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ANALYTICAL STUDY OF EFFLUENT OF PAPER MILL SPECIAL REFERENCE OF DEPOLARIZATION AND DETOXIFICATION

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ABSTRACT

An investigation was undertaken to determine the amount of Colouring bodies and Toxicity of effluent of madhaya bharat paper mill, champa, Chattisgarh. For this, Effluent samples were collected from different site of mill and analyzed for Physico-chemical parameters and tried to aware to avoid the problem which come from more effluent. In this study there are high extent of removal of organic matter was obtained for the biological process. All the regulated discharge parameters (Temperature, TDS, TSS, Total Hardness, Alkalinity, Conductivity, BOD, COD, DO, Colour, pH, Chloride Sulphate, Phosphorous content.) have been well below their respective discharge limits and even better to the raw water characteristic of other river in general.

Keywords: Toxicity, Effluent, Physico-chemical, Parameters, Conductivity.

INTRODUCTION

These properties of water have important consequences in its role in the ecosystem of Earth. Water at a temperature of 4 °C will always accumulate at the bottom of fresh water lakes, irrespective of the temperature in the atmosphere. Since water and ice are poor conductors of heat (good insulators) it is unlikely that sufficiently deep lakes will freeze completely, unless stirred by strong currents that mix cooler and warmer water and accelerate the cooling [1]. In warming weather, chunks of ice float, rather than sink to the bottom where they might melt extremely slowly. These phenomena thus may help to preserve aquatic life. The paper industry uses large quantity of freshwater and lignocelllulosic materials in the process of production of paper and it generate large quantity of effluent. The generation effluent is characterized by dark color, foul odour, high organic content and extreme quantities of chemical oxygen demand (COD), biochemical oxygen demand (BOD) and pH. The generation of waste water and characteristics of pulp and paper mill effluent depends upon the type of manufacturing process adopted and the extent of reuse of water employed in plant. Effluent of kraft mill is highly polluted, and characterized by parameters unique to this waster such as color, absorbable organic halides (AOX) and related organic compound. The alkaline extraction stage of bleach plant effluent is the major source of colour and is mainly due to lignin and derivatives of lignin. Lignin wastewater is discharged from the pulping, bleaching and chemical recovery section. Lignin is a heterogeneous, three dimensional polymer, composed of oxyphenylpropane units. The high chlorine content of bleached plant react with lignin and its derivatives and form highly toxic and recalcitrant compounds that are responsible for high biological and chemical oxygen demand. Trichlorphenol, trichoropuicol, dichlorophenol, dichloroguicol and pentachloroguicol are major contaminants formed in the effluent of pulp and paper mill [2-4].

The dark color in untreated effluent is a major environmental concern as its discharge to water bodies inhibits the photosynthetic activity of aquatic biota by reduction sunlight, besides exhibiting the toxic effects on

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biota. The brown colour imparted to water due to addition of effluents is detectable over long distances. The effluents have high biological and chemical oxygen demand (BOD and COD), lignin compound and their derivatives. The dark brown colour is due to the formation of lignin degradation product during the processing of lignocellulosics from paper and pulp miniature [5].

Several methods have been attempted for the removal of colour for the pulp and paper mill effluents. These can be classified into physical, chemical and biological methods. Physical and chemical processes are quite expensive and remove high molecular weight chlorinated lignin, colour, toxicants, suspended solids and chemical oxygen demand. But BOD and low molecular weight compound are not removed efficiently. The biological colour removal process is particularly attractive since in addition to colour and COD it is also reduces BOD and low molecular weight Chloroligninis. The present state of art technology adopted by paper mills to treat their effluent involves three major stages namely primary, secondary and tertiary treatment. this Effluent samples were collected from different site of mill and analyzed for Physico-chemical parameters and tried to aware to avoid the problem which come from more effluent [6-8].

