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POLLUTION ANALYSIS OF WATER IN LIME INDUSTRY AREA

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ABSTRACT

Now a days, in the present scenario, dissolved environmental pollutants in water resources are responsible for many types of water borne and water related diseases like jaundice, diarrhea, malaria, neurological disorders, bone structure disorder, fluorosis etc. Millions of people and children are being killed every year due to water pollution problem in the world. Increasing demand of fossil fuel such as coal, petroleum oil and natural gas may be responsible for huge environmental and water pollution problems. Availability of fresh water for human needs would be very less in near future due to poor utilization of groundwater resources. So water samples were collected from well, bore well, hand pump and tap from eight different places covering the total Rajur (Tah. Wani) area. The samples were collected for winter season. The physical parameters like temperature, tubricity, TDS and chemical parameters like E.C., pH, DO, BOD, COD alkalinity, Hardness, Fe, Mg, Zn, So_4^-, PO_3^-, NO_3^-, Cl^-, F^- were measured. The data obtained was compared with that of WHO and IS-10500.

Key words: BOD, COD, Pollution.

INTRODUCTION

Over population, worst environment conditions and lower energy efficiency of conventional processes are responsible for human health effects. Higher energy efficiency of the electrical gadgets and industrial machines can help very well to reduce water consumption and environmental pollution problem. Lower energy efficiency of many conventional technologies gives many types of environmental polluting substances like gases, heavy metals, chemicals etc. Industrial activities, transportation, modernization, inefficient power utilization and increasing demand of fossil fuel energy such as coal, petroleum oil and natural gas are also main contributors of many types of environmental pollutants like fly ash, hot water, liquid waste, chemical waste, heavy metals, gases, slug, smoke etc.

Mining for precious metals, coal, and other commodities forms an important part of economics of many countries. Developing countries, for example Brazil, China, India and Peru, contribute a large proportion of the worlds mining products, mining activities affect health via water through the method of extraction, contamination of local water sources as well as having harmful effects on the environment such as beach erosion from sand mining.

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Rajur is about 7 kms towards North-East of Wani. It is famous worldwide for the lime it produces, infact it is one of the biggest lime producers in India. Large number of (about 56) lime industries are situated in Rajur. There are three coal mines out of which currently only the mine at Bhandewada is producing coal. A large quantity of water is pumped from the mine into the nearby rivers and nallahs. The lime stone required for the lime industries is brought from nearby areas like Narsala, Dahegaon, Dongargaon, Gaurala etc. Recently near Rajur a number of coal washeries are also set up which are draining a large amount of ground water and after washing the coal adding to the pollution of water.

Recently P. R. Patel and S. R. Warhate have studied the quality of water in Wani and Kolera (Pimpri) area and tried to find out the impact of minining on the different parameters of water. But no such attempt is made for investigation in Rajur area.

EXPERIMENTAL

Methodology

Water samples were collected in clean and dry polyethene bottles of one liter capacity. We have collected eight samples from different places in Rajur and also from different sources like bore well, open well, hand pump and tap water. To study the seasonal effect if any on the quality of water, we have collected the samples in summer and winter seasons. All the water samples, after measuring temperature on spot, were immediately transported to the laboratory for analysis and stored in cool place away from light.

In the present investigation we have studied the following parameters to study the quality of water.

(i)	Temperature	(x)	Total dissolved solids
(ii)	pH	(xi)	Sulphate
(iii)	Fluoride	(xii)	Phosphate
(iv)	Nitrate	(xiii)	Dissolved oxygen
(v)	Chloride	(xiv)	Biologicaloxygen demand
(vi)	Total hardness	(xv)	Chemical oxygen demand
(vii)	Turbidity	(xvi)	Iron
(viii)	Electrical conductivity	(xvii)	Manganese
(ix)	Alkalinity	(xviii)	Zinc

All chemical used in this investigation were of AR grade. Standard methods were used for the analysis of samples. Attempt is also made to compare the results with water quality standards of WHO and IS 10500.

pH meter Eqip Tronics,model EQ 611 make was used for determination of pH. Fluoride content was determined by using Hanna Instrument model HI 93729 having accuracy of 0.01 mg/L by colorimetric method using SPADNS reagent. UV-Visible spectrophotometer of make GBC, Australia UV/Vis.911A was used for determination of nitrate, sulphate and phosphate. Determination of chloride was done by argentometric method. The total hardness was determined titrimetrically by EDTA method. Determination of turbidity was done by turbidimetry. Conductivity Meter of Labtronics, Model LT 16 was used for determination of Electrical Conductivity. Alkalinity of water sample was estimated by titrating with standard

sulphuric acid solution. Determination of total dissolved solids (TDS) was done gravimetric method. The Winkler method with azide modification was adopted for determination of Dissolved Oxygen. Determination of Bio Chemical Oxygen Demend (BOD) involved measuring the difference of the oxygen concentration between the sample and after incubation in the dark at 20^oC for 5 days. Determination of chemical oxygen demand of water (COD) was done by oxidising organic matter of the sample to carbon dioxide, water and ammonia by reflux with a known excess of $K_2Cr_2O_7$ in a 50% H_2SO_4 solution. The excess dichromate was titrated with a standard solution of ferrous ammonium sulphate solution. The dichromate consumed gave the O_2 required for oxidation of the organic matter. Estimation of metals was carried out by atomic absorption spectrometer at Soil Analysis Lab, Wardha by standard method.

