PHYSICO-CHEMICAL CHARACTERISTICS OF DAIRY WASTE WATER

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Abstract

This paper presents the physico -chemical characteristics of waste water from the Dairy Industry. The waste water from the Dairy Industry is characterized by pH, COD (Chemical Oxygen Demand), BOD (Biological Oxygen Demand) and chloride. The waste water samples were collected from the septic tank, can washer water, ETP inlet, ETP outlet and cleaning in place outlet water. The pH value ranges from 4.8 to 8.4.The chloride value ranges from33.37 mg/l to 469.66mg/l. The COD value ranges from 20mg/l to 132 mg/l. The BOD value ranges from 24.8 mg/l to 273.57 mg/l.

Keywords: pH, COD, Chloride, septic tank, cleaning in place outlet, ETP Inlet, ETP Outlet

I. INTRODUCTION

Dairy industry is the major agro based industry which involves processing of raw milk into products such as consumer milk, butter, cheese, yogurt, condensed milk, dried milk and ice cream. The Dairy effluent contains dissolved sugars, proteins, fats and residues of additives. The Dairy industry in India on an average has been reported that 2-2.5 liters of waste water per liter of milk processed. Waste water contains Casein, Lactose, Inorganic salt, besides detergents and sanitizers used for washing. The effluents are generated from milk processing through milk spillage, drippings, washing of cans, tankers bottles, utensil, equipments and floors. The water which is used for washing milk containers are known as Can Washer Water. In Dairy Industry, milk containers are convenient and attractive means of transportation of milk from farms. It protects milk from environmental influences and damage during distribution. Containers are securely closed. The container needs to be cleaned to remove soil, contaminants and other foreign objects. The water collected from cleaning in place is said to be Cleaning In Place Outlet Water. Cleaning In Place is a method of cleaning inner surfaces of piping, vessel, equipment and associated fitting with disassembly. The primary function of Cleaning In Place is to remove soil and also to sanitize the process equipment. Industries produce waste water which is known as Effluent. The Effluent contains several pollutants, which can be removed with the help of a treatment plant known as Effluent Treatment Plant (ETP). The waste water which can then be safely discharged into the environment.ETP treat the Effluent coming from different areas of the Plant.ETP Inlet is the Effluent before treatment. This sample consists of large amount of organic wastes.ETP Outlet is the Effluent which has undergone treatment. After treatment, pollutants of the sample were reduced.

II. METHODOLOGY

A. Collection of samples

The samples for the analysis were collected from the Jeppiar Dairy Industry. The waste water sample were collected from the Septic Tank, Can Washer Water, Cleaning In Place Outlet Water, ETP Inlet sample, ETP outlet sample of Dairy Industry. The samples were analyzed during a period of two months. The samples were kept in a deep freezer and used for the further treatment.

B. Physico-chemical analysis waste water

The samples collected from the Dairy Industry were brought for the physico- chemical analysis in Department of Chemical Engineering, Sathyabama University, Chennai. The pH was measured by using pH Meter. Chlorides were determined using Mohr's Method. COD was determined using Leibig Condenser.BOD was determined using titration method.

III.RESULTS AND DISCUSSION

pH: pH is a measure of activity of the hydrogen ion. pH is used to find the acidity and basicity of the sample. pH less than 7 are said to be acidic and greater than 7

are said to be basic. The pH value of the sample ranges from 4.8 to 8.4.The pH value of Septic Tank is 6.57, Can Washer Water is 4.80, Cleaning In Place Outlet Water is 8.41, ETP Inlet is 8.41 and ETP outlet is 7.08.

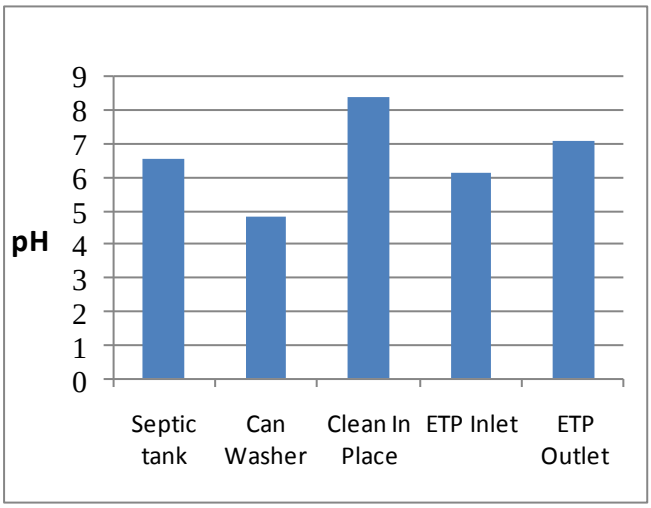

Fig.1 Comparison of pH of dairy effluent samples Chlorides

Chlorides were measured using Mohr's Method.50 ml of the sample was taken in a conical flask and add 2 ml of potassium chromate. Yellow colour will be formed. Titrate the solution using 0.005N silver nitrate. End point is the appearance of reddish brown colour. Chlorides are expressed in mg/l. Chlorides of Septic Tank, Can Washer Water, Cleaning in Place Outlet Water, ETP Inlet, ETP Outlet are 469.66mg/l, 6 mg/l, 33.37mg/l, 328.97mg/l and 347.9mg/l.