The effluent treatment system

The CETP at Madhya Bharat Paper Mill is designed to provide combination of physic-chemical and biological processes which involves all the important units such as screen chamber, equalization pond, primary clarifier, aeration tank, secondary clarifier, sludge thickener etc. A schematic flow diagram of treatment plant is shown in Fig. 5.1 & 5.2. The neutralized effluent from mill is collected in collection-cum-equalization pond. CETP has neutralization facility. Hydrated lime is used for the same whenever required. The purpose of equalization is to minimize the wide fluctuations in the effluent flow rate and variation in composition of the effluent. The uniformity of effluent produced by this process improves the consistency of performance in subsequent treatment. The neutralized effluent goes to two primary clarifiers after addition of poly electrolyte which works as flocculation agent. Here the sludge is separated form the bottom.

The primary treated effluent is then treated in aeration tank for secondary treatment. Here the wastewater is brought into contact with micro-organism and the organic matter is metabolized for energy and synthesis requirements. CEPT has aeration tank. The activated sludge is introduced here for the digestion of organic wastes present in the effluent. Activated sludge is biologically active and can oxidize organic matters. These microorganisms are capable of aerobically decomposing organic matter into CO2 and H2O. Sulphur containing compounds are oxidized into sulphate and nitrogen containing component into nitrates.

The overflow from the aeration form the aeration tank with active biological solids is admitted into secondary clarifiers. The settled sludge in the clarifier is pumped back to the aeration tank to maintain bacteriological population. In the clarifier tanks, the micro-organisms come into contact with both soluble and insoluble organic materials. The soluble material passes through bacterial cell walls and the solid material sticks to the surface of cells. The sludge settled in the primary clarifier and waste sludge from secondary clarifier is taken to the sludge thickening unit named decanter and solid waste disposed of to the common TSDF (Treatment, storage, Disposal Facility) site [9].

Methods of colour removal

The colouring bodies in pulp and paper mill wastes come from wood extractives, lignin and its degradation products, formed by the reaction of chlorine with lignin. Conventional activated sludge process removes about 1/3rd the colour in the waste by adsorption on the sludge, rather than by biological action. Use of coagulants such as alum, ferric chloride and chemicals such as lime and magnesium sulphate removes colour but results in the formation of voluminous sludge. Maximum colour removal was observed at pH 5.2. To dose of calcium sulphate to provide calcium ions and for no appreciable reduction of lignin could be obtain at CaSO4 dose of less than 1000 mg/l with initial lignin concentration of 1000mg/l and CaSO4 dose varing from 1000 to 2500 mg/l, lignin removal efficiency ranged between 63.4 to 80 parent, respectively.

Removal of toxic element for constructed ponds

For this a pound of surface area 5.25 m2, 3.5 m length, 1.5 m in width, and effective depth of 0.28 m is used. The pound was equipped with inlet and outlet hydraulic structures. Before enter in pound effluent screens in primary clarifiers for separation of suspended solids then treated with Caustic and alum to adjust pH and aid in the flocculation. The effluent enter in pond where an air blower provides air and phosphorous and nitrogen are added as phosphoric acid and urea, respectively [10].

Study Plan

In January of 2013 the program of analytical study of effluent of Madhyabharat paper mill was initiated. This study plan was designed specially to evaluate the presence amount of coloured bodies and Toxicity in the effluents. The parameters selected for this study were Temperature TDS, TSS, Total Hardness, Alkalinity, Conductivity, BOD, COD, DO, Colour, pH, Chloride and Sulphate content.

Selection of Sampling Points

Effluent of madhaya bharat paper mill, champa chattisgarh. For this Effluent samples were collected from different site of mill and analyzed for Physico-chemical parameters and tried to aware to avoid the problem which come from more effluent [11-13].

METHOD

The Effluent Samples from Madhya Bharat paper mill, champa were collected from four Different Stations in the Morning Hours between 9 to 11am, in Polythene Bottle Regularly for Every Month. The Water samples were immediately brought in to Laboratory for the Estimation of various Physico-chemical Parameters like Water Temperature, Transparency and pH were recorded at the time of Sample Collection, by using Thermometer and Pocket Digital pH Meter. Transparency was measured with the help of secchidisc while other Parameters Such as DO, TDS and TSS are estimated by Gravimetric method, Hardness, Chlorides, Alkalinity, Phosphate and Nitrate were Estimated in the Laboratory By using Standard Methods.

