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A Study on Detection and Monitoring Of Water Quality at Uttrahalli Lake in Bengaluru

Adithi Jois, Adeeb Abid A R, Darshini S, Daryll Dyson Farias, Tejaswini M

(Civil Engineering, Dayanand Sagar College Of Engineering)

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ABSTRACT: Water quality is one of the most critical indicators of environmental pollution and it affects all of us. Water contamination can be accidental or intentional and the consequences are drastic unless the appropriate measures are adopted on the spot.This review provides a critical assessment of the applicability of various technologies for real-time water quality monitoring, focusing on those that have been reportedly tested in real-life scenarios. Specifically, the performance of sensors based on molecularly imprinted polymers is evaluated in detail, also giving insights into their principle of operation, stability in real on-site applications and mass production options.Such characteristics as sensing range and limit of detection are given for the most promising systems, that were verified outside of laboratory conditions. Then, novel trends of using microwave spectroscopy and chemical materials integration for achieving a higher sensitivity to and selectivity of pollutants in water are described.

I. INTRODUCTION

GENERAL

Uttarahalli lake is located in Uttarahalli ,Bangalore opposite to Rajathadri Palace Hotel on Dr.Vishnuvardhan Road in southwestern part of the city and is frequented by many local residents during its open hours. The lake attracts many bird species that wade in the natural wetland in the north.The six inlets and monsoon rains ensure that there is water in the southern part of the lake all year.The diversion drain discharges outside of the lake and would combine with any overflow leaving the outlet. Uttarahalli lake appears to be disconnected from the chains of lakes, but would fall within the Byramangala Lake Series.

II. LITERATURE REVIEW

- **S. R. AHMAD(1999):**

The present study has shown that; There is a correlation between the BOD5 value of a wastewater sample and the fluorescence intensity at 440 nm from the same sample. The correlation is valid only for spatially and temporally uniform ubiquitous fluorophores. For water samples outside the pH range 3-7 and the temperature range, 10±808C, the correlation does not hold. The correlation is expected to be plant site-selective, i.e. whether receiving industrial or domestic sewage. Continuous detection of up welled fluorescence for the monitoring of waste water quality in industrial plants for on-line process control is possible in principle. However, for the commercial application of this technique a near-UV laser excitation source is needed. Although excimer lasers and some frequency converted solid state visible/infra-red lasers provide such outputs, these are expensive and bulky. Filtered thermal sources (e.g. Hg lamp), albeit having much less spectral power output than laser sources may be used. For this, much improvement in signal detection sensitivity, data averaging speed, signal- to-noise and computer algorithm for data processing areneeded.

- **Alaa G. M. Osman(2010):**

Higher mean value of conductivity, alkalinity, COD, NH3, NO3, TS, SO4, Cl, orthophosphate and trace metals in the water, sediments and fish tissues collected from Damietta and Rosetta sites comparing to the other sites prove the presence of large quantities of organic and in-organic pollutants in Rosetta and Damietta water. This was expected due to the fact that the water of such branches receives high concentrations of organic and inorganic pollutants from industrial, domestic as well as diffuse agricultural waste water. The heavy metal residues in the tissues of Clarias gariepinus exhibited different patterns of accumulation and distribution among the selected tissues and localities. In fish, gills are considered to be the dominant site for contaminant uptake because of their anatomical and/or physiological properties that maximize absorption efficiency from water [39]. How-ever, it was evident from our study that, liver was the site of maximum

accumulation for the elements while muscle was the over all site of least metal accumulation. The higher levels of trace elements in liver relative to other tissues may be attributed to the affinity or strong coordination of metallothionein protein with these elements.

- **Colin A. Stedmon(2011):**

The concept of monitoring organic matter fluorescence proved to be sensitive and specific enough for wastewater contamination of groundwater based drinking water. This work paves the way for further development of in situ sensors for early warning of contamination incidents in drinking water systems. The detailed PARAFAC analysis provided a suitable method to reveal which wavelengths are the most responsive and considerably reduce the data required. Based on the obtained results, only one excitation and two emission wavelengths are sufficient to develop a fluorescence sensor detecting wastewater contamination in water. The approach has great potential as an online indicator parameter at several locations on the distribution net, which can be used as an early warning system for a contamination event and prompt more intensive grab sampling.

