

STUDY ON THE QUALITY OF SURFACE WATER IN NANDYAL

**A MINI PROJECT REPORT SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF
BACHELOR OF TECHNOLOGY**

IN

CIVIL ENGINEERING

B. CHANDANA	(19091A0105)
S. JAVEED	(20095A0127)
S. VINAY	(19091A0162)
S. UGRANARASIMHA	(20095A0150)
J. SARATH KUMAR	(19091A0142)

Under the Esteemed Guidance of
Mr.BHARAT KUMAR M.TECH
Assistant Professor of Civil Engineering



Department of Civil Engineering
R.G.M. College of Engineering and Technology
(Autonomous),
Nandyal 518 501, A.P. , INDIA
(Affiliated to J. N. T. University, Ananthapuramu, A.P., INDIA)
(Approved by AICTE, Accredited by N.B.A, NewDelhi, NAAC-A⁺Grade)
2019 - 2023

R.G.M. College of Engineering and Technology

(Autonomous),

Nandyal 518 501, A. P., INDIA

(Affiliated to J. N. T. University, Ananthapuramu, A. P., INDIA)

(Approved by AICTE, Accredited by N.B.A, NewDelhi, NAAC-A⁺Grade)



CERTIFICATE

This is to certify that the Mini Project Report entitled "STUDY ON THE QUALITY OF SURFACE WATER IN NANDYAL" that is being submitted by

B.CHANDANA	(19091A0105)
S.JAVEED	(20095A0127)
S.VINAY	(19091A0162)
S.UGRANARASIMHA	(20095A0150)
J.SARATH KUMAR	(19091A0142)

in partial fulfillment of the requirement for the award of B.Tech in Civil Engineering in the **RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY**, Nandyal (Affiliated to J.N.T University, Anantapur) is a bonafide record of confide work carried out by them under our guidance and supervision. The results embodied in this technical report have not been submitted to any other university or institute for the award of any Degree.

Signature of the Project Guide

Mr.Bharat Kumar

Examiner:

Date:

Signature of Head of the Department

Dr. G. Sreenivasulu Ph.D (IISC),

Professor and HOD

Dedicated to my beloved parents, and teachers who have worked hard throughout my education.

Acknowledgements

We deem it a great pleasure and privilege to express our profound deep sense of gratitude to our project guide Mr.BHARAT KUMAR, Assistant Professor of C.E, R.G.M College of Engineering and Technology, Nandyal dist., A.P. for his encouragement and Inspired guidance through- out our mini project work.

We are thankful to Dr. G. SREENIVASULU, M.Tech (IITK), PhD (IISC), professor and HOD of C.E, R.G.M College of Engineering and Technology, Nandyal, Kurnool district, A.P for his able guidance and inspiration for his Encouragement in carrying out this mini project work.

We are highly grateful to Dr. T. JAYACHANDRAPRASAD, Principal, R.G.M College of Engineering and Technology, for his encouragement and inspiration at various points of time in the successful accomplishment of the mini project work.

We shall remain grateful to Dr. M. SHANTIRAMUDU, chairman, R.G.M College of Engineering and Technology who has been a constant source of inspiration throughout the project work we are seek his blessings for a bright future.

We shall remain grateful to Sri M. SHIVARAM, M.D, R.G.M College of Engineering and Technologys been a constant source of inspiration throughout the mini project work and we also seek his blessings for a bright who has been a constant source of inspiration throughout the mini project work and we also seek his blessings for a bright future.

We express our special thanks to all the faculty members and non teaching staff of the department and college who constantly cooperated in the completion of the mini project work.

PROJECT ASSOCIATES

B.CHANDANA	(19091A0105)
S.JAVEED	(20095A0127)
S.VINAY	(19091A0162)
S.UGRANARASIMHA	(20095A0150)
J.SARATH KUMAR	(19091A0142)

T

ABSTRACT

The aim of study is to determine the quality of surface water Nandyala district. Whether it is for drinking purpose, agriculture purpose and public purpose, which must be tested regularly in order to keep the water in safe and free from environmental risk and protect from health disorders. Physical, chemical and biological interactions are responsible for certain water quality characteristic of a water body. Water can be used for irrigational and industrial purposes without any treatment. In this study the water quality has been carried out by collecting water samples from four sampling sites and analyzed at the laboratory. The most important water quality parameters namely, PH, Dissolved oxygen (DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Electrical conductivity (EC), Temperature, Turbidity, Chloride, Hardness, Total dissolved solids (TDS), Total solids (TS), Phosphate, Nitrate were analyzed at the laboratory. Parameter values were compared with standard value (WHO and ECR'97) standard for drinking water. The project may get the feasible behaviour of water quality such that it may be good for drinking purpose and also for other uses if quality is not good then it will not be feasible for any other purpose.

KEYWORDS: Alkalinity, Dissolved Oxygen , Acidity, Chloride, pH, Total hardness, Nitrates.

Contents

Abstract	iv
1 INTRODUCTION	1
1.1 INTRODUCTION	1
1.2 HISTORY OF WATER ON EARTH	2
1.3 PROPERTIES OF WATER	2
1.3.1 STATES	3
1.3.2 DENSITY	3
1.3.3 MAGNETISM	3
1.3.4 TASTE AND ODOUR	3
1.3.5 COLOUR AND APPEARANCE	3
1.3.6 ELECTRICAL CONDUCTIVITY AND ELECTROLYSIS	4
1.4 DIFFERENT TYPES OF WATER	4
1.4.1 TAP WATER	4
1.4.2 MINERAL WATER	4
1.4.3 PACKAGED DRINKING WATER	5
1.4.4 SPRING WATER	5
1.4.5 WELL WATER	5
1.4.6 DISTILLED WATER	6
1.4.7 HARD WATER	6
1.4.8 ALKALINE WATER	6
2 LITERATURE REVIEW	7
2.1 LITERATURE SURVEY	7
2.2 OBJECTIVE OF STUDY	9
3 STUDY AREA	10

4	EXPERIMENTAL STUDY	13
4.1	PH	13
4.1.1	INTRODUCTION	13
4.1.2	PROCEDURE	14
4.1.3	TESTING OF SAMPLE	14
4.2	ALKALINITY	15
4.2.1	INTRODUCTION	15
4.2.2	PROCEDURE	15
4.3	ACIDITY	16
4.3.1	INTRODUCTION	16
4.3.2	PROCEDURE	16
4.4	DISSOLVED OXYGEN	17
4.4.1	INTRODUCTION	17
4.4.2	PROCEDURE	17
4.5	ELECTRICAL CONDUCTIVITY	18
4.5.1	INTRODUCTION	18
4.5.2	PROCEDURE	19
4.6	HARDNESS OF WATER BY EDTA METHOD	20
4.6.1	INTRODUCTION	20
4.6.2	PROCEDURE	20
4.7	TOTAL DISSOLVED SOLIDS	21
4.7.1	INTRODUCTION	21
4.7.2	PROCEDURE	22
4.8	CHLORIDE CONCENTRATION	23
4.8.1	INTRODUCTION	23
4.8.2	PROCEDURE	23
4.9	NITRATES	24
4.9.1	INTRODUCTION	24
4.9.2	PROCEDURE	24
4.10	ALUM JAR	25
4.10.1	PROCEDURE	25
5	RESULTS AND DISCUSSION	27

List of Figures

3.1	KC Canal	11
3.2	Kundu River	11
3.3	Cheruvukatta	12
3.4	Rythu Nagar Canal	12
4.1	PH meter	14
4.2	End point of alkalinity	15
4.3	Formula for alkalinity	15
4.4	End point of acidity	16
4.5	formulae for acidity	16
4.6	DO	18
4.7	Formulae for DO	18
4.8	Conductivity meter	19
4.9	End point of hardness	21
4.10	Hardness formulae	21
4.11	Conductivity meter	22
4.12	End point of chlorides	23
4.13	TDS formula	24
4.14	Spectrophotometer	25
4.15	Jar test	26

List of Tables

5.1	Different parameters before and after treatments of kundu river	27
5.2	Different parameters before and after treatments of Athmakuru cheruvu katta .	28
5.3	Different parameters before and after treatments of KC canal	29
5.4	Different parameters before and after treatments of Rythu nagar canal	30

Chapter 1

INTRODUCTION

1.1 INTRODUCTION

Water is the most important necessity for the survival,of all living beings whether humans, animals or plants, all of them need water. Water the second most important element after air for survival.According to the earth is fit for consumption.

