



Reduction in Polluting Parameters of Paper Mill Effluent by using Bio-chemical Treatment

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Research Article

ABSTRACT

Pulp and paper Industry is one of the major chemical industries which use huge amount of raw water and consequently a lot of polluted waste water (effluent) is generated. Effluent treatment is a capital cost involvement process. In this study an effort is made to reduce the polluting parameters of paper industry waste water by using selected algae treatment followed by chemical treatment. Paper industry effluents may contain many elements including calcium, magnesium, silica, chromium nickel and other polluting parameters like high BOD, COD, color etc. After treatment reduction in polluting parameters were determined. It was observed that about 50% to 80% reduction in different parameters could be obtained in this study.

Key words: Biochemical treatment, BOD, COD, Paper mill, effluent.

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INTRODUCTION

Water is one of the most important natural resource on earth. All the plants and animals need water to survive. Increases in the population and industrialization resulting into the contamination of the water So nowadays the wastewater treatment has become the most worried topic all over the world.[1] Therefore it is necessary to purify and recycle the industrial as well as the municipal wastewater. Paper and pulp industry generate effluent which contains high pollution load. It is polluting and very dangerous for environment. It should be treated being release to the environment. Biological and chemical process involve use of algae and different chemicals like lime, alum, and other coagulants.[2]

Lime, chemical name is calcium hydroxide lime which is used for purification and reduction of hardness

from water.[3] Alum which contain aluminium sulphate has the property of coagulation .Alum agglomerates suspended and other impurities present in waste water. In this study combined effect of algae and coagulant was studied.

MATERIALS

pH meter, petri dish, burette, filter paper, test tube, beaker, flask, pipette, glass rod, spatula, funnel, heating plate, weighing machine, butter paper, desiccator etc.

All reagents including lime, alum, EBT, ammonium buffer, EDTA, Potassium dichromate, ferrous ammonium sulphate, ferroin indicator, sulphuric acid, distilled water, silver sulphate, mercuric sulphate, phenolphthalein indicator of Rankem (AR grade) were used.

Waste Water samples were collected from paper industry located in western UP region. The water samples were collected in cleanbottles which were washed by ethanol and distilled water. The bottles was filled completely with effluent.

Biological Treatment- Effluent samples after collection in one litre conical flask, treatment of selected algae like *chlorella singularus* was grown for about 2 weeks. After biological treatment, coagulants (Lime, alum) were added in the effluent with mixing using mechanical stirrer for about 30 mins and then allowed to settle. Parameters before and after treatment were determined to get percent reduction.

METHODS

Table-1 Biological treatment on effluent using (algae- *chlorella singularus*)

Parametrs	Before treatment with (Effluent)	After treatment within 14 days (<i>chlorella singularus</i>)	% Reduction
pH	6.5	7.1	-
Colour	Dark brown	Lighter	High reduction
Hardness	1400ppm	1200ppm	14.2
TDS	3200mg/l	1300mg/l	59.4
COD	1100mg/l	600mg/l	45.5
BOD	280 ppm	160ppm	42.8

All the parameters like -pH, hardness, colour, conductivity, TDS, TS, TSS, BOD, COD, dissolved oxygen were determined as per standard methods given in the book of waste water treatment of American Public Health Association (APHA Book).[4] Heavy metals were determined by using Atomic absorption spectrophotometer (AA-200)..

RESULTS AND DISCUSSION

All the results of Biological treatment using algal-*chlorella singularus* are given in table-1.From this table it can be observed that by using only algae treatment, hardness is reduced by about 15 %,total dissolved solids by about 60%,COD by about 45% and BOD by 43%.

BIO-CHEMICAL TREATMENT OF EFFLUENT

When chemical treatment of lime, algae and alum was given, significant reduction in different parameters were observed, results are shown in table-2. It can seen from the results that about 80 to 90% reduction can be obtained by using combined treatment of lime, alum and algae. By this treatment hardness and TDS are reduced by about 80 to 85%.BOD and COD can be reduced by

about 70 to 75%. Heavy metals were also determined and results are given in table-3.All heavy metals including iron were reduced by about 80 to 90% by such combined treatment. Vimal Chandra Srivastava and his co-workers studied treatment of pulp and paper mill effluent with PAC and flyash materials but they used without nano-composite formation while in this study we have obtained much better results with nano-composites.

Table-2: Treatment of Algae, Lime (2% w/v) and Alum (2 % w/v)

Parameters	Effluent	Algae + Lime	Algae + Lime + Alum	Maximum Reduction%
Colour	Dark brown	Lighter brown	Light greener	
Hardness	1400ppm	550ppm	280 ppm	80
TDS	3200mg/l	600mg/l	500mg/l	84
COD	1100mg/l	500mg/l	300mg/l	72.7
BOD	280 ppm	80 ppm	40 ppm	71.4

Iron	11.5 ppm	6.6 ppm	2.3 ppm	80
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Table-3: Heavy metal reduction in Effluent

Metals	Effluent	Lime + Algae	Alum + Algae	Lime + Algae + Alum
Cadmium (Cd)	0.56	0.40	0.22	0.10
Iron (Fe)	11.5	6.6	5.6	1.6
Copper (Cu)	0.62	0.22	0.09	ND
Cobalt (Co)	0.32	0.16	0.15	0.16
Nickel (Ni)	0.42	0.30	0.18	0.10
Zinc (Zn)	1.2	0.82	0.52	0.06

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