- **Janelcy Alferes (2013):**

As water quality measurements might be carried out in difficult environments, dealing with faulty sensors represents a challenge for the reliable real-time continuous monitoring of water systems. To address that challenge multivariate methods based on PCA have been tested on data sets obtained from in situ automatic monitoring stations storing several physical and chemical variables. After training the PCA model with normal operating data, faults or abnormal conditions can be detected by monitoring some statistical metrics and their violation of confidence limits. It was shown in two case studies that this procedure enables the detection of different kinds of faults in individual sensors. These can be used to trigger process and/or maintenance alarms. Once faults are detected and correctly diagnosed corrective actions can be appliedtothemeasurementsystem.Theavailabilityan dpracticalapplicationofthesemethods to multiple and redundant water quality sensors represents a further step towards effective data quality assessment and better monitoring of water systems.

- **Guohua Chen (2003):**

This paper reviews the development, design and applications of electrochemical technologies in water and wastewater treatment. Particular focus was given to electrodeposition, electrocoagulation (EC), electroflflotation (EF) and electrooxidation. Over 300 related publications were reviewed with 221 cited or analyzed. Electrodeposition is effective in recover heavy metals from wastewater streams. It is considered as an established technology with possible further development in the improvement of space-time yield. EC has been in use for water production or wastewater treatment. It is finding more applications using either aluminum, iron or the hybrid Al/Fe electrodes. The separation of the flocculated sludge from the treated water can be accomplished by using EF. The EF technology is effective in removing colloidal particles, oil & grease, as well as organic pollutants. It is proven to perform better than either dissolved air flotation, sedimentation, impeller flotation (IF). The newly developed stable and active electrodes for oxygen evolution would definitely boost the adoption of this technology. Electroxidation is finding its application in waste water treatment in combination with other technologies. It is effective in degrading the refractory pollutants on the surface of a few electrodes. Titanium-based boron-doped diamond fifilm electrodes (Ti/BDD) show high activity and give reasonable stability. Its industrial application calls for the production of Ti/BDD anode in large size at reasonable cost and durability.

- **Pol. J.Environ(2014):**

In the present study, different multivariate statistical applications were used to evaluate variations in Seydisuyu Stream water quality. Factor analysis helped to identify the effective factors on water quality variations in the basin by using a large number of physicochemical and chemical water quality data that were not clearly visible from an examination of the analytical data in the tables, and were difficult to evaluate without using any multivariate statistical technique. Cluster analysis grouped 13 sampling sea- sons into three clusters of similar water quality characteristics, and according to data obtained from CA, it may be possible to design an optimal sampling season, which could reduce the number of field studies. The present study indicates the usefulness and necessity of using multivariate statistical techniques for the interpretation of complex data sets, identification of pollution sources, and understanding variations in water quality. The main cause of degradation of Seydisuyu Stream is the discharge of agricultural wastes, municipal sewage water from settlement areas, and mineral washing activities by Kırka Boron Works (espe- cially in summer). According to data observed, arsenic and boron accumulations detected in Seydisuyu Stream

were at critical levels.Unlessanymeasuresaretakeninthebasinassoon aspossible,thisinorganicpollution may be a significant limiting factor on aquatic life in the region and may also adversely affect human health in the immediate future.

- **Gregorio Crini (2019):**

The public demand for pollutant free waste discharge to receiving waters has made decontamination of industrial waste waters a top priority. However, this is a difficult and challenging task. It is also difficult to define a universal method that couldbe used for the elimination of all pollutants from waste waters. This review described the advantages and disadvantages of technologies available. A multitude of techniques classified in conventional methods, established recovery processes and emerging removal methods can be used. However, among the numerous and various treatment processes currently cited for waste water treatment, only a few are commonly used by the industrial sector for economic and technological reasons. Adsorption onto activated carbons is nevertheless often cited as the procedure of choice to remove many different types of pollutants because it gives the best results in terms of efficiency and technicalfeasibility at the industrial scale.

