

# Removal of COD and Colour from Textile Wastewater Using Sawdust as an Adsorbent

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**ABSTRACT:** Adsorption of colour and COD removal has been investigated in this work the effect of pH, adsorbent dosage, and contact time has been studied the equilibrium time was considered is 60mins hence adsorption rates were studied conducted the experiments at constant pH 10 with mean adsorbent dosage of 400mg/ltr with optimum agitator speed of 400rpm it was found the optimum removal of colour was dark green to light brown and COD removal was 78% this result was good as compared to other processes of adsorption process finally from the study of adsorption process it was concluded that removal of COD and colour was effective in sawdust because of its higher capacity of adsorption and sawdust is the main key in this study.

**KEYWORDS:** COD, Colour, textile wastewater, sawdust as adsorbent process parameters

## I. INTRODUCTION

India is the largest country in the production of textiles and also consumes larger amount of water and produces wastewater the main categories of textiles are animal fibres such as wool and silk vegetable fibres such as cotton and synthetic materials such as nylon, polyester and acrylics depending upon the local raw materials used thus the biggest impact for environment is that the production wastewater from the textile industries which are having higher COD, BOD, TDS, TSS, colour and etc [1]. when comparing with the other parameters COD, BOD, Colour removal is risky and in this paper only colour and COD removal is studied.

Currently there are various treatment processes such as oxidation process, coagulation, filtration, ozonation, membrane filtration, hydrogen peroxide, reverse osmosis processes are employed in determining the removal of COD, BOD and colour removal from the wastewater. Due to higher cost effective and disposal problems involved in the above treatment methods further investigations have been fed up. The adsorption process provides effective and alternative effect in removal of COD, Colour and other parameters in treatment of wastewater using low cost adsorbents which are readily available and inexpensive. Quest of non/conventional and good low cost adsorbents contributes to the sustainable development of environment and beneficiary uses in the future for commercial activities. The sawdust is readily available in local sawmills and also various activated carbons of sawdust, neem leaves, corncob, ricehusk, tea leaves and agricultural wastes used in treating the industrial wastewater. COD and Colour removal is the main target in this study and sawdust can easily remove the COD and Colour.

In the present study Batch adsorption technique is used in this process by using sawdust with respect to effect of pH, contact time and adsorbent dosage with mean adsorbent dosage of 400 mg/ltr. The wastewater used in this course of work is from the keerthi textiles near banhatti Bagalkot district and the experiments were conducted in environmental engineering laboratory department of civil engineering Basaveshwara Engineering College Bagalkot.

## II. EXPERIMENTAL DETAILS

### 1. Materials used

**Sawdust:** sawdust was collected from the local saw mill near Bagalkot. sieved through a mesh of size 0.5mm and washed with distilled water and oven dried at 103<sup>0</sup>C for 24 hrs.

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Fig.1.sawdust sample

**Textile wastewater:**the wastewater was collected from keerthi textiles near banhatti, bagalkot (dist). Initial parameters of the wastewater sample are listed below in table.1.

Table.1. Initial parameters of textile wastewater

SL.No	Parameters	Effluent
1	Colour	Dark green
2	pH	9.8
3	BOD(mg/L)	545
4	COD(mg/L)	2263
5	Total Dissolved Solids (mg/L)	3085
6	Total Suspended Solids(mg/L)	1064
7	Total solids(mg/L)	4160
8	Turbidity(NTU)	0.62

## 2. Experimental procedure

This study was conducted in two steps. The first step which consists of wastewater characterization and the analysed parameters were pH, COD, BOD, Colour, TDS, TSS, chloride, sulphate. In the second step various physicochemical parameters treatment methods like adsorption were studied for wastewater to reduce the pH, COD, BOD, Colour, TDS, TSS, chloride, sulphate. The sawdust was collected from the local saw mill and sieved through a mesh of size 0.5mm and then it was washed with distilled water to remove adhere particles from the surface and dried then it was oven dried in an oven at 103<sup>0</sup>C about 24 hrs. initially effluent was treated using adsorbent as sawdust with the rate of 4 g/L and then it was filtered whattmenn 44 filter paper the one part was termed as treated effluent with sawdust and other one as untreated effluent the sawdust treated as pH,colour,COD,TSS(Total suspended solids),TDS(Total dissolved solids).

## III.RESULTS AND DISCUSION

### 1. Effect of pH

pH is the logarithmic value of H<sup>+</sup> ion concentration. pH of the sample was 9.8 and COD was 2263mg/L also from the below figure.2. indicates that as the pH increases COD removal value will decreases maximum COD removal occurred at pH 10.

