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Research Paper

Waste water Quality of Bhopal City with Special Reference to Sewage Treatment Plant

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Abstract - *The Bhopal city is rapidly growing whereby the average growth of pupation per annual about is 6 %. The increasing population has resulted in many problems, most important being producing waste water. The authorities are not able to keep pace with the rising demand of treating water. The Bhopal city is most depending on lentic water resources for the potable water and the storage of water depends on rains. Unlike surface water is considered as any safe source of water and therefore often used without any treatment. However the seepage of contaminants from domestic sewage and metal contaminants from industries causes serious health problems. The present study was conducted to determine the wastewater quality of inlet of Sewage Treatment Plant of Kotra and Badwai. Waste water samples were collected from municipal waste water treatment plant Kotra and Badwai sewage treatment plant (STP). Samples were analyzed using pollution indicating parameters such as pH, turbidity, DO, BOD, COD and using standard methods. The results of analysis of waste water indicate that it is highly polluted therefore recommended to treatment and management of the raw / waste water properly for reuse.*

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

Introduction

Waste water is any water that has been adversely affected in quality by anthropogenic influence. It comprises liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture and can encompass a wide range of potential contaminants and concentrations. In the most common usage, it refers to the municipal wastewater that contains a broad spectrum of contaminants resulting from the mixing of wastewaters from different sources [1]. The water quality of combine sewer systems is affected by the lifestyle of the inhabitants as well as the temporal flow pattern [2]. It may also be significantly changed by other factors such as the infiltration of ground water, the leakage of pipes and the hydraulic gradient [3]. Variations in waste water quality are relatively large and abrupt change may take place due to infiltration, leakage and storm events. Biological oxygen demand (BOD) and chemical oxygen demand (COD), indirect indicators of organic matters, are representative parameter for sewer water quality. However it is very difficult to obtain continuous water quality data because of the scarcity of accessible space within the sewer system and the necessity of separate laboratory experiment .moreover, at least five days are required to acquire BOD data from the experiment and BOD itself may baised by the presence of toxic substance that might cause the inhibition of the oxidizing bacteria. Sometimes, 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 [4].Industrial wastewater disposal needs proper considerations from the points of view of manufacturer, public and the sanitary engineer alike. From the public point of view, industrial wastes cause pollution to stream making it unfit for domestic, recreational and commercial purposes, deteriorate sewers and treatment, and increase cost of treatment.

Material and Methods

The present Sewage Treatment Plant is situated at a geographical location: Kotra and Badwai, Bhopal, Madhya Pradesh, India within the geographical coordinates of 23° 15' 44'' N, 77° 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 influent 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, turbidity, DO, BOD and COD were analysis in the analytical laboratory according to the methods prescribed in the APHA Standards Methods for the Examination of Water and Waste Water, American, Public Health Association, Washington, D.C. 19th Edition [5].

Results and Discussion

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

pH

During the investigation period pH varied from 6.52 to 6.82 in the influent of Badwai and 6.53 to 6.88 in the influent of Kotra STP. The minimum value was observed in the month of December while the maximum value was observed in the month of March in the influent 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 April in the influent of sewage treatment plant Kotra (Fig-1). Wastewater discharge from sewage and industries are major component of water pollution, contributing to oxygen and nutrient loading of the water bodies, promoting toxic algal blooms and leading to a destabilized aquatic ecosystem [6, 7]. High or low pH value in a wastewater has been reported to affect aquatic life and alter toxicity of other pollutant in one form or the other [8]. Figure 1.

Turbidity

During the investigation period turbidity varied from 120.4 to 258.6 in the influent of Badwai and 110.6 to 250.6 in the influent 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 influent 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 influent of sewage treatment plant Kotra (Fig-2). Turbidity values obtained from the stations in all samples were higher than WHO standard [9]. Figure 2.

Dissolved Oxygen

Dissolved oxygen during the period of investigation remained absent in all the samples. Dissolved oxygen is an important factor used for water quality control. The effect of waste discharge on a surface water source is largely determined by the oxygen balance of the system and its presence is essential in maintaining biological life within a system [10]. Dissolved oxygen concentrations in unpolluted water normally range between 8 and 10mg/l and concentration below 5 mg/l adversely affect aquatic life [10, 11].

Biological Oxygen Demand

In the present study BOD varied from 192.6 mg/l to 372.4 mg/l in the influent of sewage treatment plant Badwai and 184.6 mg/l to 248.4 mg/l in the influent of sewage treatment plant Kotra. The minimum value was observed in the month of December while the maximum value was observed in the month of June in the influent of sewage treatment plant Badwai. The minimum value was observed in month of January while maximum value was observed in the month of July in the influent of sewage treatment Kotra (Fig-3). 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 [12]. The higher value of BOD means present of more biodegradable organic material [13]. Figure 3.

