

**ESTIMATION OF COD IN DAIRY WASTEWATER USING
ELECTROCOAGULATION MECHANISM**

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Abstract— *The removal of COD from dairywastewater was experimentally investigated using direct current electrocoagulation (EC). In the EC of dairywastewater, the effects of initial pH, electrolysis time, voltage and different electrodes were examined. The optimum operating range for each operating variable was experimentally determined. The greatest removal efficiency was obtained with the use of aluminium as anode and iron as cathode (Al-Fe system). The batch of experimental results revealed that COD is effectively removed. An efficient algorithm is developed and coded in MATLAB to calculate the corresponding COD for given input (pH, time, voltage).*

Keywords— *Electrocoagulation, electrodes, electrolysis, COD, MATLAB*

INTRODUCTION

With the increase in demand for milk and milk products, many dairies of different sizes have come up in different places. The object of these dairies is preventing the spread of disease, to prevent the spoilage of milk and to produce desirable produces from milk. These dairies collect the milk from the producers, and then either simply bottle it for marketing, or produce different milk foods according to their capacities.

Large quantity of wastewater originates 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 degraded form due to their processing. As such, the dairy wastewater, though biodegradable, are very strong in nature. The liquid waste from dairies originates from different sections like receiving station, bottling plant, cheese plant, casein plant, condensed milk plant, dried milk plant and ice cream plant. The dairy wastes are very often discharged intermittently. The nature and composition of waste depends on the type of products produced and size of the plant.

The main objective of the present study is to carryout electrochemical study for the treatment of dairy industry wastewater to reduce the pollution caused by it. Electrocoagulation technique is a simple method using minimum electricity and an economic method applicable to industries for the treatment of wastewater.

II. EXPERIMENTAL SETUP

A simple electrocoagulating reactor is made up of one anode and one cathode. When a potential is applied from an external power source, the anode material undergoes oxidation, while the cathode will be subjected to reduction or reductive deposition of elemental metals. The hydroxide species produced which cause the removal of matrices by adsorption and coprecipitation.

**TABLE 1
CHARACTERISTICS OF UNTREATED WASTEWATER**

Sl no	Parameters	Values
1.	pH	6.0
2.	Color	Whitish
3.	Total solids	813 mg/l
3.	Suspended solids	280 mg/l
3.	BOD ₅	660 mg/l
4.	COD	3200 mg/l
5.	Dissolved solids	533 mg/l
6.	Chlorides	60 mg/l
7.	Oil and Grease	25 mg/l
8.	Nitrates	3.1mg/l
9.	Phosphates	4.2 mg/l

III. Methodology

Electrocoagulation of Dairy wastewater was carried out in a batch reactor. After the initial characterization of wastewater, batch experimental studies were conducted to optimize the various parameters such as pH, ET, CD and Boric acid concentration. Experiments were performed with two electrodes connected to the DC power supply to determine optimum condition. The space between electrodes was maintained 1cm in all the experiments. The voltage is fixed to 10V. The volume of solution was 10L. To maintain homogenous mixing of the reactor content, magnetic stirring unit was used. Electrodes were washed with 15-20% HCl followed by a detergent wash before experiment. EC experiments were performed for 60 min and in each run samples were retrieved at every 10, 20, 30, 40, 50 and 60 min for necessary analysis.

IV. Result

The results obtained from the experiment that have been tabulated in table 2 is stored in the MATLAB and graph is shown in Fig. 1.

TABLE 2
CHARACTERISTICS OF TREATED WASTEWATER

Time (min)	COD (mg/l)
10	2560
20	2100
30	1650
40	1080
50	960
60	612

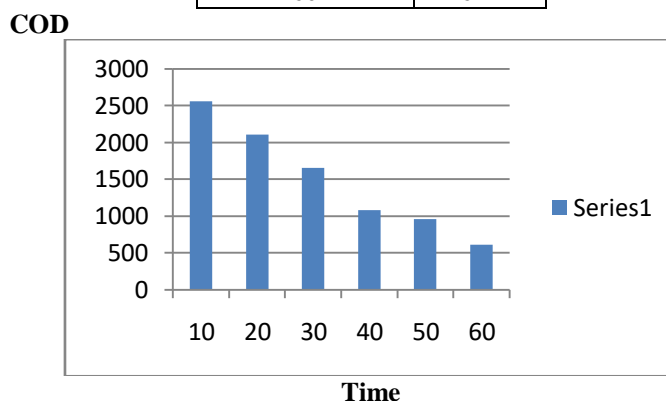


Fig. 1 Characteristics of treated wastewater

V. Conclusion

Electrocoagulation technique is a simple method using minimum electricity and an economic method applicable to industries for the treatment of wastewater. The removal efficiencies of COD was found to be dependent on initial pH, applied voltage and operating time. In this paper it has been shown that whenever the voltage is given as input, the matlab code will predict the COD. Further the matlab code can be used to predict COD when the input given may be pH, current density and different electrodes.

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