

Evaluation of borewell water of various places located in and around industrial area of Aurangabad district of Maharashtra

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ABSTRACT

Present investigation deals with the study of borewell water samples in and around the industrial area of Aurangabad district of Maharashtra, used for various domestic uses. Physico-chemical parameters of selected borewell waters were evaluated indicates that water samples are polluted, maximum of samples have E.C., TDS, Hardness, Ca^{++} , Mg^{++} and COD values exceeding the permissible limits for drinking purpose. It is observed that the main sources of pollution are due to industrial waste water, municipal sewage, lack of sanitation and presence of inorganic constituents in the waste water.

Key words: Borewell water, Physico-chemical parameter

INTRODUCTION

Aurangabad district of Maharashtra has four main industrial areas Chikalthana, Waluj, Shendra and Paithan. These area possess large numbers of industrial units. Due to rapid industrialization at Aurangabad, large quantity of industrial waste are generated which contains toxic pollutants¹ deteriorates the quality of water. Industrial units specially chemical manufacturing whose untreated and partially treated effluents are discharged to different nallah, through small stream or gutter. Through this process there is chance that waste water may percolate in the soil and contaminates ground water² in and around the industrial area.

Any change in physico chemical characteristic of water not only alters its quality but also disturb its environment³⁻⁴.

Chikalthana, waluj and shendra industrial zones were selected for the purpose of investigation. Many illiterate workers live near the industries and

use borewell water for their domestic activities. Some time they use this water for drinking purpose. It was worth examining these water resources for various water quality parameters and ascertain their quality with respect to drinking water.

MATERIAL AND METHODS

Sampling stations were located in the nearby small industrial zones and were selected as representative for the entire industrial zone. Samples were drawn from sixteen different borewells during the first week of every month and preferably in the morning hours. Two liters of sample was collected from each sampling station in a polythene container previously washed with 6N Nitric acid.

Samples were analyzed for three months i.e. July, August and September 2007 for sixteen different water quality parameters as per standard procedure⁵⁻⁶. All chemicals and reagents used in the study were of analytical grade procured from S. D. Fine, India, B.D.H. India and Renkem India. Pyrex Glass were used for processing of samples, dilutions and making

up of volume etc. double distilled water made in glass apparatus was used throughout the work.

The parameters selected for analysis were temperature, pH, conductivity, total dissolved solid, alkalinity, hardness, Ca⁺⁺, Mg⁺⁺, Na⁺, K⁺, Cl⁻, NO₂, PO₄⁻, dissolved oxygen, chemical oxygen demand and biological oxygen demand. pH was measured by LI-120 (Elico) pH meter, D.O. by Winkler method, BOD by five day incubation at 20°C, Na and K by Flamephotometer, Nitrite and phosphate by spectrophotometer.

Sampling sites are

- S - 1 Power loom area Chikalthana MIDC
- S - 2 Deogiri Chemicals Chikalthana MIDC
- S - 3 Near Skoda Auto India, Shendra MIDC
- S - 4 Shendra Villege, Shendra MIDC
- S - 5 Infront of sterlite industry Waluj MIDC
- S - 6 Ranjangaon Main Road, Waluj MIDC
- S - 7 Hanuman Nagar, Ranjangaon, Waluj MIDC
- S - 8 Zilla Parishad Primary School, Ranjangaon, Waluj MIDC
- S - 9 Ambedkar Nagar, Jogeshwari, Waluj MIDC
- S - 10 Jogeshwari Villege, Waluj MIDC
- S - 11 Dhanegaon Near Good Year Tyre, Waluj MIDC
- S - 12 Sajapur, Near Paschim Chemical, Waluj

MIDC

- S - 13 Wadgaon, Chatrapati Colony, Waluj MIDC
- S - 14 Pandharpur Gram Panchayat, Waluj MIDC
- S - 15 Pandharpur Near Bajaj Auto, Waluj MIDC
- S - 16 Wadgaon slum area Waluj MIDC.

RESULTS AND DISCUSSION

Values reported in Table 1 and 2 are the average of three months analysis performed for every sample collected in July to September 2007. Temperature was varying within 26.9 to 29°C. Heat released by decomposition of organic matter slightly raised the temperature of polluted water. pH plays a major role in most of chemical and biological reactions⁷. All samples found to be alkaline with pH value range 7.03 to 7.82. It is correlated with its bicarbonate content. But pH values are within admissible limit.

Higher values of conductivity and TDS indicate the presence of more dissolved solids in the samples. E.C. values are 763 to 3167 µs/cm and that of TDS 432 to 1942 mg/L which are above permissible limit. High TDS may lead to impairment in physiological process in human body. Higher alkalinity 263 to 424 mg/L indicates that the

Table 1: Average values of Physico-chemical parameters of ground water in and around industrial area of Aurangabad district of Maharashtra

Station	Temperature	pH	Hardness	Ca ⁺⁺	Mg ⁺⁺	Conductivity	T.D.S.	Alkalinity
S-1	27.7	7.03	1182	298	106	1769	1098	424
S-2	27.5	7.38	422.3	97	43	827	502	348
S-3	27.3	7.39	384	102	30	763	430	368
S-4	27.8	7.43	586	108	76	1157	750	372
S-5	28.3	7.68	731.3	157	81	1398	896	345
S-6	27.9	7.45	924.6	174.6	118	1802	1098	355
S-7	27.5	7.36	874	194	94	1536	930	317
S-8	26.9	7.1	1829	469	159	3167	1912	393
S-9	27.9	7.56	393.6	110	28	773	455	283
S-10	28.2	7.1	972.3	273	69	1578	950	348
S-11	28.4	7.34	808	209	67	1311	792	314
S-12	28.1	7.48	597	163	46	929	560	263
S-13	27.8	7.82	491	131	39	937	565	374
S-14	27.9	7.26	842	229	65	1363	850	394
S-15	28.3	7.34	921	238	79	1753	1050	387
S-16	29	7.47	692.6	200	62	1176	731	348

presence of bicarbonate and hydroxide salt. Water of all sampling sites is very much hard with reference to hardness ranges from 384 to 1829 mg/L, abnormal values of hardness are due to discharge from chemical industry⁸.

