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Parametric Study of Lake Water -A Case Study of Jambhulwadi Lake

Ajay Bansode¹, Yogesh Sapkale², Pragati Rathod³, Shubham Chalgeri⁴, Shrishail Khirapate⁵

Yash Inamke⁶

Associate Professor, Department of Civil Engineering, Zeal College of Engineering and Research, Pune, India¹

U.G. Student, Department of Civil Engineering, Zeal College of Engineering and Research, Pune, India^{2,3,4,5,6}

ABSTRACT:Lake water is an immense which could have significant application in regions of water scarcity. Lake water has particular advantages in that it is a large source with a low organic content. Through critical analysis of data from existing Lake water recycling application collating a disparate information base and comparing, contrasting the strength and weakness of different approaches. Finding suggest that simple technologies and sand filter have been shown to achieve only a limited treatment of the waste water where as membranes where reported to provide good removal of solid but could not efficiently tackle the organic fraction alternatively, biological and extensive schemes achieved good general treatment of waste water with a particularly good removal of organics. The best overall performance where observed with the schemes combination different types of treatment to ensure effective treatment of the entire fractions.

KEYWORDS: Lake water, recycling application, different types of treatment on lake water.

I. INTRODUCTION

Lake water is water collected from rain or as the sewers, showers, baths, washbasins, washing machines and kitchen sinks. You can collect it from some or all of these sources and, after treatment, use around the home for purposes that do not require drinking water quality such as toilet flushing or garden watering.

It is well known that hygienic water is undeniably essential for healthy living. Rivers and Lakes are the most important natural resource for human development but they are getting polluted by messy disposal of sewage, industrial waste and plethora of human activities, which affects its physicochemical and microbiological quality. As deterioration of river and Lakes water quality increasing day by day, it is necessary to monitor the water quality so as to evaluate the production capacity Water quality. Water management practices need a fresh look in order to avoid water crisis in the next successive days. This essentially requires looking for proper management practices for growing economy and population as the water resources of the basins remain almost constant while demand of water for various purposes is increasing. Water is required for different purpose like domestic, agricultural, hydro-power, thermal power, navigation, recreation, etc. consumption of all these diverse uses of water should be optimized and an awareness of water as a scarce resource should be fostered. Lakes indicate important life support system by helping in recharging of aquifers and regulating hydrological cycle. Planning, development and management of water resources need to be governed by common integrated standpoint considering local, regional, State and national context, having an environmentally sound basis, keeping in view the human, social and economic needs. All the elements of the water cycle, i.e., evapotranspiration, precipitation, runoff, river, lakes, soil moisture, and ground water, sea, etc., are interdependent and the basic hydrological unit is the Lake basin and river basin, which should be considered as the basic hydrological unit for planning.

Solanki H. A. et al. (2012) Water Quality Analysis of an Organically Polluted Lake by Investigating Different Physical and Chemical Parameters The Chandola is the largest lake of Ahmedabad city. This lake is surrounded by large number of small scale industries and slums. The waste from the industries and surrounding localities is directly discarded into the lake. To evaluate the water quality of this lake, study was carried out for the period of one year (March 2009 to February 2010). Monthly water samples were collected to analyze different physical and chemical parameters and obtained results were compared with standard values. The pollution status was investigated on the basis of obtained results of physical and chemical parameters of water. High level of variation was recorded during analysis which was



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as a result of human activity and discharge of waste water to the lake. Very soon Chandola Lake will become biologically inactive if the similar condition will be continued for longer period of time.

Sanyogita R. Verma et al. (2011) An urban lake, i.e. Phutala Lake in Nagpur city, was studied for its trophic status and sources of pollution to it during the study made at 15 years interval. All physico-chemical and biological indicator parameters showed that the lake was mesotrophic in 1996 and eutrophic in 2010. Anthropogenic activity in its catchment area and on its bank was observed to be responsible for the rapid eutrophication rate and pollution of lake water. The ecological significance of the plankton diversity and the temporal variation in total plankton are discussed in the light of limnological observations and available literature. As this lake is ecologically as well as aesthetically important because its presence making the urban landscape beautiful, preventive environmental management aspects were suggested for the restoration and conservation of lake.



Figure 1.Jambhulwadi lake ,Pune

II. METHODOLOGY

Materials:

1) Following figure shows of different activities conducted as per the project work progresses.

- 1) Selection of study area
- 2) Collection of water sample at suitable points of the lake.
- 3) Analysing water quality with standard parameters.
- 4) Treatment of water sample.

Water Sampling

The process of taking a portion of water for analysis or other tasting i.e. drinking water to check that it complies with relevant water quality standards, or river water to check for pollutant, or bathing water to check that it is safe for bathing, or intrusive water in a building to identify its source, or lake water to check for home utility or irrigation for crops purpose.

