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Study the Operational Treatment of Dye Industry Wastewater

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Abstract: ***Dye are colored organic compounds that are used to impart color to various substrates including paper, leather, fur, hair, drugs, cosmetics, waxes, greases, plastics and textile materials. The discharges of dye industrial water containing dyes cause serious environmental problems. This water can be treated by various methods which are primary treatment (screening, sedimentation, neutralization, mechanical flocculation, chemical coagulation), secondary treatment (aerobic and anaerobic treatment, activated sludge process, use of charcoal, trickling filtration.) And tertiary (Membrane technologies, adsorption, oxidation technique, electrolytic precipitation and foam fractionation, electrochemical processes, ion exchange). Certainly, use of activated carbons filter is the sole and ultimate approach for removal of textile dyes through the industrial wastewater treatment. This literature shows the feasibility of minimum cost adsorbent in term of maximum outcome of industrial wastewater treatment for textile dyes removal.***
Keywords: Dye industry, wastewater, treatment process, charcoal method, operational study.

I. INTRODUCTION

A. Dye Industry Wastewater

Dye industries are major sources of environmental pollution. As the dye industries consume large quantities of water and generate waste water in proportionate order. Moreover the dyes used in textile industry are important sources of environmental pollution. During the dyeing processes, not all dyes that are applied to the fabrics are fixed on them and there is always a portion of these dyes that remains unfixed to the fabrics and gets washed out. These unfixed dyes are found to be in high concentrations in textile effluents. These effluents usually contain indigo dyes and non-biodegradable dyes, which causes aesthetic problem. These effluents do not only contain high concentration of dyes, but also contain the chemicals used in the various processing stages. Some trace metals such as Cr, As, Cu and Zn are present in these effluent and are capable of causing several health problems including hemorrhage, ulceration of skin, nausea, severe irritation of skin and dermatitis. It is one of the largest and oldest industries present globally. The textile industry in India traditionally, after agriculture, is the only industry that has generated huge employment for both skilled and unskilled labor in textiles. The textile industry is classified into three main categories: cellulose fibers (cotton, rayon, linen, ramie, hemp and lyocell), protein fibers (wool, angora, mohair, cashmere and silk) and synthetic fibers (polyester, nylon, spandex, acetate, acrylic, ingeo and polypropylene). Dyeing and finishing are the two most important processes usually applied in textile- manufacturing industries. These two processes generate considerable amount of wastewater, which may contain high color, suspended solids (SS), pH, temperature, biological oxygen demand (BOD), chemical oxygen demand (COD), and low biodegradability .however, the major problem is strong color wastes**.** The discharge of textile wastewater into streams and rivers causes several problems, in particular, are not only aesthetic pollutants by nature of their color, but may interfere with light penetration in the receiving bodies of water, thereby disturbing biological processes. Furthermore, textile effluent contains chemicals, which are toxic, carcinogenic, mutagenic, or teratogenic in various microbiologic, fish species. Therefore, it is necessary to treat textile wastewater before discharged into water. The wastewater from dye industry is treated by the tertiary method in which at last the waste water is passed through the filter which are made up with the activated carbon, sand, gravels etc.

B. Treatment Process of Wastewater

The various operations involved in treatment process are storage of wastewater, screening process, skimming of wastewater, equalization of wastewater, clariflocculation, aeration, settling and filtration process.

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The wastewater coming from dye industry is send to the treatment plant. In treatment plant various operations are done to wastewater at the end the water is passed to filtration process from the settling tank. In filtration process water is passed through the various layer made up with the activated carbons, sand and gravel etc.

C. Activated Carbon Filter

The process of passing the water through the beds of such granular materials is known as filtration. There are three beds included in Activated Carbon Filter namely, • Gravel • Sand • Activated carbon	

D. Activated Carbon Filter

The above figure shows the activated carbon filter. The wastewater are pre-cleaned with other treatment processes such as screening, skimming, equalization, clariflocculation, and settling treatment. The activated carbon usually used in last processing to remove the most difficult impurities such as micro pollutant, dyes and chemicals.

