

PHYSICO-CHEMICAL CHARACTERIZATION OF A PULP AND PAPER MILL EFFLUENTS OF FAIZABAD DISTRICT (U.P.) INDIA

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SUMMARY

The liquid effluent of Pulp and Paper Mill, Darshan Nagar, Faizabad are discharged in a nallah through different channel during 2005-06, the effluent samples were found to contain TDS, BOD, COD, Temperature, pH colour, odour and conductivity above the recommended tolerance limits for irrigation and drinking purposes.

Key words : Pulp and paper mill, Effluent, Physico-chemical, TDS, BOD, COD, Conductivity, TPD, APHA, AWWA, WPCF.

Pulp and paper industry ranks high both in terms of water uses and pollution loads. The important pollution parameters of this industry include colour, BOD, COD, and solid residues as sludges. In India the growth of paper industry has been raised during the recent year and according to the information available there are about 220 paper mills of which more than 80 Percent are small scale units having installed capacity of 30 Tonnes per day (TPD). These mills use agricultural residues *viz.* rice straw, wheat straw, baggasses, grasses and waste paper as raw materials (Baruah and Oas, 1996).

These mills use chemical as well as mechanical pulping process for making papers. Generally chemical pulping is employed for agricultural residues based mills, where as chemical pulping is employed for waste paper based mills. The small scale paper mills using chemical pulping process do not recover chemicals like big mills due to cost factor, therefore these chemicals come out with the water as chemical effluent together with sludge (Hendry *et al.*, 1982).

At present very few mills provide treatment to the waste water, therefore the water discharged contains large amount of sludge, which present handling and disposal problem. Although pulp and paper effluent regulation, limiting the discharge of suspended solid, biochemical oxygen demanding substance and toxic materials were promulgated under the federal fisheries act in Nov. 1971, but to lack of proper implementation most of the mills defy these regulation (Browerlee and

Strachan, 1977). The pulp and paper mill effluent possess a serious threat not only to the plants but also to animals and in general, the environment. Therefore, in the present study physico-chemical analysis of pulp and paper Mill effluent of Faizabad district has been made during 2005-2006.

MATERIALS AND METHODS

Effluent sample were collected forthrightly in glass stoppered bottles at undisturbed stage from the selected sites. 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 procedures described in standard methods for the examination of sewage and industrial wastes has been adopted in the analytical techniques.

Analysis of heavy metals done for 3 sample obtained from the selected sites, for irrigational use of water. These heavy metals should be completely absent in the waste water.

RESULTS AND DISCUSSION

In the Table 1 and 2, different parameters of a pulp and paper mill effluent or Faizabad district with tolerance limits for irrigational and drinking purposes are presented.

It was found that the colour of the liquid effluent was dark brown and odour was characteristic pungent due to number of chemicals and the raw materials used in making the paper (Fox, 1977). The temperature of the effluent ranges between 20.10°C to 40.0°C and the pH between 7.5 to 8.4. The electrical conductivity was found to differ at different sites. It was ranged from 1.75- 3.6 mScm⁻¹. Besides large number of salts like carbonates,

Table 1 : Physico-chemical characteristics of effluents from Pulp and Paper Mill of Faizabad

S. No.	Characteristics	Magnitude	Tolerance limit for irrigational water (ppm) (ISI 2490-1981)	Tolerance for potable water (ISI 1981)
1.	Colour	Dark Brown	-	-
2.	Odour	Pungent	-	-
3.	Temperature	10.10 ⁰ C-20 ⁰ C	40 ⁰ C	45 ⁰ C
4.	pH	7.5-8.4	5.5-9.0	5.5-9.0
5.	Conductivity	1.75-3.66	3.0 mScm ⁻¹	3.0 mScm ⁻¹
6.	T.D.S.	1200-3210	2100	-
7.	C.O.D.	250-1088	-	-
8.	B.O.D.	250-408	100	350
9.	Total Alkalinity as CaCO ₃	255-408	-	-
10.	Chloride	28.5-315.6	600	1000
11.	Total Nitrogen	0.82-2.85	-	-
12.	Ammonia-N	0.32-1.28	-	50
13.	Nitrate-N	0.28-0.78	50	50
14.	Nitrite-N	0.15-0.39	-	-
15.	Sulphate	32.5-205	1000	1000
16.	Phosphorus (P)	0.585-0.825	-	-
17.	Calcium	30.62-138.22	75	200
18.	Magnesium	10.72-70.65	50	150
19.	Potassium	8.52-30.48	60 (ISI 2296)	-
20.	Sodium	255-325	5 (ISI 2490)	-

All the values are in mg/L, except Temp., pH and conductivity.

Table 2 : Heavy Metals (ppm)

S. No.	Parameters	Sample (1)	Sample (2)	Sample (3)	Tolerance Limit
1.	Fe	3.12	2.64	1.74	1.00
2.	Zn	5.65	3.73	1.14	5.00
3.	Pb	0.36	0.12	0.07	0.10
4.	Cu	1.73	0.05	0.03	0.50
5.	Cd	0.03	0.03	0.03	0.01
6.	Mn	0.32	0.23	0.16	0.50

bicarbonates, chlorides, sulphates and nitrates of calcium, magnesium, potassium and sodium were also found in the effluent (Table 1) Agrawal and Chaturvedi, 1995. The values of the COD ranged between 2350 mg/l to 3580 mg/l and BOD was found to range between 250 mg/l and 1088 mg/l. The chloride content was found higher.

The amount of nitrogen was found to be very low, where as sodium and potassium were higher (Vijayram *et al.*, 1988). Analysis of the effluent samples revealed the presence of various heavy metals like Iron, Zinc, Lead, Copper, Cadmium and Manganese (Table 2).

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