

An Approach to the Cause for the Foam Formation in Bellandur Lake Southwest Region, Bangalore

Dr. D. P. Nagarajappa
Professor

*Department of Civil Engineering
University B.D.T.C.E, Davanagere, Karnataka, India*

Bhimagouda Patil
PG Student

*Department of Civil Engineering
University B.D.T.C.E, Davanagere, Karnataka, India*

Abstract

The Bellandur Lake is the largest manmade lakes in Southeast Asia. Varieties of pollutants have been reported to cause deterioration of water quality in Bellandur Lake. A study was carried out for An Approach to the Cause for the Foam Formation in Bellandur Lake Southwest Region, Bangalore. The water samples collected and measured at twelve locations during January-2018 to April-2018. The physic chemical parameters like pH, EC, Total Dissolved Solids, Turbidity, Sulphate, Oil and Grease, Phenols, Hexavalent Chromium, Boron, BOD, COD, Phosphates and Nitrates, heavy metals like Fe, Cu, Zn, Ni, Pb, and microbial tests carried out during the study. The observed values of various parameters are compared with standards values recommended by BIS. The fall in water quality of Bellandur Lake is due to sewage and effluent discharge, washing cloths and utensils, religious ritual activities. Even though some parameters are within the range, parameters which help in foam production are found to be present. They have lower rate of settling. Hence, they react with chemicals present in lake water leading to formation of ignitable gases like H₂S, nitrates etc. As they move on the surface of water, they mix with air and due to turbulence, foam is formed. Only 1 % of foam is formed due to foaming agent other than 99% of foam is due to air and water. Enrichment of foam due to organic and inorganic components, heavy metals and chlorinated hydrocarbons. Foam catches fire due to high flammability compounds that are hydrocarbons and an organic polymer from industry. Continuous monitoring required in order protecting the lake from pollution.

Keywords- Bellandur Lake, Water Pollution, Foam Formation, Microbial Analysis, Surfactance

I. INTRODUCTION

Bellandur Lake which is located in Bangalore gives major problems to the nearby people by producing foam. The Bellandur Lake is the largest lake in Bangalore and around one lakh people dwell around Bellandur Lake. Most of the IT parks and industries are situated. Because of these a lot of waste water enters into Bellandur Lake and because of poor drainage system the street water is also entering into the Lake. All living things are depends on the water which is exist in nature are in many forms like ocean, river, lake, etc. The health of the lakes is directly related to the health of all components of the ecosystem. Storm water runoff and sewage discharge into the lakes causes where various nutrients enter the aquatic ecosystems resulting in their death. Most of the lakes are polluted due to entrance of foreign material includes organic matter of plant and animal origin, land surface washing. The discharge of industrial and sewage effluent into lakes the lakes become more complex and mixed ecosystem so it is reduces the self-cleaning ability. Due to the growth of population, advanced agriculture, urbanization, and industrialization the surface water get polluted and decreases the availability of drinking water. The concentration of heavy metals like Fe, Cu, Zn, Ni, Pb are should be within the limits if it is more or less leads to disorders. Cloth washing and cleaning of household's material in the lake leads to water pollution.

A. Study Area

Bangalore is located at latitude of 12.95° N and longitude of 77.57° E at an altitude of 920 m above the mean sea level. And Bellandure Lake is 130 years old total 915 acres and located near the Bellandur village, Bangalore. The Bellandur Lake is the largest manmade lakes in Southeast Asia, located 20km from the city towards southeast of Bangalore. Located at latitude of 12°58' N and longitude of 77°35' E at an altitude of 921 m above mean sea level. Due to the large area and various entrances of effluent, sewage, and anthropogenic activities etc, into Bellandur Lake. It is difficult to carry out the study of full lake so study has been conducted southwest region of Bellandur Lake. In this region 12 different sampling locations are selected and collect the samples. This study has been conducted to measure parameters of physico chemicals, heavy metals and microbiology.



Fig. 1: Bellandur Lake Southwest Region Bangalore

II. METHODOLOGY

Surface water samples for investigations were collected from twelve different stations selected which covered the southwest region of the lake from the month of January 2018 to April 2018. Grab samples of water were collected in Polyethylene bottles (2ltr) were filled with lake water. Twelve stations were selected which covered the southwest region of the lake. All samples collected were immediately delivered to the analytical laboratory for analysis. The analysis of the following physico-chemical parameters, Heavy Metals, Microbial tests and Foam analysis was carried out using standard methods. The results were compared with the desirable limit and permissible limit.

A. Sample Collection

The samples were collected to study the water quality from the month of January to April in the Year 2018 of Bellandur Lake, 15 cm below the surface of water. Grab samples of water were collected in Polyethylene bottles of 2 liter were filled with lake water.

- 1) Water was collected from the sampling point into clean polythene jerry cans of 2 liter capacity. Ensured no air bubble is inside the bottle.
- 2) Ensured that no floating materials are present at the sampling locations.
- 3) The details of the samples were mentioned on the label and affixed on the bottle and kept in the ice box.
- 4) The samples were taken to the Laboratory and are placed in cold room at a temperature of about 4 degree Celsius.
- 5) Further water samples are taken for the laboratory analysis.



