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# Alternative Method for Treatment of Wastewater in Textile industry : Review

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## ABSTRACT

In the early days of industrial revolution the waste water generated was simply passed to water bodies like rivers, wells, etc. which was fine for that time as the amount of wastewater generated was very less. The process of dilution was the principle and water purification used to take place by surrounding environment of water called as self-purification of streams. But as soon as the more and more industries were established it was seen that the self-purification process fails to purify water because the quantity of wastewater flown in water bodies was much more than its capacity to purify it. Hence there was a need of effluent treatment plants. Textile industry creates a lot of wastewater having very high amount of color. The color present in water reduces its acceptability aesthetically. Also the color present in water hampers the process of photosynthesis for the plants and other photosynthetic species if directly discharged in water bodies. The textile wastewater also has very high pH, COD, BOD

Keywords : Dilution, Self-purification, Effluent treatment plant, Zero Liquid Discharge.

## I. INTRODUCTION

Textile dyeing is the popular environmental industrial process which is not friendly, as they create colorful wastewaters which are greatly contaminated with chemicals, dyes [1].With the increasing demand for textile product the number of textile industries has increased making it one of the most important reasons for industrial pollution. In particular the release of colored effluent is undesirable not just because of color but also because of its breakthrough [2]. The use of different fibers depends on the characteristic of fiber, the type of product to be obtained and desire finish required on fiber. Though the dye constitute a very small in the total volume of wastewater generated but the color removal is very difficult due to various reasons [3]. Textile industry symbolizes central environmental trouble due to their high water consumption [4].In mixed treatment systems maintaining pH, coagulation-flotation, sedimentation is mostly considered as pretreatment processes, biological treatment are used for removal of organic wastes. But this industry again exhibit more color and less biodegradable nature hence creating difficulty in treating by physiochemical and biological process [5]. Hydroxyl molecule are extremely reacting species and react with almost all of the organic molecule and also shows characteristic of slight selective nature in attack which is one of the uses of an oxidant needed in treating wastewater plant for solving problems arising due to pollution [6]. New methods have been developed to enhance the capability of DNA which is the most important cell organelle of any biological system. The adoption of

biotechnology in textile field is due to the awareness regarding the environmental issues caused by these industries and also due to the need of better quality fabric [7]. The oxidants such as ozone, hydroxyl radicals produced by anodic process (direct) or anodic oxidation(indirect) disintegrates the organic pollutants also toxic present in dye and phenols of wastewater[8]. The electrochemical oxidation by means of electrolysis using large amount of oxygen instead of voltage anodes like $PbO_2$ and boron doped diamond [8]. The bio recalcitrant organic pollutants can be eliminated by photo catalyst $TiO_2$ in aqueous medium [9]. The textile industry produces almost 14% of total industrial pollution making it one of the most pollution creating sectors. In India the textile companies has got an important place [11]. It has a big contribution to the economy of the country. It also contributes to the company output; employment generation and earning of foreign exchange [12]. The untreated water coming from the textile industry is if directly discharged into the surface sources causes' rapid depletion of Dissolved Oxygen due to its high BOD content. The waste water having very high BOD&COD value leads to toxicity [13]. The high alkalinity traces in water leads to negative impacts on aquatic life and also interferes with biological treatment process. Physiochemical method and biological method can be used for analysis of such effluent. According to this analysis treatment method waste minimization method is applied [16]. Operational and maintenance problems can be adopted. Basically very large amount of water is used in industrial operations like fiber washing, to do bleach, mercerization, to dye, to dye, to print and the wash the finished product [17].

## II. LITERATURE REVIEW

A. M. Hassan et. Al.[1]:
For the determination of optimum condition for evaluating performing capacity of chitosan in coagulating and flocculating dosage was very important parameter. Strong acid or strong base was used for maintaining pH. Charged density explains the phenomenon of optimum chitosan..

B. Sandhya et. al.[2]:
Facultative bacteria in aerobic condition (microaerophilic) reduce and degrade the large amount of dyes. Sequential or simultaneous types of methods can be used for aerobic anaerobic treatment.

C. R. Bansal et.al.[3]:
The destruction techniques in showcase of integrated approach will be used more in expense of technologies which convert liquid state pollutants into solid one for disposing or it forms liquid again but concentrated to be treated in further treatment.

D. Bisschops et.al.[4]:
The data that we obtain by measuring online can be used in automatic control systems for implementing treatment of wastewater and its reuse. The outlook of online and inline data by (sensors) was being published for parameters like temperature, pH, turbidity, etc.

E. Hua Yein et.al.[5]:
The treatment used for water reuse showed good performance in combined process. Removal of the COD,COLOUR,$NH_3$N,hardness,turbidity was showed after treatment.

F. Mohamed A. Hassan et.al.[6]
For color removal ozone treatment is appropriate but reduction in COD is about 62%. The second order kinetics is principle for oxidizing MV-40 dyes .UV and $O_3$ combined has higher color removal capability than ozone alone and produces more hydroxyl radicals.
Deepti Gupta et.al.[7]
P. Chrysosporium is the wood degrading white rot fungus and the only found organism which can effectively brings about the degradation of a

number of azo dyes. The white rot fungus P.ostereatus produces an enzyme ie. Peroxidase enzyme which can be helpful for decolourizing triphenyl methane dye and Remazol Brillant Blue R with the oxidative mechanism.

G. X.chen et.al.[8]
The reuse of treated water in dyehouse of textile is possible. $Ti/RuO_2$, $Ti/SnO_2$ electrodes effectively oxidizes toxic compounds than our $Ti/PbO_2$ anode. More efficient electrodes help in more effective process of treatment of water.

