



Comparative Study on Distillery Spent Wash Using Different Electrodes by Electro-Coagulation Process

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Abstract: In this research work the experimental investigation on distillery spent wash for removal of COD and Colour using electrochemical process. The electrochemical chemical (EC) process is used to treat the distillery spent wash (DSW) using bare and punched Iron (Fe) & Aluminum (Al) electrodes. The proposed work directs the exclusion of colour and COD in the distillery spent wash. This research has been conducted with aim of optimizing the different factors of effecting, process of COD and Colour reduction with constant time (0-120 min), voltage (5-20 V) and distance between the electrodes (3-6 cm). It is absorbed that the removal efficiency is directly proportional to the electrode contact time, voltage and distance between the electrodes. Also, we compared the experimental results between punched and bare iron & aluminum electrodes.

Index Terms–EC, Al, COD, Punched electrodes, DSW

I. INTRODUCTION

Water is the main source for development of socio-economic development, food production, energy generation, industrial revolution, human survival and healthy ecosystem itself. The crucial link between society and environment of serving water is heart of adaptation to climate change. Waste water can be classified into many types like domestic waste water, industrial waste water specifically distillery waste water...etc. Plants, amphibian and human kind need fresh water to survive. Water from wells, springs, ponds and boreholes are untreated and not clean. Sugar cane industries are the vast producer of ethanol. These are called refinery industry which gives vast offer in modern development of our nation. Refinery ventures are introduced for sugar cane businesses. Around 5 to 12 % of ethanol generation from refinery business, where 85 to 95 % of waste water contained capacity of liquor is refined.

The waste water which is liberated from refined industry contains broken down polluting influences, supplements included amid the molasses maturation, by result of aging and disintegration items. The suspended pollutions are generally like tidy, cellulosic strands and primarily group of juice. Unpredictability blends segments are separated or refined. These industries are said to be most polluting industries in our country. Hence strict regulations are adopted to overcome the pollution and protection of environment. The refined spent treated water is an awesome to test for researchers. These refinery wastes will be in dim dark coloured, and with high pH, and have more BOD and oxygen demand. The spent wash contains some percent of sugary, aldehyde and high atomic weight. Various technologies have been implemented for colour reduction, physical substance, evaluating COD and organic strategies. In India around 732 sugar mill and 285 distilleries are producing around 40 billion liters of spent wash per year.

Another name for distillery spent wash is also known as Refinery spent wash. India has clearly defilement the issue of distillery spent washes, especially who are producing spirits by refining of sweet stick molasses. In India every year around 40.5 x108 liters of expenditure, around 319 sugar organization making 3.25 x 109 liters of ethanol annually. In the year 2006 India produced around 8.6 million MT of molasses. "Electro" means apply of electric charge to spent wash and "coagulation" means the particles surface charge allowing suspended matter to form an agglomeration. Electro coagulation is a process of application of electric current on the surface of electrodes for the treatment of flocculate contamination without any chemical/coagulant changes. In electro coagulation process we can remove colloidal materials, metals, suspended solids as well as other dissolved solids from waste water. Even pesticides pollutants and radio materials has been successfully removed by the electro coagulation process. Electrochemistry is the principal of electro coagulation technique for treatment of waste water.

II. STUDY AREA

In the present research work, we conducted the experiments in environmental engineering laboratory, department of civil engineering, UBDT College of engineering Davangere. This section includes material utilized, new technique and sample process used for treatment of distillery spent wash to achieve the destination of the work to be done.

III. METHODOLOGY

In the proposed research work, we conducted the removal of COD and colour from the DSW using electro coagulation process containing different electrodes. Determination of removal efficiency of different parameters at different varying operating parameters viz, Electrolysis time, voltage and Electrode distance. The initial characteristics of distillery spent wash of various parameters viz pH, Turbidity, TDS, Color, BOD and COD were analyzed has per APHA 2017 are shown in table 1

Table 1: Initial Characteristics of Distillery spent wash.