Surface water refers to all the water bodies present on the earth surface,from small ponds to vast oceans and everything in-between.It includes both freshwater bodies(rivers,ponds,lakes etc) as well as the saline water bodies(mainly oceans)Rivers, ponds,lakes etc,constitute freshwater,while oceans have saline water.surface water mainly originates from rainfall.It is combination of both surface run off and ground water.

Water quality is not entirely dependent on human activities, other simmering factors like whether and meteorology floods due to climate change can increase the water pollution as the pollution as the pollution from farms,residential lawns,overfilled sewage systems,trash,animals waste,nitrogen phosphorous mixes in water ways which increases the risk of contaminations and higher cost of water treatments.There is a notion that water quality is getting severely affected by climate change.

Everyone who is affected by the water industry must test water sources.This could be the government organizations trying to regulate the quality of water to protect us from the health risks involved with using chlorinated water or it could be home owners trying to ensure that the water is suitable for consumptions.

water testing is carried out to meet the regulatory requirements and adhere to the safety procedure that are needed for pollutions free water.This is a broad concept that involves several procedures to analyse and evaluate the quality of water.

water quality tests will give information about the health of the waterway. By testing water over a period of time, the changes in the quality of the water can be seen.

The most important water quality parameters namely PH, Dissolved Oxygen(DO), Biochemicals Oxygen demand(BOD), chemicals oxygen demand(COD),Electrical conductivity(EC), Temperature,Turbidity,Chloride, Hardness,Total dissolved solids(TDS),Total solids(TS),phosphate, Nitrates were analysed at the laboratory.Parameters values were compared with standard values(WHO) standard for drinking water.

1.2 HISTORY OF WATER ON EARTH

One factor in estimating when water appeared on Earth is that water is continually being lost to space. H₂O molecules in the atmosphere are broken up by photolysis, and the resulting free hydrogen atoms can sometimes escape Earth's gravitational pull.

When the Earth was younger and less massive, water would have been lost to space more easily. Lighter elements like hydrogen and helium are expected to leak from the atmosphere continually, but isotopic ratios of heavier noble gases in the modern atmosphere suggest that even the heavier elements in the early atmosphere were subject to significant losses.

While the majority of Earth's surface is covered by oceans, those oceans make up just a small fraction of the mass of the planet. A significant amount of water is also stored in Earth's crust, mantle, and core. Unlike molecular H₂O that is found on the surface, water in the interior exists primarily in hydrated minerals or as trace amounts of hydrogen bonded to oxygen atoms in anhydrous minerals.

Hydrated silicates on the surface transport water into the mantle at convergent plate boundaries, where oceanic crust is subjected underneath continental crust. While it is difficult to estimate the total water content of the mantle due to limited samples, approximately three times the mass of the Earth's oceans could be stored there. Similarly, the Earth's core could contain four to five oceans' worth of hydrogen.

1.3 PROPERTIES OF WATER

Water is a polar inorganic compound. At room temperature it is a tasteless and odourless liquid, nearly colorless with a hint of blue. This simplest hydrogen chalcogenide is by far the most studied chemical compound and is described as the "universal solvent" for its ability to dissolve many substances. This allows it to be the "solvent of life" indeed, water as found in

nature almost always includes various dissolved substances, and special steps are required to obtain chemically pure water. Water is the only common substance to exist as a solid, liquid, and gas in normal terrestrial conditions.

1.3.1 STATES

Along with Oxidane, water is one of the two official names for the chemical compound H_2O . It is also the liquid phase of H_2O . The other two common states of matter of water are the solid phase, ice, and the gaseous phase, water vapour or steam. The addition or removal of heat can cause phase transitions: freezing (water to ice), melting (ice to water), vaporization (water to vapour), condensation (vapour to water), sublimation (ice to vapour) and deposition (vapour to ice).

1.3.2 DENSITY

Water differs from most liquids in that it becomes less dense as it freezes. This expansion can exert enormous pressure, bursting pipes and cracking rocks. In a lake or ocean, water at $4\text{ }^{\circ}\text{C}$ ($39.2\text{ }^{\circ}\text{F}$) sinks to the bottom, and ice forms on the surface, floating on the liquid water. This ice insulates the water below, preventing it from freezing solid. Without this protection, most aquatic organisms residing in lakes would perish during the winter.

1.3.3 MAGNETISM

Water is a diamagnetic material. Though interaction is weak, with superconducting magnets it can attain a notable interaction.

1.3.4 TASTE AND ODOUR

Pure water is usually described as tasteless and odourless, although humans have specific sensors that can feel the presence of water in their mouths, and frogs are known to be able to smell it. However, water from ordinary sources (including bottled mineral water) usually has many dissolved substances, that may give it varying tastes and odours. Humans and other animals have developed senses that enable them to evaluate the potability of water in order to avoid water that is too salty or putrid.

1.3.5 COLOUR AND APPEARANCE

Pure water is visibly blue due to absorption of light in the region. The color can be easily observed in a glass of tap-water placed against a pure white background, in daylight. The principal absorption

bands responsible for the color are overtones of the O–H stretching vibrations. The apparent intensity of the color increases with the depth of the water column, following Beer’s law. This also applies, for example, with a swimming pool when the light source is sunlight reflected from the pool’s white tiles. In nature, the color may also be modified from blue to green due to the presence of suspended solids or algae.

1.3.6 ELECTRICAL CONDUCTIVITY AND ELECTROLYSIS

Pure water has a low electrical conductivity, which increases with the dissolution of a small amount of ionic material such as common salt. Liquid water can be split into the elements hydrogen and oxygen by passing an electric current through it is a process called electrolysis. The decomposition requires more energy input than the heat released by the inverse process.

1.4 DIFFERENT TYPES OF WATER

1.4.1 TAP WATER

The water that you get from your faucets is called tap water. This is generally sourced from a dam or river, treated at a water treatment facility, stored in a reservoir, and then supplied to homes through water pipelines. While the quality of tap water generally has to meet the government guidelines and often does at the water treatment plant, intermittent supply through old distribution pipelines (which run parallel to sewage lines in many cities of India), can render this water unsafe, especially during peak summer and during the rainy season which is prone to flooding. For this reason, the use of a water purifier in your home at the point of use is often a practical and safe solution.

1.4.2 MINERAL WATER

Mineral Water, as the name suggests, is water enriched with vital minerals, mostly calcium and magnesium. Natural mineral water is taken from underground sources which are rich in mineral content and then packaged and sold as natural mineral water. Now, as you can imagine, this process of bottling at the source and then distributing is quite expensive as compared to tap water, but the natural mineral content does provide some health benefits. This includes aiding the digestive system, promoting better immune health, and so on.

