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Characteristics of waste water in sewage treatment plant of BHOPAL, (India)

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ABSTRACT

The increasing population has resulted in many problems, most important being producing sewage. Sewage is water-carried waste, in solution or suspension that is intended to be removed from a community. Also known as wastewater, it is more than 99% water and is characterized by volume or rate of flow, physical condition, chemical constituents and the bacteriological organisms that it contains. This study was conducted to determine the pollutants level in final treated water from sewage treatment plant Bhopal and compare with BIS and World Health Organization (WHO) guidelines. Wastewater samples were collected from sewage treatment plant Kotra and Badwai sewage treatment plant (STP). Samples were analyzed using pollution indicating parameters such as pH, Conductivity, DO, BOD, COD and using standard methods. Level for BOD and COD are higher then the recommended in Burro of Indian Standard. In view of the Pollution, in this study I was found that final treated water should be treating regularly and carefully for reuse as secondary purposes.

Keywords: Sewage, DO, BOD, COD and Sewage Treatment Plant.

INTRODUCTION

Sewage treatment is the process of removing the contaminants from sewage to produce liquid and solid suitable for discharge to the environment or for reuse. It is a form of waste management. Waste water treatment system such as biofilterscan be used to treat sewage close to where it is created. Sewage water is a complex matrix, with many distinctive chemical characteristics. These include high concentrations of BOD, COD, high conductivity (due to high dissolved solids), with pH typically ranging between 7 and 8. [1]. Operating conditions and process carried out influence the amount and characteristics of the by products ad waste and formed. The waste water varies both quality and characteristics from the industries and Domestic waste. The composition of waste water from the same industry also varies widely from day to day [2, 3]. Waste water stabilization pond is considered as the most appropriate system to treat

the increasing flows of urban waste water in tropical and subtropical regions of the world [4]. Waste water treatment plants are commonly used as efficient means of waste water treatment relying on little technology and minimal, albeit regular maintenance. Their low capital and hydraulic loads have been valued for years in rural regions and in many countries wherever suitable land is available at reasonable cast [5, 6, 7, 8, and 9]. They generally consist of a series of ponds where the waste water has around twenty day's retention time and usually a depth from one to three meters depending on the type of pond [10]. Industrial wastewaters are treated partially before their discharge into sewers, or else are treated separately through suitable treatment processes so that the treated effluent is safe [11].

EXPERIMENTAL SECTION

The present Sewage Treatment Plant is situated at a geographical location: Kotra and Badwai, Bhopal, Madhya Pradesh, India within the geographical coordinates of 23^o 15' 44'' N, 77^o 28' 23'' E. Kotra sewage treatment plant receives the wastewater generated in Nehru Nagar, Kotra Sultanabad and adjoining areas. Kotra sewage treatment plant is designed to treat 10.0 MLD sewage and 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 Kotra and Badwai STP are based on waste stabilization technique using anaerobic and facultative ponds. Wastewater samples were collected from sewage treatment plant (STP) from January to December 2009. Samples were analyzed to determine those parameters which indicate the high polluted water in effluent of STP. Samples were collected in glass containers, precleaned 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, Conductivity, DO, BOD and COD were analysis in the analytical laboratory according to the methods prescribed in the APHA [12].

RESULTS AND DISCUSSION

The waste water quality analysis of sewage treatment plant locations, namely, effluent of sewage treatment plant Bhopal has been carried out for physicochemical parameters like, pH, Conductivity, DO, BOD and COD. The results are given in Table – 1.

Table-1 Physicochemical parameters of Effluent of sewage treatment plant.

Parameters/ Stations/Months		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
pH	Badwai	7.45	7.54	8.32	8.43	7.93	7.98	7.95	7.83	7.82	7.42	7.68	7.52
	Kotra	7.68	7.66	8.13	8.62	7.62	7.95	7.85	8.22	7.71	7.58	7.95	7.35
Turb.	Badwai	17.2	18.4	28.4	22.4	27.6	31.4	34.2	30.4	35.6	23.5	20.5	14.9
	Kotra	12.8	20.6	15.2	24.8	20.5	38.2	28.8	19.2	26.2	19.6	28.6	13.1
DO	Badwai	6.2	4.4	5.2	3.6	3.4	2.6	4.2	4	4.4	6.2	4	4.4
	Kotra	6.4	5.2	4	4.4	2.4	1.8	2.6	2.6	4	3.2	3.2	4.4
BOD	Badwai	20.4	52.6	48.6	62.6	92.2	104.6	62.2	86.8	68.2	49.6	79.4	27.4
	Kotra	28.6	58.2	36.6	72.4	104.2	95.6	75.2	77.4	72.4	88.4	38.6	25.6
COD	Badwai	104.6	138.6	113.8	164.6	202.6	180.8	152.4	139.8	195.6	158.6	156.8	110.4
	Kotra	94.6	152.8	122.4	149.2	195.6	208.4	140.8	112.4	163.2	181.6	144.4	120.6