Sl no.	Parameters	Units	Values
1	pH	-	4.31
2	Turbidity	NTU	9200
3	TDS	mg/L	13430
4	Colour	Pt.co	150560
5	BOD	mg/L	53640
6	COD	mg/L	184200
7	Conductivity	µs/cm	20

IV. EXPERIMENTAL SETUP

In present research work the experimental work is carried out by using batch operation method. The setup includes in two mode of operation I.e., reactor and power supply. Reactor includes: 2 litre capacity of distillery spent wash effluent sample is transferred to beaker made up of fiber, two type of different materials used as electrode i.e., Fe and Al electrodes which is immersed in the beaker. Regulated DC supply is used to supply current to the electrodes kept in the beaker, and magnetic Stirrer instrument is used to stirring the effluent for treatment, as shown in below figure 3.1

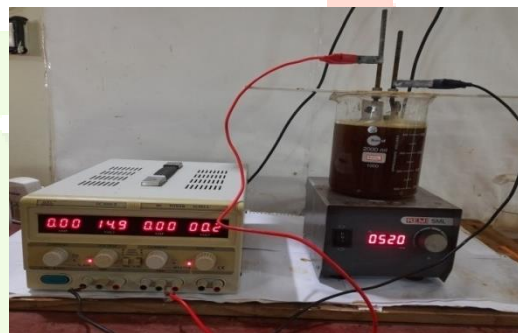


Fig:1 Experimental setup

V. OPERATING VARIABLES CONSIDERATION

In the research work the consideration of variables were obtain as listed below, Aluminium (Al) and Iron Electrodes used. The electrodes are placed in the reactor at distance of 3-5cm. Voltage given by DC supply of 5-20 V and Electrolysis time of treatment: 30- 90 minutes.

VI. EXPERIMENTAL PROCEDURE

The process used in the present research work is electro coagulation process, initially the fresh stage of sample is tested using standard method and calculated the results and tabulated the results of characteristics of waste water in table 4.1. the sample were analyze and conduction of experiment in the electro coagulation process by giving 5, 10,15 and 20V voltages and electrolysis time of 30, 60 and 90 minutes and also final treated waste water characteristics were calculated and then the efficiency of each parameters were calculated using below formula and presented in below graphs.

Efficiency (%) = $\frac{\text{Final} - \text{Initial}}{\text{Initial}} \times 100$



(A)

(B)



(C)

(D)



(E)

(F)

The above figure A, B, C are Iron normal, Iron punched, Aluminium normal, Aluminium Punched electrodes respectively. And E, F are after treated electrodes of Aluminium and Iron punched.

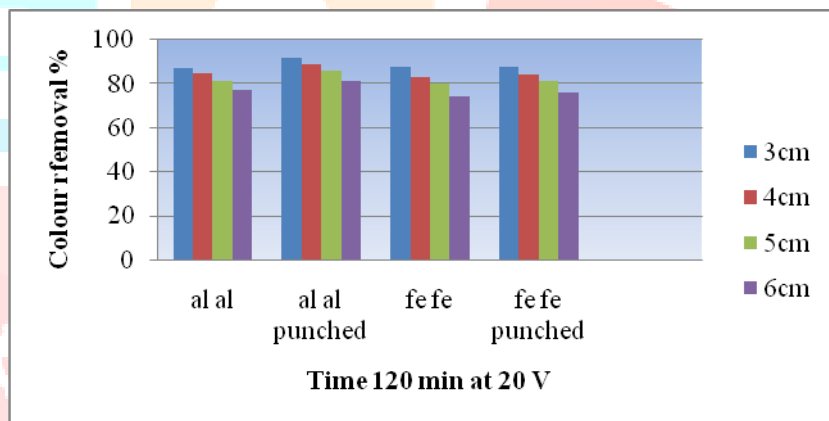
VII. RESULTS

The initial parameters like pH, colour, BOD, TDS, Turbidity, EC were examined in environmental engineering lab, Department of Civil Engineering, UBDTCE, Davangere. The below table shows the initial characteristics of distillery spent wash.

