ijCEPr
International Journal of Chemical, Environmental and Pharmaceutical Research
Vol. 2, No.2-3, 131-134
May-December, 2011

Wastewater Quality Studies of Influent and Effluent Water at Municipal Wastewater Treatment plant, Bhopal (India)

Ram Kumar Kushwah[1], Avinash Bajpai[2] and Suman Malik[1]
[1]Department of Chemistry, Sadhu Vaswani College, Bhopal, (India)
[2]Makhanlal Chaturvedi University, Bhopal (India)
*E-mail: ramkumarkushwah@yahoo.com

Article History:
Received: 18 September 2011
Accepted: 28 September 2011

ABSTRACT
This study was to determine pH, DO, BOD and turbidity reduction from Municipal Wastewater. It is based on screening, sedimentation and waste stabilization technique using anaerobic and facultative ponds. In the present study samples of influent and effluent waste water from Badwai sewage treatment plant (STP) situated at Bhopal, Madhya Pradesh were collected during the year 2010. Physico-chemical parameters namely pH, DO, BOD and turbidity were analyzed using standard methods prescribed as in the APHA (1998). The results with treated water indicate that the wastewater treatment plant is efficient in treating wastewater. This treated water can be used for secondary purposes like industrial cooling and agricultural uses.
Keywords: STP, pH, Dissolve oxygen, Biochemical oxygen demand, and turbidity.

INTRODUCTION

The wastewater is a mixture of sewage water, agricultural drainage, industrial waste effluents and hospitals facilities; it is well known that the wastewater from domestic origin contains pathogens, suspended solids, and other organic and inorganic pollutants [1]. In order to minimize the environmental and health hazards, these pollutants need to be brought down to permissible limits for safe disposal of wastewater [2, 3]. Therefore, removal of the organic contaminants and pathogens from wastewater is of paramount important for its reuse in different activities [4, 5, and 6]. The waste water that flows after being used for domestic, industrial and other purposes is known as sewage. Sewage contains water as the main component, while other constituent, and include organic waste and chemical. Sewage discharge is one of the problems presently facing Bhopal and several efforts are being vigorously pursued to control it. Assessment of water and wastewater is very crucial to safeguard public health and the environment [7]. Sewage discharges are a major component of water pollution, contributing to oxygen demand and nutrient loading of the water bodies; promoting toxic; algal blooms and leading to a destabilized aquatic ecosystem [8, 9]. The problem is compounded in areas where wastewater treatment systems are simple and not efficient. The conventional wastewater treatment technologies as adopted in industrialized nations are expensive to built, operate and maintain [10, 11] especially for decentrized communities. Research efforts are underway [12] for the development of treatment technologies suited to these decentralized communities.

MATERIAL AND METHODS

The present sewage treatment plant (Badwai) is situated at a geographical location of coordinates 23^{o} 15' 44'' N, 77^{o} 28' 23'' E. Badwai sewage treatment plant receives the wastewater generated in CTO, Hemu Colony, Beta village, Koh-e-fiza etc areas. Badwai sewage treatment plant is designed to treat 16.67 MLD sewage. The Badwai STP is based on waste stabilization technique using anaerobic and facultative ponds.

Wastewater samples were collected from influent and effluent of sewage treatment plant (STP) from January to December 2010. Samples were analyzed to determine the efficiency of the treatment plants in removing those parameters from the influents to effluent of STP. Samples were collected in glass containers, pre-cleaned by washing with non-ionic detergents, rinsed in tap water, in 1:1 hydrochloric acid and finally with demonized water before usage. Before sampling, the bottles were rinsed three times with sample water and then filled and pH, Dissolve oxygen, Biochemical oxygen demand and Turbidity were analysis in the analytical laboratory according to the methods prescribed as in the APHA [13] Standard methods for the examination of water and wastewater. 18^{th} Edition. American Public health Association, Washington, DC pp 45-60.

RESULTS AND DISCUSSION

pH

The pH value varies from 6.62 to 6.77 in the influent and 7.62 to 8.58 in the effluent of the STP. The minimum value was observed in the month of January while the maximum value was observed in the month of May in the influent water of sewage treatment plant. The minimum value was observed in month of January while maximum value was observed in the month of March, in the final treated effluent water of sewage treatment plant (Fig-1). The target water quality range for pH in water for domestic use is 6 to 9 and the target water quality range for pH in water for full contact recreation is 6.5 to 8.5. There are neither major industries nor mining activities in the area that could cause extreme changes in the pH of the effluents or of the receiving water. Thus, the results obtained for pH measurements in the water and in the effluent discharges were as expected.
The results obtained from analysis of water samples shown Table-1.