RESULTS

The anlysis results of before treatment and after treatment are mentioned below:

Parameter	Before Treatment			After treatment		
	February	March	April	February	March	April
Colour (CU)	6280	6285	6222	clear	clear	clear
Temp.	27	38	43	27	34	38
pH	7.9	8.1	8.2	7.2	7.5	7.2
Ca Hardness	125	115	120	115	112	95
Mg Hardness	78	105	89	89	78	87
Total Hardness	194	210	189	180	185	192
Alkalinity	350	300	330	221	235	210
TDS	212	200	250	180	170	208
TSS	168	180	165	52	59	57
COD	250	255	310	35	37	34
BOD	45	50	46	10.2	8.5	9.5
Conductivity (mS/cm)	0.45	0.40	0.35	0.26	0.27	0.25
Sulphate (as SO4--)	2.8	2.4	2.6	12.8	13.2	12.5
Chloride (as Cl-)	31	29	28	24	25	28
Phosphate (as PO4---)	5.9	5.5	3.5	2.9	2.4	2.1

CONCLUSION

There are high extent of removal of organic matter was obtained for the biological process. All the regulated discharge parameters (Temperature, TDS, TSS, Total Hardness, Alkalinity, Conductivity, BOD, COD, DO, Colour, pH, Chloride Sulphate, Phosphorous content) have been well below their respective discharge limits and even better to the raw water characteristic of other river in general.

REFERENCES

1. Pandey AK, Siddiqi SZ, Rama Rao. Physico-chemical and biological characteristics of Husain sagar, an industrially polluted lake, Hyderabad. *Proc.Acad. Environ. Biol*., 2(2), 1993, 161-167.
2. Trivedy RK and Goel PK. Chemical and biological methods for water pollution studies, Environmental Publication, Karad, Maharashtra, 1986.
3. Kodarkar MS. Methodology for water analysis, physico-chemical, Association of Aquatic Biologists, Hyderbad, 2, 1992, 50.
4. APHA. Standard Methods for Examination of Water and Wastewater, 20th Edition, American Public Health Association, Washington D. C., 1985.
5. Jayabhaye UM, Pentewar MS, Hiware CJ. A Study on Physico-Chemical Parameters of a Minor Reservoir, Sawana, Hingoli District, Maharashtra, 2006.
6. Salve VB and Hiware CJ. Study on water quality of Wanparakalpa reservoir Nagpur, Near ParliVaijnath, District Beed, Marathwadaregion. *J. Aqua.Biol*., 21(2), 2008, 113-117.
7. Khan MAG and Choudhary SH. Physical and chemical limnology of lake Kaptai, Bangladesh. *Trop. Eco*., 35(1), 1994, 35-51.
8. Kadam MS, Pampatwar DV, MaliR P. Seasonal variations in differentphysico-chemical characteristicsinMasoli reservoir of Parbhani district, Maharashtra. *J. Aqua. Biol*., 22(1), 2007, 110-112.
9. Kamble SM, Kamble AH, Narke SY. Study of physico-chemical parameters of Ruti dam, Tq. Ashti, dist.Beed, Maharashtra. *J. Aqua. Biol*., 24(2), 2009, 86-89.

10. Masood Ahmed and KrishnamurthyR. Hydrobiological studies of Wohar reservoir Aurangabad (Maharashtrastate) India. *J. Environ. Biol*., 11(3), 1990, 335-343.
11. Brock TD and O'Dea K. Amorphous ferrous sulfide as a reducing agent for culture of anaerobes. *Applied and Environmental Microbiology*, 33(2), 1977, 254-256.
12. Deublein D and Steinhauser A. Biogas from waste and renewable resources: An introduction. 2008.
13. Germany: Wiley-VCH Verlag GmbH & Co. Edwards, E. A., & Grbic-Galic, D. Anaerobic degradation of toluene and o-xylene by a methanogenic consortium. *Applied and Environmental Microbiology*, 60(1), 1994, 313-322.