Sl no.	Parameters	Units	Values
1	pH	-	4.31
2	Turbidity	NTU	9200
3	TDS	mg/L	13430
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7	Conductivity	µs/cm	20

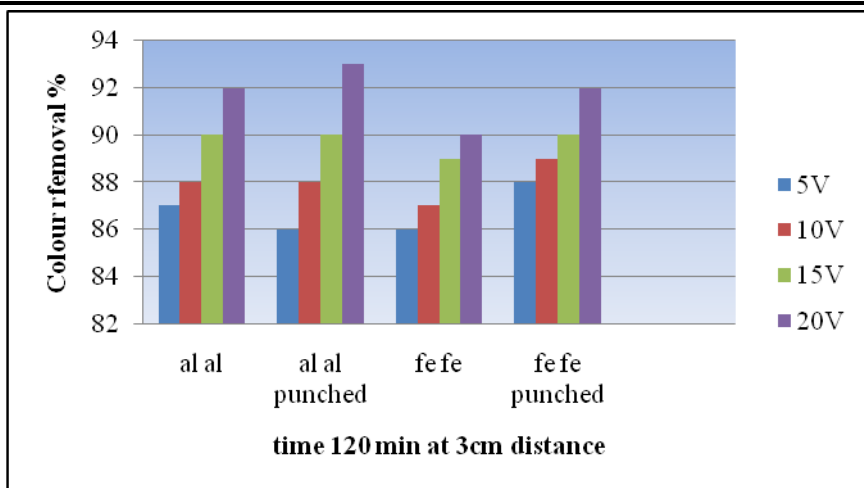
Time and voltage constant has 120 min and 20V respectively.

Varying in distance	Al-Al	Al-Al punched	Fe-Fe	Fe-Fe punched
3cm	87	92	88	88
4cm	85	89	83	84
5cm	81	86	80	81
6cm	77	81	74	76



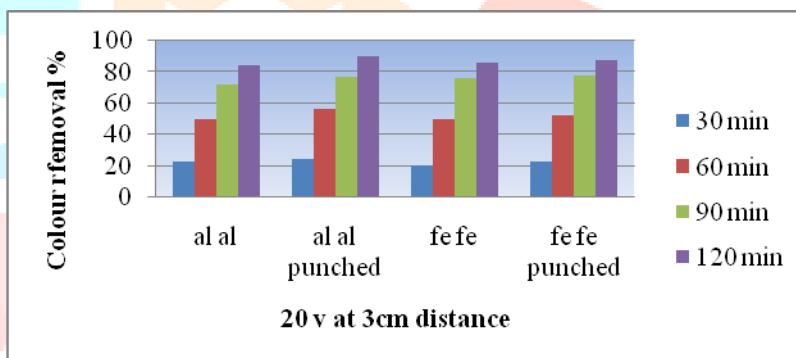
Time and Distance constant has 120 min and 3cm respectively.

Varying in voltage	Al-Al	Al-Al punched	Fe-Fe	Fe-Fe punched
5V	87	86	86	88
10V	88	88	87	89
15V	90	90	89	90
20V	92	93	90	92



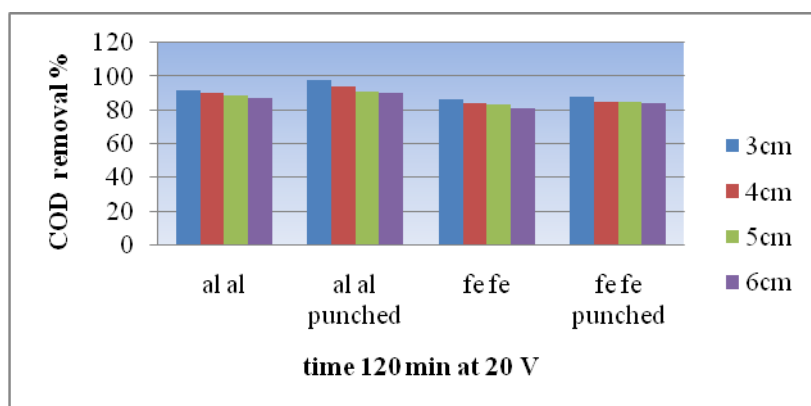
Voltage and Distance constant has 20 V and 3cm respectively.