pH

During the investigation period pH varied from 7.45 to 8.43 in the effluent of Badwai and 7.35 to 8.62 in the effluent of Kotra STP. The minimum value was observed in the month of January while the maximum value was observed in the month of April in the effluent of Badwai sewage treatment plant. The minimum value was observed in the month of December while the maximum value was observed in the month of April in the effluent of sewage treatment plant Kotra (Fig-1). WHO has recommended maximum permissible limit of pH from 6.5 to 9.2 [13 De, 2002]. pH value of different samples is within the desirable and suitable range.

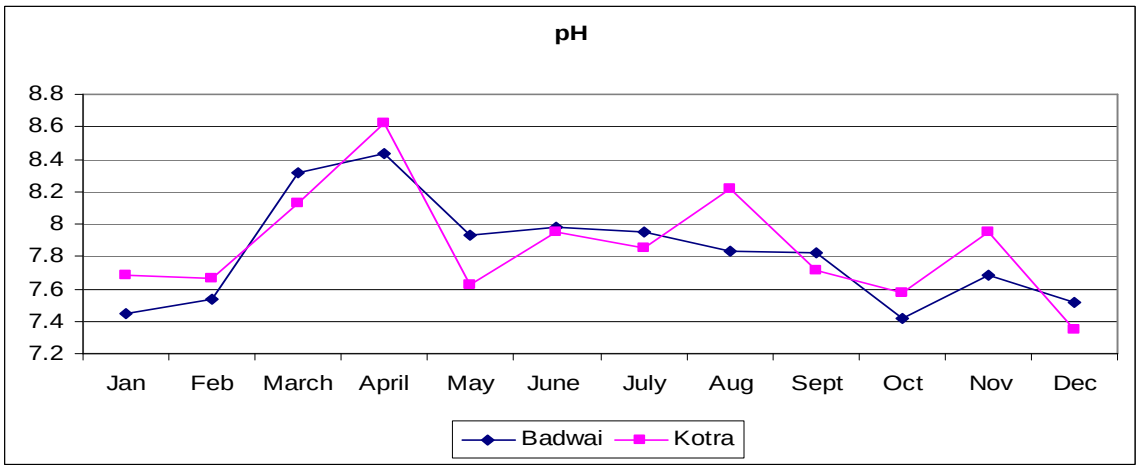

Figure-1 Variation of pH in the effluent of sewage treatment plant Badwai and Kotra.

Turbidity

During the investigation period turbidity varied from 14.9 to 34.2 in the effluent of Badwai and 12.8 to 38.2 in the effluent of Kotra STP. The minimum value was observed in the month of December while the maximum value was observed in the month of July in the effluent of Badwai sewage treatment plant. The minimum value was observed in the month of January while the maximum value was observed in the month of June in the effluent of sewage treatment plant Kotra (Fig-2). Turbidity values obtained from the stations in all samples were higher than WHO standard [14].

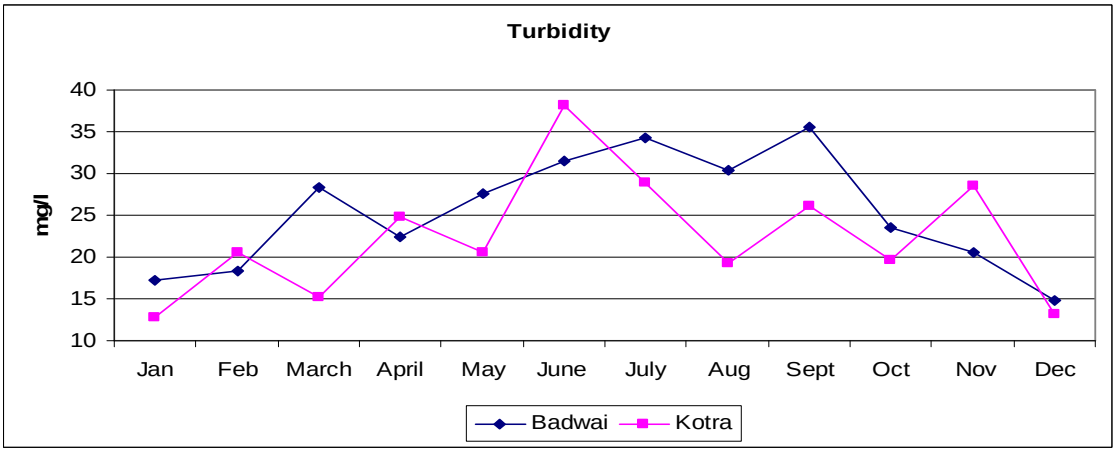

Figure-2 Variation of turbidity in the effluent of sewage treatment plant Badwai and Kotra.