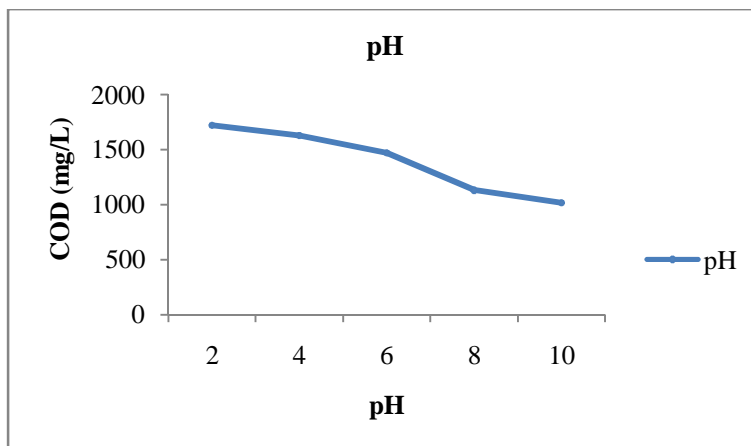


Fig.2. Effect of pH on COD removal

From fig.2. Initially 200ml Wastewater sample was collected in 5 conical flasks by changing the from pH 2 to 10 as 2,4,6,8 and 10 then adsorbent dosage has been done at the rate of 400mg/L then it was stirred with a stirrer and it was placed on agitator for the agitation at the rate of 400rpm about 60 mins then the sample was taken out from the agitator and filtered through Whatman 44 filter paper to remove the surface adhered particles. Then the filtered sample was taken for the further experiments for the calculation of COD removal. The optimum pH value for the maximum removal of COD and Colour removal occurred is at pH 10. at pH 10 maximum removal of COD was 40%.

## 2. Effect of adsorbent dosage

Adsorbent used in the course of work was sawdust which was initially washed with distilled water and oven dried at 103°C for about 24 hrs. From the below fig.3. indicates that as the dosage of the adsorbent increases COD reduction also increase

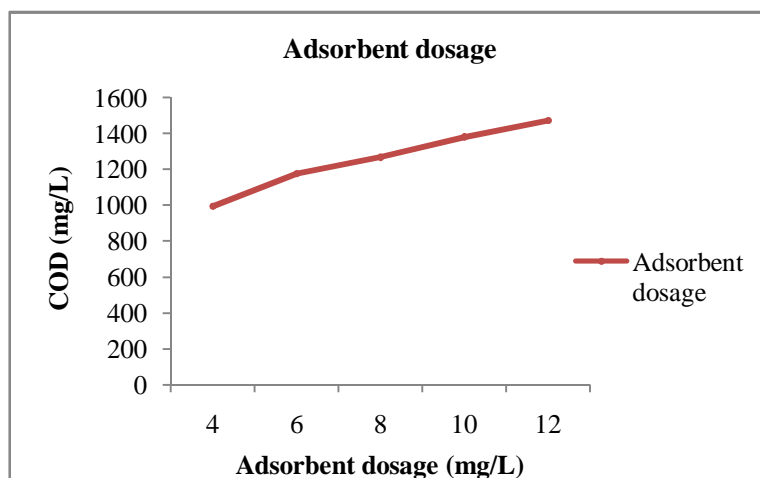


Fig.3. Effect of pH

on COD removal

From fig.3. 200ml sample was collected in 5 conical flasks by maintaining the pH 10 in all the samples then the adsorbent dosage was changed from 4, 6, 8, 10 and 12 mg/L and agitated for about 60 mins with constant pH. Then the sample was taken out from the agitator filtered through Whatman filter paper residue remained after filtration was used for the determination of COD and colour removal. Optimum adsorbent dosage occurred was 12mg/L for the maximum COD and Colour removal. at maximum adsorbent dosage cod removal was about 65%.

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### 3. Effect of contact time

Contact plays an important role in treating the textile wastewater with the presence of sawdust as an adsorbent. For the effect of pH and adsorbent dosage contact time was 60 mins. From the below fig.4. indicates that as the contact time increase with agitator speed 400rpm COD reduction increases with increase in contact time.