RESULTS AND DISCUSSION

During the tenure of the investigation pH varied from 6.9 to 8.4 thus it is within permissible range of WHO (6.5-9.8) and IS 10500 (6.5-8.5). The values of fluoride content for winter season are within the permissible limit set by WHO (1.5 mg/L) and IS 10500 (0.5-1.5 mg/L), but still in sample No. 2 and 3 values are nearing the maximum permissible limit which are alarming and may be harmful to human health.

Turbidity

Turbidity is used to measure intensity of pollution. The values of turbidity of water samples collected from various sources were varied from less than 10 NTU for winter. Increase in turbidity mainly due to presence of colloidal matter or very finely divided suspended matter which settles only with great difficulty, sewage and industrial wastes.

Sulphate

High sulphate concentration in water may contribute to the corrosion of the metals. The values of sulphate content in the winter varied from 34.5 to 37.85 mg/L. Thus the values of sulphate varied from 30.17 to 37.85 mg/L during the period of investigation. The permissible limit for sulphate as prescribed by WHO is 200-400 mg/L. Thus the all the water samples contains very low concentration of sulphate than the minimum desirable limit.

Zinc

It is an essential and beneficial element for human body. Zinc enters the domestic water supply from the deterioration of galvanized Fe and dezincification at brass beside industrial waste. During the analysis, it was found that in the winter season Zn concentration varied from 0.04 to 0.25 mg/L. The total variation is from 0.04 to 0.25 mg/L. All the values of Zn content are less than the permissible limit as per standards of drinking water prescribed by WHO (1.5 to 5.0 mg/L).

Biochemical oxygen demand

During present investigation the values of BOD in winter season varied from 2.16 to 3.18 mg/L.

Chemical oxygen demand

The values of chemical oxygen demand in the winter season was found to be varied from 4.12 to 6.35 mg/L. As per the drinking water standards of WHO, 10 mg/L is maximum permissible limit for chemical oxygen demand. Thus all the values are within the permissible limit.

The results are incorporated in Table 1.

Table 1: Report of analysis of water samples in winter (2008)

S. No.	Parameters of water	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	Permissible Limit		
										WHO	IS-10500	
											Desirable	Maxi.
1	Temperature	24°C	24.2	24.5	23.8	23.9	24.2	24	24.8	--	--	--
2	pH	7.1	7.9	8.4	7.9	8.2	7.1	7.9	8.1	6.5-9.2	6.5-8.5	6.5-8.5
3	Fluoride	1	1.2	1.2	0.6	0.7	0.5	0.5	0.8	1.5	0.5-1.5	0.5-1.5
4	Nitrate	0.2	11	13	0	7	18	12	0.9	45	45	100
5	Chloride	502	500	504	480	430	210	365	410	200	250	1000
6	Total hardness	515	718	605	470	572	815	610	552	200-600	300	600
7	Turbidity	<12	<12	<12	<13	<12	<11	<12	<10	25	10	10
8	Electrical conductivity	220.5	234.8	205	240.1	216.2	256	212	209	--	--	--
9	Alkalinity	234.15	235.1	230.42	233.17	233.5	232	236	234	--	200	600
10	TDS	435.12	460.02	445.19	448	490.2	415	418	427	500	500	2000
11	Sulphate	35.45	35.98	36.02	35.88	37.22	37.9	36.1	34.1	200-400	200	400
12	Phosphate	2.4	2.79	2.6	3.17	3.02	2.9	2.48	3.6	--	--	--
13	DO	5.63	5.97	5.6	6.15	5.94	6.05	5.37	5.88	>6	--	--
14	BOD	3.18	2.7	2.16	2.89	3.02	2.6	2.18	2.38			
15	COD	4.15	5.81	4.28	6.35	5.87	5.21	4.68	4.12	10	--	--
16	Iron	0.03	0.03	0.05	0.02	0.04	0.08	0.07	0.08	0.1	0.3	1
17	Manganese	0.05	0.04	0.07	0.06	0.04	0.09	0.06	0.04	0.05	0.1	0.3
18	Zinc	0.08	0.15	0.25	0.2	0.06	0.04	0.09	0.1	1.5-5.0	5	15

All parameters are in mg/L except pH, temparature (°C) and electrical conductivity (micro mho/cm)

CONCLUSION

From whatever the observation and results we have got, it is seen that most of the parameters are within the permissible range of WHO and IS-10500. The seasonal variation for pH, temperature, fluoride nitrate, total hardness, chloride, turbidity, electrical conductivity, alkalinity, total dissolved solids, sulphate, phosphate, dissolved oxygen, bio chemical oxygen demand, chemical oxygen demand, iron, nickel and zinc TDS, Ec, Alkinity, etc seems to be low in winter seasons, probably because of the change in temperature. Rajur, as a lime industries surrounded area, very high level of pollution in drinking water was expected from all the resoucrces of water. The environment especially in the evening is very polluted. The atmosphere in and around Rajur looks dirty. Taking into consideration pollution fact a very high pollution in drinking water was expected from all the resources of water in the area. The results which we have obtained are surprisingly different from the expectation i.e. high level pollution is not seen and most of the parameters are within the

range. The probable reason for these may lie within the lime industries and production of large amount of lime. Lime uses in industrial and mining, waste water treatment. It neutralizes acid waste, adjusts pH, removes phosphorus, fluorine, magnesium, nitrogen and organic matter etc and it precipitates heavy metals. In fact lime treats potable and industrial water supplies including drinking water which disinfects bacteria. Because of the above characteristics of lime though it is polluting the atmosphere still its natural presence in the area on the other hand must be a blessing for purification of water.

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