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STUDY OF COD AND COLOUR REMOVAL FROM DISTILLERY SPENT WASH USING Al-Al ELECTRODE IN ELECTROCOAGULATION PROCESS

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Abstract - *The distillery industries are characterized by complex organic and inorganic chemicals with high suspended solids and dissolved minerals which are further boost its characteristics with high BOD and COD. Moreover its highly complex nature affects the local and ecological environment. Untreated distillery spent wash if discharged into the water bodies it not only affects the water quality but also affects the aquatic ecosystem. Its unpleasant odour creates irritation to the workers working in that environment. Due to its high acidic nature it corrode the pipes in the treatment plant and also causes acidity to the river system. Electrocoagulation is one of the emerging physico chemical waste water treatment best suited to treat complex waste water such as distillery industries. In the present work, electrocoagulation is carried out to treat the spentwash by iron electrodes to study the removal efficiency of COD and Colour. The experiment was conducted with variable parameters such as pH, Voltage, Electrode distance and Electrolysis time. The study shows that, maximum COD removal efficiency was found to be 98% and maximum colour removal efficiency was found to be 97% with optimum pH of 9, voltage of 20V, 2cm electrode distance and 150 minutes of electrolysis time. The Electrocoagulation treatment has proved to be economical and efficient method for the treatment of tannery wastewater rather than chemical coagulation.*

Key Words: **Distillery spent wash, Electrocoagulation, Iron electrodes, COD and Color**

1. INTRODUCTION

Distillery effluent is fantastically motives large ecological contamination. The era and attributes of distillery spent wash are developing the problems. Gushing beginning from distillery industry, known as distillery waste water exceptionally stacked and causes broad ecological contamination. The generation and attributes of distillery waste water very factor. End of contaminations from distillery emanating is ending up plainly progressively imperative for natural perspective.

Because of expensive volume of emanating and nearness of biodegradable aggravates, the treatment stream is somewhat testing by regular treatment frameworks, in this way, to enhance the current treatment choice, various novel physic-concoction and organic medicines have been conducted. The center is given to the use of aluminum terminals to treat the profluent. The electrocoagulation strategy is most generally utilized as a part of water and wastewater treatment handle (8).

Electrocoagulation has attracted a great attention in wastewater treatment by the fact that it has been successfully used in the treatment of various types of waste water like textile, dye wastewater, tannery wastewater, dairy wastewater, domestic wastewater etc. This technology is characterized by simple equipment, easy operation and sludge reduction. The process of applying electric current in electrode is called electrocoagulation. The principle of electrocoagulation process depends on, responses of water contaminants to a strong electric fields and electrically induced oxidation and reduction reactions. Electrocoagulation utilizes direct current to remove undesirable contaminants by chemical reactions and precipitation. The different types of electrodes used in this process are Aluminium, Zinc, Copper, Iron etc,(7).

1.1 Effects of Distillery Spent wash on Environment

Before you begin to format your paper, first write and save the content as a separate text file. Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that foryou.

Improper management and inadequate treatment technology create heavy pollutional load to the environment. 95% of the distilleries are still adopted traditional treatment methods.

Due to its unpleasant odor it creates unnecessary nuisance

- Generally modern wastewater adjustments pH degree of the getting water body. Such modifications can have an effect on the ecological aquatic system. immoderate acidity specially can end result in the launch of hydrogen sulphide (H_2S) to air
- Color and fragrance of the profluent of the refinery had been pink earthy in colored with

the disagreeable smell of Indol, sketol and different sulphur compounds

- Fall in DO levels reasons unfortunate scents, tastes and decline that worthiness of water fir home reason.
- It acts as irritant to eyes and nose to the people working surrounding to it.
- low pH it causes corrosion of pipes in the treatment plant

- Untreated distillery spentwash containing complex organic compounds and high dissolved solids adversely affects the terrestrial and aquatic ecosystem.
- its high acidic nature it reduces soil fertility and make the land unfit for agricultural purposes.
- its high turbidity and suspended solid it does not allow the sunlight to penetrate into it and affects the photosynthetic activity if disposed in the water bodies
- Generally modern wastewater adjustments pH degree of the getting water body. Such modifications can have an effect on the ecological aquatic system. immoderate acidity specially can end result in the launch of hydrogen sulphide (H_2S) to air.
- its thick viscosity it physically alters the potable water if discharge in to river streams

- Fall in DO levels reasons unfortunate scents, tastes and decline that worthiness of water fir home reason.
- its high turbidity and suspended solid it does not allow the sunlight to penetrate into it and affects the photosynthetic activity if disposed in the water bodies.