- **Torsten Wik (1994):**

The trickling filter is a very complex process with many phenomina which is difficult to describe mathematically. By making assumptions, based on experimental data from the pilot plant, it has been possible to model the behaviour of the variables. It is our belief that the simulation work can continue, aiming at better understanding of the full scale filter. An important aspect of this work is that the PI-0-

posed filter will function in a different process structure than the pilot plant filter. Some possible improvements of the procedures have been identified. The first one is the introduction of an oxygen profile for the bulk flow. The second one is the speed of the calculations. However, this is, at this stage of the project, no limitation for our work. The few cases of numerical difficulties experienced so far, have easily been solved by changing the border lines of the filter elements.

- **Mike S.M Jetten(1997):**

The present day wastewater treatment practise can be significantly improved when new microbial processes are introduced. In this paper a new concept is discussed along general lines. The concept consists of a first stage in which a maximal sludge production is achieved. In this way COD is removed as sludge and aeration requirements minimized. This sludge can be digested to yield methane for energy generation. The nitrogen removal is based on a partial oxidation to nitrite and subsequent denitrification with ammonium as electron donor. 1997 LAWQ. Published by Elsevier Science Ltd. In this paper we have described a new concept for a municipal wastewater treatment system in which a substantial reduction in the energy and chemical use is achieved. Furthermore, there is an optimal regain of the COD (as methane) and the treatment is possible with minimal use of resources. By the use of the combined Sharon-Anammox process, the nitrogen removal will no longer require the input of COD. The combined system can thus be operated independently. This makes it possible to optimize the COD and nitrogen removal separately. No longer complex compromises between COD and N-removal as in the conventional process are needed. From the description above it is clear that the proposed concept will optimize the treatment of domestic wastewater considerably.

- **Carter borden(2015):**

Establishing an HIS network to monitor water quantity and quality provides the basis for characterizing the watersheds as well as the impacts of development such as mining on the project site and surrounding environment. The data can be used for regulatory compliance, limiting risk, infrastructure design, obtaining ISO 14001 certification, assessing impacts to downstream aquatic ecosystems and determining the efficiency of mining processes. Furthermore, the data can be used to determine if mining activities are affecting water and food security for local communities. Effective HIS monitoring and reporting provide transparent and useful data and information for monitoring the physical state of watersheds, as well as the impact of mining systems on water resources. This detailed assessment can provide short- and long-term information relevant to understanding water security and WEF security in the context ofmining.

AIM

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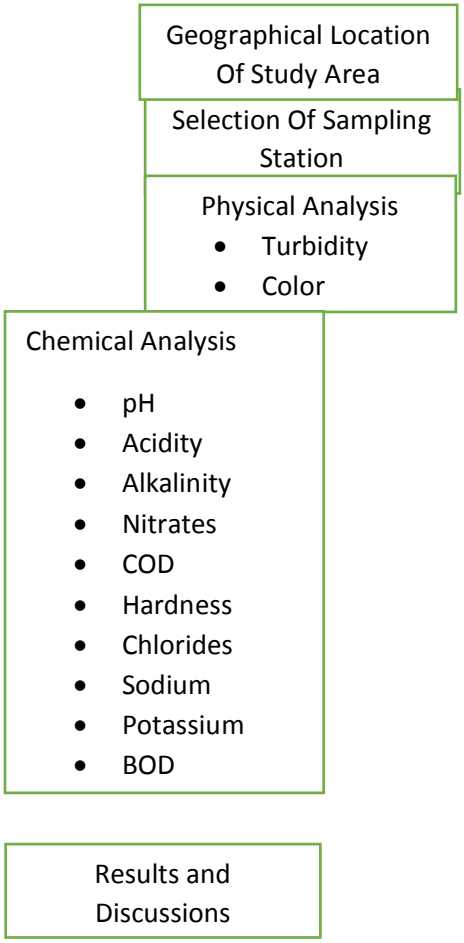
III. OBJECTIVES

- To determine quality of water.
- To determine physiochemical and bacteriological characteristics of lake.
- To check the suitability of lake water for domestic and irrigational purposes.

