

Physico-Chemical Analysis of Ground Water Samples

D.Swapna¹, Ch. Nageswara Rao², A.Vasudevarao³

^{1,2,3} Dept of Chemistry

^{1,2} Dadi Institute of Engineering & Technology, Anakapalli, Visakhapatnam, Andhrapradesh.

³ A.M.A.L College, Anakapalli, Visakhapatnam, Andhrapradesh.

Abstract- Generally the ground water is contaminated due to human and industrial activities. This is the serious problem in now a day. Thus the analysis of the water quality is very important to preserve and prefect the natural eco system. The assessment of the ground water quality was carried out in the different stations of Anakapalli City, Visakhapatnam. The ground water samples of all the selected stations from the wards were collected for a physiochemical analysis. In Physico-chemical analysis the measured quality parameters are pH, temperature, total dissolved solids (TDS), total hardness, electrical conductivity, calcium, magnesium, chloride and alkalinity. The obtained results are compared with Indian Standard Drinking Water specification IS: 10500-2012. The study of physico-chemical characteristics of this ground water samples suggests that the evaluation of water quality parameters as well as water quality management practices should be carried out periodically to protect the water resources.

Keywords- Water samples, physico-chemical analysis and IS: 10500-2012.

I. INTRODUCTION

Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life¹. Groundwater is used for domestic and industrial water supply and also for irrigation purposes in all over the world. In the last few decades, there has been a tremendous increase in the demand for fresh water due to rapid growth of population and the accelerated pace of industrialization. According to WHO organization, about 80% of all the diseases in human beings are caused by water². Once the groundwater is contaminated, its quality cannot be restored back easily and to device ways and means to protect it. The greater part of the soluble constituents in ground water comes from soluble minerals in soils and sedimentary rocks. The quality of water is of vital concern for the mankind since it is directly linked with human welfare. It is a matter of history that facial pollution of drinking water caused water-borne diseases which wiped out entire population of the studied area³. The present work is an attempt to measure the water quality of some stations in Anakapalli city, Visakha district, Andhrapradesh, India.

II. EXPERIMENTAL

Materials

During water quality investigation, the selection of sampling points is more important than actual chemical analysis of water. A successful sampling program entails the selection of sampling points in line with objective of the study. Since various natural and man-made factors are responsible for water pollution. Therefore, there is no general rule that governs the selection of sampling sites. For the purpose of water quality estimation, the selection of sampling sites require, on a prior basis, extensive investigation and field survey of such factors/sources, such as waste discharges, natural and man-made pollutants, chemical treatments, underground water resources, agro wastes, seasonal variations, surface runoff, geographic weathering, etc. In addition, full information on population density around a given water source and behavioural aspects of people is also required. For this purpose, all different locations/sampling sites were outlined and samples were collected. The samples were collected in polythene bottle of 1.5 L capacity. Before sampling, the bottles were washed thoroughly with the detergent, acid (1: 1 HNO₃ and H₂O by v/v) tap water, and then distilled water. Chemical parameters were determined by using standard methods immediately after taking them into the laboratory. Usual preservative methods⁵ were used to preserve the samples. The samples were analyzed as soon as it was possible. A total of four water samples were collected. The sources and locations of samples are given in Table 1.

Table 1: Sampling Stations in Anakapalli City, Visakhapatnam District.

Sample No.	Name of the Sampling Station
Sample No. 1	B.R.T Colony
Sample No. 2	A.M.A.L College junction
Sample No. 3	Sai Colony
Sample No. 4	Anakapalli municipal Water

Methods

pH and Temperature: Measurement of pH and temperature of all the water samples was measured at the time of collection

by using portable battery operated pH meter. The calibration was carried out with two standard buffer solution of pH 4.0 and 7.0. The pH of the sample should lie between these values. The sample temperature is determined at the same time. The reading is taken after the indicated value remains constant for about 1 min. After each measurement, the electrode of the pH meter was washed with distilled water and was cleaned with tissue paper.

Total dissolved solids: Solids refer to matter suspended or dissolved in water or wastewater. Solids may affect water or effluent quality adversely in a number of ways. Waters with high dissolved solids generally are of inferior palatability and may lack an unfavourable physiological reaction in the transient consumer. For this reason, there is a limit of 500 mg for some organic substances and dissolved gases. The total dissolved solids (TDS) of the samples was measured using pre-calibrated conductivity meter model **Zeal tech**. Before measurement, the beaker and electrode must be washed several times with the solution under test. The measurement was taken at room temperature. The samples were transferred into beaker in specific volume to dip the electrode, after which the button was pressed and the scale was set before the TDS of each sample was noted.

Electrical conductivity: The conductivity of the samples was measured using pre-calibrated conductivity meter **Zeal tech**. Before measurement, the beaker and electrode must be washed several times with the solution under test. The measurement was taken at room temperature. The samples were transferred into beaker in enough volume to dip the electrode, after which the button was pressed and the scale was set before the conductivity of each sample was then noted.

Total hardness: 1 ml of hardness buffer solution was added to 50 ml of water sample followed by the addition of 1 to 2 drops of indicator. Then, this solution is titrated against versenate solution (EDTA solution) from burette, end point reddish to blue colour. Total hardness is calculated by the following formula: Total hardness = [Versenate solution (ml) × MI of sample (mg/L)] 1000

Alkalinity: Alkalinity is the measure of hydroxide and carbonate ion content of water sample. Water sample is titrated with standard H₂SO₄ using indicator. Pink colour of solution changes to colourless. This is the indication of end point.

Chlorides: This test is for the determination of chloride ions. A solution of potassium chromate is used as indicator. Chlorides are precipitated as brick red in the solution because

silver ion reacts with chloride ion forming brick red precipitate of AgCl, end point is the brick red coloration.