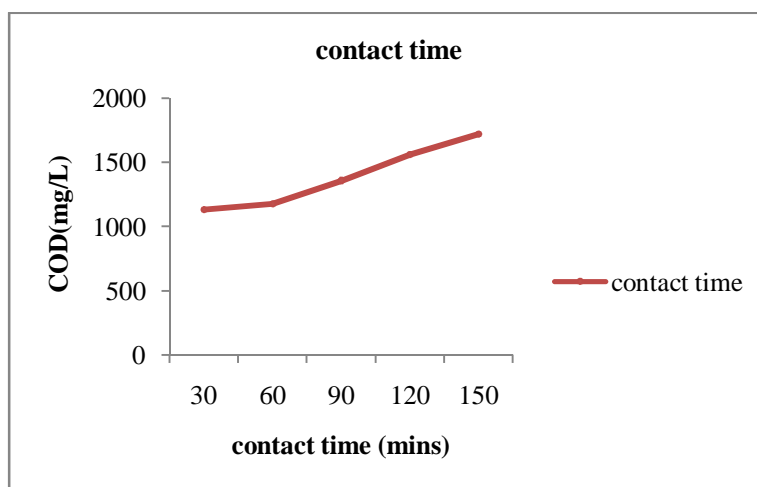


Fig.4. Effect of contact time on COD removal

From fig.4.200ml sample was collected in 5 conical flasks by maintaining the constant pH 10 and constant adsorbent dosage as 12mg/L and kept for agitation in agitator for different time intervals as 30,60,90,120 and 150 mins then the sample was taken out and filtered through Whatman filter paper. Then the remaining residue was taken for the determination of maximum COD and Colour removal for optimum contact time at constant pH and adsorbent dosage. At optimum contact time COD removal occurred was about 76% and colour changes from dark green to light brown.

### IV. CONCLUSION

In this paper an attempt has been made in the study of removal COD and Colour from the textile effluent wastewater by using sawdust as an adsorbent. From the experimental course of work maximum COD removal occurred was about 76%.color changes from dark green to light brown.



Fig.5. colour removal at pH 10 at maximum adsorbent dosage of 12mg/L

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From the experiments using sawdust as an adsorbent in treating textile wastewater is simple and less economical. Sawdust not only removes COD and Colour it can also removes BOD, Total dissolved solids(TDS), total suspended solids(TSS), Total solids(TS) for my course of work I have used only removal of COD and Colour using sawdust as an adsorbent as shown in figure.5.

### REFERENCES

1. AkrityParihar and PiyushMalaviya. "Textile Wastewater Treatment Using Sawdust as Adsorbent".International Journal of Environmental Sciences Vol.2 No.3.Pp. 110-113, 2013.
2. Nitin P. Khatmode ,Dr. Sunil B. Thakare, "Removal of pH, TDS, TSS & Color from Textile Effluent by Using Sawdust as Adsorbent" International Journal of Sciences: Basic and Applied Research (IJSBAR) ISSN 2307-4531.
3. Mercy Badu, Isaac W. Boateng and Nathaniel O. Boadi. "Evaluation of adsorption of textile dyes by wood sawdust". Research Journal of Physical and Applied Sciences 2014 Wudpecker Journals Vol. 3(1), pp. 006 - 014, May 2014.
4. Dr. Radharani Das, PathikritSaha, IshitaSinha. "Utilization of Fly Ash as Low Cost Adsorbent for Treatment of Textile Dying Industry Effluents: Kinetics and Isotherms". International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 5, Issue 2), February 2015.
5. Geetha K.S and Belagali S.L. "Removal of Heavy Metals and Dyes Using Low Cost Adsorbents from Aqueous Medium-, A Review". IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT), PP 56-68 e-ISSN: 2319-2402,p- ISSN: 2319-2399. Volume 4, Issue 3, May. - Jun. 2013.
6. Geetha and P. N. Palanisamy"Adsorption of acidic and basic dyes from aqueous solutions using polyaniline coated sawdust as an adsorbent" Journal of Chemical and Pharmaceutical Research, 7(2):268-274 ISSN : 0975-7384 CODEN(USA) : JCPRC5.2015.
7. Nitin PremsukhKhatmode, Dr.SunilBhimraoThakare. "Treatment of Textile Effluent using Coagulants and Plants as Adsorbents". International journal of Research of Engineering,Science and Technologies ISSN 2395-6453.
8. SivakumarDurairaj and Shankar Durairaj"Colour Removal from Textile Industry Wastewater Using Low Cost Adsorbents" international journal of Chemical, Environmental and Pharmaceutical Research Vol. 3, No.1, 52-57,January-April, 2012.
9. Suleiman Idris, Muhammed M. Ndamitso, Yahaya A. Iyaka and Etsuyankpa B. Muhammad. "Sawdust as an Adsorbent for the Removal of Methylene Blue from Aqueous Solution: Adsorption and Equilibrium Studies". Journal of chemical engineering VOL. 1, NO. 1, JANUARY 2012.
10. Shukla, A., Zhang, Y.H., Dubey, P., Margrave, J.L. and Shukla, S.S. "The role of sawdust in the removal of unwanted materials from water." J. Hazard. Mater 95: 137-152.2002