Research Paper

Volume : 2 | Issue : 4 | Apr 2013 • ISSN No 2277 - 8179

Science

KEYWORDS : EFFLUENT

Physiochemical Analysis of Paper Mill Effluent

S. R. Paranthaman — Department of Microbiology, Faculty of Science, Annamalai University, Chidambaram – 608 002, Tamil Nadu

B. Karthikeyan — Department of Microbiology, Faculty of Science, Annamalai University, Chidambaram – 608 002, Tamil Nadu

ABSTRACT

In this, study paper mill liquid effluent collected, Rajaganapathy Paper mill, Pondicherry are outlet of primary discharge channel. To analysis Physiochemical studies were observed and monitored at sites. During 2011-12 effluent sample were found to high physiochemical parameter, above the recommended tolerance limits.

Introduction

The pulp and paper industry typically generates large quantities of wastewater whose correct treatment prior to discharge into the environment is critical. Paper factory effluent is one of the major pollutants on the earth. The pulp and paper mill effluent is highly coloured. The on persistent dark brown colour in the released paper and pulp industrial effluent from wastewater treatment facilities is brown or black in colour due to dissolved lignin based synthetic, aromatic and chlorinated compounds derived from the blow heat condensate, pulp decker washing, chlorine and alkali bleach waste, black liquor spillage and foul evaporator condensate (Paranthaman and Karthikeyan 2013).

The current pattern of industrial activity alters the natural flow of materials and introduces novel chemicals into the environment. The released organic compounds and heavy metals are one of the key factors that exert negative influences on man and environment causing toxicity to plants and other forms of biotics and abiotics that are continually exposed to potentially toxic heavy metals (Paranthaman and Karthikeyan 2013).

At present very few mill provide treatment to the waste water, therefore the discharged contain large amount of sludge, which creates handling and disposal problems. Although paper mill effluent regulation, limiting the discharge of suspended solid, biochemical oxygen demanding substance and toxic material were promulgated under the federal fishing act in Nov.1971, but to lack of proper implementation most of the mill defly these regulation (Browerlee and Strachaln, 1977).the paper mill effluent possess a serious threat not only to the plant but also animals and in general the environment. Therefore, in the present study physiochemical analysis of paper mill effluent of Pondicherry has been made during 2011-12.

Materials and Method

Effluent sample were collected fortnightly in glass stoppered bottles at undisturbed stage from the selected site. Sampling was done from the depth ranging from 25 to 50 cm at various points. Care was taken to avoid any disturbance by loose sediments. The procedure described in standard method for the examination of effluent and industrial wastes (APHA 2005) has been adopted in the analytical techniques. Analysis of heavy metal done for the sample obtained from the selected site, recycling of water. These heavy metal should be completely absent in the water.

Result

In the table (1) different parameters of a paper mill effluent of Pondicherry with tolerance limits for recycling drinking purpose are presented. It was found that the colour of the liquid effluent was dark brown and odour was characteristic pungent due to number of chemical and the raw materials using making the paper. Temperature of the effluent ranges between 38 to 40oC and pH between 9.5. The electrical conductivity was found to differ at the site. It was range form 30.7 to 31.4mScm-1. Besides this higher of calcium, magnesium, potassium and sodium were also found in the effluent (table 1). The values of COD and BOD ranged between 2350mg L-1 respectively. The chloride content was found higher. The amount of nitrogen was found to be very low, where as sodium and potassium were higher. Analysis of the effluent sample revealed the presence of various heavy metals like iron, zinc, lead, copper, cadmium and manganese (Vijayram et al., 1988).