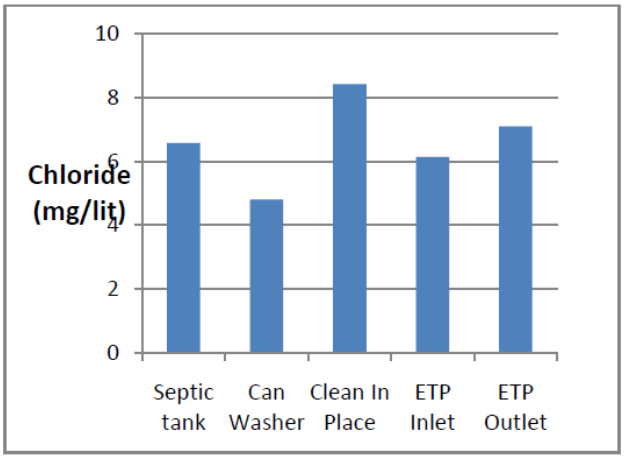

Fig.2 Comparison of Chloride in dairy effluent samples

COD

COD is known as Chemical Oxygen Demand .It is an indirect measurement of pollutants. It is used to find the amount of organic compounds in the sample .COD is the amount of oxygen required to oxidize the portion of organic matter in a sample of waste water by using a strong chemical oxidizing agent like potassium dichromate.COD is expressed in mg/l also referred to as ppm (parts per million), which indicates the mass of oxygen consumed per litre of solution. Standard method was adopted to determine the COD of the various samples from septic tank, can washer, cleaning in place, ETP inlet and ETP outlet and were found to be 20 mg/l, 28 mg/l, 72 mg/l, 132 mg/l and 64 mg/l.

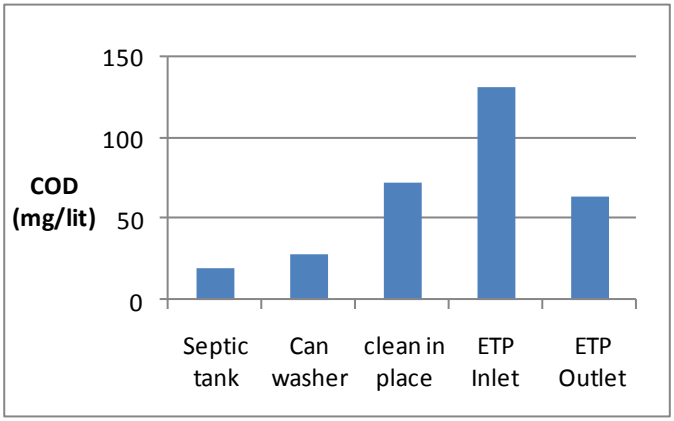

Fig.3 Comparison of COD of dairy effluent samples

BOD

BOD is known as Biological Oxygen Demand.BOD is the amount of oxygen required for the aerobic microbial organism in a body of water to break down organic material present in a given waste water sample at certain temperature over a specific time period.BOD is most commonly used parameter to define the strength of a municipal or organic industrial waste water.BOD is expressed in mg/l. It is the amount of oxygen consumed per litre of sample during five days of incubation. The BOD of septic tank, can washer water, cleaning in place outlet, ETP inlet and ETP outlet determined by standard methods are 123.78 mg/l, 2.5 mg/l, 24.8 mg/l, 273.57 mg/l and 144.79 mg/l.

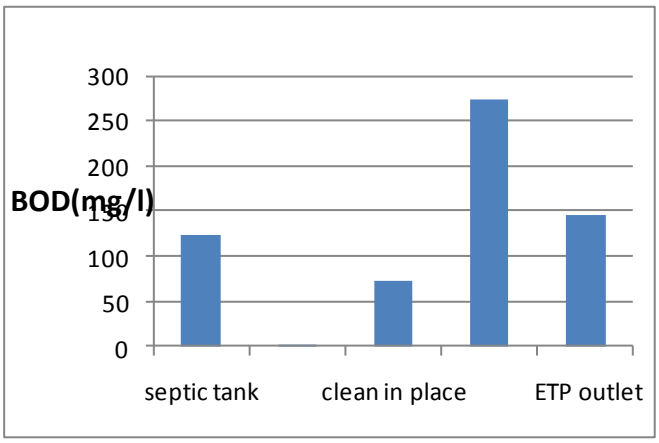

Fig.3 Comparison of COD of dairy effluent samples

IV.CONCLUSION

The physical and chemical characteristics of Dairy effluent samples were determined using the standard methods. The treated effluent characteristics like pH(7.08),Chloride(278.32 mg/l)),COD(64 mg/l),BOD(144.79 mg/l) are found to be well within standards.

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