Study on Dye Industry Wastewater Treatment by Coagulation Process

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Abstract- **The research is designed to investigate various parameters of dye industry wastewater and the removal of color of dyes by using coagulation and flocculation process. We have used the Coagulation as the main treatment process which is followed by adsorption achievement about total elimination of dyes from the wastewater with the significant reduction of (80-90 %) of COD, BOD, TDS, SS, pH, and about total removal in color of dyes. This study also investigate a comparative experiment data between two samples A & B, where the sample A was treated with Activated Carbon and sample B treated with Natural Charcoal (made by wood coal). It is observed that natural charcoal is more efficient in comparison to Activated carbon for removal of total dissolved solids and removal of color, as well as cost effective too.**

Index Terms- **Azo Dye, Alum, Activated Carbon, Natural Charcoal**

INTRODUCTION

The textile industry is one the most polluter industry of waste gas solids, water, and noise. Wastewater is the most ecologically pernicious, and the effluent from textile plant is classified as most polluting effluent of all the industrial segments. Considering the volume generated effluent as well as its composition, the textile industries use dyes and pigment to color their final products, such extensive use of color poses a problem in the form of colored wastewater that requires pretreatment prior to its treatment and then proper disposal into the local water bodies. Different processes for the removal of dyes from industrial effluent have been reported. Best of them are coagulation, flocculation. As a flocculent, alum is the most used easily available low cost, in waste treatment. Activated Carbon happens to be the most frequently used conventional adsorbent because of its high surface area. Present study deals with the dying wastewater analysis with the help of alum, activated carbon and natural charcoal. Also the comparison between the commercial activated carbon and natural charcoal is been highlighted and analyzed with socio-economic behavior too.

Material and Method: Our study area is Bhairavgarh, in city Ujjain, on the banks of river Kshipra, is the small area of Bhairavgarh. Glowing yellows and acute hues of reds brighten the streets of Bhairavgarh with flouncing lengths of cloth printed with patterns of melted wax. The sample is inclusive characteristics of Azo dyes. Azo dyes are chemical compounds bearing the functional group R–N=N–RO in which R and RO are aryl groups. As the electron delocalized through the N=N group, these compounds show vivid colors, such as red, orange, yellow etc. The color is dependent on the chromosphere and the extent of conjugation of the compound. Depending on the number of azo groups there are mono-, di- and tri-azo dyes. Azo dyes generally bound to the cloth fibers through their secondary bonds. The physical chemical characteristics of collected wastewater sample are as follows in Table: 1

i) Raw wastewater Characteristics with Standard norms:

Parameters	Standards as per CPCB Norms.	Our Analysis
pH	6.5-9.0	10.5
Total Suspended solids (mg/L)	100	29420
Total Dissolve Solids (mg/L)	100	11000
Total Solids (mg/L)	200	40420
Dissolve Oxygen (mg/L)	4-6	1.5
COD (mg/L)	250	16900

BOD (mg/L)	30	370-420
Color (Hz)	<25	320
Turbidity (NTU)	<10	700
Alkalinity(mg/L)	<100	610
SiO2(mg/L)	<5	46
Total Hardness(mg/L)	300	970
Chloride (mg/L)	250	692

Table:1

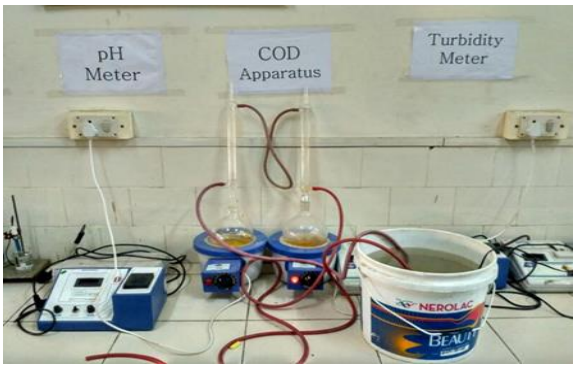


Fig: 1.Water Analysis Unit at our Department Laboratory

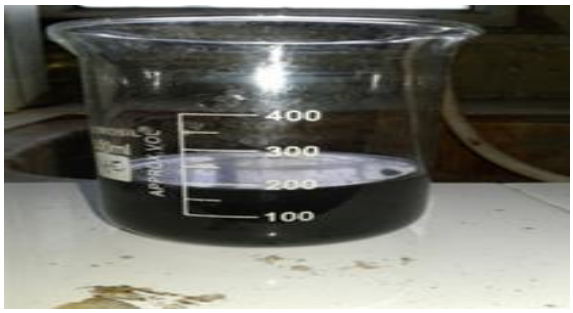


Fig: 2. Raw Sample

The sample has been primarily treated with Alum about 3 gms/ 200ml water as in. fig 3. Alum is been used as a flocculent in process industrial wastewater treatment