Chemical Oxygen Demand

In the present study period the COD varied from 458.6 mg/l to 698.4 mg/l in the influent of sewage treatment plant Badwai and 416.4 mg/l to 682.4 mg/l in the influent of sewage treatment plant Kotra. The minimum value was observed in the month of December while the maximum value was observed in the month of May in the influent of sewage treatment plant Badwai. The minimum value was observed in month of January while maximum value was observed in the month of May in the influent of sewage treatment Kotra (Fig-4). Chemical oxygen demand is defined as the amount of a specified oxidant that reacts with the samples under controlled conditions [14] and is often used as a measurement of pollutants in wastewater and natural water. Figure 4.

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 (highly polluted waste water) of this turbidity, BOD and COD were present in the influent of sewage treatment plant.

Instead of discharging the raw sewage into the nearby body of water, it is proposed to let it pass through the sewage treatment plant that would remove most of the pollutants. So the sewage treatment is essential for maintaining the water quality and the final treated wastewater can be used as the secondary purposes like industrial cooling, and irrigation purposes.

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Table 1: Physicochemical parameters of Influent of sewage treatment plant

Parameters/ Stations/Months		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
pH	Badwai	6.54	6.64	6.82	6.78	6.56	6.61	6.65	6.54	6.72	6.59	6.56	6.52
	Kotra	6.53	6.58	6.75	6.88	6.61	6.67	6.58	6.63	6.54	6.57	6.68	6.57
Turb.	Badwai	123.6	128.4	198.3	148.6	181.6	232.6	258.6	156.7	160.4	149.8	204.3	120.4
	Kotra	110.6	154.2	138.2	195.2	172.5	250.6	238.6	144.6	185.4	146.3	166.3	124.4
DO	Badwai	0	0	0	0	0	0	0	0	0	0	0	0
	Kotra	0	0	0	0	0	0	0	0	0	0	0	0
BOD	Badwai	198.2	292.4	268.6	298.2	356.4	372.4	226.4	284.2	272.4	254.6	282.6	192.6
	Kotra	184.6	275.2	234.4	332.4	372.8	346.4	248.4	294.2	264.8	315.6	248	195.2
COD	Badwai	471.2	571.2	498.6	574.6	698.4	623.4	592.2	492.6	632.6	504.2	575.2	458.6
	Kotra	416.4	598.2	458.4	602.6	682.4	658.4	556.4	468.8	548.2	618.2	488.2	453.2

Badwai – Influent of Sewage treatment Plant. **Kotra -** Influent of Sewage treatment Plant

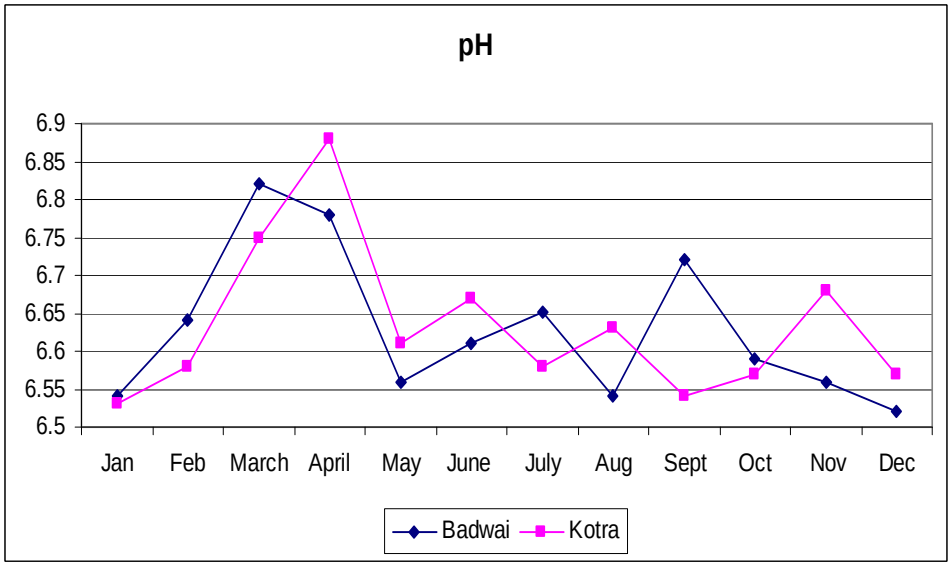

Figure 1: Variation of pH in the influent of sewage treatment plant Badwai and Kotra

