# Evaluation of physicochemical factors of Vehar Lake, Mumbai, India

## C. S. Mitter

Head and Associate Professor,
Department of Zoology,
Sathaye College, Mumbai, Maharashtra, India

**Abstract**: Water supply has been a consequential problem in the metropolis cities like Mumbai ever since people have started to migrate from their native places to towns and cities.

The potable water comes to Mumbai from long distance and supplied by Municipal Corporation after being filtered to international standards.

Lake is a body of water surrounded by land. The Vehar Lake has situated in the heart of the suburban about 18 miles away from the North of Mumbai. It is formed by damming three valleys with earth embankments. Total capacity of lake is 9,120million gallons, with catchment area are 2,883 acres, excluding the lake area which is 1,800 acres when filled.

The quality of water has now become a serious problem due to human activity and population explosion. Hence periodic assessment of water quality is required for proper management.

*Key words*: Municipal Corporation, international standards, catchment assessment, management.

**1. Introduction:** A modern water war is brewing in the cradle of civilization [9]. Due to urbanization; with increasing population the requirement of pure water is increasing many folds [4]. Throughout the world both in developing and under developing countries water authorities are still trying to find out ways and means to augment the existing sources of water supply. Each drop of water must be count because water sources are limited.

To curb the demand it is necessary that the consumers must cooperate and keep the demand low. Our onus should be on saving water. Though adequate supply of fresh and clean water is a basic need of all human beings on the earth, millions of people in the world are deprived from the same [5].

Mumbai is one of the financial and commercial cities of India so demands for potable water are increasing day by day with increase population [3]. Mumbai water supply has taken a great leap from 30 million litters /day in 1860 to 3100 litters /day in [11]. This race is against the ever increasing water demand still continues as BMC water engineers are now starving for 5000 million litters / day by 2021.

Adequate water supply is a vital component of civic infrastructure of the metropolis city like Mumbai. The founders of the Mumbai had recognized Mumbai's potential to become a powerful commercial centre and started developing Mumbai's water supply facilities as early as 1860 over the years this tradition continued (2005) [10]. After independence the BMC engineers too up the challenges of developing new water supply sources to meet the need burgeoning population. New water supply was created, water treatment plants, and pumping stations were commissioned. Water mains were laid and tunnels were driven to augment to meet the ever increasing water demand of this sprawling city. The water department of Mumbai has always been remained in the forefront of adoption of new technologies.

Vehar Lake is located near the Vehar village on the Mithi River within the precincts of the Borivali National Park. It was constructed 1860 by British Government. It supplies potable water to the Mumbai city after filtration at Bhandup where large filtration plant is located. Unplanned urbanization, rapid industrialization and indiscriminate use of chemical fertilizers are causing serious water pollution leading to the deterioration of water quality and depletion of aquatic biota [14]. Each drop of water must be count because water sources are limited.

## 2. Methodology:

**Study area:** water samples were collected for analysis from Vehar Lake from around ten feet depth. Three different places were selected for sampling. Collection was done between 8.00 AM and 10.00 AM every month from October 2016 to May 2017. Collected samples were kept in clean brown coloured BOD glass bottles with capacity 250ml. Ambient and water Temperature and pH measured at the time of collection and for rest of the work water samples were brought to the laboratory. All the samples were kept in refrigerator with labels till further use. Physicochemical analysis was done for Electrical Conductance (EC), total Hardness, Turbidity, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) by standard laboratory method. Results in **Table-I.**

**Temperature:** High temperature reduces the ability of water to hold DO. Temp shows great influence on surface water. Therefore specific correlation always exists between air and surface water temp. This parameter is useful to calculate solubility of $CO_2$ and $O_2$. Vehar Lake water was with good amount of oxygen indicating good water quality.

**pH:** With low dissolved solids, which consequently have low buffering capacity. pH of Vehar Lake water was with advisable range, indicating no polluted substances were entering in Vehar Lake water body.

**Electrical Conductance (EC):** It is a numerical expression of the waters ability to conduct electricity. E.C. of Vehar Lake is between 96.5- 132 *s/cm., indicates that still water of this lake is free from any point pollution sources [8]

**Total Hardness:** Hardness of water is that has high mineral content like calcium, carbonate below 60 mg/L is soft, 60-120 mg/l moderately hard and120- 160 mg/l hard [6]. It was done by EDTA titration method [1].

**Turbidity:** Organic and inorganic suspended and colloidal particles fall turbidity in natural water [2]. Turbidity range was observed 0.9- 1.8 NTU, which is negligible amount.

**Total Dissolved Solids (TDS):** level less than 300 mg/l is good, 300-600mg/l is fair, 600- 900 mg/l is poor and more than 1200 mg /l is unacceptable [12]. WHO standards water contains TDS concentration below 1000 mg/l is usually acceptable to consume although acceptability may vary according to circumstances. Findings are shown in the **Table-I.**

**Dissolved Oxygen (DO):** Dissolved oxygen in water

Indicates water quality it is calculated by Winkler's method.