- It also pollutes indoor and outdoor atmosphere due to release of hydrogen sulphide gas into the atmosphere.(8)

Due to its high abundance, darkish brown in color and undesirable organic contents and high dissolved solids it poses a serious threat to soil and to the eco-aquatic system that releases melanoidin because of the increasing burden of biodiversity associated with water bodies. This then poses a problem, such as reducing the sun's penetration of light, reducing dissolved oxygen content decreasing the performance of photosynthesis.

High acidic content causing a decrease in soil growth and a blockage of seed germination. In addition, because there is likely to be a melanoidin reaction, they can influence the biogeochemical sequence of many populations in natural water environments, which are strongly resistant to microbial action. Therefore, wastewater needs to be treated prior to its safe disposal into the environment

1.2 Principal of Electrocoagulation

The predominant precept of electrocoagulation method is based totally on “electrolysis”. Electrolysis is technique in which oxidation and discount response happens when electric powered contemporary is utilized to an electrolytic solution. EC device consists of an anode and cathode electrode which is linked to exterior DC strength supply. These electrodes are submerged in aqueous answer which is being treated. EC is a manner in which the anode cloth undergoes oxidation whilst cathode fabric undergoes reduction. When anode cloth undergoes oxidation, there is production of quite a number polymeric steel hydrolyzed species (7).

In an Electro Coagulation system the coagulating ions are Resulting in situ entails following successive levels

1. Formation of destabilization marketers such as Al and Fe ions with the aid of electrolytic oxidation of the sacrificial electrode and neutralize the electric powered cost existing on colloidal particles.
2. Destabilization of the contaminates, particulate the suspension and breaking of emulsion.
3. Accumulation of the destabilized phases to shape flocs.
4. Formation of OH ions, formation of H_2 and O_2 fuel at cathode and anode respectively.
5. Removal of colloids by means of sedimentation of floatation(7).

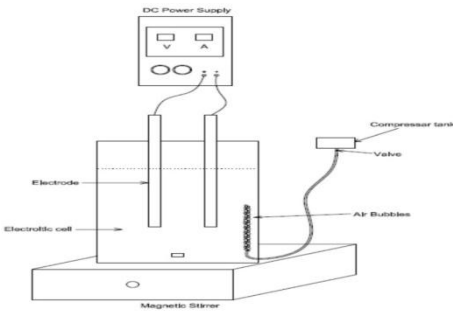

Fig 1.1 : Electrocoagulation Treatment

2. Materials and Methodology

2.1 Materials

The sample for the study was collected from the common effluent from the distillery industry. The sample was stored under 40C and conducted experiment in an electrochemical reactor. Iron plates of dimension 15cm x 5cm x 0.2cm were used for the experimentation and a glass container as an electrochemical cell with a working capacity of 2 liters and a DC power supply of 0-30V and 0-2A was used.

The composition of the distillery spentwash are determined using Standard Methods and are presented in Table 2.1

Table -2.1: Initial characteristics of raw distillery spentwash

Sl no	Parameter	Unit	Values
1	pH	-	3.5-4.6
2	TDS	mg/l	92000-50000
3	Turbidity	NTU	3600
4	Conductivity	µs/cm	38000
5	Colour	Pt.co	3,18,000
6	EC	ms/cm	20
7	Total hardness	mg/l	1000-1200
8	Total alkalanity	mg/l	1100-1600
9	Chlorides	mg/l	8000-8200
10	COD	mg/l	134000

2.2. Experimental Setup

For batch Electrocoagulation concentrates the reactor will be comprised of acrylic fabric with the combination working quality of 2 liter Capacity. The electrocoagulation till will contain of two terminal in the reactor and DC electricity supply. The DC wellspring of 0-30V and 0-2A will be utilized as energy furnish to this body work. Aluminum will b e utilized as anode having measurements of 5 mm thickness and 150 mm *50 mm length and breadth.

2.3 Experimental procedure

The experimentation was carried out by using a reactor consists of two Aluminum electrodes arranged in series and connected to a 0-30V and 0-2A DC power supply. two numbers of electrodes were arranged in series, the end electrodes were connected to positive and negative terminals. A constant gap of 1cm, 2cm and 3cm was kept between the electrodes. The glass container was filled with 2 liters wastewater and the initial pH was adjusted to 3, 5, 7 and 9. The voltage in the DC power supply was adjusted to 5,10V, 15V and 20V to evaluate the optimum voltage. The electrolysis was carried out for120 minutes and the samples were taken at an interval of 30 minutes. The collected sample was filtered with the whatman filter paper and simultaneously the COD and color were measured. COD and chromium test were conducted by instrumental methods. HACH 2700 Spectrophotometer of was used to analyze the parameters.