1.4.3 PACKAGED DRINKING WATER

Simply put, packaged drinking water is water that has been treated with technologies such as Filtration, Reverse osmosis, UV, and Ozone in a water treatment plant and then filled into bottles/pouches and sealed. Often, in a bid to render the water “healthy” calcium and magnesium salts are added in defined proportions to make it “mineral water”. The lacunae in this type of water are often in the treatment processes and in the handling and distribution itself. Unless the process is foolproof by combining all the technologies in their correct order, and the handling and distribution is done hygienically; bottled or packaged drinking water may be micro biologically unsafe. Exposure of these plastic bottles to sunlight may also be responsible for some harmful chemical reactions which in turn affect the health of those who consume this water. Installing a home water purifier and using reusable bottles made of glass or stainless steel help to overcome the problems associated with packaged drinking water sold in plastic bottles or pouches.

1.4.4 SPRING WATER

Spring Water or Glacier Water is sourced from, as you guessed it, springs and glaciers. Since water is collected right from the source, it is generally clean, and free from toxins and other unwanted particles. In some cases, depending on the spring or glacier it is collected from, the water might even be infused with vital minerals. If you get your spring or glacier water from authentic brands like Arrowhead, then you can rest assured that you are getting some of the best drinking water in the world. However, it is going to be very expensive compared to regular packaged water, let alone tap water. But dont let the price tag let you choose other lesser-known brands. Some companies are guilty of selling raw spring/glacier water without testing it. As such, if it contains any toxins, germs, or bacteria, then that can get into your system and make you ill.

1.4.5 WELL WATER

Well, Water is not commonly seen in the cities and urban areas. However, it is a prime source of water supply in most rural regions. When it rains, the water trickles down the crevices into the soil and starts accumulating underground. A well is then drilled on top of one of these natural underground water reservoirs to directly collect from the water source beneath. This water is completely free to use, and if you have a well-constructed right in your backyard, it is probably the most convenient source of drinking water. But with that being said, it does carry some risks. The raw water collected from the wells might be infested with tons of bacteria. Also depending on the locality, it can have high traces of iron and even arsenic, the latter of which can lead to toxic metal poisoning.

1.4.6 DISTILLED WATER

Distilled Water is any source of water that has been purified using the process of distillation. This involves boiling the water until it turns into water vapour, then capturing the gas and condensing it back into its liquid state. This is by far one of the safest types of water devoid of any contaminants and bacteria.

1.4.7 HARD WATER

When the water has a high mineral content, it is called hard water. This happens when water percolates through several layers of limestone, chalk, and even gypsum which are high in calcium, magnesium carbonates, bicarbonates, and sulfates. Another reason for increased hardness in some areas is the depleting level of groundwater due to over-extraction. As a result, these compounds contaminate the water, increasing its hardness. Other elements in hard water may be compounds like iron, aluminium, and manganese which also add to hardness.

1.4.8 ALKALINE WATER

Alkaline water is a much-hyped term these days. While it goes without saying that you should not drink acidic water, many people have the idea that drinking alkaline water can help neutralize the acid in the body, which can then help slow process and even prevent cancer. However, there is very little scientific evidence to showcase that alkaline water has these many health benefits. Plus, although there is no proof that alkaline water offers these miraculous health benefits, we also do not have any confirmation that it is harmful. Generally, it is safe for drinking, but there are some cases where it may cause some issues.

Chapter 2

LITERATURE REVIEW

2.1 LITERATURE SURVEY

Some of the papers that are referred during the project work are given below:

1.**Robert Damo** ,et.al(2013)are studied the Evaluation of Water Quality Index for Drinking Water,in this study they determine the quality of drinking water in the city of Pogradec, Albania. Daily samples were taken from six fixed points in the city. They were analyzed based on the standard methods for the following parameters: taste, odor, temperature, pH, conductivity (EC), turbidity, NO_3^- , NO_2^- , NH_4^+ , chloride, and microbial load. The assessment of water quality was made using the water quality index (WQI) of the Canadian Council of Ministries of the Environment (CCME). The calculated value of CCME WQI by 87.81 indicates that the drinking water quality in the city of Pogradec is “good,” and that turbidity is the main problem in quality.

2.**C.R Rama Krishnaiah**, et.al(2013) Assessment of water quality parameters in Tumkur Taluka, Karnataka state,INDIA.The present work is aimed at assessing the water quality parameters for the ground water of Tumkur Talak. This has been determined by collecting groundwater samples and subjecting the samples to a comprehensive physicochemical analysis, For calculating the following parameters have been considered: PH,TOTAL HARDNESS, CALCIUM CHLORIDE, TASTE AND ODOUR, NITARTES, TOTAL DISSOVELD SOLIDS. The WQI for these samples ranges from 89.21 to 660.56. The high value of WQI has found to be mainly from the higher values of nitrate, total dissolved solids, hardness in the ground water.The results of analysis have been used to suggest models for predicting water quality. The analysis reveals that the groundwater of the area needs some degree of treatment before consumption, and it also needs to be protected from the perils of contamination.

3.**Rachna Bhateria**,et.al(2016) are studied Water quality assessment of lake water ,in this study they

reviewed that due to presence of impurities in the lake, there are many different parameters found to be increased during summer season and have got diluted during rainy season. So, this kind of changes would affect the aquatic environment as increase in nitrogen content would result in eutrophication naturally which leads to decrease in the oxygen content level. Proper bioremediation techniques should be used to improve the water quality.

4. **Ammar Tiria**, et.al (2018) studied the Evaluation of surface water quality for drinking purposes using fuzzy inference system, in this study they are find out the propose a surface water quality index using fuzzy inference system. Three stations and ten parameters (pH, TDS, Ca, Mg, Na, K, Cl, SO₄, SO₄ and HCO₃) are selected from Oued El Hai Basin of Algeria to develop the approach. The results show that calcium and sulfate are the dominate ions in the three stations. TDS is strongly and positively correlated with SO₄ and HCO₃. From ANOVA test, there are no significant differences for all parameters except Ca and K in terms of their temporal variation. Water-rock interactions and anthropogenic process are the main factors that are controlling the surface water quality. The water quality index is assessed with the FWQI index, and the results show that the values of WQI and FWQI have similar characteristics regarding the water quality index.

5. **Shaik. Fazlur Rahman**, et.al (2018) are studied A QUALITY ASSESSMENT OF POTABLE WATER IN NANDYAL, KURNOOL DISTRICT (A.P) in this conclusion, the concentrations of the investigated major ions and trace metal ions in the drinking water samples from these communities in the Nandyal region, Some of the samples are above the limit of BIS .and maximum samples are within the limit of BIS.

6. **NAYLA HASSAN OMER** (2019) Water Quality Parameters, in this study Since the industrial revolution in the late eighteenth century, the world has discovered new sources of pollution nearly every day. so, air and water can potentially become polluted everywhere. Little is known about changes in pollution in rates. The increase in water-related diseases provides a real assessment of the degree of pollution in the environment. This chapter summarizes water quality parameters from an ecological perspective not only for humans but also for other living things. According to its quality, water can be classified into four types. Those four water quality types are discussed through an extensive review of their important common attributes including physical, chemical and biological parameters.

7. **P Payment, M Waite, A Dufour** (2020). Introducing parameters for the assessment of drinking water quality. The index and indicator concept and outlined a number of microorganisms that have been adopted in quest to determine whether or not drinking water is microbiological safe to drink.

This chapter examines the range of both microbial and non-microbial parameters and briefly outlines their uses and applications. A number of non-microbial parameters are described, which can provide useful information about quality, and changes in quality, of source waters and the effectiveness of treatment processes.