Varying in time	Al-Al	Al-Al punched	Fe-Fe	Fe-Fe punched
30 min	22	24	20	22
60 min	50	56	50	52
90 min	72	77	76	78
120 min	84	90	86	88



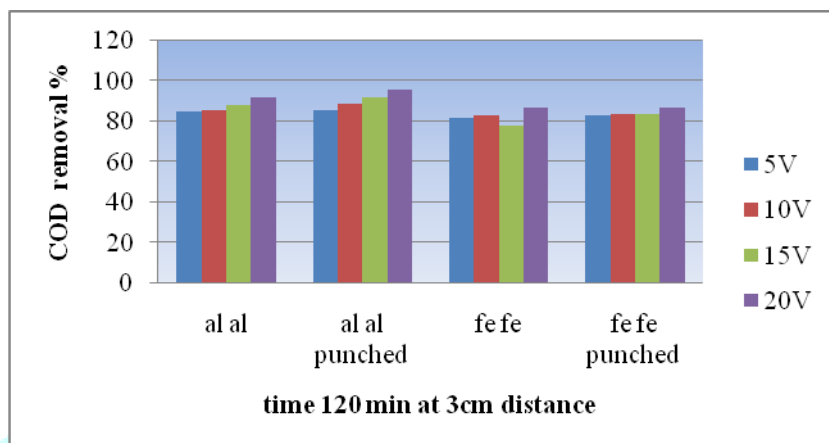
Time and Voltage constant has 120 min and 20V respectively.

Varying in distance	Al-Al	Al-Al punched	Fe-Fe	Fe-Fe punched
3cm	92	98	86	88
4cm	90	94	84	85
5cm	89	91	83	85
6cm	87	90	81	84



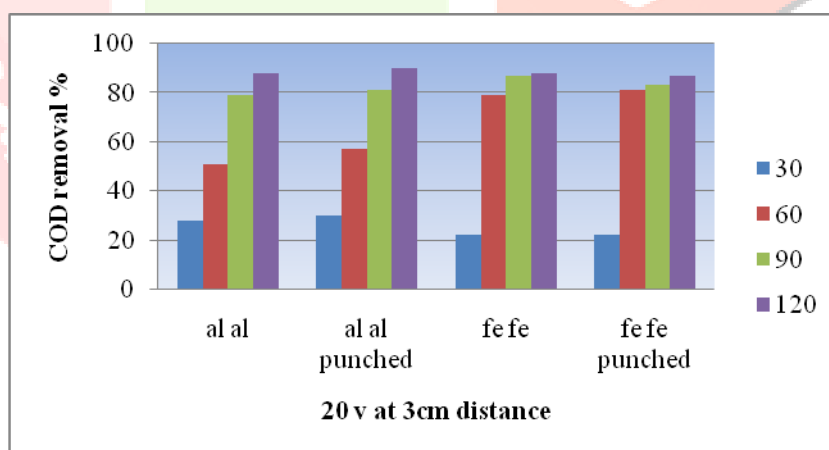
Time and Distance constant has 120 min and 3cm respectively.

Varying in distance	Al-Al	Al-Al punched	Fe-Fe	Fe-Fe punched
5V	85	86	82	83
10V	86	89	83	84
15V	88	92	78	84
20V	92	96	87	87



Voltage and Distance constant has 20 V and 3cm respectively.

Varying in time	Al-Al	Al-Al punched	Fe-Fe	Fe-Fe punched
30	28	30	22	22
60	51	57	79	81
90	79	81	87	83
120	88	90	88	87



VIII. CONCLUSION

The present study is focused on distillery spent wash waste water treatment by electro coagulation process. The treatment has given effective results which can be adapted for DSW. In this research study both bare electrodes and punched electrodes are used which is effective, simple, easily available and low-cost equipment, less space is required for installation of equipment. The above result tells that the punched electrodes had more removal efficiency than bare electrodes. Where punched Aluminium electrodes has given 92% removal efficiency of colour compared to bare electrodes, and 98% removal efficiency COD by punched Aluminum electrodes. From the above graph we can conclude that EC process plays a very important role in treatment of distillery Spent wash (DSW).

IX. REFERENCE

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