The ground water is normally saturated with 7.6mg/L of dissolved oxygen at 30°C. DO determine the quality of drinking water ,it gives aesthetic taste to it. The value of DO depends on physical, chemical and biological activity of water sources⁹ .The DO level of water samples is 6.38 to 8.5,which is within permissible limit.BOD values are less, ranges from 0.55 to 2.02 mg/L are also within limit.

For good quality of drinking water, the tolerance limit for COD is 10 mg/L. The water samples from all the stations indicate that water has very high values of COD, these values are 71 to 125 mg/L, much above the limiting values indicating danger for domestic¹⁰use.

Chloride ion concentration 112 to 1165 mg/L The higher chloride ion concentration¹¹ is an indicator of pollution by sewage which is highest at S-8 site.

Calcium has no hazardous effect on human health. Higher concentration of Ca⁺⁺ may be due to leaching of soil. Magnesium is non-toxic element. However portable water having concentration greater than 50 mg/L, exerts laxative effect. High concentration is found at S-1and S-8. sites. Sodium is an essential element but may adversely affect people with cardiac renal & circulatory problem. In present investigation, it is found to be 16 to 164 mg/L. maximum concentration is found at S-5 site. Results recorded in table no 2 shows that all samples have potassium less than 6 mg/L which is below the harmful limit.

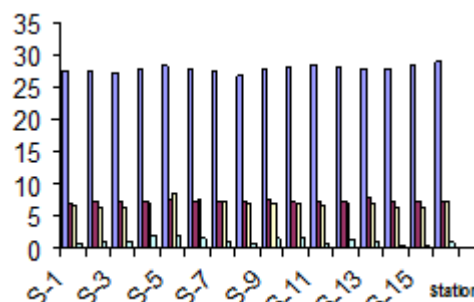


Fig. 1: A plot of Station vs Temp., pH,BOD and DO

Table 2: Average values of Physico-chemical parameters of ground water in and around industrial area of Aurangabad district of Maharashtra

Station	D.O.	B.O.D.	C.O.D.	Cl ⁻	Na	K	NO ₂ ⁻	PO ₄ ⁻³
S-1	6.66	0.84	85.5	506	77	3.3	0.071	0.183
S-2	6.38	0.96	87.5	122	22	1.1	0.053	0.23
S-3	6.48	1.24	98.5	116	22	1.6	0.035	0.205
S-4	7.09	1.85	101.44	192	72	6	0.053	0.21
S-5	8.5	2.02	71.73	134	164	2.5	0.051	0.213
S-6	7.65	1.61	106.7	320	78	3	0.031	0.216
S-7	7.44	1.07	106.8	409	81	2.3	0.036	0.23
S-8	6.93	0.79	92	1165	53	2.3	0.058	0.161
S-9	6.96	1.61	86.3	133	16.3	3	0.053	0.25
S10	7.02	1.67	104.9	387	29	1.1	0.046	0.222
S-11	6.61	0.76	125.4	482	21	1.1	0.076	0.227
S-12	6.77	1.4	101.3	206	16	4.5	0.051	0.241
S-13	7.04	0.94	108.7	141	27	0.83	0.043	0.271
S-14	6.45	0.55	78	288	31	1.16	0.052	0.226
S-15	6.5	0.66	76	431	79	1.5	0.068	0.25
S-16	7.36	0.99	106	190	28	1.16	0.046	0.22

The highest concentration PO_4^{-3} (0.271 mg/L) have been recorded in S-13 station. The PO_4^{-3} alone is not harmful to man, but in association with high value of calcium may cause kidney stone.

Nitrites are generally formed in water due to bacterial action on ammonia and organic nitrogen. All samples found to be less nitrite concentration.

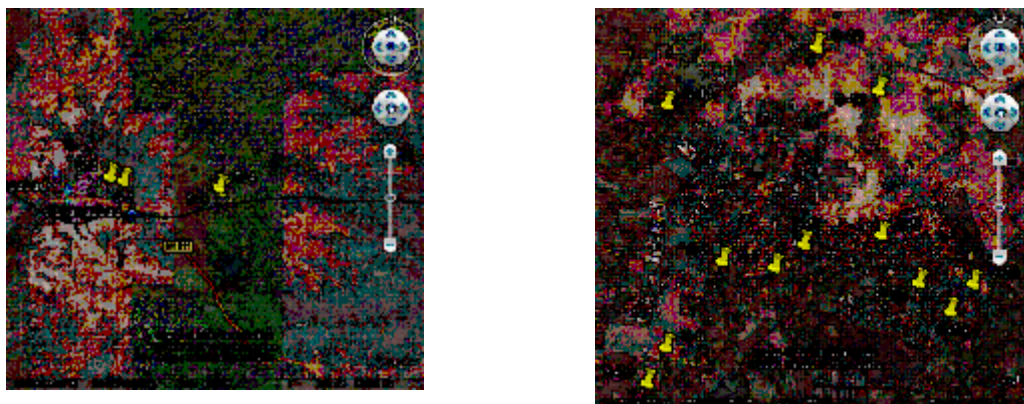


Fig. 2: Study area

CONCLUSION

Borewell water samples under investigation are generally used for domestic purpose and only sometime for drinking purpose. But looking at the results obtained, it can be concluded that borewell water is contaminated and should not be used for drinking purpose without pretreatment.

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