[1] Types of water sampling

There are two types of water sampling i) Grab Sampling. ii) Composite Sampling.

i) Grab Sampling:-

A properly taken grab sample is a snap shot of the quality of the water at the exact time and place the sample was taken. Depending on the water body, grab samples may be taken by simply dipping a sample bottle in the water body, or they may require the use of specific sampling devices.

There are two types of grab samples that are used for sampling water matrices:

discrete and depth-integrated. The discret grab sample is one that is taken at a selected location, depth, and time and then analyzed for the constituents of interest.



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A Depth-Integrated Grab Sample is collected over a predetermined part or the entire depth of the water column, at a selected location and time, in a given body of water, and then analyzed for the constituents of interest.

The primary advantage of grab samples is that sometimes very little equipment is required for sample collection and there is flexibility in sampling location selection. However, this method sacrifices data resolution because of the smaller number of samples that are usually collected.

III. RESULT AND DISCUSSION

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The pH value of a water source is a measure of its acidity or alkalinity. The pH Level is a measurement of the activity of the hydrogen atom, because the hydrogen. Activity is a good representation of the acidity or alkalinity of the water. The pH scale range from 0 to 14, with 7.0 being neutral. Water with a low pH is said to be acidic, and water with a high pH is basic, or alkaline. Pure water would have a pH of 7.0, but water sources and precipitation tends to be slightly acidic, due to contaminants that are in the water.

The pH scale is logarithmic, which means that each step on the pH scale presents tenfold change in acidity. For example, a water body with a pH of 5.0 is ten times more acidic than water with a pH of 6.0. and water with a pH of 4.0 is 100 time more acidic than water with a pH of 6.0.

Surface water typically has a pH value between 6.5 and 8.5 and ground water tends to have a pH between 6.0 and 8.5s. The pH of a water source can vary naturally me types of rock and soil such as limestone, can neutralize acid more effectively. an other types of rock and soil, such as granite. Or, when there are a large number .



Figure 3.1.ph of Lake

Plants growing in a lake or river, they release carbon dioxide when they die and decompose. When the carbon dioxide mixes with the water, a week carbonic acid is formed; this can then cause the pH of the water body to decrease.

Total Solids (TS)

Total Dissolved Solids (TDS) is a measure TDS stands for total dissolved solids, and represents the total concentration of dissolved substances in water. TDS is made up of inorganic salts, as well as small amount of organic matter. Common inorganic salts that can be found in water include calcium, magnesium, potassium and sodium, which are all cations and carbonates. Nitrates, bicarbonates, chlorides and sulfates, which are all anions. Cations are positively charged ions and anions are negatively charged ions.

Total Dissolved Solid (TDS) is a measure of the combined content of all inorganic and organic substances contained in a liquid in: molecular, ionized or micro granular Total (colloidal sol) suspended from. Generally the operational definition is that the solids must be small enough to survive filtration through a sieve the size of two micrometer. These minerals can originate form a number of sources, both natural and as a result of human activities.

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Graph 3.2 Graph of TD, TDS, TSS of Standard Water Lake Water (mg/l)

Table 1. Levels of TDS

Level of TDS (milligrams per liter)	Rating
Less than 300	Excellent
300-600	Good
600-900	Fair
900-1.200	Poor
Above 1,200	Unacceptable

[1] Taste of Water with Different TDS Concentrations

Increased concentrations of dissolved solids can also have technical effects Dissolved solids can produce hard water, which leaves deposit and films on fixtures, and on the insides of hot water pipes and boilers. Soaps and detergents do not produce as much lather with hard water as with soft water. As well, high amounts of dissolved solids can stain household fixtures, corrode pipes, and have a metallic taste. Hard water causes water filters to wear out sooner, because of the amount of minerals in the water.

TDS measured in the Standard Water was Less than 300 mg/l which is already below the permissible limits as per Is-10500-2012. And when the water was check for the TDS the TDS value was reduced to 200 mg/l which is far below the normal range of 500 mg/l.

High TDS levels generally indicate hard water, which can cause scale buildup In pipes, valves, and filters, reducing performance and adding to system maintenance costs. These effects can be seen in aquariums, spas, swimming pools, and reverse osmosis water treatment systems. Typically, in these applications, total dissolved solids are tested frequently, and filtration membranes are checked in order prevent adverse effects.

Dissolved Oxygen

Dissolved oxygen refers to the level of free, non-compound oxygen present in water or other liquids. It is an important parameter in assessing water quality because of its influence on the organisms living within a body of water. In limnology (the study of lakes), dissolved oxygen is an essential factor second only to water itself ¹. A dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality.