A12(SO4)3 + 3 Ca(HCO3)2 ----------> 2Al(OH)3 + 3CaSO4 + 6 CO2+ Cax+ Cx Aluminum + Calcium gives Aluminum Sulfate Bicarbonate Hydroxide SulfateDioxide
(present in the water to treat)

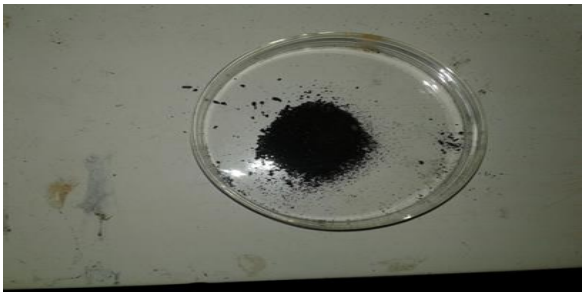
Fig:3 Alum (Powder Form)

Result & Discursions:

We used 3 gms alum (powder form) in 200ml of dye wastewater. The added alum powder in both samples is been Stirrer with wastewater properly for 5 -10 min so that alum dissolved easily and without lumps. Process is done at a temperature of 30'C. Leave the sample for 45 min to get settled the suspended solids as well as shifting of pH is observed from 10.9 to 6. Separate the water with the help of filter paper from the settled dye sample. As show in fig: 4

Fig: 4. Separated wastewater after treatment by Alum

The Light orange color of separated water was observed after the alum treatment. after that in sample is divided in two parts A & B. where the sample A id exposed to 1.5 gm Activated Carbon well starried for 2-3 min. after settlement of carbon the pH was observed about 7.4 . for sample B Naturally Charcoal is used 1gms/ 200ml and is stirred for 2-3 min. After settlement of Charcoal its pH is observed about 7.1 Fig:5



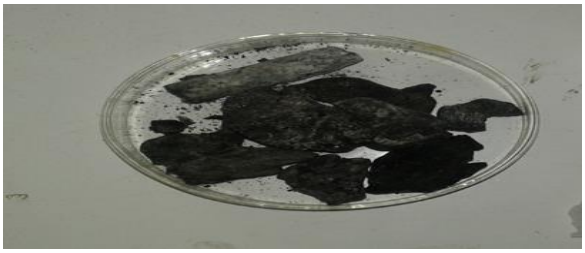


Fig:5.1 Activated Carbon (Powder Form)

Fig:5.2 Natural Charcoal

The color appearance of the water of sample A & B appeared clean after treatment with both coagulants. Activated Carbon is more efficient in removal of Total dissolved solid in compare to Naturally Prepared Charcoal. Natural prepared Charcoal is economical as it is prepared by burned wood or forest fires.Fig: 6

Fig:6.1 SAMPLE ''A''

Fig:6.2 SAMPLE ''B''

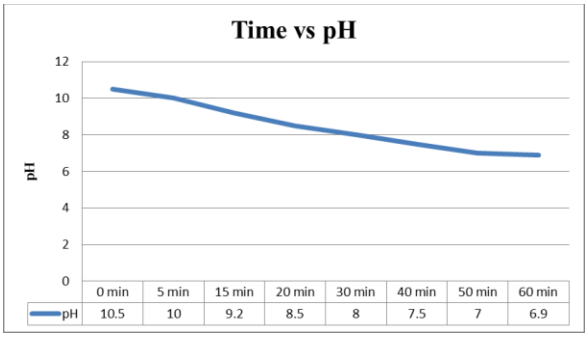
As shown in fig: 6 Sample A and B have approx same clarity in color removal

ii) Observed parameters Of Sample A and B

Parameters Characteristics	Dye Wastewater Characteristics before treatment	Sample A (Activated Carbon Treated Sample)
pH	10-10.5	6.9
SS mg/L	29420	370
TDS mg/L	11000	200
TS mg/L	40420	570
DO mg/L	1.5	3.2
COD mg/L	16900	300
BOD mg/L	370	50
Color (Hz)	320	25
Turbidity	700	10
Alkalinity	610	120
SiO2	46	5
Total Hardness	970	300
Chloride (mg/L)	692	250

Table: 2

Conclusion: Textile industry effluent is mostly treated by use of chemical and biological treatment. From the results of the present study, it is concluded that, the coagulation/flocculation processes are very effective processes for the decolonization of dying wastewater, as we can reach 97% decolonization in few minutes. There is a need to enhance the coagulation/flocculation process effectively by varying parameters so as to bring down the values to permissible limits for wastewater before discharging it to the water environment. The removal of color from wastewater using alum and two sorbent materials Activated Carbon(commercial) and low cost sorbent Natural Charcoal(prepared by wood) was studied by studying the effect of time, adsorbent dosage and pH. It have been also observed that the there were a major effective changes are shown in wastewater parameters like BOD and COD in compare to Initial parameters the two experimented parameters are not equally but approximately good.



Graph: pH vS Time

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