Parameters Degradation of Distillery Spent wash by Electrocoagulation using Aluminum electrodes and Titanium Dioxide as a Nanoparticles

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Abstract- *Distillery spent wash is also known as refinery spent wash and it is a undesirable fluid waste created amid the liquor generation and contamination caused by it is a standout amongst the most basic natural issues. Electro coagulation is the technique adopted to remove contaminants like COD and color from distillery spent wash. In the present study, it mainly focuses on the treatment of distillery spent wash by electro coagulation using the combination of aluminum – aluminum electrodes and titanium dioxide crystals as adsorbents for different time intervals to obtain the optimum results. The color removal is 99.67% and COD removal is 97.95% with the combination of aluminum – aluminum electrodes and titanium dioxide nano particles.*

Keywords- Distillery spent wash, Titanium dioxide nano particles, Aluminum, COD and Color.

I. INTRODUCTION

Water is a major source which is required for the survival of all the living and nonliving part of the environment. Water which we use for drinking purposes should be free from unwanted impurities. Industrial waste water is a class of water that has been adversely affecting the human beings, plants and aquatic life to a certain instant from many decades. An industrial wastewater is consists of various pollutants discharged from the sources such as domestic and commercial properties, industrial and agricultural properties, which encounter wide range of pollutants with their high concentrations.

Distillery is the way toward isolating the parts or substances from a fluid blend by particular bubbling and builds up. It separates in the unpredictability of the blends segments. It is a viable and customary strategy for desalination. On, every alcohol production they discharged 15L of spent wash. So, they are considered as the most polluting industries in India; hence, it is advised to adopt modern methods to overcome the pollution and to safeguard the environment.

II. BACKGROUND

Electro coagulation is the capacity to expel the contaminants which are hard to be expelled by filtration or other compound treatment, for example, emulsified oil, hard-headed organics, suspended solids and substantial metals. The entire procedure measure by changing separations, pH, voltages, dose of titanium dioxide nano particles, and time.The principal test was parse for getting the ideal separation, pH, and voltage fluctuated the dose of adsorbents and time at 10,20,30,40,50, and 60 min. After the parse the example was permitted to make due with the supernatant to quantify the shading and COD and acquired the greatest effectiveness by plotting the charts.

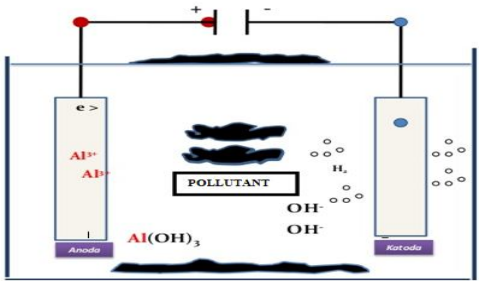

Figure 1. Electro coagulation cell scheme

Aluminum electrodes were chosen for the crude water treatment, though wastewaters and debarking emanating were treated with press terminals. Titanium dioxide is for the most part brought into nature as nano particles by means of wastewater treatment plants. Titanium dioxide disintegration increments when there are more elevated amounts of broke down natural issue and dirt in the dirt.. Because of the hydrophilic character of titanium dioxide, water shapes a shut film at first glance in which contaminations and corruption items can be effortlessly diverted.

III. STUDIES AND FINDINGS

Electro coagulation is an entangled procedure, as it includes numerous concoction and physical phenomenon during consumable anodes disintegration for coagulating particles creation. It depends on the in-situ formation of the coagulant as the conciliatory anode erodes because of a connected current, while the simultaneous advancement of hydrogen at the cathode permits toxin evacuation. For group electro coagulation focuses the reactor will be involved acrylic material with the total working volume of 2 liter Limits. The electro coagulation unit will include two terminals in the reactor and direct current control supply. The direct current wellspring of 0-30V and 0-2A will be used as power supply to this structure.

Aluminum will be used as anode having estimations of 5 mm thickness and 150 mm x 50 mm length and broadness. The sample was collected in the form of grab sampling which was located in Duggathi, Davangere. And was tested in the Environmental Engineering Lab, UBDT College, Davangere.