IV. METHODOLOGY



CHEMICAL ANALYSIS

- **pH** – Normal range (6.5-8.5)(6.5-8.0)
- **Alkalinity** – Normal range (20-200mg/l)
- **Nitrates** – Normal range (10mg of nitrate per liter of drinking water)
- **COD** – Normal range (75-100mg/l)
- **Hardness** – Normal range (below 60 mg/l)
- **Chlorides** – Normal range (between 1-100 ppm)
- **Sodium** – Normal range (30-60mg/l)
- **BOD** – Normal range (1-2 mg O/L)

SAMPLE COLLECTION

- The first set of samples were collected in the 2nd week of March in Uttarahalli Lake.
- The samples were collected at 5 different points at the lake.
- The points were marked for reference to take the samples second time.
- The second set of samples were collected at the previously marked points in the 2nd week of April.

V. ANALYSIS OF COLLECTED WATER SAMPLE

The following tests were conducted on the retrieved water sample

Physical : Turbidity, Colour.

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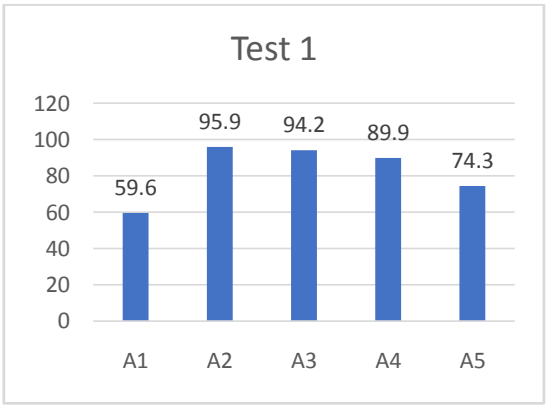
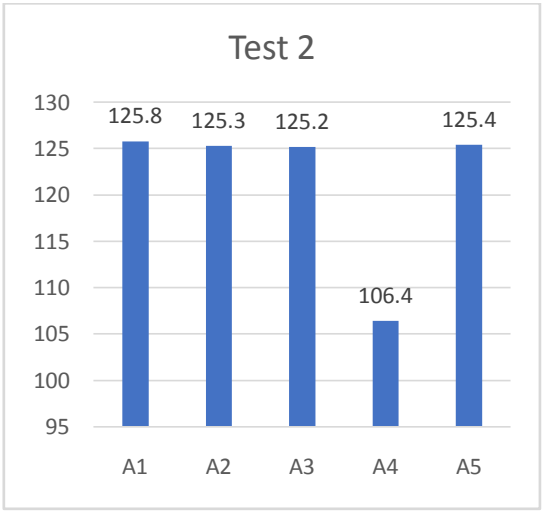
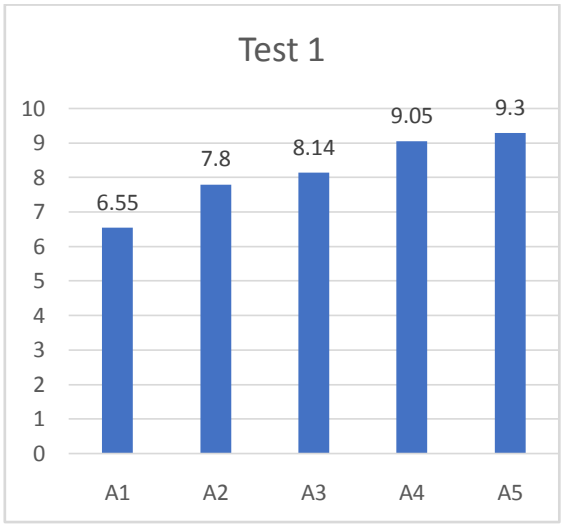
Chemical : Alkalinity, pH, Hardness, Chlorides, Sodium, Nitrates, COD, BOD and DO.