Table -1: Physico-Chemical parameter of Influent and Effluent water of Badwai Swage Teatment Pant

Parameters/ Months		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
pH	Influent	6.62	6.72	6.86	6.78	6.77	6.62	6.74	6.64	6.75	6.69	6.72	6.64
	Effluent	7.62	7.76	8.58	7.98	8.36	7.58	8.12	7.78	7.87	7.67	7.79	7.49
DO	Influent	0	0	0	0	0	0	0	0	0	0	0	0
	Effluent	5.2	4	4.4	2.6	2.4	2.6	2.8	4	3.4	4.4	3.6	3.6
BOD	Influent	198.6	288.6	242.6	328.6	382.4	348.6	297.8	254.6	275.2	298.8	275.6	205.4
	Effluent	30.2	58.6	47.2	83.2	102.6	88.6	78.6	58.6	67.4	88.6	48.2	32.6
Turb.	Influent	116.5	154.3	138.2	192.5	198.5	248.6	236.5	156.8	168.5	159.3	196.5	117.4
	Effluent	18.5	30.8	23.5	34.2	23.3	35.2	27.4	20.2	25.4	22.7	32.4	19.8

Dissolve Oxygen

In investigation period Dissolved Oxygen (DO) was nil in the influent and 2.4 mg/l to 5.2 mg/l in the effluent water. The minimum value was observed in the month of May while the maximum value was observed in the month of January in the treated effluent water of sewage treatment plant. The Dissolved Oxygen in waste water is of the great importance to all support aquatic life and is considered to be the factor that reflects the biological activity taking place in the water bodies and determines the biological changes, which are brought about by the aerobic or anaerobic organisms. In the present study we got zero value of dissolved oxygen influent in the sewage treatment plant. This may be due to mixing of industrial effluents and dumping of municipal solid waste into sewage water. Zero dissolved oxygen values may also be due to the stagnant and non-flushing conditions of the water with increasing waste load by regular addition of foods and pesticides**.** The DO values obtained from this study are similar to those reported else whereas [14]. The value of dissolve oxygen was found low, mostly at the bottom layer on account of low production of oxygen and higher consumption of dissolve oxygen by microbial activities [15].

Biochemical Oxygen Demand

During the period of investigation Biological Oxygen Demand varied from 198.6 mg/l to 382.4 mg/l in the influent and 30.2 to 102.6 mg/l in the effluent water. The minimum value was observed in the month of January while the maximum value was observed in the month of May, in the influent water of sewage treatment plant. The minimum value was observed in the month of January while the maximum value was observed in the month of May in the final treated effluent water of sewage treatment plant (Fig-3).

The Biochemical oxygen demand (BOD) test is widely used parameters of organic pollution applied to the wastewater. The BOD is define as the oxygen required for the microorganism to carry out biological decomposition of dissolved solids or organic matter in the wastewater under aerobic conditions at standard. BOD is the most widely used parameter to measure water quality. Anaerobic and facultative pond systems designed for the removal of BOD and pathogens. BOD was higher in the influent than the effluent of water. This could be because of algal biomass present in the treated effluent. The BOD is an indication of the organic load of sewage wastewater. The high value of BOD may be due to extensive use of organic nutrients in the untreated wastewater. Usually the microorganisms require more oxygen to reduce the high organic nutrients present in sewage wastewater. BOD measure the amount of oxygen required by bacteria for breaking down to similar substances the decomposable organic matter present in any water, wastewater or treated effluent. It is also taken as a measure of the concentration of organic matter present in any water. The greater the decomposable matter present, the greater the oxygen demand and the greater the BOD

[16]. In the untreated sewage Influent BOD was very high. So the sewage wastewater is unsafe. Treatment is required for domestic, industrial and irrigation purposes.

Turbidity

In the period of investigation turbidity was observed from 116.5 NTU to 248.6 NTU in the influent water and 18.5 NTU to 35.2 NTU in the effluent water. The minimum value was observed in month of January while maximum value was found in the month of June in the influent water of sewage treatment plant and the minimum value was observed in month of December while maximum value was observed in the month of June in the final treated effluent water of sewage treatment plant. The turbidity values were higher than WHO standard of 5 NTU [17]. Also, the excessive turbidity in water can cause problem with water purification processes such which may increase treatment cost.

Based on original data of influent turbidity received by the filter units, it was noted that most of the incoming water to the filters could be described as "tough water". Such water was hard to tackle as far as turbidity removal was concerned. Obviously a filter could remove the maximum raw turbidity when the incoming turbidity was high. On the contrary, the filters could remove very little when received turbidity was low. As stated earlier, sand filters capping. Some other quality merits of sand filter capping was the probability of intermix that might occur among anthracite coal and sand grains. Intermix provided more uniform decrease in pore size with thickness. This allowed more efficient use of storage space in the media and consequently provided longer runs [18].