Dissolved Oxygen

During the investigation period dissolved oxygen varied from 2.6 mg/l to 6.2 mg/l in the effluent of Badwai and 1.8 mg/l to 6.4 mg/l in the effluent of Kotra STP. The minimum value was

observed in the month of June while the maximum value was observed in the month of January in the effluent of Badwai sewage treatment plant. The minimum value was observed in the month of June while the maximum value was observed in the month of January in the effluent of sewage treatment plant Kotra (Fig-2). Dissolved oxygen concentrations in unpolluted water normally range between 8 and 10mg/l and concentration below 5 mg/l adversely affect aquatic life [15, 16]. The lower values of dissolved oxygen during in the month of May and June, It can be attributed to the fact that the rise in temperature leads to the warming of water and ultimately helps in an increase in mineralization of nonliving matter which demands oxygen [17] and decrease in solubility of oxygen at higher temperature. The level of oxygen concentration in aquatic ecosystem is dependent on temperature, photosynthetic activity, respiration of biotic communities and organic loading. For supporting fish life there should be at least 3.00 ppm dissolved oxygen in water [18].

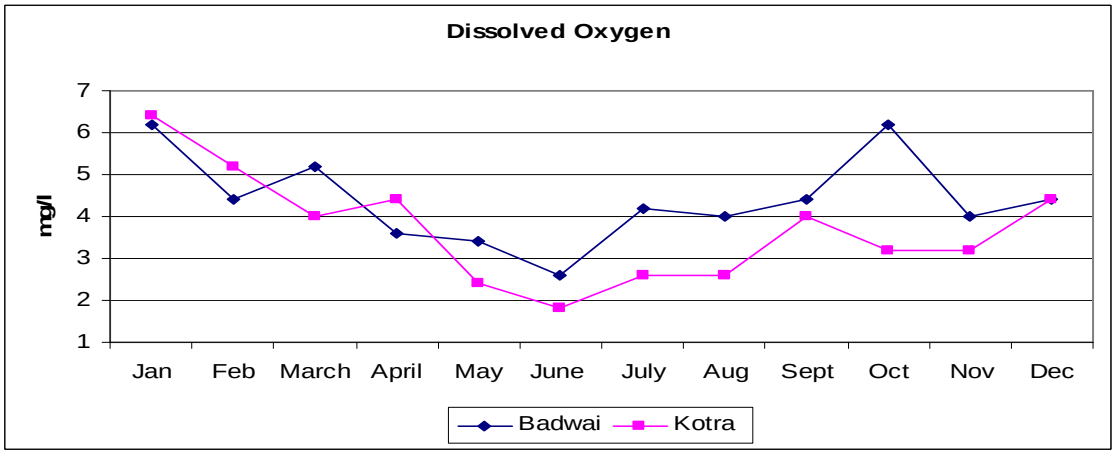

Figure-3 Variation of Dissolved Oxygen in the effluent of sewage treatment plant Badwai and Kotra.

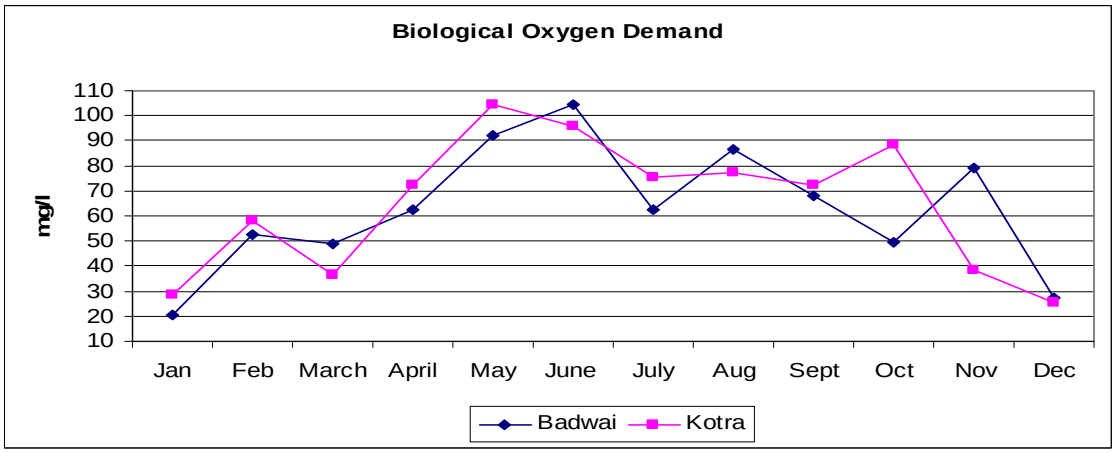

Figure-4 Variation of BOD in the effluent of sewage treatment plant Badwai and Kotra.