Fig. 2: Sampling Collection Points in Bellandur Lake Southwest Region, Bangalore

III. RESULTS AND DISCUSSION

Even though some parameters are within the range, parameters which help in foam production are found to be present. They have lower rate of settling. Hence, they react with chemicals present in lake water leading to formation of ignitable gases like H₂S, nitrates etc. As they move on the surface of water, they mix with air and due to turbulence, foam is formed. The entry of these

chemicals are due to untreated sewages, industries, hospital wastes etc., with the increase in the nutrient content in the lake water algal growth increases leading to eutrophication and accumulation of phosphorous in the sediments. When precipitation occurs along with wind, due to the turbulence, foam increases largely in quantity.. Electrical conductivity, turbidity, hexavalent chromium, boron, Fe, Ni these are the more concentrations and pH, sulphate, oil and grease, nitrates, are less concentrations than BIS. Urban Lake Front Apartments, Sri Siddheswar Industries, Suncity Sewage Treatment Plant, Kitply Industries Limited, Sobha Primrose Apartment. Doctor Levine Memorial Hospital, Super Specialty Dental Hospital, Dr Sunny Medical Center. These industries are located near Bellandur Lake southwest region.

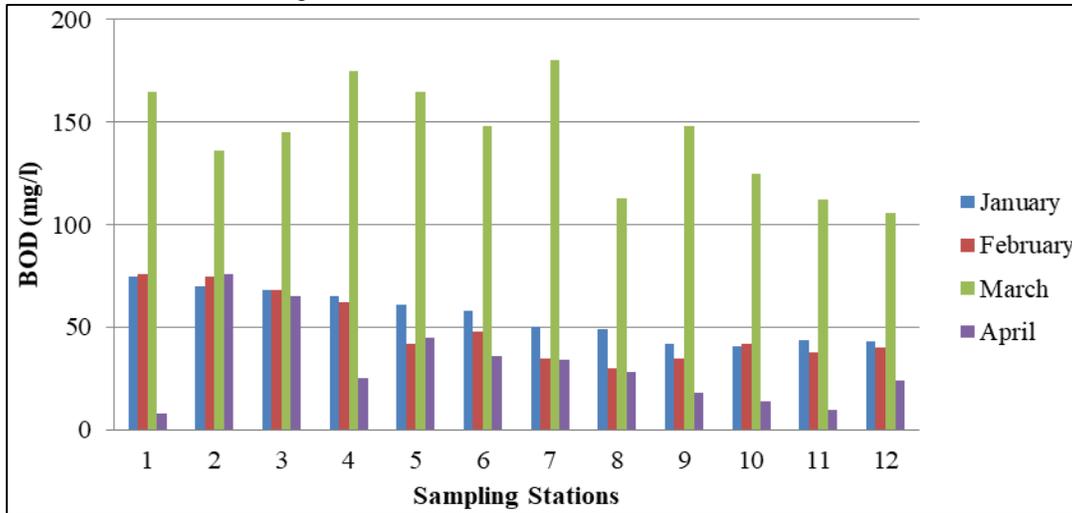


Fig. 3: Graphical Representation of BOD

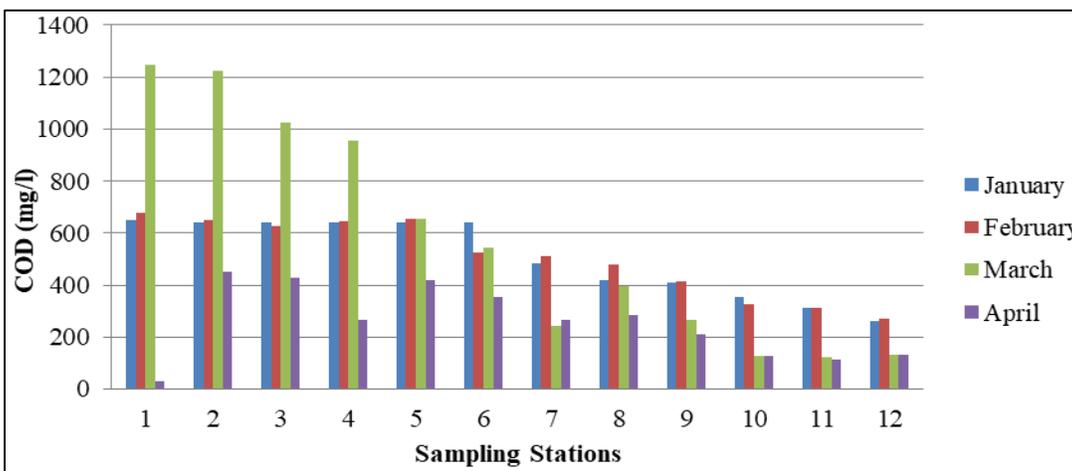


Fig. 4: Graphical Representation of COD

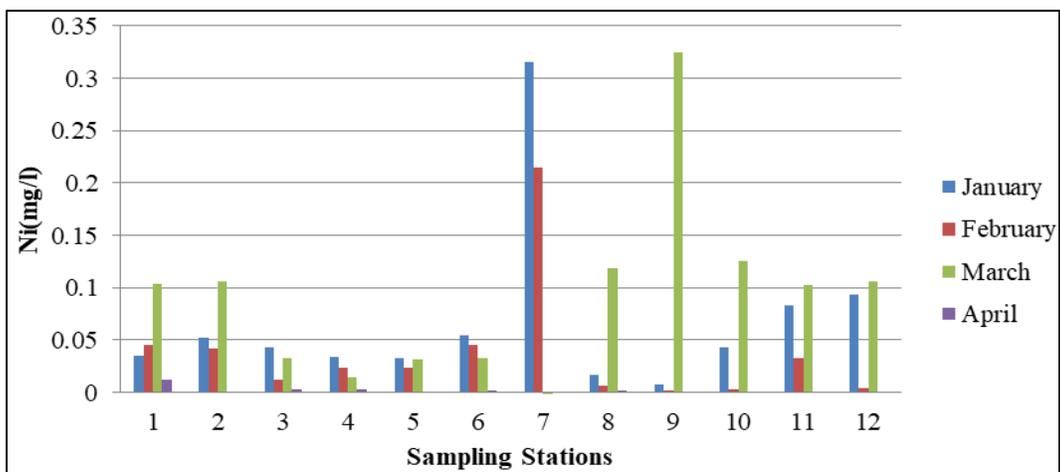


Fig. 5: Graphical Representation of Ni

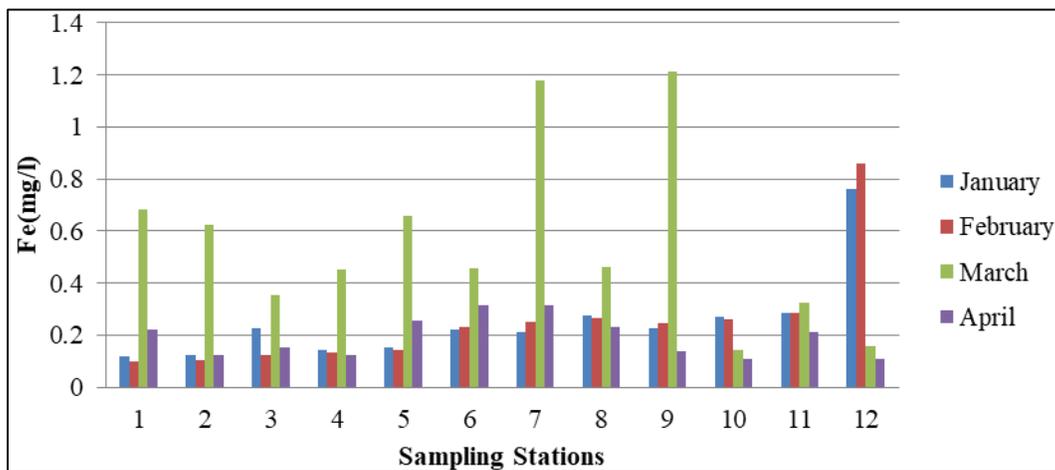


Fig. 6: Graphical Representation of Fe

IV. CONCLUSIONS

Due to the unmanaged and unregulated discharge of wastes into the lake, concentration of pollutants is increasing causing many problems to the people and ecosystem around the lake. Pungent smells, variations in flora and fauna, variations in atmospheric characteristics etc., may be caused due to the