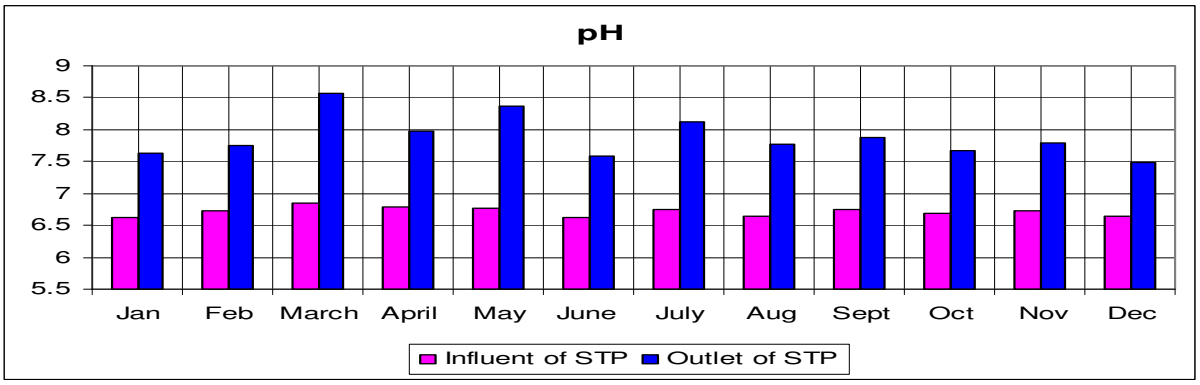

Fig-1: Variation of pH in the Influent and Effluent of Sewage Treatment Plant.

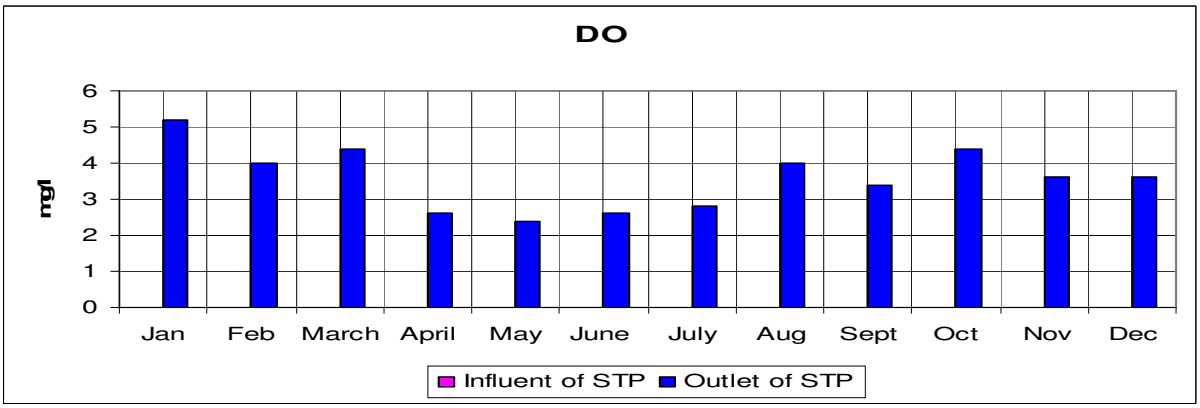

Fig-2: Variation of Dissolve Oxygen in the Influent and Effluent of Sewage Treatment Plant.

A decrease in the uniformity coefficient would reduce the amount of intermix since larger particles would not be present. This strongly confirmed in Table 1.

CONCLUSION

The present study on the quality of sewage wastewater at Badwai reveals that the effluent water from STP shows the values within the acceptable standard for pH, DO but BOD and Turbidity depicted maximum values when compared with the BIS standards and may cause problems in the long run. Due to continuous application of sewage wastewater, the water aquifer gets polluted resulting in increase in BOD and turbidity. Generally, the average application rate of sewage wastewater permissible within application rates in any properly managed irrigation system. Therefore sewage wastewater, if treated properly with reduced BOD and Turbidity can be provided as alternate source of water for irrigation. It may be concluded that the sewage wastewater of Bhopal is not fit for industrial, domestic and irrigation purpose, without treatment, but treated final effluent of the sewage treatment plant may be recommended for use as secondary purposes like industrial cooling, gardening and irrigations.