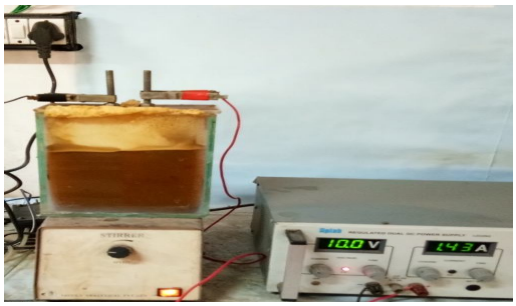

Figure 2. Photographic view of Experimental set up

Electrodes have to be cleaned with sandpaper and then washed with distillery water. Electro coagulation reactor has to be washed with water and then rinsed with sample. Setting up all the circuits in proper way like positive to anode and negative to cathode. Fill the reactor with sample with varying pH and then arrange the electrode distance and place in the reactor. Now add stirrer beats to reactor and on the switch, set the voltage, note down the time and after the completion, off the switch. Allow the sample to settle for few minutes and then carryout the analysis of the parameters.

Note down the readings and plot the graphs according to the results. Clean the reactor after the complete use. The same is carried out by adding titanium dioxide nano particles in the reactor and noting the readings and plotting the graphs with different time intervals. Optimizing the results and comparing the maximum removal efficiencies.

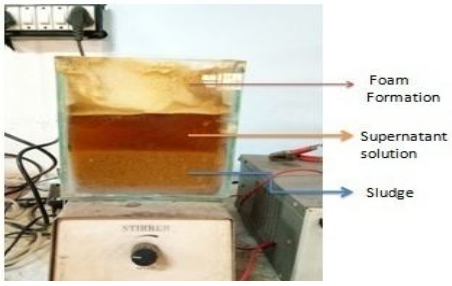

Figure 3. three layers after electro coagulation

Electro coagulation is the procedure to make aggregates of the suspended, broke down or emulsifying particles in the fluid medium utilizing electrical current causing generation of metal particles to the detriment of giving up cathodes and hydroxyl particles because of water part. Metal hydroxides are created because of electro coagulation and go about as coagulant / hairy for the suspended solids to change over them into flocs of enough thickness to be silt under gravity.

IV. RESULTS AND DISCUSSIONS

The qualities of refinery spent wash obtained, and the experimental outcome on the treatment of refinery spent wash using Aluminum-Aluminum electrodes and Titanium dioxide nano particles by electro coagulation.

Comparison of Normal Electro coagulation Treatment and Titanium dioxide electro coagulation Treatment using aluminum electrodes for the distillery spent wash.

Distillery spent wash is the undesirable lingering fluid waste created amid the liquor generation and contamination caused by it is a standout amongst the most basic natural issues. It is considered as a misuse of refinery forms and can be delegated weaken natural fluid manure with potassium content. The given effluent was tested prior to know its conditions twinned with prescribed limits and treating the same by electro coagulation using aluminum electrodes and titanium dioxide nano particles. Nano technology is best used in the wastewater treatment.

The treated sample is observed using spectrophotometer to measure the percentage of color removal and open reflex method carried to check the percentage of COD removal after electro coagulation process. COD and Color degradation by using pure aluminum electrodes by electro coagulation gave the optimized result for constant distance, voltage and varying pH.

By using the combination of titanium dioxide nano particle and aluminum electrodes by electro coagulation gave optimized result for the optimized constant pH, distance, voltage and varying time intervals. Below tables and graphs shows the maximum removal efficiency of COD and Color. Initial characteristics of the sample is shown below followed by the optimum results obtained by aluminum-aluminum electrodes and titanium dioxide nano particles.

Table 1. Initial Characteristics of distillery spent wash.

Parameter	Value	Units
pH	3.67	-
Color	123600	Pt. Co
Turbidity	11300	NTU
Electrical Conductivity	20	µS/cm
TDS	10780	ppm
BOD	50190	mg/l
COD	122000	mg/l

Table 2. Optimum removal efficiency of aluminum electrode after electro coagulation at distance 3 cm, 15V voltage, and pH-9.

pH	Distance (cm)	Voltage (V)	COD (mg/L)	Color Pt Co	% Removal Efficiency of COD	% Removal Efficiency of Color
3	3	15	19000	15400	84.42	87.54
5	3	15	24000	13813	80.32	88.82
7	3	15	12000	13407	90.16	89.15
9	3	15	4880	9000	96	92.71