The activated carbon used for cleaning has to fulfill many different tasks:

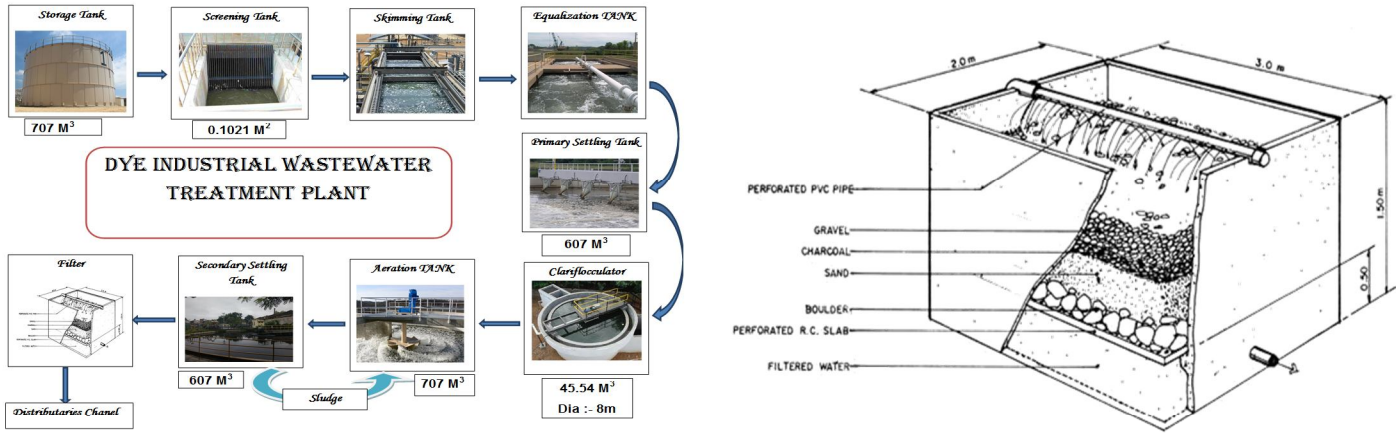
1) Removal of organic- chemical substances and colorants
2) Reduction of trace substances like chemical or dyes
3) Enormous decrease of residuals of COD, turbidity and residuals of non-settle able type of particles

II. SCOPE OF WORK

A. To determining characteristics of influent and effluent of dye industrial wastewater treatment plant.
B. To study the various units of dye industrial wastewater treatment plant and also design of dye Industrial wastewater treatment plant.

III. MATERIALS AND METHODOLOGY

The various unit operations involved in treatment process is shown by the flowchart of wastewater treatment plan



Flowchart of wastewater treatment plant

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A. Physical Unit Operations

Treatment methods in which the application of physical forces predominates. Screening, mixing, flocculation, sedimentation, flotation, filtration, and gas transfer are typical unit operations.