Biological Oxygen Demand

In the present study BOD varied from 20.4 mg/l to 104.6 mg/l in the effluent of sewage treatment plant Badwai and 25.6 mg/l to 104.2 mg/l in the effluent of sewage treatment plant Kotra. The minimum value was observed in the month of January while the maximum value was observed in the month of June in the effluent of sewage treatment plant Badwai. The minimum value was observed in month of December while maximum value was observed in the month of

May in the effluent of sewage treatment Kotra (Fig-4). BOD indicates the presence of microbial activities and dead organic matter on which microbes can feed. BOD is directly linked with decomposition of dead organic matter present in the wastewater and hence the higher values of BOD can be directly related with pollution status of the wastewater [19]. The higher value of BOD means present of more biodegradable organic material [20]. BOD of samples was not found in limit prescribed by WHO [14] and BIS [23].

Chemical Oxygen Demand

In the present study period the COD varied from 104.6 mg/l to 202.6 mg/l in the effluent of sewage treatment plant Badwai and 94.6 mg/l to 208.4 mg/l in the effluent of sewage treatment plant Kotra. The minimum value was observed in the month of January while the maximum value was observed in the month of May in the effluent of sewage treatment plant Badwai. The minimum value was observed in month of January while maximum value was observed in the month of June in the effluent of sewage treatment Kotra (Fig-5). Chemical oxygen demand is defined as the amount of a specified oxidant that reacts with the samples under controlled conditions [21] and is often used as a measurement of pollutants in wastewater and natural water. COD of samples was not found in limit prescribed by WHO [14] and BIS [22].

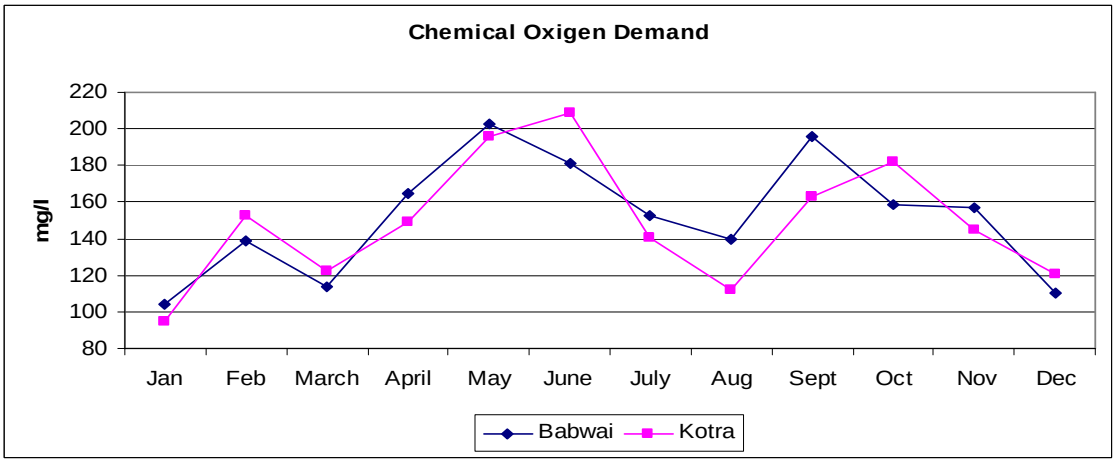

Figure- 5 Variation of COD in the effluent of sewage treatment plant Badwai and Kotra.

CONCLUSION

The present study reveals the water quality deterioration due to location of sewage treatment plant (Badwai & Kotra) in Bhopal. From the above study, it was proved that high concentration of this turbidity, BOD and COD were not found within permissible limit prescribed by WHO and BIS present in the effluent of sewage treatment plant. Instead of discharging the effluent sewage water into the nearby body of water, it is proposed to sewage treatment is essential improvement of working for reducing most of the pollutants and get better water quality of the effluent of sewage treatment plant It may be concluded that the effluent of sewage treatment plant Bhopal is not fit for industrial, domestic and irrigation purpose, without proper treatment.

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