8. **Vinod suman** et.al(2021). Correlation of various water quality parameters and water quality index of districts of Uttarakhand. The study is based on hydrogeochemical and biological parameters and calculation of water quality of a rural tract in five districts of garhwal and Kumaon district of Uttarakhand, India. The drinking water quality parameters are PH, CHLORIDE, TOTAL HARDNESS, ALKALINITY, DISSOLVED SOLIDS, NITRATE (NO₃). It was observed that the physicochemical properties were as BIS standards and found suitable for drinking purposes. However bacteriological parameters i.e., Total coliform and fecal coliform of some sampling sites ranged from 20 to 300 CFU/100ml, which were higher than permissible limits (0 CFU/100ml) as per BIS standards. Statistical analysis had been used to calculate the correlation coefficient of different parameters with WQI and the study showed significant linear relationship and the high correlation coefficient between different Pairs of water quality parameters. The correlation matrix shows that iron concentration, total coliform, and faecal coliform have a significant effect on water quality index. Among these parameters, TDS has the highest correlation with conductivity, chloride ion concentration with presence of nitrate in drinking water.

2.2 OBJECTIVE OF STUDY

1. To determine the surface quality of water in its natural state in Nandyala.
2. Whether it is for drinking purpose, agriculture purpose and public purpose, which must be tested regularly in order to keep the water safe and free from environmental risk and protect from health disorders.

Chapter 3

STUDY AREA

Nandyal town is located at 15°28'42. 8484'' N 78°28'59. 1348'' E. Altitude of nandyal is 203 meters. There are many oil factories located in Nandyal town and one sugar factory was established very near to Nandyal town. Nandyal is surrounded by hills with the Kundu River on its west, the dense forests of Nallamala Hills to the east and granite mines to the south. The town is rich in water resources like reservoirs. These give it an equitable climate throughout the year. However, summers can be particularly hot. The average temperature is around 28 °C. It has total 17 villages in nandyal region.

The 4 water samples were collected such as KC CANAL, CHERUVUKATTA , KUNDHU , RYTHUNAGAR CANAL as per Indian standards water sampling for laboratory analysis procedures. After that brought to laboratory to evaluate the selected water quality parameters like pH, EC, Turbidity, Nitrate, chloride, total hardness, TDS, DO and represented in tables in their respective S.I units. We used the analytical procedures for pH by pH meter, EC by using Conductivity meter, Turbidity by nephelometric method, Nitrate by using Spectrophotometer, Hardness in water by using EDTA Complexometric Titration method, Chloride by An argentometric method, TDS by using TDS meter, DO by Wrinklers method finally. The obtained results are after analysis compared with Indian Standard Drinking water specification IS 10500-2012. Sample codes are distributed.

1. The coordinates of the KC canal is Latitude: 15.4777397° and Longitude: 78.515344°. This canal interconnects the river Penna and Tungabhadra. This canal is 130 years old major irrigation system which takes off from right flank of Anicut construction across Tungabhadra river near sunkesula village.

2. The coordinates of kundu river is Latitude: 15.480622° and Longitude: 78.459227° in nandyal. The kundu river is also known as kunderu. It goes through many changes before merging with the penna at kamalapuram of kadapa district. A lot of people in nandyal are dependent on agriculture for their earnings and kundu river is the main source of irrigation water for this area.

3.The coordinates of the cheruvukatta is Latitude:15.49177° and Longitude:78.498425° in nondyal.The water is stored in cheruvukatta and it is further purified by the municipality.Agricultural land having much benefit due to cheruvukatta.The storage capacity is high so ,in summer season also benifited by growing crops through out the year.

4.The coordinates of the rythu nagar canal is Latitude:15.438557° and Longitude:78.500178° in nandyal.The water that is stored in kanikkalavagu is further purified by the municipal corporation and use those water to the municipality of nandyal and rythunagar.Agricultural land are having much benefited to the rythunagar canal.



Figure 3.1: KC Canal

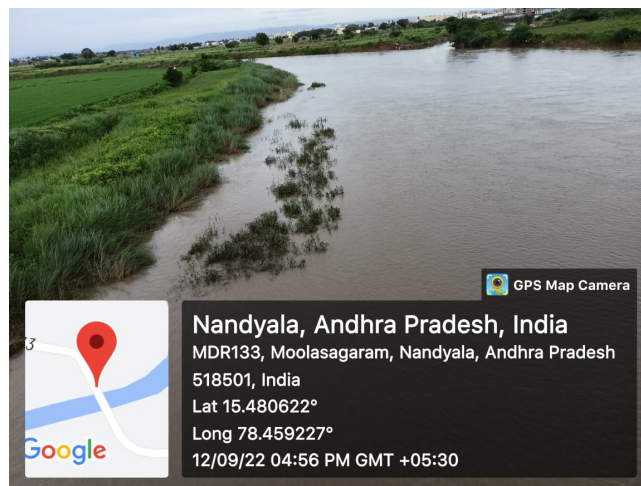


Figure 3.2: Kundu River

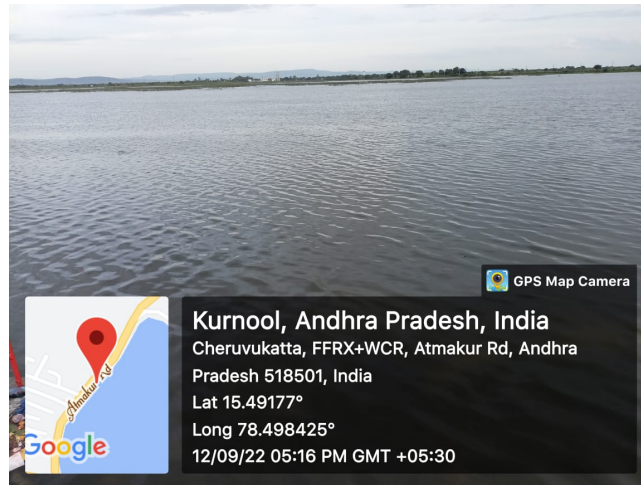


Figure 3.3: Cheruvukatta

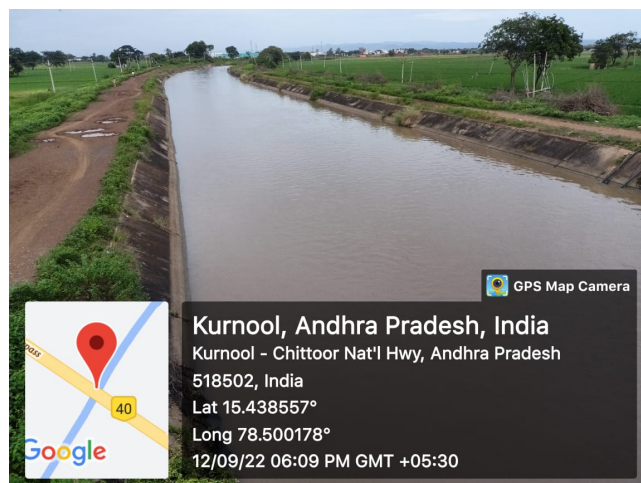


Figure 3.4: Rythu Nagar Canal

Chapter 4

EXPERIMENTAL STUDY

Water sample is collected from the different areas and its tested for drinking purpose. The different parameters which are determined in this project are :

1. pH of water
2. Alkalinity and acidity of water
3. Dissolved oxygen(DO)
4. Electrical conductivity(EC) of water
5. Hardness of water
6. Total dissolved solids
7. Chloride concentration
8. Nitrates
9. Alum Jar

4.1 PH

4.1.1 INTRODUCTION

pH stands for hydrogen (H) potential and it represents the measure of concentration of H^+ ions in a solution. As a mathematical consequence of the formula that defines pH, the units on the pH scale range from 0 to 14. A value of 7 indicates neutrality, values less than 7 are called acidic, and values greater than 7 are called basic or alkaline. Values close to 0 to 14 represent extremes acidity and basic, respectively. In general, the pH of water for drinking purpose should be between 6.5 and 8.5.



