



Seasonal Variations in Different Physico-Chemical Characteristics In Ground Water Quality Of Industrial Area, Aurangabad. (Maharashtra)

KEYWORDS

Physicochemical Characteristics, Groundwater quality, Industrial effluent.

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ABSTRACT A laboratory study was conducted to monitor the physicochemical characteristics of water samples of Wells from Waluj MIDC area Aurangabad for a period of twelve months during February 2009 to January 2010. The parameters were analysed such as Temperature, pH, Electrical Conductivity, Alkalinity, Nitrate, DO, BOD & COD. This research work shows that the water quality of the wells from Waluj MIDC area is deteriorated possibly due to increased of human activities and improper release of industrial effluents.

Introduction

Aurangabad is the headquarters of the district as well as the division of Marathwada. Its geographical location is latitude 19° 53 ' north and longitude 75° 20' east. Waluj industrial area is one of the fastest developed industrial sectors. Groundwater becomes the only alternate source of good quality water. But there are problems of ground water contamination in certain parts of the city, particularly in the industrial belts. The quality of water is described by its physical and chemical characteristics. But if, some correlations were possible among these parameters, then significant ones would be fairly useful to indicate the quality of water (Dhembare et.al, 1997). Water resources has been the most exploited natural system since man strode the earth water is an essential requirement for all biological systems (S.S. Patil & I.B.Ghorade 2013). "Water Quality" in term of ground water is generally used to express the physical, chemical or biological state of water. The contamination of ground water from the manmade and natural sources is causing a great threat to the ground water system. The increase in urbanization and industrialization are generating huge quality of waste and wastewater. The disposal of these waste and wastewater without proper treatment on unlined surface is finding its way to groundwater through percolation.

Material and Methods

The water samples were collected for physico-chemical analysis from Waluj industrial area of Aurangabad District to evaluate the quality of the ground water. The aim of the study is to assess the impact of urbanization and industrialization and rapid growing developmental activities in the study area on the quality of ground water and to locate various sources and types of pollutants which are responsible for changes in ground water quality. To assess the ground water quality in Aurangabad region ten sampling stations (dug wells), which are scattered in the main areas of Waluj industrial area. The selected sites are of approximately 700 to 1000 m far from each other. Analysis of the samples was carried out seasonally throughout the years from summer 2009 to winter 2010. Each parameter was analysed seasonally. In order to undertake accurate estimation of water quality, water analysis are done for the parameters like temperature, pH, dissolved oxygen(DO), Biological Oxygen Demand (BOD), Chemical Oxygen demand (COD), Total dissolved solid (T.D.S), Chloride & Sulphate. These analyses were carried out by referring the standard procedures according of APHA, AWWA, and WPCT, 1995, Trividy, and Goel (1986) and NEERI. The results are expressed as ppm or milligram per liter.

Table 1:-Seasonal variation of Physicochemical Parameters of the Ground water from the waluj Industrial area (2009-2010).

S.N	Temperature			Ph			DO			BOD		
	S	R	W	S	R	W	S	R	W	S	R	W
1	31.20	24.87	21.25	6.93	6.78	6.87	7.05	7.47	7.48	12.25	5.24	4.21
2	31.64	24.85	21.12	7.55	7.75	7.95	6.98	7.31	7.32	10.75	4.94	3.88
3	32.05	23.87	20.22	7.93	7.73	7.82	7.16	7.35	7.5	13.12	5.8	4.97
4	31.87	23.68	21.95	7.05	6.99	6.86	7.30	7.37	7.52	7.95	5.7	5.5
5	31.85	23.55	20.35	7.98	7.66	7.83	6.91	7.51	7.50	8.96	5.98	4.97
6	31.72	25.15	21.25	7.22	6.77	6.89	6.89	7.45	7.45	8.75	5.01	4.25
7	31.42	23.77	20.75	8.05	7.85	7.78	7.11	7.41	7.61	6.21	5.6	5.45
8	31.95	24.12	22.65	7.17	7.03	6.86	6.82	7.34	7.43	6.45	4.75	5.32
9	31.10	24.47	19.97	7.24	7.23	7.67	7.14	7.28	7.42	5.84	5.32	5.14
10	31.11	24.10	22.37	7.17	6.56	7.02	6.92	7.25	7.43	6.01	4.22	5.04

Table 2:-Seasonal variation of Physicochemical Parameters of the Ground water from the waluj Industrial area (2009-2010).