RESULTS: TURBIDITY





PH



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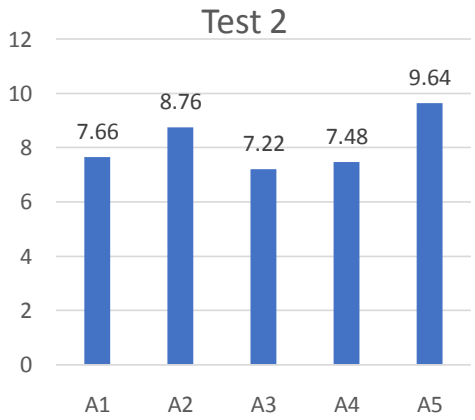
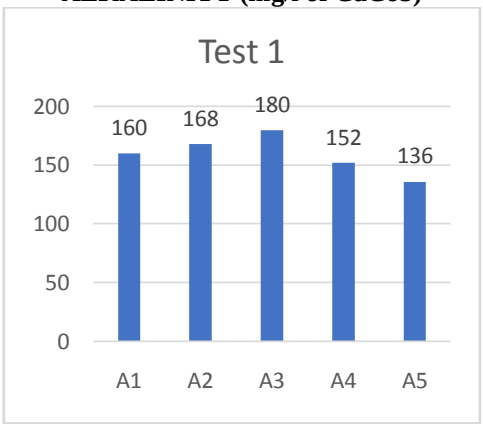
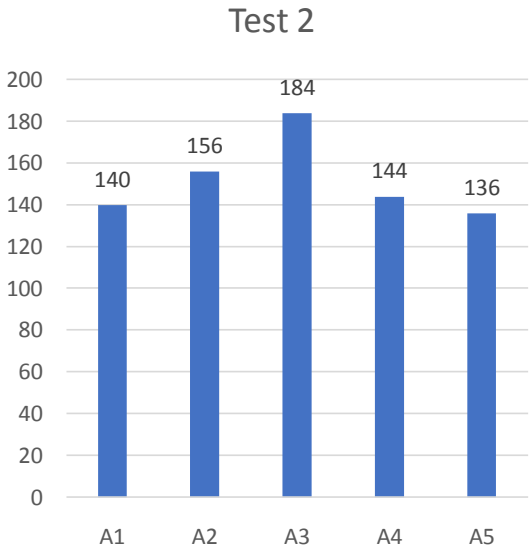


ALKALINITY (mg/l of CaCo3)





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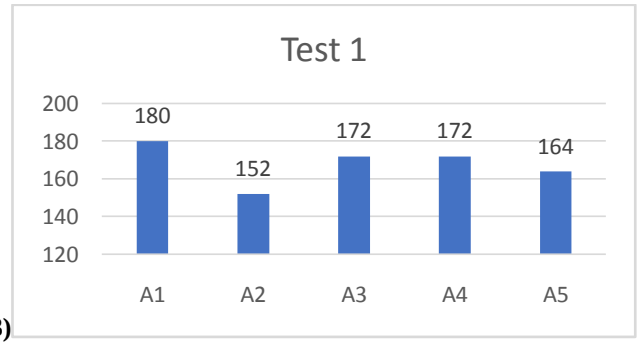
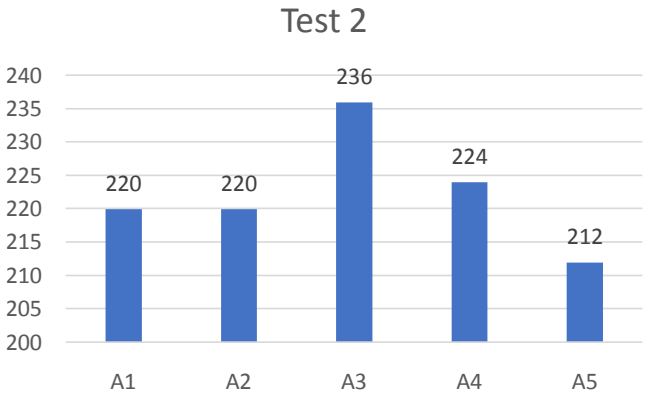
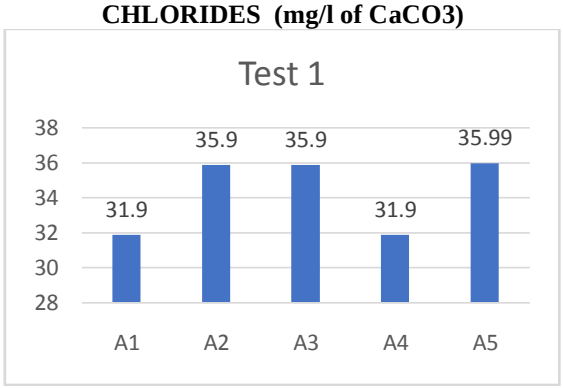
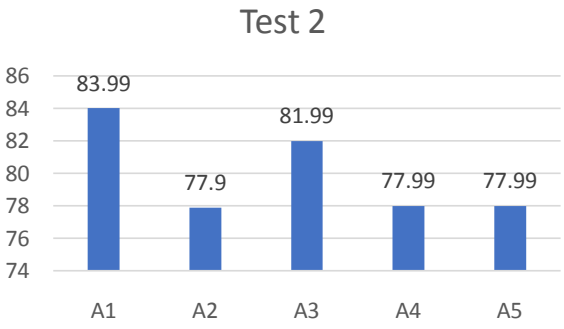