Table 1: Physico-Chemical parameters analysis in raw Paper mill effluent

Parameters	Raw Effluent	Bis Limit Is 2490-2009
Colour	Brown	-
Odour	Offensive	-
Temperature	38°C	-
pH	9.5	5.5 - 9.0
Electrical conductivity dsm^{-1}	30.7	NM
Total hardness (mg/l)	5400	100
Total suspended solids (mg/l)	215	100
Total dissolved solids (mg/l)	406	
Biological Oxygen Demand (mg/l)	1260	30
Chemical Oxygen Demand (mg/l)	2035	250
Carbonate (mg/l)	850	600
Bicarbonate (mg/l)	1423	NM
Calcium (mg/l)	150	200
Magnesium (mg/l)	58	30-100
Chloride (mg/l)	1462	1000
Sodium (mg/l)	186	NM
Potassium (mg/l)	600	NM
Fluoride (mg/l)	6.0	2.0
Nitrate (mg/l)	46	100
Nitrite (mg/l)	32	10
Sulphate (mg/l)	345	1000

Table 1 (cont.): Elemental analysis

Chromium (mg/l)	140	0.5
Nickel (mg/l)	58	3.0
Zinc (mg/l)	34	-
copper (mg/l)	2.8	3.0
Iron (mg/l)	18	-
Cadminum (mg/l)	5.0	2.0
Lead (mg/l)	4.0	0.1
Manganese (mg/l)	9.0	-

Values are mean of triplicates
NM - Not mentioned
BIS - Tolerance limits for industrial effluent discharged into inland surface waters prescribed by the Bureau of Indian Standards (2009)

Discussion

In developing as well as under developed countries, the industrial effluents are released directly or indirectly into natural water resources, mostly without proper treatment, thus posing a serious threat to the environment (Altug and Balkis, 2009). Therefore, the effluents discharged form pulp and paper mills, even after anaerobic-aerobic treatment, have several negative effects on receiving aquatic ecosystems and adjacent agricultural fields, cattles etc (Mishra et al., 2007). Regular monitoring of pollution parameters in these effluents in respect of total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD),chlorophenols, dioxins and colour, therefore assumes paramount importance to maintain environmental safety (Pandey et al., 2005).

The present study on effluent quality parameters with the heavy metals concentration emphasizes the need for using identical management for the better effluent characteristics, as has also been emphasized by the results of Singh et al. (1996). The data bank generated by this monitoring study of pulp and paper mill effluent could be successfully used in prediction of their hazards and effective management (Malaviya and Rathore, 2001).

Conclusion

The paper mill is growing fast and produces different varieties of paper. The physico-chemical characteristics of effluent from this mill revealed that the effluent is light brown in colour, pH shows alkaline nature of the effluent, SS, BOD, COD and heavy metals are the parameters from the treated effluent is high in concentrations compared to Indian standards.

REFERENCE

1. Altug, G. and N. Balkis, 2009. Levels of some toxic elements and frequency of bacterial heavy metal resistance in sediment and sea water, Environ.Monit. Assmt., 149: 61-69. | 2. APHA: Standard methods for examination of water and waste water, 21st Edition, American Public Health Association, Washington, DC (2005). | 3. Brownlee, B. and W.M. Strachaln: Distribution of some organic compounds in the receiving waters of a craft pulp and paper mill. Canda Fish Research Board, J. 34: 830-837 (1977). | 4. Mishra, R.R.,R.N. Pandey, N.K. Singh and D.D. Tewari: Characterization of Paper mill effluent and its possible treatment at Faizabad (U.P.). J. Natcon., 19: 175-178 (2007). | 5. Malaviya, P. and V. S. Rathore: A correlation study on some physicochemical quality parameters of pulp and paper mill effluents. Pollut. Res., 20: 465-470 (2001). | 6. Paranthaman .S.R and Karthikeyan .B: Studies on different indigenous microorganism in pulp and paper mill industry effluent. Gol Res Thou [2231-5063] vol:2 iss:8 (2013). | 7. Paranthaman .S.R and Karthikeyan .B: Bioremediation of heavy metal from paper mill and using potential of mercury resistant bacterial strain. Rev of Res [2249-894X] vol:2 iss:5 (2013). | 8. Pandey, R.N., S. Upadhyaya, V.K. Pandey, D.D. Tiwari and Y.N. Pandey: Characterization of sugar, distillery and fertilizer industry effluents for their bioremediation. Acta Ecol., 27: 11-16 (2005). | 9. Vijayram, K., S.R. Vasugi, S. Chitra and U. Asha: Pollution load of a paper mill effluent and its impact on water quality. J. Ind. Pollut. Control, 4: 73-80 (1988).