pollution. Issues like foam formation and fire catching takes place. This causes high level of risk. Also frequent and higher rate of silt deposition decreases the lake capacity. Bio accumulation of chemicals in plants and animals takes place. Surfactants and other inorganic substances interfere in the natural activities of lake with atmosphere and blockage of soil pores. So strict rules have to be followed to maintain the lake water quality. Due to biochemical process, many biological substances like protein create foam on aeration. Antifoaming agent like silicon oils is added to prevent the problem. Mechanical method of foam control is more common than chemical because it cause the food and pharmaceutical industry. Use of washing detergents or laundry detergents foam is formed. Surf excel is effects the formation of more foam than vim. Foam cause breathing difficulties, unbearable stench and whenever rain comes the lake overflows and blocking the traffic. Households waste and industrial waste cause toxicity and leading to foam formation. Around 40% of 1800 households use 5 kg of detergents in a month. The foaming happens when the surfactance that reduces the surface tension of water, allowing air bubbles to persist at the water surface. Detergents consist of phosphates. Due to wind the surface water coupled with high flow areas narrow channel, it leads to bubble formation. Generally bubble size is 2 to 4 cm, finally ends up in size less than 2mm. Only 1 % of foam is formed due to foaming agent other than 99% of foam is due to air and water. Enrichment of foam due to organic and inorganic components, heavy metals and chlorinated hydrocarbons. Foam catches fire due to high flammability compounds that are hydrocarbons and organic polymers from industry. BOD has increased during March. This may be due to the discharge of effluents having high amount of Phosphates and Nitrates into the Lake.

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