HARDNESS (mg/L Of CaCO3)



CHLORIDES (mg/l of CaCO3)





DISSOLVED OXYGEN (mg/l)

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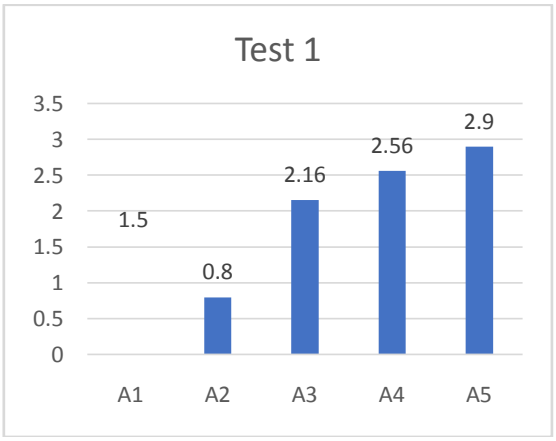
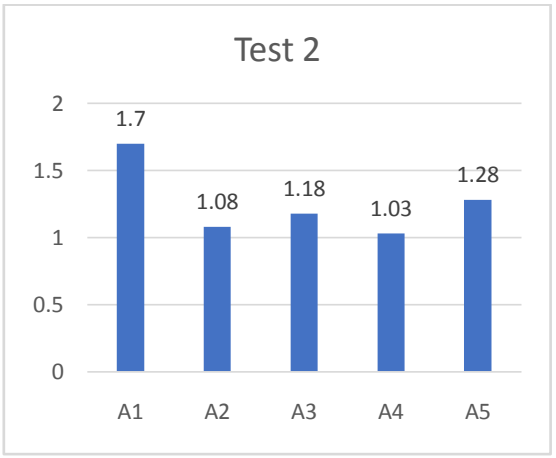
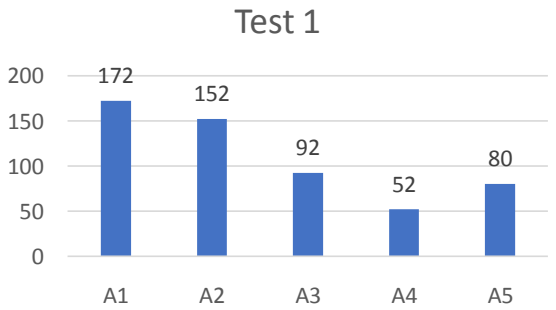




COD (mg/l)