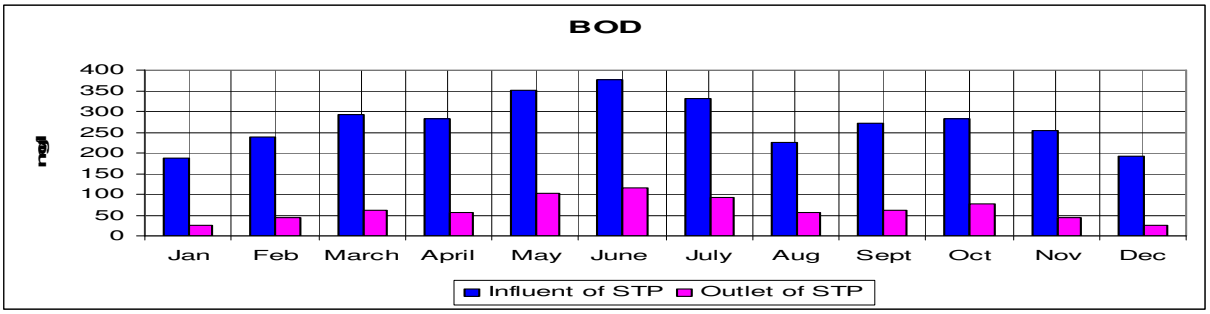

Fig-3: Variation of Dissolve Oxygen in the Influent and Effluent of Sewage Treatment Plant.

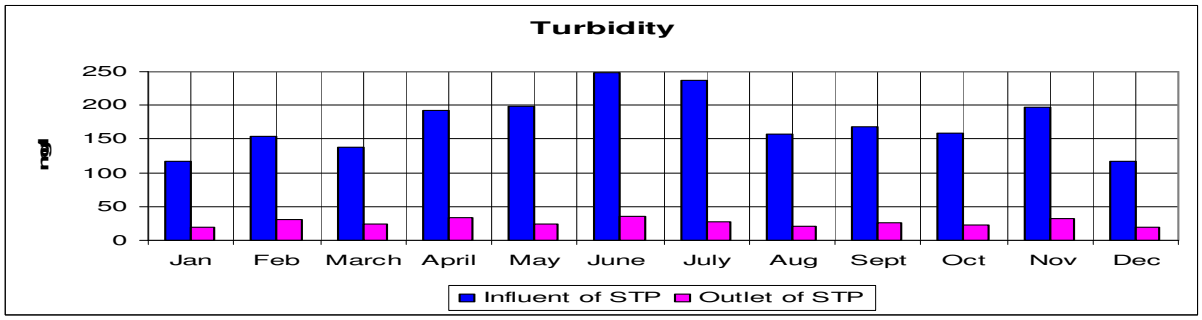

Fig-4: Variation of Turbidity in the Influent and Effluent of Sewage Treatment Plant.

REFERENCES

1. Andrew B., Xiaodong S. and Edyveen G.J., Removal Water Res., **31** (1997) 2084.
2. Manju G.N., Raji C. and Anirudhan T.S., Water Res., **32** (1998) 3062.
3. Boots V. J. P., Mackay G. and Healy J.J., J. Water Pollution Control Federation, **50** (1978) 926.
4. Ali M. and Deo N., Indian J. Environ. Pro., **12** (1992) 202.
5. Chen, P. H., Envon. Inter., **13** (1997) 63.
6. Raj C.P., Subha T.S. and Anirudhan T.S., Indian J.Environ Health, **39** (1997) 230.
7. Okoh A. I., Barkare M. K., Okoh O. O., Odjadjare E., J. Appl. Sci., **5** (2005) 1041.
8. DWAF; WRC, WRC Report No. T T **64/94** (1995).
9. Morrison G., Fatoki O. S., Persson L., Ekberg A., Water SA, **27** (2001) 475.
10. Majumder D. and Roy B., Indian J. Environ. Prot., **20** (2000) 529.
11. Majumder S.C.B. and Kumar K., Indian J. Environ Health, **41** (1999) 170.
12. Wang S., Lin L., Hongwei W. and Zhu Z. H., J. Coooid Interface Sci., **292** (2005) 336.
13. APHA., American Public health Association, Washington, DC ,**45** (1998)60.
14. Fatoki S. O., Gogwana P., Ogunfowokan, A. O., Water S. A., **29** (2003) 183.
15. Tamod P. and Bhatnagar G.P., Proc. Nat. Symp. Past Present and future of Bhopal Lakes, S.K. Kulshreshtha, Ed. **37-40**. (1998)
16. Adeemoroti, C.M.A. Foludex., press Ltd, Ibadan pp. **22-23** (1996) 44, 111.
17. WHO, World Health Organization. Technica l Report Series **778** (1989)
18. Cleasby J., Intermix of Dual Media and Multi-media Granular Filters. J. AWWA. **76** (1975).

[IJCEPR-186/2011]