

Study of physico-chemical characteristics of treated effluent of Sugar Industry

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Abstract

An attempt has been made to study the characteristics of the treated effluent of Saraswati Sugar Mill in Yamunanagar, by analyzing various physico-chemical parameters (pH, temperature, TS, TDS, TSS, DO, BOD, COD and oil and grease). Saraswati Sugar Mill is India's second largest sugar industry having well equipped effluent treatment plant. The duration of study was from January 2001 to March 2001. Almost all the monitored parameters were within the prescribed limits. Thus this industry does not possess any threat to water quality.

Keywords: *Sugar industry, Physico-chemical characteristics*

Introduction

All over the world, industrial development has caused indiscriminate exploitation of natural resources, without any regard to conservation aspect. Sugar industry is one of the major industries in India. On one hand sugar industry is playing a vital role in the economy of country on other hand it is a potent and problematic source of environmental pollution. Effluent treatment plant (E.T.P.) of Saraswati sugar mill was designed by Hindustan Dor Oliver. It contains equalization tank, primary clarifier, aeration tank, secondary clarifier and sludge drying beds. Process adopted for the treatment of effluent is activated sludge method, which involves primary treatment, secondary treatment and dewatering of sludge on sludge drying beds.

The main purpose of water analysis is to evaluate methods of treatment of wastewater; with to reuse or dispose, ascertain quality of water and aim at recovery of valuable products from waste effluents. In order to ascertain the above objectives, it is necessary to analyze various parameters, which would throw light on quality of water (Lokhande *et al.*, 2005). Several workers have carried out studies on water of different sources in respect of physico-chemical parameters (Khanna, 1993 and Khanna *et al.*, 2003). Considering the present conditions a quantitative study of physico-chemical conditions of treated effluent of Saraswati Sugar Mill was done.

Materials and Method

Sampling

Water samples were collected from the outlet of the treatment plant.

Analytical methods

The physico-chemical analysis was carried out according to standard methods given by APHA (1998) and Trivedi and Goel (1986). The analytical methods for various parameters are given in Table-1.

Table 1: Various analytical methods used for analysis

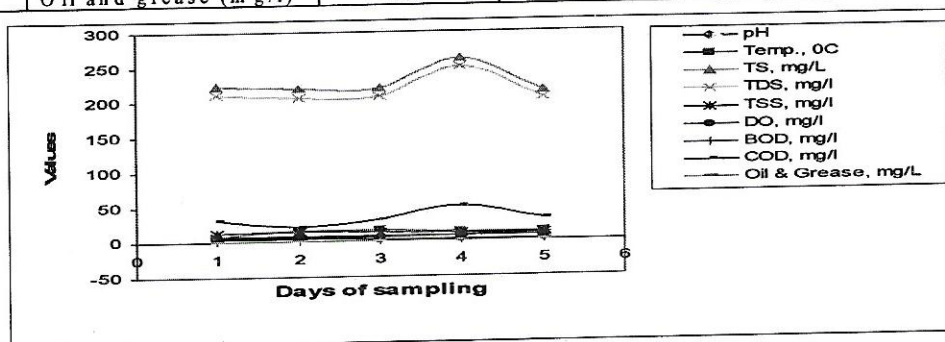
S.No.	Parameters	Analytical method
1	pH	pH metery
2	Temperature	Thermometry
3	Dissolved oxygen (DO)	Winkler's Iodometric with azide modification method
4	Biochemical oxygen demand (BOD)	5 days incubation method
5	Chemical oxygen demand (COD)	Dichromate reflux method
6	Total solids (TS)	Gravimetric method
7	Total dissolved solids (TDS)	Gravimetric method
8	Total suspended solids (TSS)	Difference of TS and TDS
9	Oil and grease	Petroleum ether method

Results and Discussion

The results for the various physico-chemical parameters determined in the treated effluent sample are presented in Table-2. It summarizes the maximum, minimum, mean values and standard deviations of the parameters monitored. The graphical representations are given in Fig. 1.

Table 2: Various physico-chemical parameters at the outlet of effluent treatment plant

S.No.	Parameters	Maximum	Minimum	Average	Standard deviation
1	pH	7.50	7.33	7.43	0.07
2	Temp. (°C)	16.0	7.50	12.9	3.15
3	TS (mg/l)	261.0	214.0	227.0	19.12
4	TDS (mg/l)	250.0	204.0	215.2	19.59
5	TSS (mg/l)	14.0	10.0	12.0	1.58
6	DO (mg/l)	4.1	2.0	3.02	0.99
7	BOD (mg/l)	10.0	5.0	6.8	2.17
8	COD (mg/l)	50.0	20.0	32.0	10.95
9	Oil and grease (mg/l)	0.2	0.0	0.06	0.09

**Fig. 1. Variations in different physico-chemical parameters**

The pH values were in the range of 7.33 to 7.50 (Table-2). The pH range for the discharge of treated effluent is 5.5 to 9.0. pH of the samples were found to be in the safe range. The values obtained were similar as observed by Manjappa and Naik (2007) for Malaprabha river. It is apparent from results that temperature values ranged between 7.50 to 16.0 °C. and these values were within the prescribed limits (<45 °C). The range of temperature of water samples was similar as observed by Muduli and Dhal (2006) in river Baitarani at Anandpur.

The total solids (TS) values ranged from 214 to 261 mg/l. TDS values ranged between 204 to 250 mg/l. The suspended solids (SS) represent the floating material (bacteria, algae) and undissolved particles, which ranged from 10 to 14 mg/l. All types of solids were found within tolerable limits.

The concentration of dissolved oxygen in water depends on temperature, pressure and the concentration of various ions. Due to pollution load the concentration of DO depletes and possess thrust on the aquatic life. Low oxygen in water can be detrimental to fishes and many other organisms in the aquatic system. The DO values ranged between 2.0 to 4.10 mg/l. BOD is the empirical test to determine the relative oxygen requirement of water mostly due to organic ingredients. Its application is to calculate the pollution load. The BOD values ranged from 5 to 10 mg/l. Maximum permissible limit for the discharge of effluent for BOD is 30 mg/l. Therefore, BOD is not possessing any threat to water quality.

COD is the amount of oxygen required for oxidation of organic constituents with strong oxidizing agent and it is also an important parameter for stream and industrial wastewater pollution studies. In the present study the COD ranges from 20 to 50 mg/l. Maximum permissible limit for the discharge of effluent for COD is 250 mg/l. Oil and grease values were from 0 to 0.2 mg/l. Permissible limits for oil and grease is 10 mg/l.

Conclusion

Saraswati sugar mill follows advanced process technology and system to achieve the environment management and performance. Therefore this industry is conscious of its responsibility and has invested heavily in reducing pollution. All the monitored parameters (pH, temperature, TS, TDS, TSS, DO, BOD, COD and Oil and grease) were within the prescribed limits and this industry is not possessing any threat to water quality.

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