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Non-compound oxygen, or free oxygen (O2), is oxygen that is not bonded to any other element. Dissolved oxygen is the presence of these free O2 molecules within water. The bonded oxygen molecule in water (H2O) is in a compound and does not count toward dissolved oxygen levels.

Dissolved oxygen saturation decreases with rise in temperature, decreases with rise in salt concentration, decreases with rise in altitude and decries with rise in organic concentration.

Temperature, °C	0	5	10	15	20	25	30	35	40	45	50
Do	14.62	12.80	11.33	10.15	9.17	8.38	7.63	6.95	6.41	5.93	5.48
Saturation,											
Mg/l											

 Table 2. Variation of DO with Temperature

Dissolved oxygen is necessary to many forms of life including fish, invertebrates, bacteria and plants. These organisms use oxygen in respiration, similar to organisms on land. Fish and crustaceans obtain oxygen for respiration through their gills, while plant life and phytoplankton require dissolved oxygen for respiration when there is no light for photosynthesis. The amount of dissolved oxygen needed varies from creature to creature. Bottom feeders, crabs, oysters and worms need minimal amounts of oxygen (1-6 mg/L), while shallow water fish need higher levels (4-15 mg/L).



Graph 3.3 Graph of Dissolved Oxygen of Standard Water Lake Water (mg/l)

Dissolved Oxygen measured in the Standard Water was same range of 6 mg/l which is already below or same the permissible limits as per Is-10500-2012. And when the water was check for the Dissolved Oxygen value was reduced to 6 mg/l which is far below the normal range of 1-6 mg/l.

Microbes such as bacteria and fungi also require dissolved oxygen. These organisms use DO to decompose organic material at the bottom of a body of water. Microbial decomposition is an important contributor to nutrient recycling. However, if there is an excess of decaying organic material (from dying algae and other organisms), in a body of water with infrequent or no turnover (also known as stratification), the oxygen at lower water levels will get used up diffusor.

Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand or B.O.D. is the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over specific time period. The term also refers to a chemical procedure for determining this value. The BOD sample during 5 days of incubation at 20° C and if often used as robust surrogate of the degree of organic pollution of water.



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Biochemical oxygen demand is the amount of oxygen required for microbial metabolism of organic compound in water. This demand occurs over some variable period of time depending on temperature, nutrient concentrations, and the enzymes available to indigenous microbial populations. The amount of oxygen required to completely oxidize the organic compounds to carbon dioxide and water through.Generations of microbial growth, death, decay, and cannibalism is total biochemical oxygen demand (total BOD). Total BOD is of more significance to food webs than to water quality. Dissolved oxygen depletion is most likely to become evident during the initial aquatic microbial population explosion is response to a large amount of organic material. If the microbial population deoxygenates the water, however, that lack of oxygen imposes a limit on population growth of aerobic aquatic microbial organism resulting in a longer than food surplus and oxygen deficit.



The BOD of Standard water was 30 mg/l And when the water was check for the BOD value was 50 mg/l. According to Indian Standard the BOD should be below 30 mg/l. And the Lake water is above 30 mg/l which is above the standard.

Chemical Oxygen Demand (COD)

It is measure of the total quantity of oxygen required for oxidation of nearly all organic compounds in wastewater, by the action of a strong oxidizing agent. BOD us a measure of only he carbonaceous component of biodegradable organic matter in a waste, whereas COD measure nearly all the oxidizable matter in the waste. Therefore COD for a waste is greater than its BOD value. Both BOD &COD value of any waste are important parameter, as their inter-relationship decide the type of treatment to be adopted for the waste. If COD is very much greater than BOD, then the water is not biodegradable.

Biodegradability of the waste is indicated by the treatability index (TI) TI = BOD/ (COD-BOD)



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Waste	COD/BOD	TI	Waste	COD/BOD	TI
Phenolic waste	1.3	3.0	Soft drinks	2.1	0.9
Pharmaceuticals	1.4	2.3	Synthetic Textiles	2.2	0.8
Dairy Waste	1.5	2.0	Paper & Pulp	2.4	0.7
Domestic Sewage	1.8	1.2	Straw board waste	3.0	0.5
Meat processing	1.9	1.1	Metal Plating	4.5	0.3
Sugar mill waste	2.0	1.0	Electroplating		Zero

COD/BOD Relation & Treatability Indices of some Common Wastes.

The COD is often measured using a strong oxidant (e.g. potassium dichromate, potassium iodate, potassium permanganate) under acidic conditions. A known excess amount of the oxidant is added to the sample. Once oxidation is complete, the concentration of organics in the sample is calculated by measuring the amount of oxidant remaining in the solution. This is usually done by titration, using an indicator solution. COD is expressed in mg/L, which indicates the mass of oxygen consumed per liter of solution.