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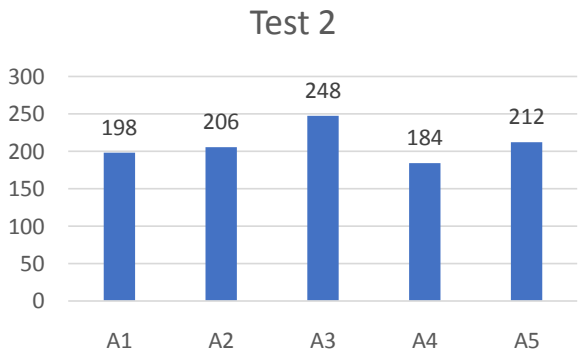
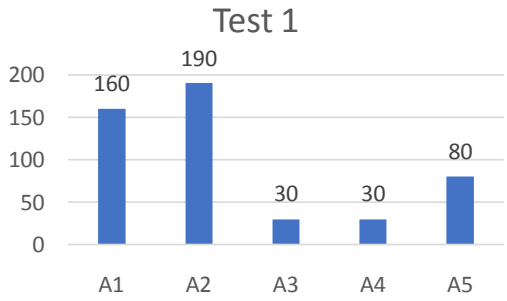
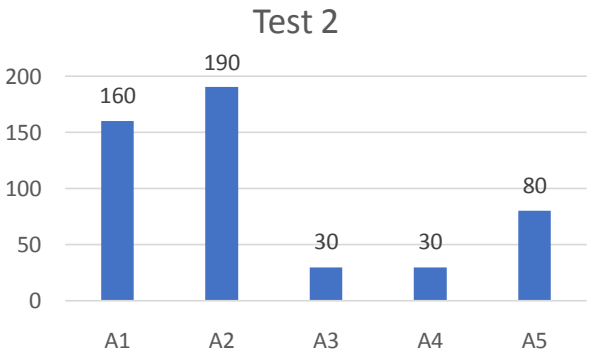
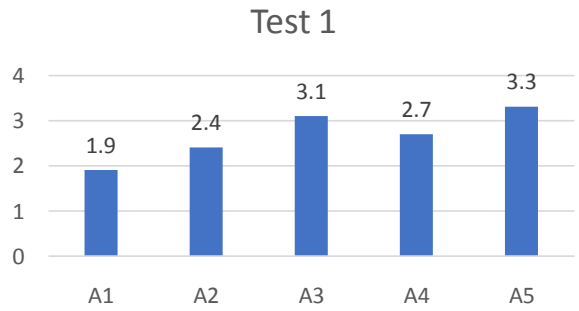


BOD(mg/l)







NITRATES(mg/l)

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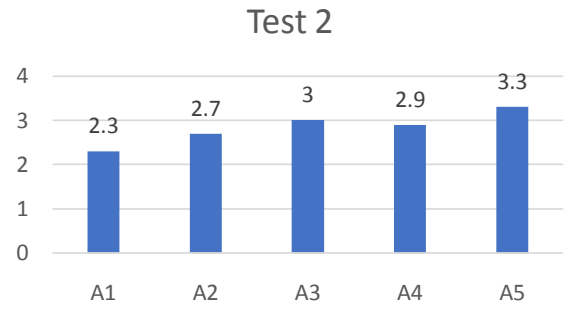
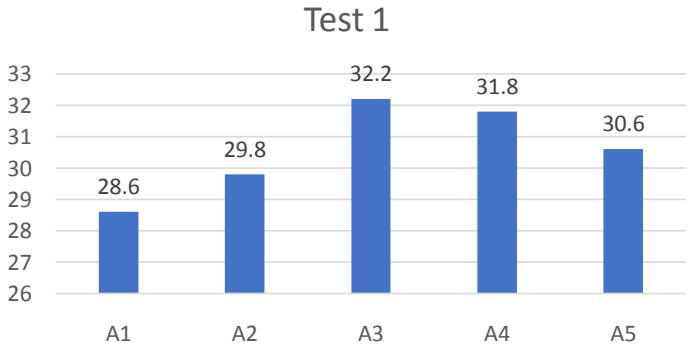
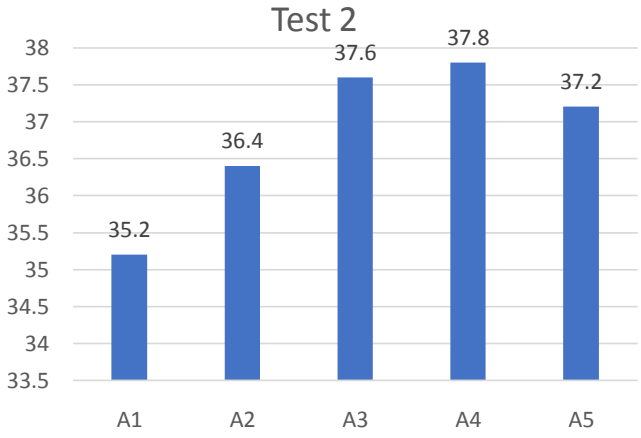


