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Research Paper
Engineering

Modification in COD Reduction By Adsorption in Dyes & Dyes Intermediate Industry

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ABSTRACT *Progress in dyes & intermediates industry requires to find the solution of problem i.e. effluent having high COD level. Primary & secondary treatment like aeration is generally followed. But, COD reduction rate is small at tertiary level. This study gives COD reduction in metanilic acid effluent by adsorption by using activated carbon & lignite powder. With this adsorbents experiments were done for COD reduction which depends upon two factors, time of adsorption & concentration of adsorbent . COD reduction will differ with time & concentration of adsorbents. One more thing to be taken is the effect of adsorbent on sample, before & after neutralization. Process is divided in stages. Comparison is done for COD reduction for both adsorbents. Taking 1% & 2% concentration for both adsorbent. Stage wise operation showed low concentration of adsorbent gives higher COD reduction. The details are further shown.*

KEYWORDS: Dye Intermediate, adsorption, COD Reduction.

INTRODUCTION:

1.1 INTRODUCTION TO DYES AND DYES INTERMEDIATE INDUSTRY:

The synthetic dye industry today is vast and contains many groups of dying processes and dyes. From the synthesis of biological stains used in the preparation of microscope slides to the production of acetate rayon dyes and nylon dyes used in the preparation of commercial textiles, the industry continues to develop new processes and dyes to serve the needs and wants of humanity. One area of early synthetic dye chemistry though, azo dyes, remains one of the largest and most important to the birth of azo dye came in 1858.The same year Perkin started his factory for the production of mauve, although their value was not appreciated until Bottiger produced congo red, the first direct cotton dye in 1884. Johann Peter Griess had made the original discovery that a diazo compound could be derived from the reaction of nitrous acid with conclusion that this diazo compound could couple to another aromatic amine resulting in the conclusion that the formation of a dye. This area of chemistry has been greatly expanded and refined and now includes trisazo, tetrakisazo and polyazo dyes. The diazonium ion, containing the -N=N- chromospheres, serves as a weak electrophone which may perform an electrophonic aromatic substitution on an aromatic ring to produce a vast and diverse array of different dyes. Upon referral to the above discussion of the chemistry behind the colors, one can see how these dyes with their great amounts of conjugated Π bonds serve as excellent dyes. The future of the synthetic dye chemistry appears certain. As the global market continues to expand and western culture proceeds to penetrate even the world's most isolated regions, the demand for inexpensive dyestuffs will continue to rise. It is promising that this demand will be well met as "the possibilities of further synthesis are unlimited." With these prospects in sight for the synthetic dye chemistry, one might say that this industry certainly promises a bright and colorful future.

Aromatic amines. After, experiments he gave Ever since the beginning of humankind, people have been using colorants for painting and dyeing of their surroundings, their skins and their clothes. Until the middle of the 19th century, all colorants applied were from natural origin. Inorganic pigments such as soot, manganese oxide, hematite and ochre have been utilized within living memory. Paleolithic rock paintings, such as the 30,000 year old drawings that were recently discovered in the Chauvet caves in France, provide ancient testimony of their application. Organic natural colorants have also a timeless history of application, especially as textile dyes. Synthetic dye manufacturing started in 1856, when the English chemist W.H. Perkin, in an attempt to synthesize quinine, obtained instead a bluish substance with

excellent dyeing properties that later became known as aniline purple. Perkin 18 years old patented his invention and set up a production line. This concept of research and development was soon to be followed by others and new dyes began to appear on the market, a process that was strongly stimulated by Kékulé's discovery of the molecular structure of benzene in 1865. In the beginning of the 20th century, synthetic dyestuffs had almost completely supplanted natural dyes.

Metanilic acid a dye intermediate. It is used in the wide range of application in dyestuff industry. In India, it is mainly manufactured by small and medium-sized industries.

1.2 Scope of Experimental Work:

Adsorption of pollutants from effluent stream of metanilic acid manufacture:

1.3 Objective:

Whereas activated carbon is the most widely used adsorbent, it is found to be quite expensive. Considering the resource constraints experienced by the small scale industries, they use adsorption technique only if it is cost effective. Inexpensive adsorbents like lignite and bentonite could be, therefore, considered for detailed studies with respect to their performance in treating different waste water streams from effluent.