Figure 4.1: PH meter

4.1.2 PROCEDURE

CALIBRATING THE INSTRUMENT

Using the buffer solutions calibrate the instrument.

Step 1: In a 100 ml beaker take pH 7.0 buffer solution and place it in a magnetic stirrer, insert the Teflon coated stirring bar and stir well. Now place the electrode in the beaker containing the stirred buffer and check for the reading in the pH meter. If the instrument is not showing pH value of 7.0, using the calibration knob adjust the reading to 7.0. Take the electrode from the buffer, wash it with distilled water and then wipe gently with soft tissue.

Step 2: In a 100 ml beaker take pH 4.0 buffer solution and place it in a magnetic stirrer, insert the Teflon coated stirring bar and stir well. Now place the electrode in the beaker containing the stirred buffer and check for the reading in the pH meter. If the instrument is not showing pH value of 4.0, using the slope knob adjust the reading to 4.0. Take the electrode from the buffer, wash it with distilled water and then wipe gently with soft tissue.

Step 3: In a 100 ml beaker take pH 9.2 buffer solution and place it in a magnetic stirrer, insert the Teflon coated stirring bar and stir well. Now place the electrode in the beaker containing the stirred buffer and check for the reading in the pH meter. If the instrument is not showing pH value of 9.2, using the slope knob adjust the reading to 9.2. Take the electrode from the buffer, wash it with distilled water and then wipe gently with soft tissue.

4.1.3 TESTING OF SAMPLE

1. In a clean dry 100 ml beaker take the water sample and place it on a magnetic stirrer, insert the Teflon coated stirring bar and stir well.
2. Now place the electrode in the beaker containing the water sample and check for the reading in the pH meter. Wait until you get a stable reading.
3. The pH of the given water sample is given.
4. Take the electrode from the water sample, wash it with distilled water and then wipe gently with soft tissue.

4.2 ALKALINITY

4.2.1 INTRODUCTION

Water alkalinity is a measure of the concentration of bases in a solution or the ability to neutralize acids in water. It can also be referred to as the buffering capacity of water. Examples of bases are carbonates, bicarbonates, magnesium bicarbonate, ammonia, borates, phosphates, silicates, and organic bases. For all practical purposes, carbonates and bicarbonates are the main contributors to the alkalinity of water. Since corrosion is caused by calcium carbonate, the corrosion process is dependent on the pH and alkalinity of water.



Figure 4.2: End point of alkalinity

4.2.2 PROCEDURE

Take 100 ml of sample in a conical flask. Add 3-4 drops of phenolphthalein indicator. If no color is produced, the phenolphthalein alkalinity is absent. If the sample turns pink, titrate with N/50 H_2SO_4 till the pink colour disappears. Record the ml of acid used (P). Add 1 drop of methyl orange to same sample to the titrated mixture and re titrate with N/50 H_2SO_4 until first change from yellow to orange colour is noted (T).

$$Alkalinity(mg/lit) = \frac{m * N * 50 * 1000}{vol.of sample}$$

Figure 4.3: Formula for alkalinity

4.3 ACIDITY

4.3.1 INTRODUCTION

The acidity of natural water is primarily due to dissolved CO₂ and is defined as the capacity to neutralize bases. However in water polluted by trade wastes acidity may be because of mineral acids (below pH 4). Acidity due to CO₂ is present within a pH range 4.5-8.3. When the pH of a Sample is more than 8.3, acidity is absent.

4.3.2 PROCEDURE

Place 100 ml water in a conical flask and add to it one drop of Methyl orange indicator. If it gives an orange-red colour, mineral acidity is present. Titrate it with N/50 NaOH to a yellow end point. Note the ml of N/50 NaOH used. In another flask place 100 ml water and add 0.5 ml phenolphthalein indicator. If it does not give any color, titrate with N/50 NaOH to light pink (first permanent change) end point. Note the ml of solution used. If Phenolphthalein gives a pink color on addition of the sample, acidity is not available.



Figure 4.4: End point of acidity

$$\text{Mineral Acidity (mg/lit)} = \frac{\text{ml of NaOH used in Methyl Orange} * 1000}{\text{Vol. of sample}}$$
$$\text{CO}_2 \text{ Acidity (mg/lit)} = \frac{\text{ml of NaOH used in Phenolphthalein} * 1000}{\text{Vol. of sample}}$$

4.5: formulae for acidity

4.4 DISSOLVED OXYGEN

4.4.1 INTRODUCTION

The term Dissolved Oxygen is used to describe the amount of oxygen dissolved in a unit volume of water. Dissolved oxygen (DO) is essential for the maintenance of healthy lakes and rivers. It is a measure of the ability of water to sustain aquatic life. The dissolved oxygen content of water is influenced by the source, raw water temperature, treatment and chemical or biological processes taking place in the distribution system.

The presence of oxygen in water is a good sign. Depletion of dissolved oxygen in water supplies can encourage the microbial reduction of nitrate to nitrite and sulfate to sulfide. It can also cause an increase in the concentration of ferrous iron in solution, with subsequent discoloration at the tap when the water is aerated. In a healthy body of water such as a lake, river, or stream, the dissolved oxygen is about 8 parts per million.

The minimum DO level of 4 to 5 mg/L or ppm is desirable for survival of aquatic life. The wastes serve as the food for certain aerobic bacteria. As it moves downstream, the concentration of bacteria increases. Because these bacteria remove oxygen from water, their population increase causes a decline in the amount of DO. Beyond certain point, most of the wastes break down. The concentration of DO rises as the river recovers oxygen from the atmosphere and aquatic plants. Thus DO test is the basis for BOD test which is an important parameter to evaluate organic pollution potential of a waste.

4.4.2 PROCEDURE

1. Take 300 ml glass stoppered BOD bottle and fill it with sample to be tested. Avoid any kind of bubbling and trapping of air bubbles.
2. Take the sample collected from the field. It should be collected in BOD bottle filled up to rim.
3. Add 2 ml of manganese sulfate to the BOD bottle by inserting the calibrated pipette just below the surface of the liquid.
4. Add 2 ml of alkali-iodide-azide reagent in the same manner.
5. If oxygen is present, a brownish-orange cloud of precipitate or flocc will appear.
6. Allow it to settle for sufficient time then add 2 ml of concentrated sulfuric acid via a pipette held just above the surface of the sample.
7. At this point, the sample is "fixed" and can be stored for up to 30 minutes if kept in a cool, dark place.
8. Rinse the burette with sodium thiosulphate and then it with sodium thiosulphate. Fix the burette to the stand.

9. Measure out 203 ml of the solution from the bottle and transfer to an conical ask.
10. Titrate it against sodium thiosulphate using starch as indicator (add 3-4 drops of starch indicator solution).
11. End point of the titration is first disappearance of blue color to colorless.
12. Note down the volume of sodium thiosulphate solution used.



Figure 4.6: DO

$$DO(mg/lit) = Vol.of\ Sodiumthiosulphate * \frac{1000}{vol.of\ sampleused}$$

4.7: Formulae for DO

4.5 ELECTRICAL CONDUCTIVITY

4.5.1 INTRODUCTION

This method is used to measure the conductance generated by various ions in the solution/water. Rough estimation of dissolved ionic contents of water sample can be made by multiplying specific conductance (in S/cm) by an empirical factor which may vary from 0.55 to 0.90 depending on the soluble components of water and on the temperature of measurement. Conductivity measurement gives rapid and practical estimate of the variations in the dissolved mineral contents of a water body.



