

Characteristics of Organic Textile Dye Wastewater

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Abstract: - This work focuses on analyzing the characteristics of Organic Textile dye wastewater. The textile dye wastewater in India is of particular concern due to its hazardous and toxicity in nature and its direct discharge into the water bodies. By knowing the characteristics proper treatment method can be applied. The wastewater is collected from dye industry in Mumbai. This textile industry produces complex wastewater containing organic dyes. Study characteristics involves pH, BOD₅, COD, TDS, and colour.

Keywords: Organic, Textile dye, Wastewater

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I. INTRODUCTION

Textile industry is a main creator of effluent wastewater due to more consumption of water for its different operations. Textile dyeing is the most water consuming and chemically intensive process among all textile preparations. The dyes used in the textile dyeing and printing industries not only impart colour to water sources but also can cause Environmental damage to living organisms by stopping the reoxygenation capacity of water and also blocking sunlight, thereby disturbing the natural growth activity of aquatic life. The water that is primarily employed in dyeing and finishing operations eventually ends up as wastewater characterized by high temperature, high COD, a large amount of solids, and intense colour due to extensive use of dyes. The direct discharge of these coloured compounds in the environment causes considerable aesthetic pollution and serious health-risk factors.^[1]

Water containing dye is harmful for the species, in turn harming the Environment. Water pollution results from all Human activities domestic, industrial and agricultural, and is not only due to petroleum, minerals, sewage treatment sludge or persistent Organic pollutants produced by the incineration of waste, but also due to synthetic substances produced by chemistry. Several methods are being used to decolourise dye wastewater, but individually these methods are ineffective for dealing with treating wastewater containing soluble and insoluble dyes.

Recently, advanced oxidation processes (AOPs) have been proposed as offering promise for wastewater treatment because AOPs are able to oxidize a wide range of compounds that are otherwise difficult to degrade^[2]. Heavy metals, present in textile industry effluent, are not biodegradable; hence, they accumulate in primary organs in the body and over time begin to fester, leading to various symptoms of diseases. Thus, untreated or incompletely treated textile effluent can be harmful to both aquatic and terrestrial life by adversely affecting the natural ecosystem and causing long-term health effects.

II. MATERIALS AND METHODS

Mumbai is most populated city in India, enjoying humidity of 83%, temperature 28°C. The textile industrial dye wastewater sample is collected from a representative textile dye industry in Mumbai, which uses Organic dyes to dye the cloths. Polythene bottles of 5.0 L are used to collect the wastewater samples. The bottles were thoroughly cleaned and washed with tap water to render acid free, washed with distilled water and again rinsed with the collected wastewater and filled up the bottle with sample leaving a small air gap at the top. The bottles are stoppered and sealed.

All the chemicals and reagents used for analysis are of analytical grade. The glasswares used in the analysis are washed with distilled de-ionized water, the pipettes, burettes were rinsed with experimental solution before and final use. The experiments using the wastewater are carried out at EICT (Environmental Infrastructure and Clean Technology) laboratory of CESE(Centre for Environmental Science and Engineering) department of IIT Bombay. The Physico-chemical characteristics as per standard methods for the examination of water and wastewater (21st edition, 2012) are analyzed for wastewater.

III. RESULTS AND DISCUSSION

The physico-chemical characteristics of Organic textile dye wastewater is represented in Table 1 and the effluent standards for discharge into Stream, Sewer and On land is represented in Table 2.

Table 1: Physico-chemical characteristics of Textile dyeing wastewater

Sl.No	Characteristics	Units	Results
1	pH	----	3.14
2	TDS	mg/L	2280
3	COD	mg/L	6400
4	BOD	mg/L	2750
5	Colour	Hazen	Black
6	BOD/COD		0.42

Table2: Effluent Standards for discharge into Stream ,Sewer and On land

S.No	Characteristics	Units	Standards for discharge into streams	Standards for discharge into Sewer	Standards for discharge into on land
1	Colour	Hazen			
2	pH	--	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
3	Total solids	mg/L			
4	Total Organic solids(volatile suspended solids)	mg/L			
5	Total Inorganic solids	mg/L			
6	BOD ₅ @20 ⁰ C	mg/L	250	350	100
7	COD	mg/L		-	-
8	Chlorides	mg/L		250	
9	Total Alkalinity	mg/L		200	
10	Nitrates [N]	mg/L	10	-	-
11	BOD/COD	---		0.5 or greater	

From the above physico-chemical characteristics, it is observed that the wastewater is highly strong with high amount of BOD,COD values and also acidic in nature. The value of pH, COD, BOD and Total dissolved solids are more than the discharge standards of sewer, on land water and stream. The wastewater cannot be discharged directly without treatment.

IV. CONCLUSIONS

1. The textile dye wastewater is highly organic in nature
2. For biological decomposition the BOD/COD ratio should be 60% but where as our ratio is 42% which cannot be easily degraded.
3. The value of COD, BOD, Dissolved solids and pH for Textile dyeing waste water exceeds the discharge standards of sewer, streams and On land standards.

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