

Comparision of Water Quality Index of Rajghat Dam & Lakha Banjara Sagar Lake

Sohil Jain

Department of Civil Engineering
(B.T. Institute of Research & Technology, Sagar M.P.)

Abstract—

“One Stitch In Time Saves Nine”

This is an old age saying but ever new, and it is most befitting in context of river, lake or pond quality management. Due to rapid industrialisation and intensive irrigation the flow in our streams is ever decreasing, which is posing more stress on self purifying capacity of stream. It has been felt lately that the Lakha Banjara Lake which is a substantial lake in Bundelkhand region is fast losing its importance because of the degradation in its water quality. Various physical and chemical tests are carried out on the samples of the two sources and quality index of each is studied. The main focus is to compare the quality of the two sources and point out the deterioration of water quality, changes in its properties and adverse effects on environment.

Keywords— *Quality index, self purifying capacity, quality management, degradation, intensive irrigation, industrialisation.*

I. INTRODUCTION

Being located in the close vicinity of the town, the Lakha Banjara Sagar Lake has great importance for human activities like boating, recreational, washing of clothes, etc. As a result the water quality is adversely affected because of the dumping of large amount of solid and liquid wastes. The various tests i.e. the physical tests which indicate the properties detectable by senses and the chemical tests which determine the amount of minerals and organic substances which affects the water quality, are carried out on the samples of the two sources. The recognition of various pollutants in the water and specific steps to rectify the same should be carried out.

II. LOCATION & GENERAL FEATURES

Sagar Lake is situated in the heart of Sagar city (23 degree 50 Minutes N: 78 degree 45 Minutes E and 517 MSL) with an area of 82 hectares. The lake is generally divided into two parts and has a deepest depth of 5.5m and an average depth of 2m.

The main morphometric features of the lake are as follows:

1. Water spread area: 1.1sq. kms
2. Catchment area: 5.5sq. kms
3. Maximum water level: 109.50 m
4. Full reservoir level: 108.21 m.
5. Quantity of Inflow: 62 m.ft.
6. Maximum Depth: 5.5 m.

The catchment area of Bewas river at the Rajghat dam site is 472 sq. kms is located between 23° 23' 36" N to 23° 46' 22" N latitude and 78° 30' 32" E to 78° 46' 42" E longitude.

III. TESTED PARAMETERS

To access the water quality of various sites the following parameters are selected:

A. Physical Parameters:

1. Temperature
2. Total Solids
3. Dissolved Solids

B. Chemical Parameters:

1. pH
2. Specific Conductance
3. Alkalinity
4. Dissolved Oxygen (DO)

5. Biochemical Oxygen Demand(BOD)
6. Chemical Oxygen Demand(COD)
7. Hardness(Total and Calcium)
8. Nitrite
9. Phosphate
10. Chloride
11. Sulphate
12. Fluoride

IV. STANDARD ANALYTICAL FORMULAE FOR VARIOUS TESTS/PARAMETERS

1. Temperatures, pH, Specific Conductance are directly given by Mercury Thermometer, pH meter, and Conductivity meter respectively.
2. Total Solids:

$$\text{mg Total Solids/L} = [(A-B) \times 1000] / \text{mL of sample}$$

where,

A = Weight of Dish + Residue, mg

B = Weight of Dish, mg

3. Dissolved Solids:

$$\text{TDS} = \text{TS} - \text{TSS}$$

where,

TDS = Total Dissolved Solids, mg/L

TS = Total Solids, mg/L

TSS = Total Suspended Solids, mg/L

4. Dissolved Oxygen (DO):

$$\text{mg DO/L} = [V \times M] / 0.025$$

where,

V = Volume of Thiosulphate sol. used, mL

M = Molarity of Thiosulphate titrant

5. Biochemical Oxygen Demand (BOD):

- i. When dilution water is not seeded:

$$\text{BOD}_{3,27}, \text{mg/L} = [D_0 - D_T] / P$$

- ii. When dilution water is seeded:

$$\text{BOD}_{3,27}, \text{mg/L} = [(D_0 - D_T) - f \times (B_0 - B_T)] / P$$

where,

D_0 = DO of diluted sample initially, mg/L

D_T = DO of diluted sample after 3 days, mg/L

P = Decimal Volumetric fraction of sample used

B_0 = DO of seed control initially, mg/L

B_T = DO of seed control after incubation, mg/L

f = Ratio of % seed in diluted sample to % seed in seed control

6. Chemical Oxygen Demand (COD):

$$\text{COD, mgO}_2/\text{L} = [(A-B) \times M \times 8000] / (\text{Volume of sample, ml})$$

where,

A = FAS used for blank, mL

B = FAS used for sample, mL

M = Molarity of FAS

7. Hardness:

$$\text{Total Hardness (EDTA), mg CaCO}_3/\text{L} = [A \times B \times 1000] / (\text{Volume of sample, mL})$$

where,

A = EDTA titrated for sample, mL

B = mg CaCO₃ equivalent to 1.00 ml EDTA titrant

8. Chloride:

$$\text{mg Cl}^-/\text{L} = [(A - B) \times N \times 35.5] / (\text{Volume of sample, mL})$$

where,

A = Volume of titration for sample, mL

B = Volume of titration for blank, mL

N = Normality of AgNO₃

9. Nitrite: It is directly calculated by the curve by using a Spectrometer.

10. Fluoride: It is also computed by the use of Spectrometer.

$$\text{mg F}^-/\text{L} = (\text{A} / \text{B}) \times (\text{1} / \text{R})$$

where,

A = Reading from the standard curve

B = Volume of diluted/undiluted sample taken for color development, mL

R = Volume of sample taken for dilution/ final volume of sample, mL

V. CONCLUSIONS

The Lakha Banjara Sagar Lake is not fit for domestic purposes due to the presence of high alkalinity, hardness, high chloride content and lack of dissolved oxygen. It can be used for irrigation purposes as it contains large amount of organic matter which could be good for crops.

The Rajghat dam is fit for drinking purpose and can be used for domestic as well as irrigation purposes since it contains higher amount of dissolved oxygen, less alkalinity and less chloride content.

The concentration of nitrites, sulphates & fluorides for lake water and Rajghat water is under acceptable limit. pH value of lake higher than that of Rajghat dam but under acceptable limit.

Hence it is essential that the sewage of Sagar city should not be directly dumped to the lake but should be treated first and arrangements should be made for stopping the domestic activities on ghats.

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REFERENCES

- [1] Municipal Corporation, Sagar (M.P.)
- [2] Regional Laboratory, Madhya Pradesh Pollution Control Board, Sagar (M.P.)
- [3] *Standard Methods for Examination of Water and Waste Water*, 16th Edition, jointly published by American Public Health Association (APHA), American Water Work Association (AWWA) and Water Pollution Control Facility (WPCF).