3. RESULTS AND DISCUSSION

COD and Colour Removal by Electrocoagulation Using Al-Al Electrode

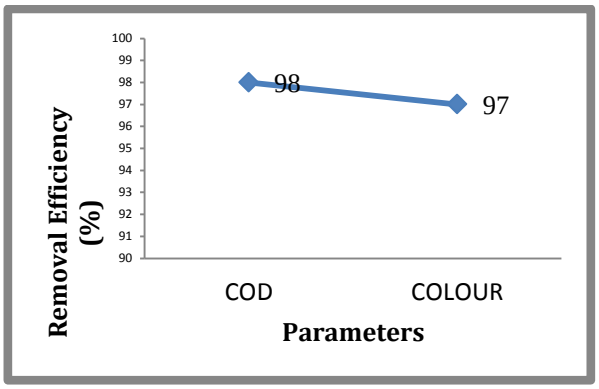

Figure 3.1: Figure shows the Maximum colour and COD removal efficiency of Al-Al Electrodes at pH=9, Distance of electrodes 2cm, 20voltes and 150minutes in time interval

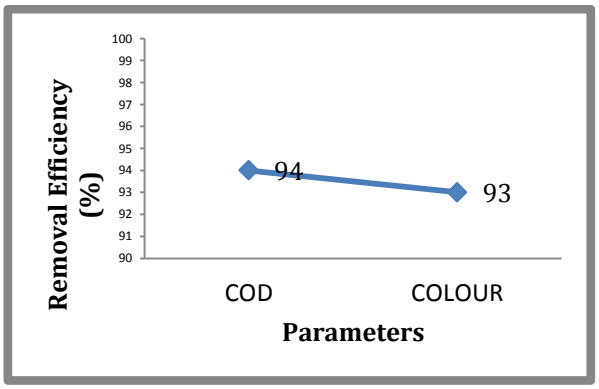

Figure 3.2: Figure shows the Maximum colour and COD removal efficiency of Al-Al Electrodes at pH=9, Distance of electrodes 3cm, 20voltes and 150minutes in time interval

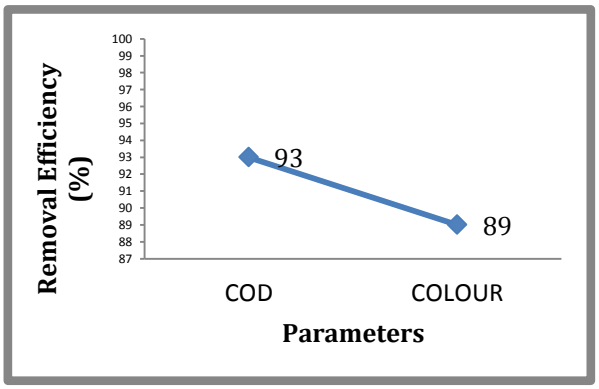

Figure 3.3: Figure shows the Maximum colour and COD removal efficiency of Al-Al Electrodes at pH=9, Distance of electrodes 4Cm 20voltes and 150minutes in time interval

From the above figures represents Increasing the inner Electrode distance from 1cm to 3cm, Decreasing the Removal efficiency of the COD and Colour. Figure 3.1 indicates the highest COD and Colour Removal efficiency ie: 98%& 97% respectively and Figure 3.3 shows the lower Removal efficiency of 93% in COD Removal and 89% in Colour removal.

The electric potential between the anodes increments with the diminishing in separation between the terminals henceforth in a huge scope activity when numerous number of cathodes can be utilized with insignificant terminal separation between them.

It is discovered that at power ph greatest cod evacuation happens in light of the fact that acidic condition is increasingly good for cod expulsion in acidic condition chlorine is available in type of hypo chlorous acidic which has more oxidation potential.

The applied voltage has noteworthy effect on the proficiency of the electrocoagulation process. This can be credited because of the way that at high voltage the degree of anodic disintegration increments and thus the measure of hydroxocationic complexs coming about expanded cod evacuation. Further the applied voltage decides the pace of coagulant and air pocket creation, which thus can impact the procedure effectiveness. Anyway it very well may be seen that expanding the voltage past 25v didn't show any noteworthy improvement in the shading evacuation.

4. CONCLUSIONS

- Aluminium cathodes was seen as most extreme expulsion productivity is COD 98%, Colour-97%. At a Distance (D)=2cm, pH=9, and V=20v and Time(T)=2.5h.
- Results got from utilizing Aluminium terminals concluded that lesser the distance between the cathodes more will be the maximum removal efficiency.
- Aluminum cathodes were respond that the large removal efficiency was found to be in alkaline condition.
- Electrocoagulation strategy is a treatment of refinery spent wash is economical but one and only the issues is secondary sludge developed during Electrocoagulation method.

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