Aquatic life depends on DO present in water. Amount of DO is mainly depends on water temp, sediments, photosynthesis and aeration. It is a biological and chemical reaction for respiratory activity by aquatic organism. DO- 6.25—8.7 mg/L [11]

As per the Central Polluted Board (CPB) the permissible limit of DO level for propagation of wild life and fishes is 4mg/l or more.

According to Trivedi and Goal (1986) [7] low oxygen concentration is associated with heavy contaminants are present in water.

**Biochemical Oxygen Demand (BOD):** It is the amount of dissolved oxygen needed for aerobic biological organisms to break down organic material in the sample water [2]. Low BOD is an indicator of good quality water.

**Chemical Oxygen Demand (COD):** COD test is applicable to heavily polluted waters and to waste waters. It provides information to assess the effluents discharged in water bodies [13].

Results of BOD and COD revealed that water of Vehar Lake is free from pollutants like domestic and industrial pollution.

**3. Conclusion:** Parameters which are estimated here reveal that water of this Lake is not highly polluted. Vehar Lake water is protected from point pollution from surrounding area by the Mumbai Municipal Corporation. Water of Vehar Lake which the population of Mumbai receives after purification at Bhandup pumping station is potable.

**Table-I**: **Physico-chemical Parameters of Powai Lake water**

| Parameters | October | November | December | January | February | March | April | May |
|---|---|---|---|---|---|---|---|---|
| **Temperature (Degree Celsius)** | 34.5 | 29.7 | 28.7 | 29.5 | 30.5 | 34.7 | 34.8 | 34.8 |
| **Turbidity (NTU)** | 1.3 | 1.3 | 1.6 | 1.4 | 1.2 | 1.8 | 0.9 | 0.9 |
| **pH** | 6.1 | 6.2 | 6.2 | 6.8 | 6.2 | 6.4 | 6.3 | 6.7 |
| **Total Dissolved Solids (TDS) mg/L** | 29 | 32 | 36 | 31 | 35 | 32 | 31 | 28 |
| **Dissolved Oxygen (DO)** | 4.6 | 4.5 | 5.7 | 6.1 | 6.7 | 6.2 | 6.9 | 4.9 |
| **Biochemical Oxygen Demand (BOD) mg/L** | 1.7 | 1.3 | 1.5 | 1.4 | 1.0 | 1.6 | 1.5 | 1.2 |
| **Chemical Oxygen Demand (COD) mg/L** | 2.5 | 2.5 | 2.4 | 2.7 | 2.6 | 2.8 | 2.1 | 2.4 |

**References:**

[1] APHA 1998 Part 3240, C, pp 2- 36.

[2] BIS (1993) Indian standard drinking water specification Bureau of Indian standards, New Delhi.

[3] C. S. Mitter (2018). "Assessment of water quality of Powai Lake, Mumbai, India". International Journal of Science and Research (IJSR).ISSN: ( 2319-7064), Vol:7,Issue: 1, pp:1139-1139.

[4] Eruola Ao.,Ufoegbune GC., Awomeso JA.,  Adeofun Co (2011) "An assessment of the effect of industrial pollution on Ibese River, Lagos Nigeria . Afr. J. Environment Science Technology. 5(8): 608-615.

[5] Goyal A. (2013) "water quality and management – water quality pollution level 17, 18, 19 module D Status of water  amiability in India and efforts made by international and national agencies to mitigate water scarcity"

[6] McGowan (2000) "Water processing: residential commercial light industries" 3rd editon water quality association.

[7] Trivedy R.K. and Goel P.K (1986)" Chemical and biological methods for pollution studies, Enviromental Publication karad Maharastra.

[8] Verma S., Sing A. and Verma R.K. (2014) "Assessment of monthly variation of water quality characteristics and morphometric analysis of vehar lake Mumbai India"

[9] 'Water' (2003) World Water Day MEA & BMLPA (Brihan Mumbai Licensed plumbers Association ) published on the occasion of world water Day 22nd March,2003.

[10] 'Water' (2005) world water Day MEA & BMLP (Brihan Mumbai Licensed plumbers Association) published on the occasion of world water Day 2004. MEA & BMLPA

[11] 'Water' (2006) Mumbai water World water Day MEA and Brihan Mumbai Licensed plumbers Association (BMLP) Association (BML) publishing municipal Engineer's Association Mumbai.

[12] WHO, Geneva (1996). "Guideline for drinking water quality, 2nd edition  vol:12 Health Criteria and other supporting

[13] WHO (2011). "The degree of hardness drinking water is important for aesthetic acceptability by consumers and for economic and Operational consideration". Guideline for Drinking water Quality 3rd edition, incorporating the 1st ans2ndedition Vo http:/whglibdoc who int/publication (2009) 97982415635501org.pdf.

[14] Yeole S. M and Patil G.P.2005) "Physicochemical status of Yedshi Lake in relation to water pollution". J. aquatic boil, 20 (1), pp41-44.

[15] (http://theory.tifr.res.in/Bombay/ history/water html. Bombay history: Water )

[16] (http://theory.tifr.res.in/Bombay/ history/water html. Bombay history: Water )

[17] http://theory.tifr.res.in/Bombay/ history/water html. Bombay history: Water )

[18] www.pedia.com

[19] www.water.net