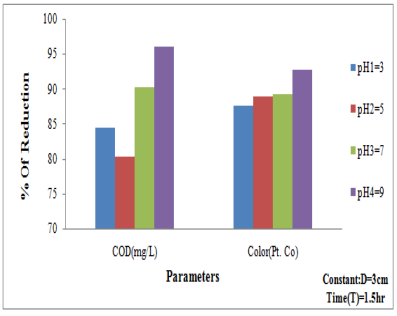

Figure 4. Graphical representation of optimum removal effeciency of aluminum after electro coagulation

Table 3. Optimum removal efficiency of aluminum electrode along with titanium dioxide as a nano particles after electro coagulation at distance 3 cm, 15V voltage, and pH-9.

pH	Distance (cm)	Voltage (V)	Time (min)	Color Pt. Co	% Removal efficiency of color	COD (mg/L)	% Removal efficiency of COD
9	3	15	10	650	99.47	5500	95.49
9	3	15	20	600	99.51	4900	95.98
9	3	15	30	550	99.55	4300	96.47
9	3	15	40	500	99.59	3700	96.96
9	3	15	50	450	99.63	3100	97.45
9	3	15	60	400	99.67	2500	97.95

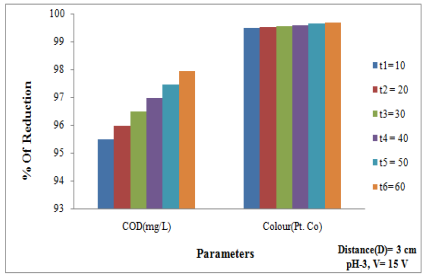

Figure 5. Graphical representation of optimum removal effeciency of aluminum electrode along with titanium dioxide as a nano paricles after electro coagulation.

Figure 5. Photographic view of color change at optimized results

V. SUMMARY AND CONCLUSIONS

A. SUMMARY

To meet the goal work, following synopses were drawn from the trial ponder led on treatment of distillery spent wash utilizing aluminum cathodes and titanium dioxide.

Electro coagulation process was directed in this present examination utilizing aluminum anodes to decide the qualities of distillery spent wash, for example, Shading (color) and COD. The qualities of distillery spent wash were completed, pH- 3.67, Shading- 123600 Pt. Co, and COD- 122000 mg/L.

Aluminum electrodes were used for removing parameters such as COD and Shading. Electro coagulation using Aluminum electrode was carried out for their different pH, distances and voltages and the maximum removal of

Shading and COD was found to be with pH=9, D=3 cm and V=15 V.

After the optimum values the titanium dioxide crystals were used at pH-3, D=3 cm, V=15 V, and varying time 10,20,30,40,50, and 60 min, and dosage of TiO2 varied from 0.5,1,1.5, and 2 grams. The maximum removal of Shading and COD was found to be at time 60 min and dosage 2 grams.

B. CONCLUSIONS

Aluminum electrodes was found to be maximum removal efficiency was, COD and Color- 96%, 92.71% at a Distance (D)=3cm, pH=9, and V=15v and Time(T)=1.5h. Results obtained from using Aluminum electrodes concluded that lesser the distance between the electrodes more will be the maximum removal efficiency. Electro coagulation method is a treatment of distillery spent wash is economical but only the problem is secondary sludge is developed during electro coagulation process which has to be further treated. The combination of titanium dioxide crystals / nano particles and Al-Al electrodes resulted in maximum removal efficiency of Color and COD than that of Al-Al electrodes alone. Using TiO2 and Al-Al electrode combination resulted maximum removal efficiency, Color, and COD is 99.67% and 97.95%.

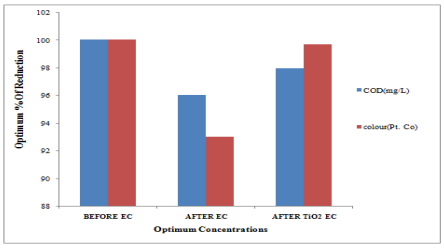

Figure 6. Graphical representation of Optimium percentage reduction of COD and Color before electro coagulation, after electro coagulation, and after Titanium dioxide electro coagulation.

VI. ACKNOWLEDGEMENT

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