III. RESULTS AND DISCUSSION

Temperature

The temperature of the water samples was taken at the spot in December 2017. Among the samples taken from the different places ranges from 25 to 27°C, while the average temperature of water of Anakapalli city, Visakha district was found to be 25°C.

Ph

The pH value of water samples taken from the different stations of Anakapalli city, Visakha district ranges from 8.80 to 8.95 was slightly alkaline (Table 1, Figure 2). The standard of water quality on pH base lies in the range of 6.5 to 8.5. These studies show that water samples exceed the limits set by IS: 10500-2012⁶ (Table 2).

Total dissolved solids (TDS): Maximum TDS of ground water found in Anakapalli city, Visakha district having the value of 664 mg/l while the minimum TDS value was found to be 198 mg/l in Anakapalli city. The result showed that the drinking water of Anakapalli city, Visakha district is fit for drinking in terms of TDS.

Conductivity: The results reflect that the mean conductivity of drinking water samples of the ground water is found to be 0.0275 S. The maximum value of the conductivity is 2.56 mS. The minimum conductivity value is 1.25 mS. The obtained values after the analysis are in between IS: 10500-2012.

Total hardness

The minimum value of Total hardness is 200 mg/L found in Anakapalli city, Visakha district and maximum value of Total hardness is 810 mg/L. The results obtained after analysis some samples have greater than the permissible limits set by IS: 10500-2012.

Calcium

The minimum value of calcium hardness is 120 mg/L found in Anakapalli city, Visakha district and maximum value of calcium hardness is 400 mg/L. The results obtained after analysis some samples have greater than the permissible limits set by IS: 10500-2012.

Magnesium

The minimum value of magnesium is 80 mg/L found in Anakapalli city, Visakha district and maximum value of magnesium is 410 mg/L. The results obtained after analysis some samples have greater than the permissible limits set by IS: 10500-2012.

Chlorides

The minimum value of chloride is 120 mg/L found in well wall of Anakapalli city, Visakha district and maximum value of chloride is 470 mg/L. The results obtained after analysis when compared with the standard values of chlorides are found to be less than the permissible limits set by IS: 10500-2012.

Alkalinity

The alkalinity range set by IS: 10500-2012 is 200 - 600 mg/L. The minimum alkalinity found in Anakapalli city, Visakha district water sample was 350 mg/L. The maximum range of alkalinity is 425mg/L. The results obtained after analysis when compared with the standard values of chlorides are found to be less than the permissible limits set by IS: 10500-2012.

Table 2: Primary Physico-Chemical parameters of drinking water samples

Parameter	Indian Standards 10500:2012		Sample-1	Sample-2	Sample-3	Sample-4
	Desirable limits mg/l	Permissible limits mg/l				
pH	6.5-8.5	No relaxation	8.85	8.45	8.95	8.25
Temperature	---	---	25	26	26	25
Conductivity	0.005S	0.05S	1.614 mS	1.85 mS	2.56 mS	1.25 mS
Total Dissolved Solids(TDS)	500	2000	181	150	664	198
Calcium(mg/L)	75	200	120	200	400	120
Magnesium(mg/L)	30	300	230	375	410	80
Total Hardness(mg/L)	200	600	350	575	810	200
Chloride(mg/L)	250	1000	82	220	470	450
Alkalinity(mg/L)	200	600	800	425	345	700

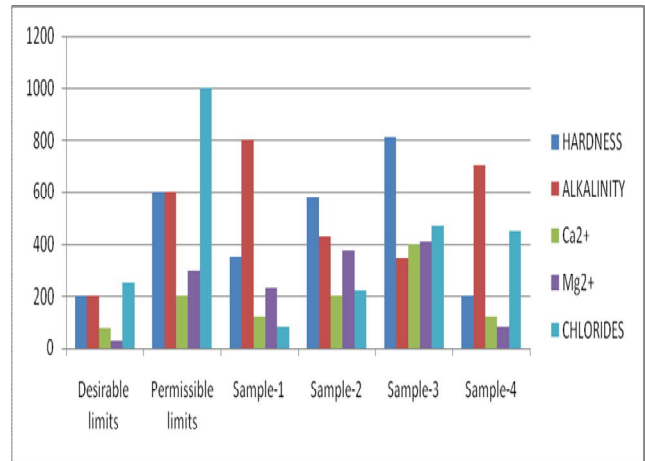


Figure 1: Comparison of parameters with IS-10500-2012

IV. CONCLUSION

The results of the present research work show that drinking water collected from various stations in Anakapalli city, Visakha district was found to be suitable to human health after done the some treatment to reduce the amounts of some parameters.

REFERENCES

- [1] S.P. Gorde and M.V. Jadhav, Assessment of Water Quality Parameters: A Review, Journal of Engineering Research and Applications. 2013; 3(6):2029-2035.
- [2] R. Kavitha and K. Elangovan, Review article on Ground water quality characteristics at Erode district, (India), of I.J.E.S.(2010); 1(2):145-150.
- [3] S. S. Yadav, Rajesh kumar. Assessment of physico-chemical status of ground water taken from four blocks (suar, milak, bilaspur, shahabad) of rampur district, uttar pradesh, india. R J.Chem. 2010; 3(3): 589-596.
- [4] K. Karunakaran, P. Thamilarasu and R. Sharmila, Statistical study on physicochemical characteristics of groundwater in and around Namakkal, Tamilnadu, India. e-j. Chem. 009; 6(3): 909-914.
- [5] R.K Trivedy and P.K. Goel, Chemical and biological methods for water pollution studies, Environmental publication, karad, maharashtra kaushik, 1986.
- [6] Indian standard drinking water - specification (second revision): Bureau of Indian Standards, New Delhi, 2012.