

# Treatment of Dairy Waste Water by Electro-Coagulation process

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**Abstract** – Dairy industry waste water is characterized by high BOD, COD and other pollution load. The dairy industry generates on an average 2.5-3.0 lit of waste water per lit milk processed. As India is a developing country, there are various industries in the market which generates wastewater in a maximum amount which needs to be treated before passing into the natural stream. Electro-coagulation is one of the various methods of treatment of wastewater which is efficient, economic & convenient. In this study of treatment of dairy waste water by electro-coagulation mechanism shall be used to remove chemical oxygen demand (COD) of dairy wastewater. In the process, the effects of initial pH, time and current we will examine. The optimum operating range for each operating changeable will experimentally resolved. The greatest removal efficiency may be obtained with the use of iron electrode as anode as well as cathode, with this system, optimal values of current, initial pH and electrolysis time respectively. In this study we formed three sets on which we will calculate the percentage removal of COD, BOD and turbidity.

**Key Words:** Electro-Coagulation, Dairy Waste Water, COD, BOD, Jar test etc.

## 1. INTRODUCTION

Dairy industry is considered large quantities of waste water originate due to their different operations. The organic substances in the wastes comes either in the form in which they were present in milk or in a dissolve form due to their operation. Which causes severe environmental problems because of generation of strong waste water characterized by high biological oxygen demand BOD and chemical oxygen demand COD. Water is used in all course in the dairy industry, wastes from dairy industry hold high concentration of organic materials high BOD and COD. High concentration of suspended solids and oil and grease. All of these require treatment to prevent or minimize environmental problem.

The other techniques used to treat the waste water are conventional aerobic purification and anaerobic process such as coagulation, flocculation, Nano filtration, reverse osmosis. The process suffer the disadvantage the reagent costs are high and the soluble COD removal is low hence electro coagulation process can be other alternative process for treating dairy waste effluent.

This technology has been very successfully employed in removing oil and grease and suspended solid from a variety of industrial effluent stand is a combined coagulation and

floatation process induced by the passage of electric current. The contamination of natural water is currently a major problem that is leading environmental control agencies to establish stricter limit for disposal of effluents in to environment. Hence it is important to treat waste water. Dairy industries represent an activity of great important for the food sector Indian, through its contribution in terms of pollution is very significant. The dairy industry is generally considered to be largest source of food processing waste water in many countries. Water is used throughout all steps of the dairy industry containing cleaning, sanitization, heating, cooling, floor washing, naturally the industries need for water in huge quantity. Wastes from the dairy processing industry contain a large concentration of organic matter such as proteins, carbohydrates and lipids and high BOD<sub>5</sub> and COD and high concentration of suspended solid and oil greases.

**General characteristics of dairy wastewaters:-** waste water from the dairy industry are usually generated in an intermittent way, so the flow rates of these effluents change significantly. High seasonal variations are also encountered frequently and correlate with the volume of milk received for processing which is typically high in summer and low in winter month, since the dairy industry produce different product such as milk, butter, yoghurt, ice-cream, various types of desserts and cheese. The characteristics of the effluents also vary greatly depending on the type of system and the method of operation used. The use of acid and alkaline cleaners and sanitizers in dairy industry additionally influences waste water characteristics and typically results in the highly variable PH. Actually information about the general characteristics of dairy waste water from full scale operation.

**Electro-Coagulation:-** Electro-coagulation is technique for treating wastewater using electricity instead of expensive chemical reagents. An electro-coagulation process has been attracted a great concentration on treatment of industrial wastewater because of the versatility and environmental compatibility. This methodology has several advantages as compared to conventional methods in terms of use of simple equipment, ease of operation, less treatment time, reduction or absence of chemicals addition Moreover, an electro-coagulation process provides rapid sedimentation of electro generated flocs and a less amount of sludge production. Electro-coagulation has the advantage of removing the smallest colloidal particles compared with traditional flocculation coagulation, such electric particles have a greater liability of being coagulated and destabilized because

of the electric field that sets them in motion Electrolysis is a process in which oxidation and reduction reactions take place when electric current is applied to an electrolytic solution. Electro-coagulation is based on separation of the electrode material used as an anode. This also called "sacrificial anode" creates metals ions which act as coagulant agents. At its simplest, an electro-coagulation system consists of an anode and a cathode made of metal plates, both submerged in the solution being treated. The electrodes are usually made of aluminum, iron or stainless steel, because these metals are cheap, preferably accessible, proven effective and non-toxic. Thus they have been take up as the main electrode materials used in electro-coagulation system. The configuration of electro-coagulation systems vary An electro-coagulation system may contain either one or multiple anode-cathode pairs and may be connected in either a monopolar or a bipolar mode. The Electro coagulation technique can be conveniently used in rural areas where electricity is not accessible, since a solar panel attached to the unit may be sufficient to carry out the process.

