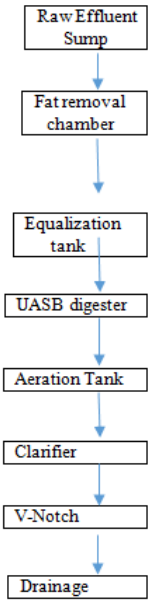
- Mehul Savaliya.et.al has done research on measurement and evaluation of total dissolved solid from dairy ETP and its comparison with other plants and possible load reduction method. It provide plant wise comparison with respect to common effluent treatment plant of Amul Dairy.
- Harush.et.al has done their research on Treatment of dairy wastewater using aerobic biodegradation and coagulation. They have investigated about the optimum dosage of aeration for degradation of COD and value was found to be 320ml/min with removal of 87.05 percent. Odor removal was around 70 to 80 percent.
- Ambreen Lateef.et.al has done research on Biological treatment of dairy wastewater using activated sludge. They studied about the activated sludge process and found that it is operated best at retention time of 5 days with BOD percentage removal efficiency of 95% for dairy wastewater.
- Burak Demirel.et.al has done their research on anaerobic treatment of dairy wastewaters.They researched about the Conventional anaerobic treatment processes which are often used for treating dairy wastewaters.

IV. EXPERIMENTAL

The dairy under study produces curd, flavored milk, table butter, pasteurized concentrated cream, ghee, butter milk, Kadhi , raw cheese, ice-cream, cone, candies, Kulfi, masti dahi, gulabjamun, peda, shrikhand etc.

Type of raw materials, their consumption type and quantity of finished products are as per consent conditions. Environ-friendly measures have been adopted by dairy in the manufacturing process. To control and to mitigate all types of pollution dairy has very well designed and well- maintained environmental management system.

The Dairy Effluent follows the following treatment



Flow chart of effluent treatment plant

Fat Removal:-

Dairy wastewater contains fats and the inhibitory action of the fat to the anaerobic treatment does not allow fast and increased removal efficiency. The enzymatic hydrolysis of fats as pre-treatment may remove this problem.

Equalization Tank:-

Equalization tank is divided into two sections, both the sections does the same type of work. When one section gets over-flow, the second section is used. There are floating agitators in the tank.

UASB Digester:-

UASB digester are used for adjusting C.O.D. and B.O.D. this process works without gas and approximately 60% C.O.D. and B.O.D. are removed.

Aeration Tank:-

Aeration tanks are used to maintain oxidation. Value oxidation must be above 300m/l and be below 400 m/l.

Clarifier:-

This is the final stage of treatment. After completion of this process waste gets drained out through gutter line.

Experimental values

Sample No's	TDS (mg/l)	SS (mg/l)	C.O.D (mg/l)	D.O (mg/l)	pH
1	1600	200	65	1.2	4.2
2	1560	240	72	1.05	4.6
3	890	290	68	1.2	4.3
4	1500	290	71	1.4	5.3
5	1660	240	63	1.3	6.2
6	1440	252	82	1.21	6

V. CONCLUSION

As we can figure out from the values which we got from experiments, we can say that values of C.O.D and D.O are permissible, and according to regulations or standards are properly treated. There are some variations in the values of pH and TDS.

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.

We suggest that we can decrease TDS values by applying the experimental methods using ammonium hydroxide in influent wastewater of the plant, the total dissolved solids can be decreased. There are also other alternative methods to decrease TDS.

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