Figure 4.8: Conductivity meter

4.5.2 PROCEDURE

1. Switch ON the instrument half an hour before the conduction of experiment. Electrode probe is to be washed with Distilled water and do not dip in any solution.
2. Press ENTER for getting SELECTION MODE select mode as (EC) using different keys up or down arrow and press ENTER.
3. Enter Cell constant value as 1.00 (Press ESC key, if cell of different cell constant say 0.5., is being used and enter the cell constant value) and press Enter.
4. If automatic temperature meant is desired and thermo probe is not connected in which case connect it and press Enter key to get temperature.
5. If the temperature is desired to be entered manually, press ESC key and enter temperature.
6. If the actual temperature is not what is displayed as default, measure the temperature with a thermometer, press ESC key and enter the temperature.
7. Keep the sample-filled-container near the cell/probe stand and lower the holding clamp to dip the sensor part of the cell in the sample. Insert thermoprobe also into the sample. Press ENTER key and it display cell constant value as 1.00 and then dip the cell in the sample and press Enter. There temperature and EC values are displayed.

4.6 HARDNESS OF WATER BY EDTA METHOD

4.6.1 INTRODUCTION

1. Hardness is caused due to the presence of multivalent cations, mainly Ca^{+2} and Mg^{+2} in water.
2. Hard water has many disadvantages: capacity to precipitate soap. Thus measurement of water hardness is very necessary.
3. Total hardness of water is the sum of Ca^{+2} and Mg^{+2} concentration of water. The results are expressed as calcium carbonate, in mg/L, that is, "mg/L as CaCO_3 ".
4. When total hardness is numerically greater than the sum of carbonate and bicarbonate alkalinity for a water sample, the amount of hardness equivalent to the carbonate plus bicarbonate alkalinity is called "carbonate hardness". The amount of hardness in excess of this is called "non carbonate hardness". When hardness numerically is equal to or less than the sum of carbonate and bicarbonate alkalinity, all hardness is carbonate hardness, and non carbonate hardness is absent.

4.6.2 PROCEDURE

TOTAL HARDNESS DETERMINATION

1. Take 50 ml well mixed sample in conical flask.
2. Add 1-2 ml buffer solution of ammonia.
3. To each aliquot add a pinch of Eriochrome Black-T powder (indicator) or 2 drops of Eriochrome Black-T. The aliquots are wine-red in colour.
4. Titrate each aliquot using the standard EDTA (0.01M) solution (in burette).
5. Note down the volume of EDTA required (A).
6. Run a reagent blank if buffer is not checked properly. Note the volume of EDTA required for blank (B).
7. Calculate the volume of EDTA required for sample i.e., (A-B).
8. Value B may be taken as 0, if double distilled water and "A.R." grade chemicals are used.

CALCIUM HARDNESS DETERMINATION

1. Take a 50 ml of sample in conical flask.
2. Add 1 ml NaOH to raise pH to about 12.0.
3. Add a pinch of ammonium purpurate (murexide) powder (indicator).
4. Titrate using the standard EDTA solution (in burette) until colour change occurs from pink to purple.

5. Note the volume of EDTA used (C).



Figure 4.9: End point of hardness

$$\text{Total hardness (mg/lit) as CaCO}_3 = \frac{\text{Vol. of sample used (A - B)} * 1000}{\text{ml of sample taken}}$$

$$\text{Calcium hardness (mg/lit) as CaCO}_3 = \frac{\text{Vol. of sample used (EDTA)} * 1000}{\text{ml of sample taken}}$$

4.10: Hardness formulae

4.7 TOTAL DISSOLVED SOLIDS

4.7.1 INTRODUCTION

The term solid refers to matter either filterable or non-filterable that residue upon evaporation and subsequent drying at a defined temperature. Further categorization depends upon the temperature employed for drying and ignition. Different forms of solids are defined on the basis of method applied for their determination. Solids may affect water or effluent quality adversely in number of ways. Water with high dissolved solids may induce an unfavourable physiological reaction in the transient consumer and generally are of inferior palatability. Highly mineralized water are unsuitable for many industrial applications. High suspended solids in waters may be aesthetically unsatisfactory for such purposes as bathing. Analysis of total solids is important to decide upon the various unit operations and processes in physical and biological waste water treatment and to assess its performance evaluation. For assessing compliance with regulatory agency, waste water effluent Limitation for various forms of solid act as indicating parameters.

4.7.2 PROCEDURE

1. Switch ON the instrument half an hour before the conduction of experiment.
2. Electrode/probe is to be washed with Distilled water and do not dip in any solution.
3. Press ENTER for getting SELECTION MODE select mode as(TDS) using different keys up or down arrow and press ENTER.
4. Enter TDS Factor as 0.50. (Press ESC if it is desired to enter a different TDS Factor say 0.56.,) and press Enter.
5. Enter Cell constant value as 1.00. (Press ESC key, if cell of different cell constant say 0.5., is being used and enter the cell constant value) and press Enter.
6. If automatic temperature meant is desired and thermo probe is not connected in which case connect it and press Enter key to get temperature.
7. If the temperature is desired to be entered manually, press ESC key and enter temperature.
8. If the actual temperature is not what is displayed as default, measure the temperature with a thermometer, press ESC key and enter the temperature.
9. Keep the sample-filled-container near the cell/probe stand and lower the holding clamp to dip the sensor part of the cell in the sample. Insert thermoprobe also into the sample. Press ENTER key and it display cell constant value as 1.00 and then dip the cell in the sample and press Enter. There temperature and TDS values are displayed.



Figure 4.11: Conductivity meter

4.8 CHLORIDE CONCENTRATION

4.8.1 INTRODUCTION

Chlorides are widely distributed as salts of calcium, sodium and potassium in water . In potable water, the salty taste produced by chloride concentrations is variable and dependent on the chemical composition of water.

The major taste producing salts in water are sodium chloride and calcium chloride. The salty taste is due to chloride anions and associated cations in water. In some water which is having only 250 mg/L of chloride may have a detectable salty taste if the cat-ion present in the water is sodium. On the other hand, a typical salty taste may be absent even if the water is having very high chloride concentration for example 1000 mg/L. This is because the predominant cation present in the water is not sodium but either calcium or magnesium may be present.

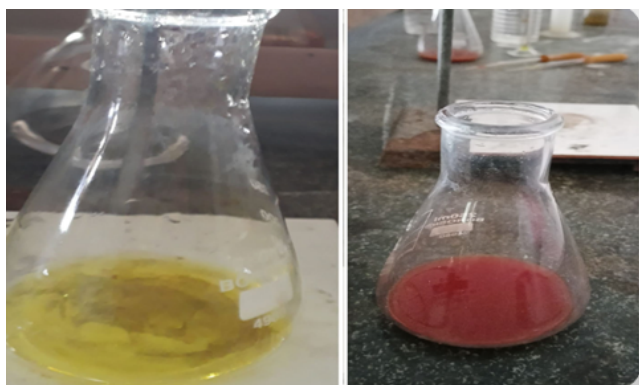


Figure 4.12: End point of chlorides

4.8.2 PROCEDURE

1. Before starting the titration rinse the burette with silver nitrate solution. Fill the burette with silver nitrate solution of 0.0141 N. Adjust to zero and fix the burette in stand.
2. Take 20 mL of the sample in a clean 250 mL conical flask. Add 1 mL of Potassium Chromate indicator to get light yellow color.
3. Titrate the sample against silver nitrate solution until the color changes from yellow to brick red. i.e., the end point.
4. Note the volume of Silver nitrate added (A).
5. Repeat the procedure for concordant values.

