



Investigation on Treatment of Paper and Pulp Industry Waste Water using Air Column Reactor

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Abstract: Environmental protection has been in focus for many years especially in industries and clean water is scarce in many places. Waste water treatment issues are becoming increasingly important for pulp and paper industry, as it requires an extensive amount of water and production of different kind of waste water. Treatment of this waste water can be carried out by using air bubbling column. This technique is economical and cost saving and also energy efficient. By using this method various parameters like pH, chemical oxygen demand (COD), biochemical oxygen demand (BOD) can be reduced. Present study deals with the use of an Air Bubble Column reactor for treatment of paper and pulp industry waste water. It is observed that colour of waste water changes from blackish to whitish and parameters like PH, TS, TDS, and TSS were reduced. COD reduced from 840 mg/l to 200 mg/l and BOD from 546 mg/l to 98 mg/l.

Keywords: Air Bubble column Reactor, effect on various parameters like PH, TS, TDS, TSS; COD, BOD.

I. INTRODUCTION

Most treatment systems have been designed with large oxidation tanks and over sizing the aeration system to deal with the peak load with a very high oxygen demand, during the vintage period. As a result, wastewater treatment plants are quite large and difficult to manage. One of the most promising technologies appears to be the vertical reactors characterised by high oxygen mass transfer improving the biological conversion capacity [1]. The various reactors are used for industrial waste water treatment such as air bubble column, air lift column, air lift bioreactor.

The air bubble column bioreactors are simple devices that have wide application in bio-processing, the chemical process industry and treatment of waste water [2]. It's widely used due to their simple construction without internal or moving parts [3].

In industrial waste water, it contains some organic matter or biological matter. To decompose these organic matter into simple form, micro-organisms used dissolved oxygen (DO) present in the industrial waste water. During this process dissolved oxygen level decreases.

To maintain the dissolved oxygen level in waste water, we commonly used air lift bioreactor through which air is supplied to the waste water, due to concentration difference in waste water and air the oxygen transfer from air to water and DO level remains constant. The organic matter is decomposed in CO₂ and H₂O [4]. In this study, paper and pulp industry waste water treatment has been carried out in an Air Column reactor. We report the effects on colour of waste water PH, TS, TDS, TSS; COD, BOD.

II. MATERIALS AND METHODS

The experimental set up is shown in Fig.1. It consists of cylindrical column having industrial waste water inlet on upper side and outlet for air is just below it. It has the centrifugal pump for pumping the industrial waste water into the column from waste water tank. Also the compressor is used for blowing the air from bottom of the column. The flow rate of both centrifugal pump and compressor is adjusted by rotameter. Also the column provided sedimentation tank for sedimentation of treated waste water.

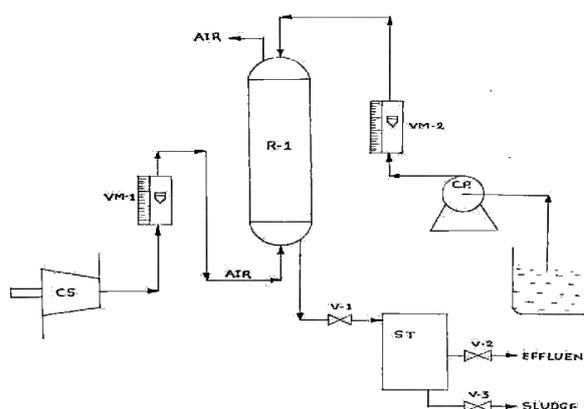


Fig. 1 Experimental set up of waste water treatment by using Air Bubble Column Reactor

Table 1

Sr. No.	Code	Description
1.	Rm-1,2	Rotameter
2.	R-1	Reactor



3.	Cp	Centrifugal pump
4.	Cs	Compressor
5.	St	Sedimentation tank
6.	V-1,2,3	Valve
7.	Ft	Feed tank

A) Materials:

- i) The materials (pulp and paper Industrial waste water) is used in the present study were collect from Navrang papers, Survey No.09, Waghapur, Yavatmal.
- ii) Compressed air.

B) Method

Collected wastewater from paper and pulp industry was kept in wastewater tank. The column was provided containing industrial waste water pumped by Centrifugal pump from waste water tank. The air at sufficient pressure was provided from the bottom of the Column by compressor. Due to this air is mixed thoroughly with industrial waste water; the Process was carried out for 6-20 hours. The sludge was separated from the bottom of sedimentation tank & effluent was removed at top of tank.

