

Foam Formation In Bellandur Lake North-East Region, Bangalore – Causes, Environmental Effects And Remedies

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Abstract- Lake water is the major source for drinking and other domestic use in rural and urban population in India. Twelve different locations were selected based on their importance and a representative sample was collected from Bellandur Lake North-East Region, Bangalore. To identify the cause for foam formation, analysis of water sample was carried out for various Physico-Chemical parameters, Heavy Metals and Microbiology. Foam sample was also collected and analyzed. Interference of Effluent from STP's and ETP's was checked. Possible ways to reduce or eliminate the formation of foam in the lake is suggested in this paper.

Keywords – Foam Formation, BOD, COD

I. INTRODUCTION

Need of drinking water which is safe is essential life of human beings, and this water which is safe should not enforce any kind of threat to human life. In the developing countries with rapid industrial development such as pesticide industry, paper industry, fertilizer industry, mining operations, metal plating operation, etc., waste water is released into the environment. Through air, water, food or through absorption by skin pollutants enter the body of living organisms. These heavy metals are non biodegradable, unlike general organic pollutants in water that are mostly biodegradable in nature. Hence, they tend to accumulate inside the body from time to time. Although some of the heavy metals are necessary for human life, an excess amount of the metals can impact human life adversely. Many of these metals are found to be toxic or carcinogenic. Various research studies have reported the acute and chronic illness of different pollutants based on their amount inhaled or ingested during specific period of time. Therefore, prior to discharge of pollutants into the environment it is very much essential to treat polluted wastewater.

Lakes play a vital role in the ground water table restoration. The fate of the lakes in Bangalore is very bleak. One such heavily polluted lake is the Bellandur Lake which is the oldest big tank in Varthur situated in Bangalore's southern tale. The poor and the labor class people use the lake water for washing and bathing leading to pollution and also affect the environment. The socio - economic conditions of the people must be improved for better infrastructure and lake restoration. Due to some destructive land use practice in Bellandur Lake catchment area, the lake is under serious threat. The lake is choking with weeds and is silting on all sides. It is shrinking the capacity of the lake in size with deterioration in quality and loss of varied flora, fauna and some other resources. Now the lake is a health hazard as most of the pollutants are slowly leaching into the ground water table and the crisis is enhanced since there is no other source of water except the ground water.

II. STUDY AREA AND METHODOLOGY

A. Study Area

The study was carried out on heavily polluted lake the Bellandur Lake. It is a major tank in Varthur of Bangalore South Taluk. It is located at a latitude of $12^{\circ}45'0''\text{N}$ and longitude of $77^{\circ}40'0''\text{E}$. The lake catchment area, annual rainfall is 32 inches. The total catchment area of the lake is 110.94 Sq. miles. It has a submerged area of 915 acres.

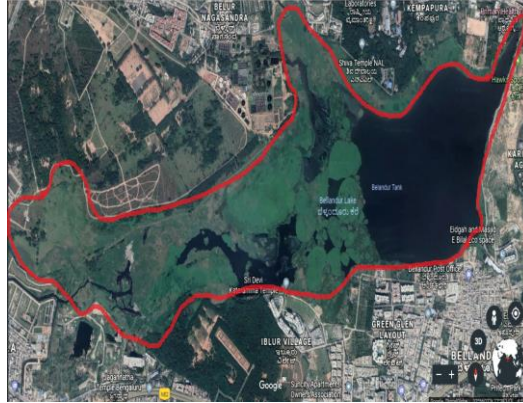


Fig. 1: Bellandur Lake, Bengaluru

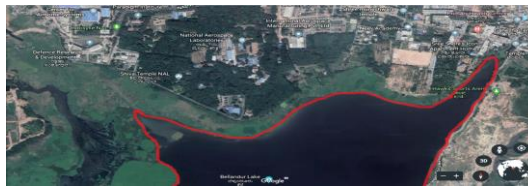


Fig. 2: Bellandur Lake North-East Region, Bengaluru

B. Methodology

In North-East region of the Bellandur Lake, twelve stations were selected. For investigation surface water samples were collected during January-April 2018. In Polyethylene bottles (2000 ml) grab samples of water was collected. The samples after collection were transferred to the laboratory for analysis. The analysis physico-chemical parameters, Heavy Metals, Microbial tests and Foam analysis was carried out using standard methods. Interference of Effluent from STP's and ETP's of Apartments, Commercial Buildings and Industries into the Bellandur Lake, Bangalore was checked.



Fig. 3: Sample Collection Stations in Bellandur Lake North-East Region, Bengaluru

C. Sample Collection

Collection of sample was done in clean and sterilized plastic bottles of 2 litre capacity. In the month of January to April 2018, the samples were collected to determine the water quality of Bellandur Lake. The samples are collected at a depth 30 cm below the surface of water and the samples were brought to

the laboratory for analysis of Physico-chemical parameters, Heavy metals and Microbial Analysis. Foam samples were collected and then taken to laboratory for analysis.

III. RESULTS AND DISCUSSIONS

It is found that there are no remarkable excess of physicochemical parameters in the analysis of samples. Some of the parameters such as oil and grease, phosphate, sulphate are found to be in lower concentration which may lead to formation of foam. Toxic chemicals enter the lake water through various sources such as industrial wastes, biomedical wastes, agricultural wastes, untreated sewage, surfactants which increase the nutrient content in the lake water and further raise the growth of algae and Phosphorous may get captured in sediments.