BLANK TITRATION

1. Take 20 mL of the distilled water in a clean 250 mL conical flask.

2. Add 1 mL of Potassium Chromate indicator to get light yellow color.
3. Titrate the sample against silver nitrate solution until the color changes from yellow to brick red. i.e., the end point.
4. Note the volume of silver nitrate added for distilled water (B).

$$\text{Chloride (mg/lit)} = \frac{(\text{vol.sample}(V_s) - \text{Vol.of Blank}(V_b)) * N * 35.45 * 1000}{\text{Vol.of Sample used}}$$

4.13: TDS formula

4.9 NITRATES

4.9.1 INTRODUCTION

Determination of nitrate (NO₃⁻) is difficult because of the relatively complex procedure required, the high probability that interfering constituents will be present and the limited concentration ranges of the various techniques. Nitrate is the most highly oxidised form of nitrogen compounds commonly present in natural waters. Significant sources of nitrate are chemical fertilizers, decayed vegetable and animal matter, domestic effluents, sewage sludge disposal to land, industrial discharge, and leachates from refuse dumps and atmospheric washout.

Depending on the situation, these sources can contaminate streams, rivers, lakes and ground water. Unpolluted natural water contains minute amounts of nitrate. Excessive concentration in drinking water is considered hazardous for infants because of its reduction to nitrite in intestinal track causing methemoglobinaemia. In surface water, nitrate is a nutrient taken up by plants and converted into cell protein. The growth stimulation of plants, especially of algae may cause objectionable eutrophication.

4.9.2 PROCEDURE

1. Switch on the instrument and wait for 10-15 minutes.
2. Select the source as " UV" (or) "VIS" depending on sample Clear water (colour less) - UV Waste water (colour) -VIS.
3. Depending on sample press the source button such that the light makes visible on the source.

4. Select 6th filter " DARK" then close door.
5. Press the "
6. Again wait for 10-15 minutes 7. Set Zero (000) using " SETZERO" knob.
8. Select wave length by pressing "CLEAR" and then enter wave length of 220(nm) 9. Take blank water sample (distilled water) and keep in 1st hole and select 1st filter (desirable) by taking the filter wheel and close the door.
10. Set the "COARSE "knob to very high.
11. By rotating the "FINE" knob clockwise set to 100
12. Press "ABS" (absorbance) button.
13. Again using the "FINE" knob set to zero (000)
14. Place the sample in the 4th filter hole and note the reading.



Figure 4.14: Spectrophotometer

4.10 ALUM JAR

4.10.1 PROCEDURE

1. Take 1.0 litre of the sample into each of the 6 beakers.
2. Add varying doses of alum solution i.e. 0 ml, 1.0 ml, 2 ml, 3 ml, 4 ml or 6 ml to different beakers simultaneously. One beaker is kept as blank in which no alum is added. These doses correspond to alum doses of 0mg/l, 10 mg/l, 20 mg/l, 30mg/l, 4.mg/l and 60mg/l respectively. The dosage varies with the turbidity of water.

3. Switch on the motor and adjust the speed of paddles to about 100 rpm so that rapid mixing of coagulant is done. Because of flash mixing, the positively charged Aluminium ions will combine with the negatively charged turbidity impurities. Flash mixing (or rapid mixing) is done for 1 to 2 minutes.
4. Reduce the speed of paddles to about 30 to 40 rpm and continue mixing for 10 to 15 minutes. This corresponds to flocculation during which the particles already combined during coagulation combine to form much larger sized agglomerations of floc.
5. Switch off the motor and allow it to settle for 15 to 20 minutes. This corresponds to sediment and find the turbidity of each.
6. Collect the supernatant from each beaker with the help of a pipette without disturbing the sedimentation and find the turbidity of each.
7. Also record pH. Colour, alkalinity and temperature of the supernatant as optimum coagulant dose depend on turbidity of raw water, pH, alkalinity and temperature. Minimum alkalinity required for every 10 mg/l dosage of alum is 4.5 mg/l as CaCO_3 . Deficiency must be supplemented with lime if the water has alkalinity. Repeat the experiment at different pH values of the samples and at different doses of alum and find the optimum coagulant dose by measuring the turbidity in each case with the help of a nephelo meter or any other turbidity meter. Note the ideal (or optimum) coagulant dose that corresponds to efficient and economical removal turbidity from water.



Figure 4.15: Jar test

Chapter 5

RESULTS AND DISCUSSION

The results obtained through various test conducted on surface water are presented in Table. From the table, it is clearly observed that the comparison between drinking water and river water with the standard range as per IS 10500:2012

Table 5.1: Different parameters before and after treatments of kundu river

S.NO	Parameters	Drinking water values	River water values	Drinking Standards	Agricultural standards
1	PH	6.56	7.78	6.5-8.5	6.5-8.4
2	Alkalinity	150 mg/l	270 mg/l	< 200 mg/l	> 200 mg/l
3	Acidity	20 mg/l	10 mg/l	0 mg/l	>50 mg/l
4	Electrical conductivity	84.86 μ s @33.1°C	490.9 μ s @31.9°C	< 800 μ s	< 800 μ s
5	Total dissolved solid	47.42 PPM @34.9°C	269.3 ppm@31.4°C	<500 PPM	< 2000 PPM
6	Chloride Concentration	2.99 mg/l	44.98 mg/l	< 250 mg/l	< 150 mg/l
7	Dissolved Oxygen	2.2 mg/l	3.5 mg/l	6.5–8.5 mg/l	>8 mg/l
8	Nitrates	6.06 mg/l	1.221 mg/l	<45 mg/l	50-150 mg/l
9	Total Hardness Calcium Hardness Magnesium hardness	Absent	170 mg/l 150 mg/l 20 mg/l	<300 mg/l < 75mg/l < 30mg/l	>300 mg/l < 400mg/l < 60mg/l
10	Alum Jar	PH,Alkalinity	PH,Alkalinity		
	1 ml	6.57 ,22 mg/l	7.27 , 240 mg/l	6.5-8.5 < 200 mg/l	6.5-8.4 >200 mg/l
	3 ml	6.22,17 mg/l	7.13,220 mg/l		
	5 ml	5.52,11 mg/l	6.92,220 mg/l		

- From the table **5.1** it shows that the pH value is greater than 7 so it indicates that basic in nature.
2. For Alkalinity it shows that river water is not suitable for drinking.
 3. For dissolved oxygen it shows that it is not fit for drinking as well as agricultural purpose we need to increase dissolved oxygen by using supplementing wind and wave action.
 4. For nitrates it is not with in the agricultural purpose we need to be increase.

Table 5.2: Different parameters before and after treatments of Athmakuru cheruvu katta

S.NO	Parameters	Drinking water values	River water values	Drinking Standards	Agricultural standards
1	PH	6.56	7.83	6.5-8.5	6.5-8.4
2	Alkalinity	150 mg/l	265 mg/l	< 200mg/l	> 200mg/l
3	Acidity	20 mg/l	10 mg/l	0 mg/l	>50 mg/l
4	Electrical conductivity	84.86 μ s @33.1°C	585.8 μ s @31.9°C	<800 μ s	< 800 μ s
5	Total dissolved solid	47.42 PPM @34.9°C	322.5 ppm@31.4°C	<500 PPM	< 2000 PPM
6	Chloride Concentration	2.99 mg/l	89.92mg/l	< 250 mg/l	< 150 mg/l
7	Dissolved Oxygen	2.2 mg/l	4.23 mg/l	6.5–8.5 mg/l	>8 mg/l
8	Nitrates	6.06 mg/l	1.289 mg/l	<45 mg/l	50-150 mg/l
9	Total Hardness Calcium Hardness Magnesium hardness	Absent	160 mg/l 134 mg/l 26 mg/l	<300 mg/l < 75 mg/l < 30 mg/l	>300 mg/l < 400 mg/l < 60 mg/l
10	Alum Jar	PH,Alkalinity	PH,Alkalinity		
	1 ml	6.57 ,22 mg/l	7.32 , 255 mg/l	6.5-8.5 < 200 mg/l	6.5-8.4 >200 mg/l
	3 ml	6.22,17 mg/l	7.12,210 mg/l		
	5 ml	5.52,11 mg/l	6.94,190 mg/l		

- From the table **5.2** it shows that the pH value is greater than 7 so it indicates that basic in nature.
2. For Alkalinity it shows that river water is not suitable for drinking.
 3. For dissolved oxygen it shows that it is not fit for drinking as well as agricultural purpose we need to increase dissolved oxygen by using supplementing wind and wave action.
 4. For nitrates it is not with in the agricultural purpose we need to be increase.