B. Chemical Unit Operations

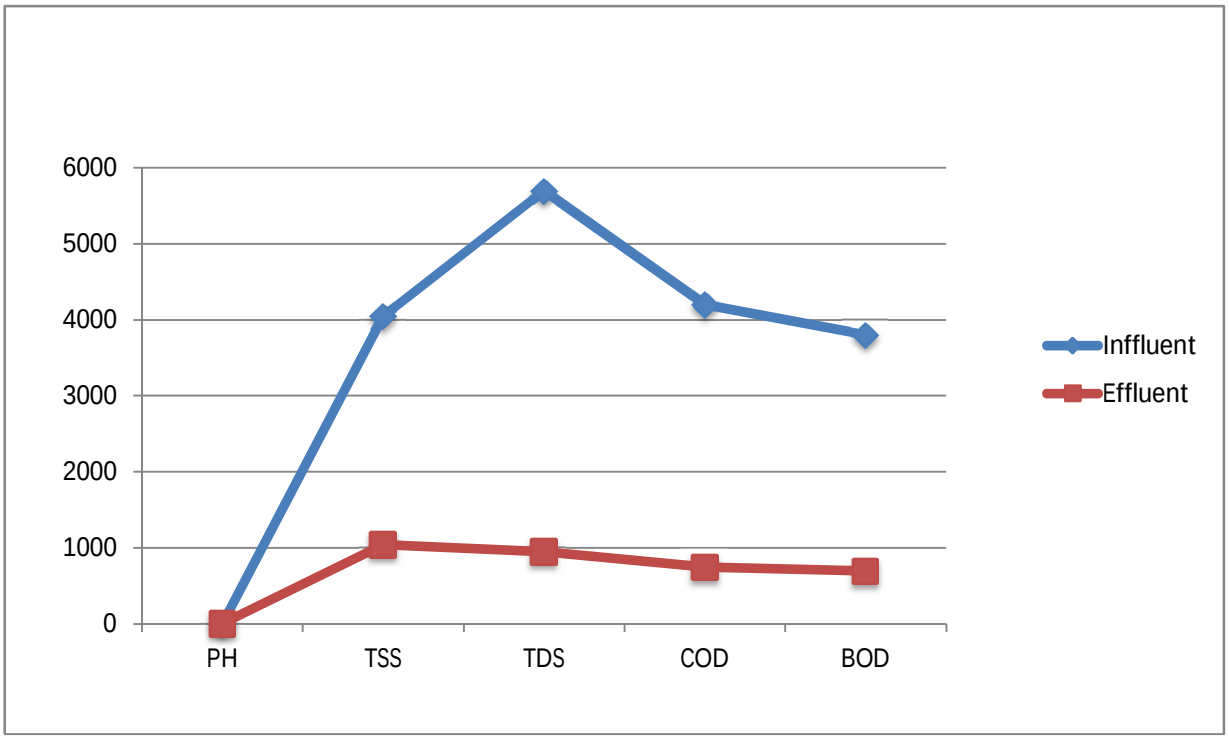
Treatment methods in which the removal or conversion of contaminants is brought about by the addition of chemical reactors. Precipitation, adsorption and disinfection are the most common examples used in wastewater treatment.

IV. CHARACTERISTICS OF TEXTILE INFLUENT AND EFFLUENT

Parameter	Influent	Effluent	G.P.C.B
pH	6-10,	7.32-7.89	6.5-9.00
Total Suspended Solid (TSS)	15-8,000 mg/l	800-1500 mg/l	700-2000 mg/l
Total Dissolve Solid (TDS)	5000-12000 mg/l	500-1500 mg/l	300-2000 mg/l
Chemical Oxygen Demand (COD)	150-12000 mg/l	320-800 mg/l	200-900 mg/l
Bio-chemical oxygen demand (BOD)	250-6000 mg/l	450-1020 mg/l	300-800 mg/l

Sr. No	Parameters	Permissible Limit	Unit	Result at different sampling days					Average Value
				12/2/2018	13/2/2018	14/2/2018	15/2/2018	16/2/2018	
1	pH	7.32-7.89	NA.	7.5	7.3	7.7	7.2	7.5	7.44
2	TSS	800-1500	mg/l	870	1420	1100	900	930	1044
3	TDS	500-2600	mg/l	750	2560	2350	1150	640	1490
4	COD	320-1040	mg/l	840	460	570	370	890	626

Results Of Test



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MODEL OF DYE INDUSTRY WASTEWATER



V. CONCLUSION

Research was conducted on the development of applicable method of textile wastewater treatment to satisfy law 48 on 1984, SS,BOD,COD and po4 removal efficiency were 76%, 84%, 86%, 92% and 100% respectively without filtration. Removal efficiency improved with providing charcoal filtration for SS, BOD, and COD to be 98.3%, 91.2% and 95% respectively From the study of dye industry & its wastewater characteristic we conclude that the dye industrial wastewater are discharge into river and lake after treating this wastewater and maintaining parameters of water such as COD & BOD and pH. The maximum COD contain reducing in aeration tank. The water come out from filter are reuse for in same industry and for gardening.