H. K. Venkata Subba Rao et.al.[9]
Feasibility is shown by membrane filtration and electrochemical oxidation. TSS is removed effectively by membrane filtration while color is removed by electrochemical oxidation.

I. C. Z. A. Abidin et.al.[10]
The by-products of the ozonation is mineralized by biological process effectively, is not capable of reducing color comparing to ozonation process.A medium ozone dose should be used as a pre-treatment for removing azo dye.

TABLE-1 : EFFLUENT CHARACTERISTICS FROM TEXTILE INDUSTRY [20]

| Process | Composition | Nature |
|---|---|---|
| Sizing | Starch, carboxymethyl, cellulose (CMC), polyvinyl alcohol (PVA | High BOD, COD |
| Desizing | Starch, waxes, pectin | High BOD, COD, SS, DS |
| Bleaching | Sodium hypochlorite, sudfacts, $NaSiO_3$, sodium Phosphate. | High in alkalinity and SS |
| Mercerizing | Cotton wax | Low BOD, High DS |
| Dyeing | Reducing agents, oxidizing agents, acetic acid. | High BOD, DS, low SS |
| Printing | Oils, binders, acids, thickeners, reducing agent, alkali | Oily appearance, SS, slightly alkaline, low BOD |

## INLET NORMS OF MPCB [19]

1. pH:-6.5-8.5
2. Color:-100 Units
3. Temperature:- $40^0$C
4. Oil and Grease:-10mg/L
5. Suspended solids:-100mg/L
6. Ammonical nitrogen:-50mg/L
7. COD:-100mg/L
8. BOD(5 days at $20^0$C):-30mg/L
9. Sulphates:-1000mg/L
10. TDS:-2100mg/L

### Treatment of wastewater:-

In textile industries the operation processes requires a lot of energy for its functioning thus producing highly concentrated water having high salts, TSS, color, COD, nutrient nitrogen and phosphorus. The ability of chitosan to bind to negatively charged surface by making hydrogen or ionic bond make it an ideal coagulant. Chitosan is used in the process of flocculation which helps in the reduction of effect of dosage on the percentage of COD and turbidity. Also the use of chitosan for coagulation influences the mixing of wastewater [1].GC-MS analysis used for the identification of the ozonation by products and also evaluates the degradation of treated aqueous solutions fail to show any toxic compound. The advanced oxidation processes also reduces the zooplankton toxicity of the raw solution is being shown by results calculated [6]. The aerobic treatment degrades the aromatic amines formed during anaerobic cleavage

and the azo dyes. The sulfonated azo dyes were the first studied strategy for feasibility [2]. It is been studied that many of the gut organisms are capable reducing azo bonds in food grade dyes with the help of extracellular flavonoid compounds it produces. The degradation of a range of reactive dyestuff, including the commercially important dye Remazol Black B was done by gram negative bacteria shewanella species. From effluent streams heavy metals were also removed by fungi. The ligninase which is produced by white wood rot shows effectiveness in biphenyls, aromatic hydrocarbons and chlorinated compounds such as PCP and DDT [7]. The color of wastewater remain above 500 after treating in second electrochemical oxidation process as well also removal of COD is not effective as well. The reason behind this is low SS in wastewater after the process of filtration. There are many kind of ions in the wastewater some of which serves as catalyst. Ions $Ag^{2y}OCo^{3y}$ and $Fe^{3y}$ have ability to change their forms such as oxidative intermediates and are thus able to accelerate the degradation of organic pollutants. This ions has the function of oxidation of benzene, phenols and oil [8]. Electro flocculation combines oxidation of the polluting content with electrolytic process by precipitating the sludge by physiochemical process and is used for recycling process water. There's no simultaneous addition in anions such as sulfate or chloride [3]. The end use of yarn decides the quantity of spin finish. Physiochemical methods such like membrane filtration is used for treating the wastewater. Fouling depends on the transport mechanism. NF is used to remove dyes from wastewater and the UF to remove the spin finish [4]. Preozonation is required for removing color like RR120 which is impossible by biological treatment alone. Hence biological process is not used alone for color removal. Biological process can only mineralize the byproducts formed in ozonation [10]. In this it was reported that the rate of photocatalytic degradation with suspended $TiO_2$ of 4-chlorophenol starts decreasing to 50% of the initial rate after performing the 10 experiments. The reason for its declination is considered to be the formation of chloride ions [9]. Quality water for industrial process is obtained by combined two steps. The sand filtration process is used to remove SS. Color is being removed by ozonation [5].

## III.CONCLUSION

Nature environment is greatly affected by the industries in which textile industry affect the most. The outcome of highly colorful wastewater in the environment by the industry causes serious threat. Removal of color is a huge challenge. Stain repellents and biocides which is used in industry for softening, brighting, anticreasing, wetting and sizing of fabric is used. High concentration of dyes can led to increase in BOD and also causes water borne diseases. Adding either a strong acid or strong base can helps to control the pH. As the number of textile industries is growing rapidly the release of textile industry wastewater can result into serious threat to environment which can led to health risks. Having the study of all this it is clear that environmental friendly textile industries are a key factor to be considered and grown. The study also focuses on showing the alternative methods that is studied and available that should be adopted for better performance

### Result

The study of paper helps to come to final result that should be kept in mind are:

- Equalization tank is necessary to be installed because if there is no equalization tank characteristics so waste water will not equalize which will increase the load on other process leading to failure of plant.
- Various problems faced by ETPs of industries are inappropriate chemical dose necessary for treatment mechanism, inactive nature or death

of microorganism because of pH lack of oxygen and may be nutrient. Proper eye keeping is required for this.

- Proper evaluation of performance efficiency is to be done from time to time for better performance of ETP and economically.

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