Table 5.3: Different parameters before and after treatments of KC canal

S.NO	Parameters	Drinking water values	River water values	Drinking Standards	Agricultural standards
1	PH	6.56	7.265	6.5-8.5	6.5-8.4
2	Alkalinity	150 mg/l	265 mg/l	<200 mg/l	> 200 mg/l
3	Acidity	20 mg/l	10 mg/l	0 mg/l	> 50 mg/l
4	Electrical conductivity	84.86 μ s @33.1°C	508.5 μ s @28.4°C	< 800 μ s	< 800 μ s
5	Total dissolved solid	47.42 PPM @34.9°C	264.5 ppm@28.5°C	<500 PPM	< 2000 PPM
6	Chloride Concentration	2.99 mg/l	79.95mg/l	< 250 mg/l	< 150 mg/l
7	Dissolved Oxygen	2.2 mg/l	3.103 mg/l	6.5–8.5 mg/l	> 8 mg/l
8	Nitrates	6.06 mg/l	8.36 mg/l	< 45 mg/l	50-150 mg/l
9	Total Hardness Calcium Hardness Magnesium hardness	Absent	113 mg/l 100 mg/l 13 mg/l	< 300mg/l < 75mg/l < 30mg/l	> 300mg/l < 400mg/l < 60mg/l
10	Alum Jar	PH,Alkalinity	PH,Alkalinity		
	1 ml	6.57 ,225 mg/l	7.73 , 255 mg/l	6.5-8.5 < 200mg/l	6.5-8.4 > 200mg/l
	3 ml	6.22,240 mg/l	7.37,240 mg/l		
	5 ml	5.52,220 mg/l	6.9,220 mg/l		

From the table **5.3** it shows that the pH value is greater than 7 so it indicates that basic in nature.

2. For Alkalinity it shows that river water is not suitable for drinking.

3. For dissolved oxygen it shows that it is not fit for drinking as well as agricultural purpose we need to increase dissolved oxygen by using supplementing wind and wave action.

4. For nitrates it is not with in the agricultural purpose we need to be increase.

Table 5.4: Different parameters before and after treatments of Rythu nagar canal

S.NO	Parameters	Drinking water values	River water values	Drinking Standards	Agricultural standards
1	PH	6.56	7.9	6.5-8.5	6.5-8.4
2	Alkalinity	150 mg/l	295 mg/l	< 200 mg/l	> 200 mg/l
3	Acidity	20 mg/l	30 mg/l	0 mg/l	> 50 mg/l
4	Electrical conductivity	84.86 μ s @33.1°C	581.5 μ s @28.4°C	< 800 μ s	< 800 μ s
5	Total dissolved solid	47.42 PPM @34.9°C	319.25 ppm@28.5°C	<500 PPM	<2000 PPM
6	Chloride Concentration	2.99 mg/l	84.975mg/l	< 250mg/l	< 150 mg/l
7	Dissolved Oxygen	2.2 mg/l	3.7 mg/l	6.5–8.5 mg/l	>8 mg/l
8	Nitrates	6.06 mg/l	7.78 mg/l	< 45mg/l	50-150 mg/l
9	Total Hardness Calcium Hardness Magnesium hardness	Absent	139 mg/l 115 mg/l 24 mg/l	< 300mg/l < 75mg/l < 30mg/l	> 300mg/l < 400mg/l < 60mg/l
10	Alum Jar	PH,Alkalinity	PH,Alkalinity		
	1 ml	6.57 ,225 mg/l	7.98 , 300 mg/l	6.5-8.5 < 200mg/l	6.5-8.4 > 200mg/l
	3 ml	6.22,240 mg/l	7.33,290 mg/l		
	5 ml	5.52,220 mg/l	6.51,270 mg/l		

From the table 5.4 it shows that the pH value is greater than 7 so it indicates that basic in nature.

2. For Alkalinity it shows that river water is not suitable for drinking.

3. For dissolved oxygen it shows that it is not fit for drinking as well as agricultural purpose we need to increase dissolved oxygen by using supplementing wind and wave action.

4. For nitrates it is not with in the agricultural purpose we need to be increase.

Chapter 6

CONCLUSION

After conducting the tests on different locations we noticed that:

1. Compared to all the locations of PH values is more in Raithu nagar canal(7.9) and less in KC canal(7.265)
2. All the parameters like PH,TDS,Total hardness are in within the limits in all locations.
3. Dissolved oxygen is not within the limits in all locations.
4. The Total hardness is more in Kundu river(170 mg/l) and less in KC canal(113 mg/l).
5. Nitrates value is more in KC canal (8.36 mg/l) and less in kundu river(1.221 mg/k).

The dissolved oxygen content is not within the limits as per Indian standard(IS:10500-2012)the standard value of dissolved oxygen is 6.5-8.5 mg/l for drinking purpose and greater than 8.5 mg/l for agricultural purpose, but for our all locations it is less than standard value so we need to be increase dissolved oxygen by using supplementing wind and wave action.

REFERENCES

1. Robert Damo, Pirro Icka(2013),”Evaluation of Water Quality Index for Drinking Water” ,Article in Polish Journal of Environmental Studies ,volume:22.
2. Rachna Bhateria¹ , Disha Jain(2016)”,Water quality assessment of lake water” ,Sustain. Water Resour. Management.
3. Shaik.Fazlur Rahman, Dr.M.Umamahesh(2018),”A QUALITY ASSESSMENT OF POTABLE WATER IN NANDYAL, KURNOOL DISTRICT(A.P)” ,volume:5,issue:4.
4. Ammar Tiria, Lazhar Belkhiria, Lotfi Mouni(2018)”Evaluation of surface water quality for drinking purposes using fuzzy inference system” ,Groundwater for Sustainable Development 6 (2018)235-244.
5. C. R. RAMAKRISHNAIAH,C. SADASHIVAIAH and G. RANGANNA(2019),”Assessment of Water Quality Index for the Groundwater in Tumkur Taluk, Karnataka State, India” ,E-Journal of Chemistry.
6. P Payment, M Waite, A Dufour(2020).”Introducing parameters for the assessment of drinking water quality” ,USEPA.
7. Vinod suman (2021)”Correlation of various water quality parameters and water quality index of districts of Uttarakhand” ,volume 9.
8. BIS (Bureau of Indian Standards) 10500, Indian Standard Drinking water specification, First revision, 1991.
9. WHO (World Health Organisation) Guidelines for drinking water quality, 2nd Ed.,1993, Vol 1.
10. BIS 10500:2012, Indian Standard for drinking water-specification IS 10500:2012, <https://cpcb.nic.in>, retrieved on 11 November 2021.