## 2. REAGENT AND MATERIAL:-

**2.1 REAGENTS USED:-** Carbon dioxide free distilled water, Phenolphthalein indicator, methyl orange indicator, 0.1 N sodium thiosulphate solution, 0.02 N Sulphuric acid, Standard potassium dichromate solution (0.25N), Concentrated sulphuric acid ( $H_2SO_4$ ), Silver sulphate ( $AgSO_4$ ), mercuric sulphate ( $Hg_2SO_4$ ), ferroin indicator solution, standard ammonium sulphate (FAS) titrant (0.1 N), Manganous sulphate solution, alkali iodide azide reagents, concentrated sulphuric acid, starch indicator solution, standard sodium thiosulphate titrant ( $Na_2S_2O_3$ )(0.025 N), standard potassium Iodate solution (0.1N), 3% Acetic acid, KI (Potassium Iodide) crystals, Phosphate buffer solution, Magnesium Sulphate Solution, Calcium Chloride Solution, Ferric Chloride Solution.

**2.2 MATERIAL AND EQUIPMENT USED:-** Dairy waste water, Iron plates (5cm x5cm x1cm) as a electrodes, connecting wires, magnetic stirrer, DC supply (0-3 A)

## 3. METHODOLOGY:-

### 3.1 EXPERIMENTAL SETUP OF ELECTRO COAGULATION:-

Procedure:-

Two iron electrode of size 5cmx5cmx1cm are used as an anode as well as cathode for the set up and connected by using connecting wires.

Between two electrodes rubber is placed for preventing it from short circuit.

Then other end of connecting wire is connected to regular DC supply for completing the circuit.

Then 500ml sample is taken in beaker and both the electrodes deep in to the sample.

After elect coagulation done in three stage . In first stage PH and current are kept constant and time varying, in second stage PH and time are kept constant and current varying, in third stage current and time are kept constant and PH varying.

While processing electro-coagulation rpm of magnetic stirrer are kept constant in all three stages.

After treating sample by above sets sample are taken out in beaker for calculating parameter (i.e.PH, turbidity, BOD, COD)

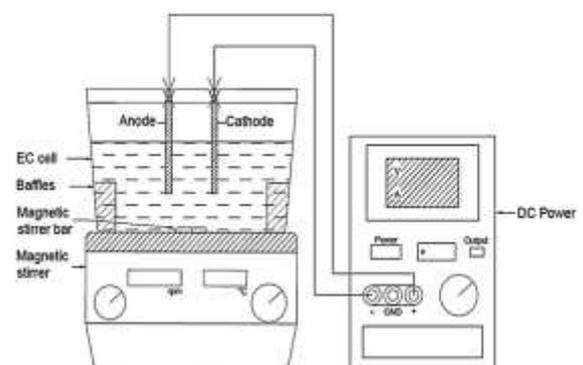


Fig:-1 set up of electro-coagulation

### 3.2 EXPERIMENTAL SETUP OF JAR TEST:-

Procedure:-

Take 1 lit beaker and fill them with sample up to the mark.

Maintain each beaker below each paddle and lower the paddles such that each One is about 1 cm above the bottom

Discover the PH of the sample and adjust it to 6 to 8.5.

Pipette 1, 2, 3, 4, 5 ml of alum solution into the test samples.

Immediately run the paddle at 100 rpm for 1 min.

Reduce the speed to 30-40 rpm and run at this rate for 30 min.

Stop the machine, lift out the paddles and allow to settle for 30 min.

Find the residual turbidity of supernatant using nephelometer.

The dosage of alum which represents least turbidity gives maximum coagulant dosage.

### 3. CONCLUSION

Conventional electro-coagulation processes are often used for treating wastewater. Particularly aluminum, iron or stainless steel electrodes are the most common electrode configuration employed. In fact the aluminum, iron or stainless steel electrode which act as a coagulant agent are very suitable for treating food industry waste water, since they can treat large volume of waste water in sacrificial anode in electro-coagulation techniques in near future to make use of these potential advantages outlined. Electro-coagulation is technique for treating waste water using electricity discuss in literature since electro coagulation need lesser material and energy compared to the conventional treatment system. To overcome problems associated with chemical coagulation, electro-coagulation has been advocated as a removal approach in removing suspended solids and color substances from waste water. But the other source of developing country like the India the problem associated with waste water reuse arise from its lack of treatment the challenge thus is to find low, cost low technology and user friendly method.

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