SODIUM (mg/l)





POTASSIUM(mg/l)

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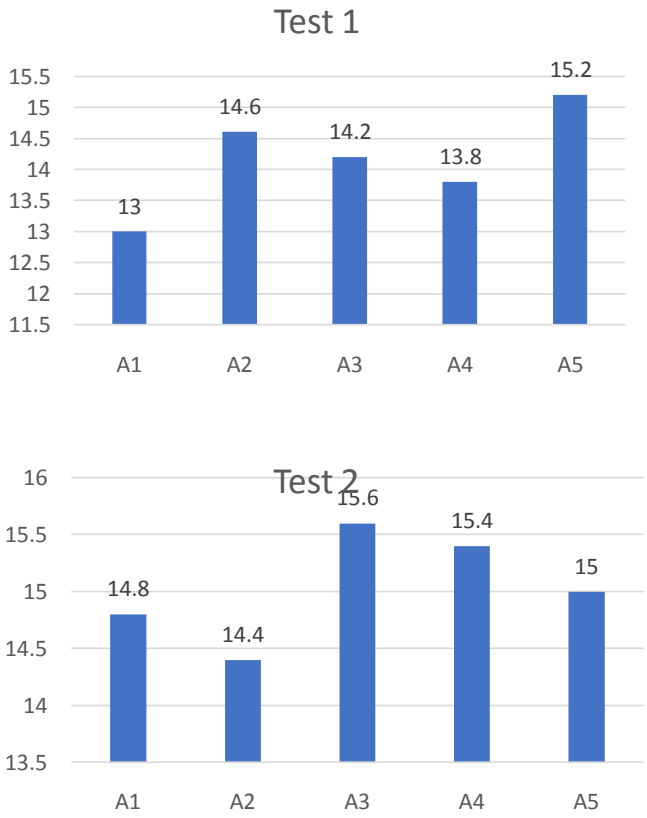

VI. CONCLUSION

1. The results of turbidity and solids shows that the lake water is turbid as the values are more which might be due to the presence of more suspended, dissolved and colloidal solids.
2. Hardness of the water is found to be slightly less which may utilize more soap if the water is used for laundry and if the waster has to be treated with suitable softening methods if it has to be used for drinking purposes.
3. The values of dissolved oxygen shows that at many points the D.O values are very less and further if at deeper depths of lake the D.O might be nil which may not support aquatic life to flourish thereby disturbing the aquatic ecosystem of the lake.
4. The possible reduction of D.O values also reveals that B.O.D of the lake is more which could be due to the entry of organic pollutants from different sources and it can be concluded that the water has to be treated to remove organic pollutants if it has to be used for drinking or irrigation purposes.
5. The value of sodium is slightly more in pre monsoon stage but water is acceptable for irrigation purpose since it will not contribute much to SAR (Sodium absorption ratio)
6. The physico chemical analysis of results revealed that the alkalinity of the lake is more which may be due to possible entry of sewage into the lake and the water has to be treated to reduce the alkalinity to make it fit for drinking purposes
7. Studies revealed that as of now the lake water is not used for potable use but the water can be effectively used for potable uses with the proper treatment methods which will treat the water to acceptable drinking water standards as the city is facing shortage of water.
8. It can be concluded finally that after the analysis of physico chemical attributes the water cannot be used for both drinking and Irrigation purposes.

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