



## DRINKING WATER QUALITY OF COAL MINE SURROUNDED LIME INDUSTRY AREA

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### ABSTRACT

This Study aims to analyse the impact of coalmine and lime industries on the drinking water of Rajur Tah. Wani Dist. Yavatmal (M.S). Rajur is one of the biggest lime producers in India surrounded by lime industries and coal mines. In fact the atmosphere around Rajur is so polluted that in the evenings it looks milky and breathing becomes difficult. Therefore it was thought important to find out the quality of drinking water is such a highly polluted area. For this purpose water samples were collected from well, bore well, hand pump and tap from eight different places covering the total Rajur area. The samples were collected for summer season. The physical parameters like temperature, lubricity, TDS and chemical parameters like E.C., pH, DO, BOD, COD alkalinity, hardness, Fe, Mg, Zn,  $\text{SO}_4^-$ ,  $\text{PO}_3^-$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{F}^-$  were measured. The data obtained was compared with that of WHO and IS-10500.

**Key words:** Pollution, Drinking Water quality.

### INTRODUCTION

Earth is the unique planet in the universe to originate and flourish living creatures on it due to one of the very important factors i.e. water. But it is polluted more or less all over the world. Water resources in India have no exception for this phenomenon. There are various sources of water like ponds, rivers, lakes, dams etc. available for the use of industrial, domestic and agricultural purposes. These water bodies get polluted due to effluents from the industries, domestic wastes, land and agricultural drainage. This results in the degradation of water quality of these water resources. According to Discovery news, in India, 90% of the patients suffer due to water borne diseases. This is due to poor sanitation facilities available within the country. Lack of awareness of common man regarding the quality of water is also a major problem. The purity of water is the basic of all kinds of hygiene. Water that may be considered absolutely pure is not found in nature. Even rain water which is in fact distilled water collects impurities such as dust, gases, bacteria etc, during its passage through the atmosphere. The part of rain water which flows over the surface and collect runoff, picks up organic and suspended matter whereas the portion percolating through ground has got mineralogical, organic and inorganic matter.

Rajur has a population of about 15,000 to which about 500 is added by workers of coal washeries. The population there is mainly of lower class workers living mainly in slums. Therefore there seems no

awareness about health, state of population or quality of water they drink. Survey shows different types of diseases like asthma, bronchitis, whooping cough, diphtheria etc. Taking into consideration all the above points and probable level of pollution in the area, it was thought to be our social responsibility to investigate the pollution level of all types in the Rajur area. So it was thought essential in the beginning to carry out the study of drinking water of this polluted 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 (ii) pH (iii) Fluoride (iv) Nitrate (v) Chloride (vi) Total hardness (vii) Turbidity (viii) Electrical conductivity (ix) Alkalinity (x) Total dissolved solids (xi) Sulphate (xii) Phosphate (xiii) Dissolved oxygen (xiv) Biological oxygen demand (xv) Chemical oxygen demand (xvi) Iron (xvii) Manganese (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.

## RESULTS AND DISCUSSION

All the observations are as shown in Table 1.

The variation in nitrate content during the year was between 00 to 25 mg/L. The values are in permissible limit as proposed by WHO and IS-10500 for nitrate content which is 45 mg/L. The sample collected from bore well (S3) contains 70 mg/L of nitrate which was very much above the permissible limit. High nitrate concentration is hazardous to health particularly in case of infants which may cause disease Methemoglobinemia i.e. blue baby syndrome. All the samples except sample number 3 contain chloride within permissible limit. The sample number 3 contains 800 mg/L of chloride which is beyond the permissible limit.

Electrical conductivity: Electrical conductivity of water is proportional to temperature and dissolved mineral content. In the present study, the values of electrical conductivity range from 227.1 to 280.5  $\mu$  mho/cm for the summer. Increase in electrical conductivity indicates that this area contains ions like  $\text{Ca}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{SO}_4^{-2}$ ,  $\text{Cl}^-$  etc. Electrical Conductivity is directly proportional to temperature and therefore its values are higher in summer. The slight increase in electrical conductivity in summer may be attributed to the higher temperature and also increase in total dissolved solids, thereby increasing the number of ions in the water.

Biochemical oxygen demand: Biochemical oxygen demand is the measure of the degradable organic material present in water sample and can be defined as the amount of oxygen required by micro-organisms in stabilizing the biologically degradable organic matter under aerobic condition. During present investigation the values of BOD in summer season varied from 1.96 to 4.67 mg/L.

**Table 1: Report of analysis of water samples in summer (2007)**

S. No.	Parameters of water	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>	Permissible Limit		
										WHO	IS-10500	
											Desir- able	Max
1	Temperature	26.1	28	26.3	27.2	26.0	28.0	25.3	25.8	--	--	--
2	pH	7.0	8.1	8.2	7.9	8.0	6.9	8.1	8.0	6.5-9.2	6.5-8.5	6.5-8.5
3	Fluoride	1.0	1.0	1.5	0.5	0.5	0.5	0.4	0.7	1.5	0.5-1.5	0.5-1.5
4	Nitrate	0.0	10	70	0.0	10	25	0.0	0.1	45	45	100
5	Chloride	500	475	800	450	425	175	300	385	200	250	1000
6	Total hardness	450	690	600	450	570	780	480	517	200-600	300	600
7	Turbidity	<10	<10	<10	<10	<10	<10	<10	<10	25	10	10
8	Elect conduct	280.5	265.1	270.2	254.8	227.1	240.3	230.1	248.5	--	--	--
9	Alkalinity	240.6	250.1	218.6	264.7	240.0	252.3	220.0	234.8	--	200	600
10	TDS	484.0	491.3	475.2	496.0	498.2	448.1	452.1	460.8	500	500	2000
11	Sulphate	34.4	34.0	36.0	30.17	31.4	32.6	32.6	33.1	200-400	200	400
12	Phosphate	4.10	3.70	3.16	3.08	3.0	2.72	3.08	3.76	--	--	--
13	DO	5.32	5.80	5.62	5.98	5.72	3.0	2.15	2.32	>6	--	--
14	BOD	2.19	2.38	1.96	2.35	2.82	4.67	4.11	3.92			
15	COD	4.26	5.91	4.10	5.39	5.22	5.01	4.22	4.04	10	--	--
16	Iron	0.02	0.01	0.03	0.02	0.03	0.05	0.02	0.03	0.1	0.3	1.0
17	Manganese	0.04	0.04	0.06	0.05	0.03	0.07	0.03	0.04	0.05	0.1	0.3
18	Zinc	0.07	0.14	0.22	0.20	0.05	0.03	0.04	0.06	1.5-5.0	5.0	15.0

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

Chemical oxygen demand: Chemical oxygen demand determines the oxygen required for chemical oxidation of organic matter present in water with the help of strong oxidant. It is used to measure pollution level of domestic and industrial waste water. The values of chemical oxygen demand in the summer were found to be 4.04 to 5.91 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.

## 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 seems to be low in summer. The TDS, Ec, Alkinity, etc as expected is high in summer.

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 situated there in 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. The above investigation suggest that a detailed survey and study of air, water, and soil in the area is required especially the air pollution.

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