The COD of Standard water was 250 mg/l And when the water was check for the BOD value was 96 mg/l. According to Indian Standard the COD should be below 250 mg/l for inland surface water. And the Lake water is below 250 mg/l which is below the standard.

The ratio of BOD to COD is 0.52 as per our calculations.



Graph 3.5 Graph of COD of Standard Water and Lake Water (mg/l)

Chlorides

Chloride is a naturally occurring element that is common in most natural waters and is most often found as a component of salt (sodium chloride) or in some cases in combination with potassium or calcium.

The presence of chloride in groundwater can result from a number of sources including the weathering of soils, saltbearing geological formations, deposition of salt spray, salt used for road de-icing, contributions from wastewaters and in coastal areas, intrusion of salty ocean water into fresh groundwater sources. In PEI, chloride levels in groundwater are relatively usually fairly low, but can become elevated in areas near the coast, or in areas of heavy salting of roads. Chloride is a salt compound resulting from the combination of the gas chlorine and a metal. Some common chlorides include sodium chloride (NaCl) and magnesium chloride (MgCl2). Chlorine alone as Cl2 is highly toxic, and it is often used as a disinfectant. In combination with a metal such as sodium it becomes essential for life. L D A

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Graph 3.6 Graph of Chlorides of Standard Water and Lake Water (mg/l)

Nitrates

Nitrate is a compound that is formed naturally when nitrogen combines with oxygen or ozone. Nitrogen is essential for all living things, but high levels of nitrate in drinking water can be dangerous to health, especially for infants and pregnant women. Nitrates are also made in large amounts by plants and animals, and are released in smoke and industrial or automotive exhaust.

Nitrate can occur naturally in surface and groundwater at a level that does not generally cause health problems. High levels of nitrate in well water often result from improper well construction, well location, overuse of chemical fertilizers, or improper disposal of human and animal waste. Sources of nitrate that can enter your well include fertilizers, septic systems, animal feedlots, industrial waste, and food processing waste. Wells may be more vulnerable to such contamination after flooding, particularly if the wells are shallow, have been dug or bored, or have been submerged by floodwater for long periods of time.



Graph 3.7 Graph of Nitrates of Standard Water and Lake Water (mg/l)

The Nitrates of Standard water was 45 And when the water was check for the Nitrates value was 10.7249. According to Indian Standard the Nitrates should be below 250 mg/l for inland surface water. And the Lake water Nitrates is below 250 mg/l which is ok for the standard.



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CALIBRATION CURVE FOR NITRATES

Concentrat ion (mg/l)		Absorba 220nm	nce at	Absorbar 275nm	Absorbance at 275nm		
0		0		0	0	0	
5		0.5305		0.009	0.018	0.5125	
10		1.0615		0.0064	0.0128	1.0487	
20		2.1801		0.009	0.018	2.1621	
Sample		1.0178					



IV. CONCLUSION

Actually for maintaining ecological balance of jambhulwadi lake along with its natural view we have to stop the external and internal pollution. Saving the lake from the pollution should be a priority concerns for the sake of environment. Awareness program is necessary to stop unauthorized activities that seriously lead to pollution of the lakes and surrounding environment . our lack of knowledge about environment management and indifferent attitude towards protection of environment have turned these beautiful water body into a sink of pollution ,receiving numerous unauthorized sewage outlets, surface run-off, urban drainage discharges and even solid waste from various sources. So finally we can say if we can aware people on throwing waste material ,apply proper law on the area the mitigation of pollution on jambhulwadi lake can be seen. In the other hand pollution level of the water can be decrease by cultivating filter feeder fishes, cleaning of water, maintaining the water level



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REFERENCES

- 1. Aher D. N., Kele V. D., Malwade K. D., Shelke M. D. (2016) "Lake Water Quality Indexing To Identify Suitable Sites For Household Utility: A Case Study Jambhulwadi Lake Pune(MS)".
- 2. Sumant Kumar, Bhanu P. Vellanki, Shafeeque Rahman P.K., Absar A. Kazmi, Narayan C. Ghosh, (2018) "Runoff characterization and pollutant load estimation of Nainital lake, India".
- 3. Antara Bhattacharya and AnugyaShandilya, (2017) "Lake Water Pollution and Treatment".
- 4. Sanyogita R. Verma1, P.R. Chaudhari, R.K.Singh, and S.R Wate, (2011), "Studies on the ecology
- 5. and trophic status of an Urban lake at nagpur city, india".
- 6. Solanki H. A., Verma P., Chandwat D., Dr. Urvi G., (2012) "Water Quality Analysis of an Organically Polluted Lake by Investigating Different Physical and Chemical Parameters".



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