The value of PH were continuously decreases with increase in the treatment time as shown in Fig. 3

The values of Chemical Oxygen Demand (COD) were continuously decreases with increases in the treatment time as shown in Fig.4 and also the values of Biochemical Oxygen Demand (BOD) were continuously decreases with increases in the treatment time as shown in Fig.5

III. RESULTS AND DISCUSSION

The values of TS, TSS and TDS were continuously decreases with increase in the treatment time as shown in Fig. 2

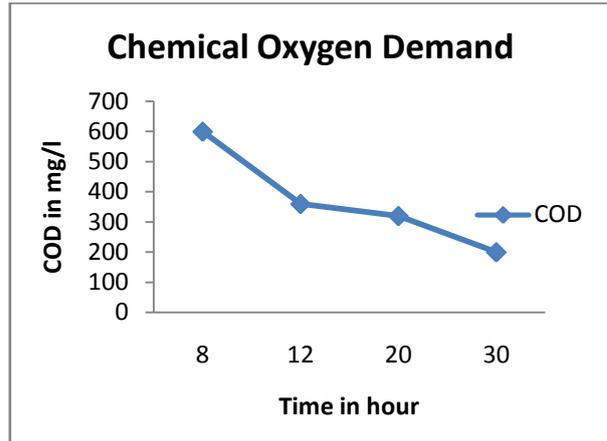


Fig.4 COD in mg/l vs Time in hrs

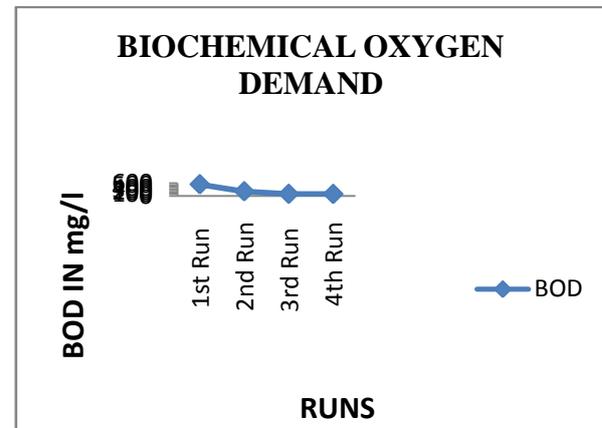


Fig.5 BOD in mg/l vs RUNS

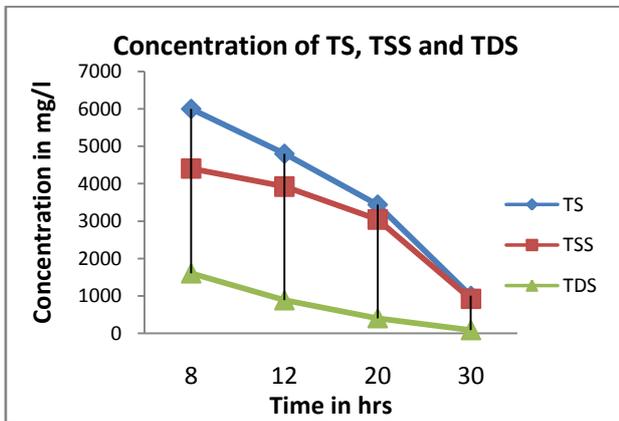


Fig.2 Concentration in mg/l vs Time in hrs

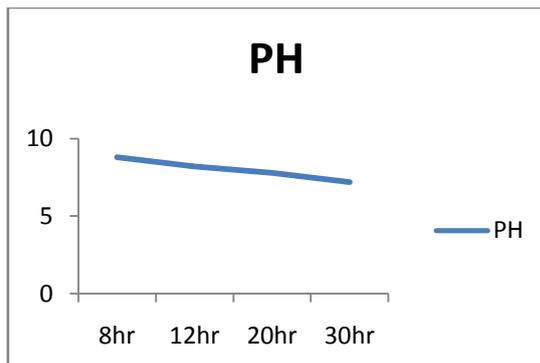


Fig.3 PH vs Time in hrs

Table 2 Analysis of Pulp & Paper Waste Water

Parameters	Raw waste water of pulp and paper	Treated Waste water of pulp and paper
Colour	Blackish	Whitish
pH	9.1	7.2
TS	11200 mg/l	1000 mg/l
TDS	5800 mg/l	80 mg/l
TSS	5400 mg/l	920 mg/l
C.O.D.	840 mg/l	200 mg/l
B.O.D.	546 mg/l	98 mg/l

IV. CONCLUSION

In the present study, it was found that the values of TS, TSS, TDS, BOD and COD of paper and pulp waste water



were continuously decreases as we increases the treatment time in hour and also changes the colour of waste water from blackish to whitish. Paper and pulp waste water treatment by using Air column reactor decomposes organic matter into simple form, micro-organisms use dissolved oxygen present in the industrial waste water. By using Air Column reactor, treatment of paper and pulp waste water can be carried out at low cost and also saves energy. Therefore it is energy saving technology for paper and pulp waste water treatment.

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