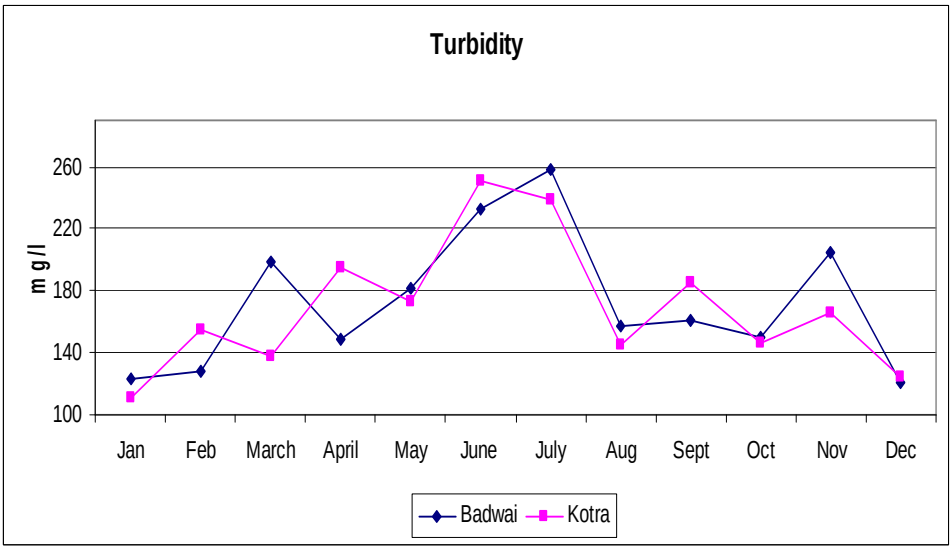

Figure 2: Variation of turbidity in the influent of sewage treatment plant Badwai and Kotra.

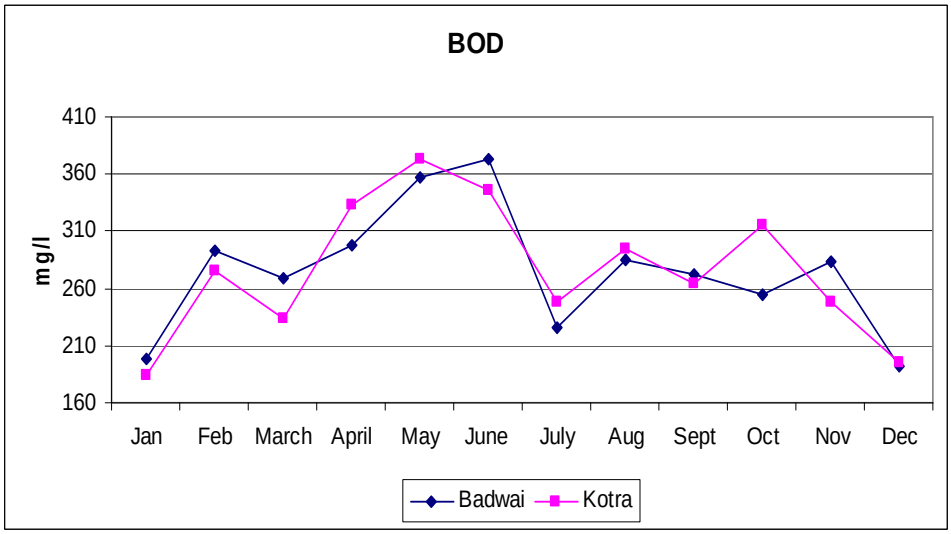

Figure 3: Variation of BOD in the influent of sewage treatment plant Badwai and Kotra

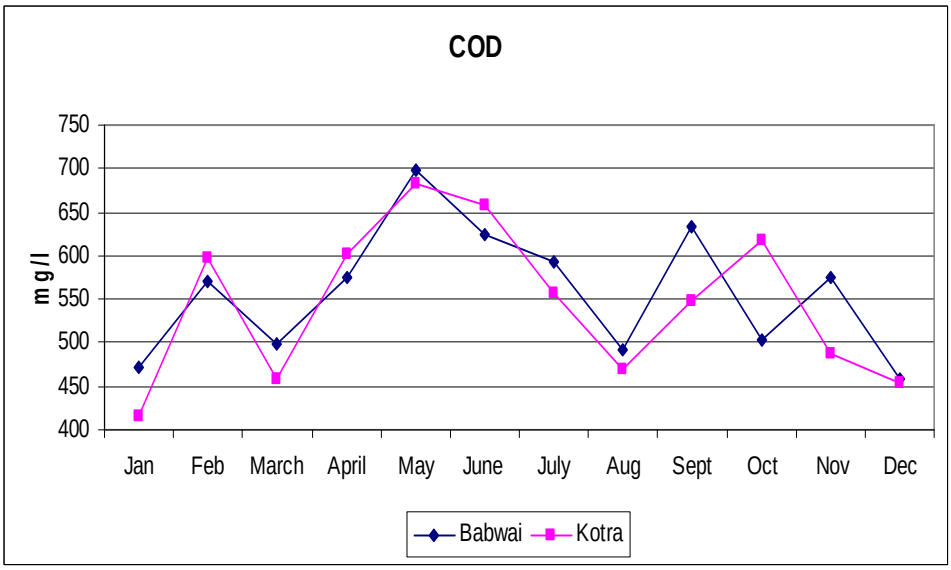

Figure 4: Variation of COD in the influent of sewage treatment plant Badwai and Kotra