Jr. of Industrial Pollution Control 22 (2)(2006) pp 311-314

MONITORING THE OXYGEN LEVEL OF UPPER LAKE USING ARTIFICIAL AERATION UNITS

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Key words : Upper lake of Bhopal, Artificial aeration unit, COD, BOD, Oxygen level.

ABSTRACT

Pond aeration is a tool that is often recommended in pond management programme. A basic understanding of oxygen's role in ponds and lakes is crucial. The present study is undertaken to evaluate the impact of aeration units on the Physico-chemical characteristic of Upper lake situated in Bhopal. The lake receives a large amount of sewage from its densely populated habitation .The continuous input of biologically active nutrients (Phosphates & Nitrates) through inflow of sewage has changed the water body into an eutrophic lake resulting in frequent oxygen depletion. The installations of aeration units have been found to have significant impact in increasing the oxygen concentrations, changing the species diversity besides reducing the pathogenic microbial population.

INTRODUCTION

Water is a wonderful gift that nature bestowed upon us. 'Water is life' this axiom is getting full attention on paper but practically nobody is taking any steps to justify it. Day by day the lowering of the ground water level has now become a serious point of discussion. We cannot deny this truth that the groundwater level is decreasing day by day. The deterioration in the water quality status of lakes everywhere has become a very important and burning topic. The quality standards include the fast rate of oxygen depletion due to inflow of industrial effluents, domestic wastewaters, and religious wastes, etc.

Aeration by itself is not a magic bullet that will solve all our pond management problems overnight. Nutrient loading is still the critical factor that

must be dealt with before a pond can be brought back into balance.

Raja Bhoj , the King of Dhar in Central India created the Upper Lake (Latitude 23°12′-23°16′N, Longitude 77°18′-77°23′); in the 11th century by constructing an earthen dam across the Kolans River. The Kolans was originally a tributary of the Halali River, which in turns joins Betwa River near Vidisha. With the construction of the earthern dam and a spill channel a major change in the hydrological basins was effected almost about 900 years back, in the sense that the Kolans basin was linked to the Betwa River directly through Kaliasote river and finds its way to Yamuna river through the River Betwa. A waste weir at Bhadbhada, constructed in 1965 to increase the storage capacity of the Upper lake, now controls the outflow(Varghese, 2001).

The Upper Lake, in a linear west alignment, has a catchment area of 361 sq.km and at present water spread area of 31 sq.km. The upper Lake has a partial Urban component in its catchment on the eastern and while the remainder is rural (Varghese, 2001). The Upper Lake of Bhopal receives large amount of untreated sewage from its densely populated residential area. The water body is one the examples of Urban lakes where the amount of nutrients is very high with prominent anaerobic conditions. The phenomenon of oxygen depletion is more prominent in the summer seasons (Varghese, 2001).

Experimental

A. Collection of water samples

Collection of water samples for analysis of physico- chemical parameters were done at Yatch Club, Takia island, Prempura and Khanugaon, situated at the bank of Upper Lake, from middle layer at a distance of 0m, 10m, 20m, and 30m and at a distance of more than 100 m from the aeration units. The water samples were collected in acid washed plastic cans with 5 litres capacity from lake. For estimation of dissolved oxygen separate samples were collected in 250 mL glass bottles. Microbiological samples were collected in washed and sterilized glass bottles. Samples were taken from the locations as given in the Table 1.

b. Methods of analysis

The Standard methods for the Analysis of water were followed as prescribed in APHA (1995) and NEERI (1980).

RESULTS AND DISCUSSION

The results of the study are given in the Table 2 to 5:

Dissolved oxygen is one of the important parameters, which indicates the extent of industrial and domestic pollution load in a water body. Dissolved oxygen ranged from 7.2 mg/L. to 9.1 mg/L and was maximum at a distance of 10 m This trend in the DO shows that the aeration units have been a successful tool in improving the water quality.

The COD of all the samples ranged from 18.0 to 40.0 mg/L. Here there was

Table 1

Sampling points from the aeration units	Location
At 0 m	This point is right at the place where the Unit is in-
stalled	
At 10 m	The point is 10 mts away from the Unit.
At 20 m	This point is at a distance of 20 m from the unit
At 30 m	This point is at a distance of 30 m from the unit.
At a distance of more than 100m	This point is at a distance of more than 100 m from the aeration unit.