1.4 Approach:

The conventional flow-sheets of industrial wastewater treatment shown below include the primary treatment oil and grease removal, pH adjustment and clarification, the secondary treatment which may consist of biological/chemical treatment and clarification, and depending on the quality of the waste water and the statutory discharge standards, tertiary treatment with activated carbon.

During primary treatment, neutralization of the waste water results in to increase of salts. Salts in high concentration inhibit biological activity and may cause an increase in non-settle able suspended solids in the treated waste water. The flow sheet shown below is, therefore, proposed wherein adsorption with inexpensive adsorbents is employed prior to the conventional primary treatment for increasing the efficiency of subsequent biological treatment.

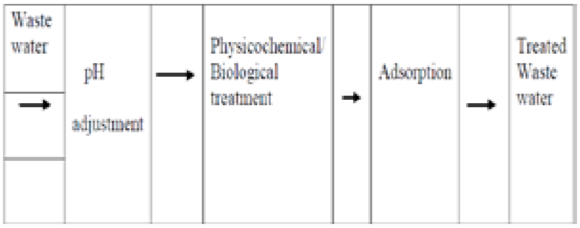
This is expected to reduce refractory organics as well as BOD of the wastewater substantially at the first stage of wastewater treatment itself, facilitating further treatment.

Considering the limited resources usually available to small and medium enterprises, it is apparent that only simple and low-cost wastewater treatment methods can be put into practice by these companies. Accordingly, work can be undertaken by using inexpensive adsorbents i.e. lignite, fly ash, bentonite and activated carbon for studying adsorption characteristics with respect to the reduction of COD and color from concentrated wastewater streams from the plant.

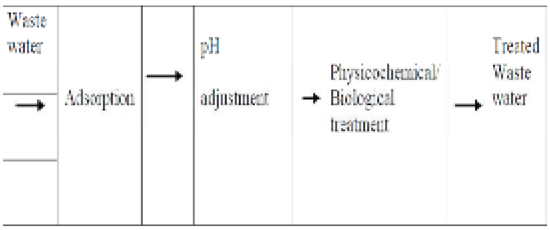
2. EXPERIMENTAL WORK:

Experimental work for this study is done at Environment department of L.D.College of engineering. Experimental methodology for this is simple adsorption by using two adsorbent, activated carbon and lignite powder with respect to different time.

Flow Sheet 1:



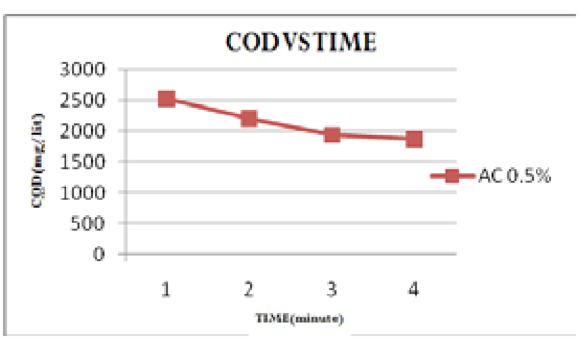
Flow Sheet 2:

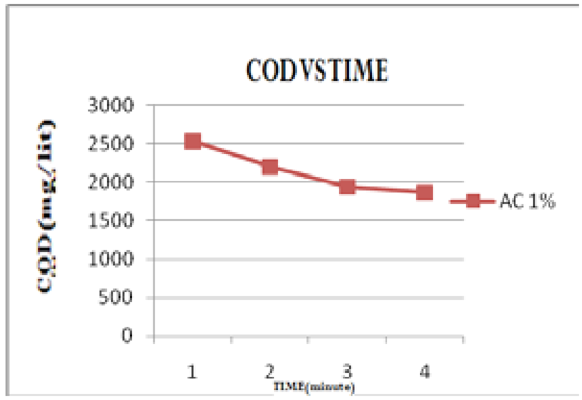


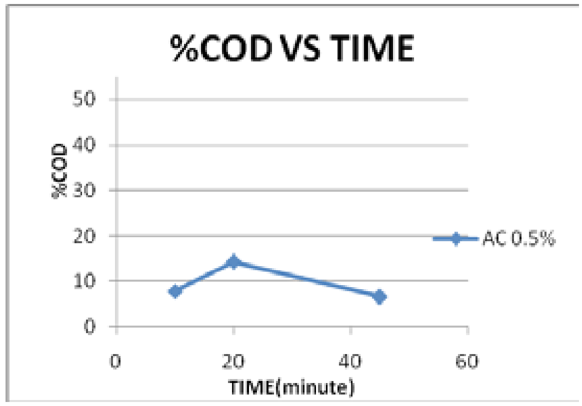
3. RESULT: MATHEMATICAL MODEL:

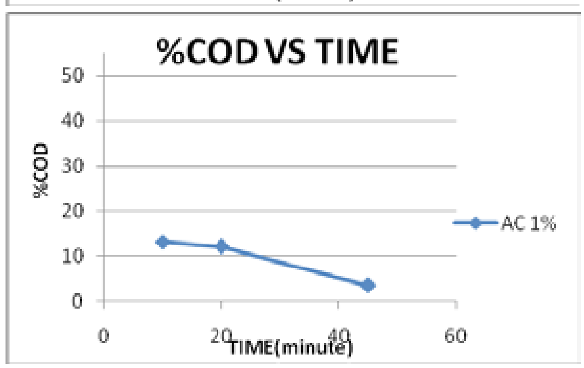
In this experimental work effluent is treated by using different adsorbent quantity for different time duration. Effluent used is highly acidic and second one is neutral effluent. And first one acidic effluent is treated stage wise in which in first stage adsorption is done and then after in second stage this treated sample is neutralized and then experiment is done with same adsorption quantity that is used for stage-1.analysis is done by using standard COD method.

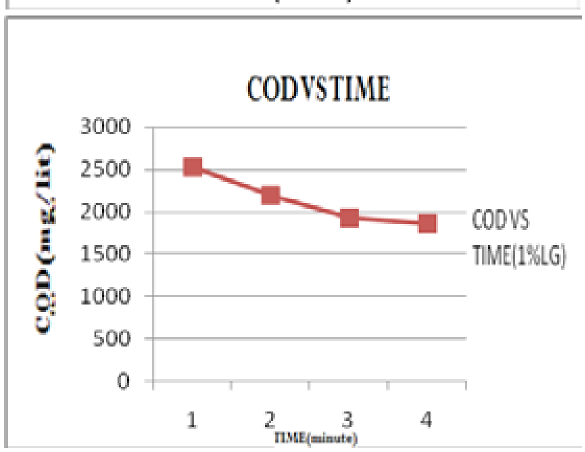
					Rathi-Puranik Model	
C_i	T min	c	Cordt=c_i-c/t	LOG (CORDT)	Codrt= c_i-c/t	LOG (CORDT)
25330	0	25330	-	-	-	-
	10	25330		3.336	217	2.336
	20	23800	1530	3.568	185	2.267
	30	21000	4330	3.8129	216.66	2.335
	45	20660	4670	3.8350	152	2.181
	60	20410	4920	3.8573	118.166	2.072
	90	20300	5030	3.8557	80	1.903
	120	20185	5145	3.6789	60.9	1.7850











Conclusion:

All the above observation for the two cases under consideration clearly indicate that values of CODRT for the case of acidic effluent will be compared than the values of CODRT for the case of neutral effluent. Thus by modifying industrial effluent treatment flow sheet by carrying of adsorption operation initially than at the end, rates of CODRT can be increased under otherwise identical condition. Hence, in industry, adsorption operation can be performed for contact time 30 min & higher rates of COD reduction for acidic effluent can be utilized conveniently to carry out "Effluent Treatment" more effectively. Thus, either in existing plant, more quantity of effluent can be handled, or keeping effluent quantity same, effluent treatment can be carried for lesser contact time. Thus, operational cost can be decreased for the both categories.

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