Wind and heavy rainfall due to variations in the elevation may lead to formation of froth by phosphorous. Huge formation of foam may lead to formation of fire hazard. Filamentous bacteria also cause formation of froth in water.

A. Total Dissolved Solids

TDS comprise of inorganic salts and small amount of organic matter that is dissolved in water. Permissible limit is 500 mg/l-2000 mg/l according to Bureau of Indian Standards. In the present study the maximum value of 499, 498, 578, 575 in mg/l are recorded and a minimum value of 423, 413, 514, and 514 in mg/l are recorded in the month of January, February, March and April respectively. High values of TDS results in staining, corrosion and deposition on pipes.

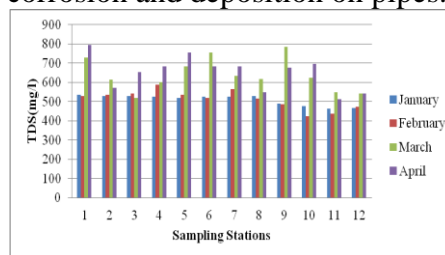


Fig. 4: Graphical Representation of TDS

B. Biochemical Oxygen Demand

BOD determines the quality of water. BOD is caused by natural and introduced organic matter that is present in lake water. The Permissible limit of BOD is 30 mg/l as per Bureau of Indian Standards. In the present study the maximum value of 49, 40, 68, and 123 in mg/l are recorded and a minimum value of 26, 20, 6 and 24 in mg/l is recorded in the month of January, February, March and April respectively.

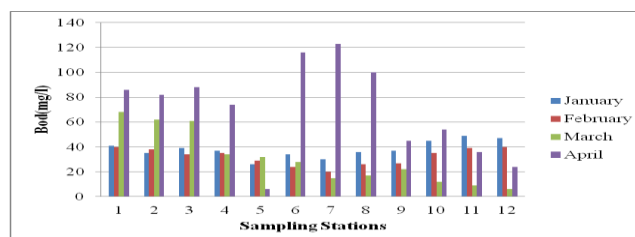


Fig. 5: Graphical Representation of BOD

C. Chemical Oxygen Demand

COD determines the overall quality of the lake. It is due to natural or introduced organic matter. The permissible limit of COD is 250 mg/l as per Bureau of Indian Standards. In the present study the maximum values of 295, 295, 589 and 765 in mg/l are recorded and a minimum value 143, 103,

32 and 132 in mg/l are recorded in the month of January, February, March and April respectively. This indicates the presence of chemical oxidizing matter which includes maximum of non biodegradable matter. Higher COD values recorded is due to sewage flow, effluent discharges and lean flow in the river.

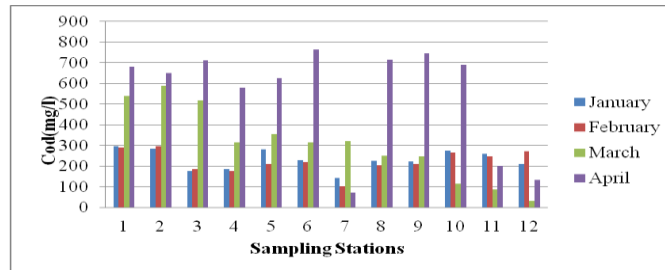


Fig. 6: Graphical Representation of COD

D. Analysis of Microbial Parameters

The pH of the foam sample analyzed was found to be 6.9. When focused under 100X oil immersion Gram Positive Cocci (purple color) was found. Cocci were found in cluster and some were found in chains.

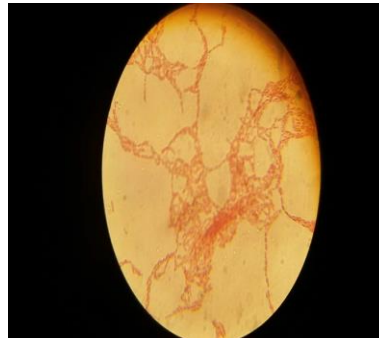


Fig. 7: Slide 1 of Microbiological Analysis

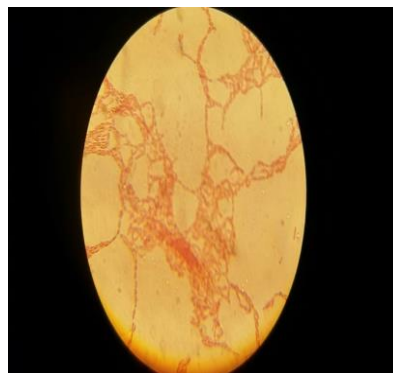


Fig. 8: Slide 2 of Microbiological Analysis

IV. CONCLUSIONS

Due to consequent changes and urbanization the quality of water in Bellandur Lake has amplified with pollution concentration. Environmental study on Bellandur lake was not systematically carried out. Physico-chemical concentrations in Bellandur lake was found to be high. Industrial wastes contain harmful chemicals and heavy metals which accumulate in the nature. Quality and quantity of water is directly or indirectly affected due to degradation of water bodies. Various human activities are obstructed when natural environmental factors like

air, water and land is disturbed beyond self sustainable capacity limit. Major issue concerned with Bellandur Lake is the formation of foam and fire catching. Assimilation capacity of the lake is decreasing due to interference of large quantity of pollutants. The lake is impending immeasurably despite of various conservation efforts made by the government authorities.

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