Table 2

BOD_5 of water samples from the site Yatch Club of Upper Lake

Parameters	Distance from Aeration units					
	At 0mts.	At 10 mts.	At 20 mts.	At 30 mts.	At a distance more than 100 mts.	BIS Standards
DO mg/L	7.8	8.1	7.9	7.9	7.9	> 6.0 mg/L
COD mg/L	38.0	24.0	22.0	25.0	26.1	250 mg/L
BOD mg/L	8.2	7.8	9.5	7.9	8.3	2.0 mg/L

Table 3

BOD_5 of water samples from the site Takia Island of Upper Lake

Parameters	Distance from Aeration units					
	At 0m	At 10 m	At 20 m	At 30 m	At a distance more than 100 m	BIS Standards
DO mg/L	8.3	8.4	7.9	7.3	7.3	> 6.0 mg/L
COD mg/L	29.0	23.0	21.0	22.0	22.0	250 mg/L
BOD mg/L	8.3	8.1	8.1	8.2	10.7	2.0mg/L

Table 4

BOD_5 of water samples from the site Prempura of Upper Lake

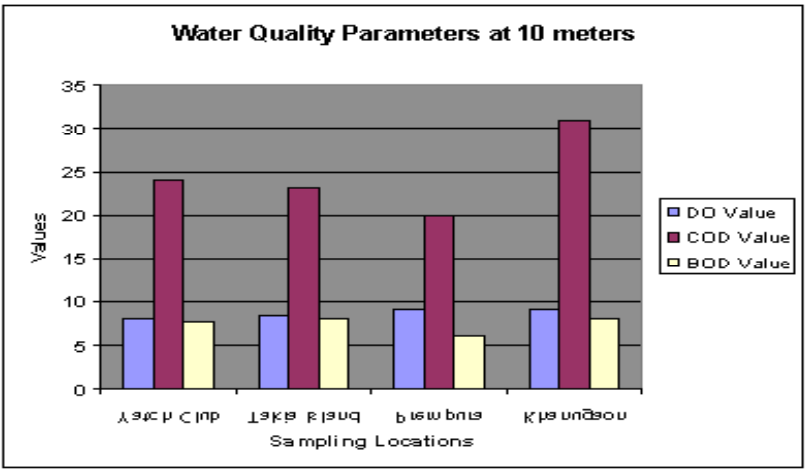
Parameters	Distance from Aeration units					
	At 0m	At 10 m	At 20 m	At 30 m	At a distance more than 100 m	BIS Standards
DO mg/L	8.4	9.1	8.9	8.4	8.4	> 6.0 mg/L
COD mg/L	20.0	20.0	18.0	24.0	24.1	250 mg/L
BOD mg/L	6.2	6.1	6.0	9.2	9.1	2.0mg/L

a sharp decline in COD at 20 m. showing that COD content reduces due to aeration. It is high at 0 m, 10 m, 30 m. and 100 m, because near the aeration unit the effect of aeration is little less and at 30 and100 m the water becomes stable.

The BOD ranged from 6.0 to 10.7 mg/L. The BOD is least at a distance of 10 mts. showing that effective aeration is happening in the area of 10 m, 20 m and beyond which water becomes stable.

Table 5
BOD_5 of water samples from the site Khanugaon of Upper Lake

Parameters	Distance from Aeration units					
	At 0m	At 10 m	At 20 m	At 30 m	At a distance more than 100 m	BIS Standards
DO mg/L	7.2	9.1	7.8	7.5	7.5	> 6.0 mg/L
COD mg/L	40.0	31.0	28.0	30.0	29.1	250 mg/L
BOD mg/L	10.3	8.1	8.0	8.2	8.3	2.0mg/L



CONCLUSION

The present study thus shows that installation of units has given a positive impact on the physico-chemical parameters of the Upper Lake. The eutrophication of the lake has been prevented by the installation of aeration units. Degradation of environment and depletion of resources are caused among other factors by improper disposal of wastes.

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