A. Books

1) Industrial waste treatment (Pub. Dateoctobe2006) book, author NELSON LEONARD NEMEROW PUBLISHED by ELSEVIES SCIENCE & TECHNOLOGY BOOKS.

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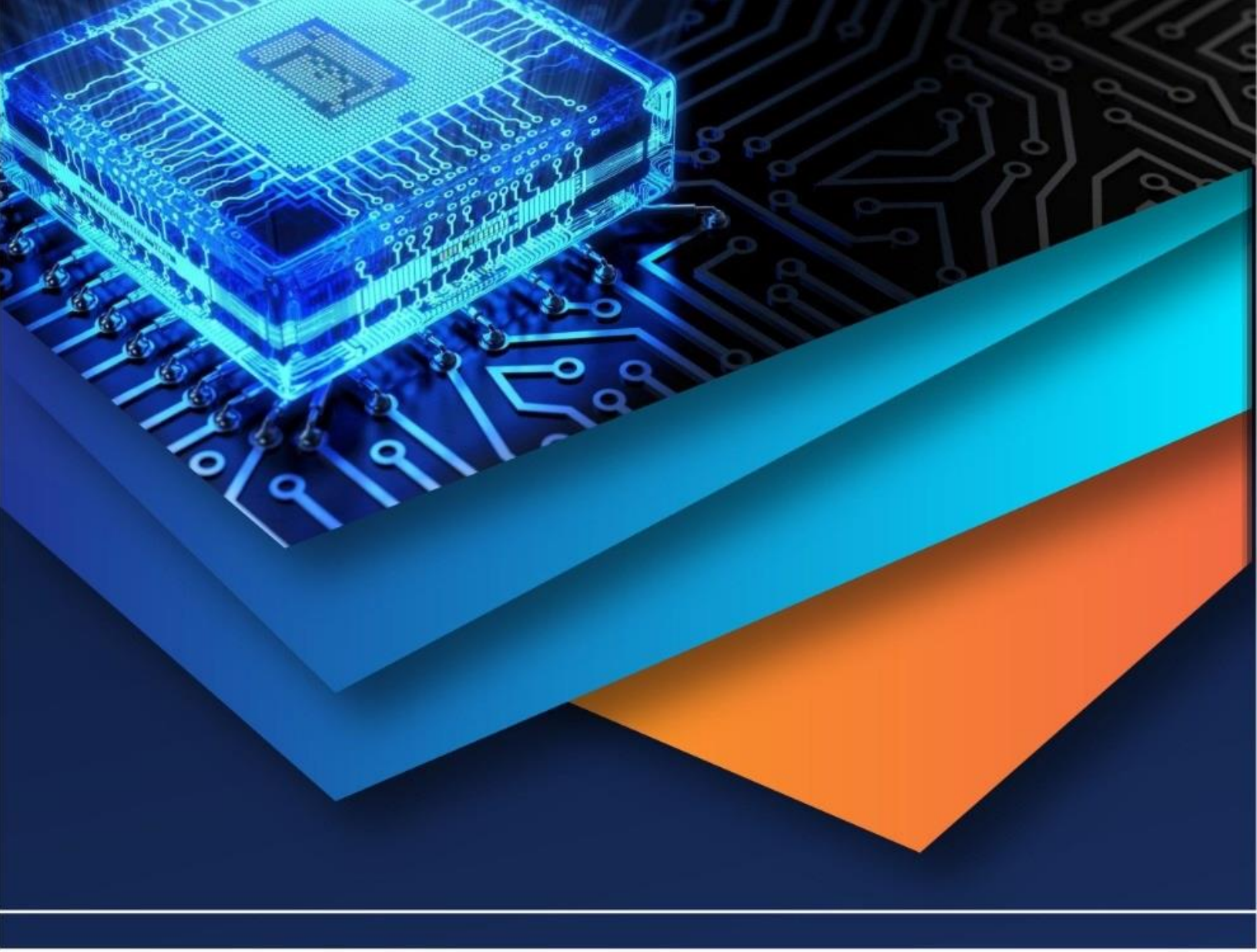
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