W.N	COD			TDS			Chloride			Sulphate		
	S	R	W	S	R	W	S	R	W	S	R	W
1	23.75	20.23	29.32	1875.63	2540.6	1467.86	206.16	171.31	184.53	217.29	211.68	213.65
2	27.12	23.34	31.61	3050.38	3632.41	2491.44	282.39	265.31	241.17	120.07	117.18	119.51
3	24.13	22.18	30.97	3022.26	3283.74	2373.81	363.78	353.81	331.76	123.07	121.80	122.38
4	22.77	20.65	28.65	2518.22	2488.96	1839.23	255.93	234.03	204.31	24.06	22.86	23.64
5	21.33	18.12	27.88	2148.35	2141.72	1877.69	266.41	256.43	246.70	32.90	32.15	32.64
6	21.87	19.85	27.66	2388.85	1814.31	2049.11	276.96	267.94	243.06	115.64	112.91	114.25
7	24.00	20.93	28.79	2183.33	2441.79	1693.33	215.24	292.94	276.17	22.69	21.54	22.27

8	23.92	22.87	30.33	1910.57	2278.35	1711.63	245.16	238.44	198.12	49.62	47.69	48.82
9	23.35	19.84	27.83	2165.72	2311.14	1550.44	487.63	376.67	276.82	20.21	20.11	19.84
10	22.97	21.64	29.55	1924.66	2162.84	1547.56	442.59	340.22	207.67	44.23	44.14	43.44

W.N=Well number. S=Summer. R= Rainy.
W=Winter

RESULTS & DISCUSSION

Temperature: In the present study during the study period the water temperature was higher in summer and lower in winter seasons. The water temperature was varied from 31.10 °C (well no 9) to 32.05°C (well no 3) in summer season, from 23.55°C (well no 5) to 25.15°C (well no 6) in rainy season and from 19.97°C (well no 9) to 22.65°C (well no 8) in winter season. A high water temperature and low flow means that the self purification process will be more rapid and the water will recover from the effects of organic pollution in shorter period during summer. On the other hand, many rivers in India may contain little or no DO content in the summer but satisfactory in the winter Kiran et.al. (2006).

pH: In this study the pH values ranged from 6.93 (well no. 1) to 8.05 (well no. 7) in summer season, from 6.56 (well no. 10) to 7.85 (well no. 7) in rainy season and from 6.86 (well no 4 and 8) to 7.95 (well no 2) in winter season. pH is the measure of the acidity or alkalinity of water and measured in terms of hydrogen ion concentrations in water. The pH plays a vital role in the waste treatment and for fixing alum does in the water supply. The pH of the water sample indicates the neutral to alkaline nature which may be due to the presence of bicarbonate which undergo hydrolysis in solution (Kulkarni and Pawar, 2006). All the samples analyzed in the present study were found to be slightly acidic to basic in nature ranging from 6.08 to 8.10 in all the seasons showing alkaline nature of ground water from most of the wells in the study area.

Dissolved Oxygen (DO): The dissolved oxygen (D O), value in the study area varied from 6.82 mg/l (well no 8) to 7.30 mg/l (well no 4) in summer, from 7.25 mg/l (well no 10) to 7.51 mg/l (well no 5) in rainy and from 7.32 mg/l (well no 2) to 7.61 mg/l (well no 7) in winter season. The dissolved oxygen level in natural water depends on physical, chemical and biological activities of the water body (Mohammad Musaddia and Anil Fokmare, 2002). Concentration of dissolved oxygen decreases with increase in temperature. Clean and healthy water should have adequate and saturated dissolved oxygen. The oxygen rich water helps bacteria, protozoa, microorganism life which afterward multiply rapidly and then become food for advanced aquatic animals.

Biological Oxygen Demand (BOD): The BOD values varied from 5.84 (well no 9) to 13.12 mg/l (well no 3) in summer, from 4.22 mg/l (well no 10) to 5.98 mg/l (well no 5) in rainy and from 3.88 mg/l (well no 2) to 5.5 mg/l (well no 4) in winter season. All organic constituents of sewage degrade under

aerobic conditions. The organics in sewage can be divided into three major groups carbohydrate (starches, sugars and cellulose), proteins and fats. The approximate distribution of organics being 40 to 50% carbohydrates, 40 to 50% proteins and 5 to 10% fats.

Chemical Oxygen Demand (COD): The variations in the COD values during the study period it varied from 21.33 (well no 5) to 27.12 mg/l (well no 2) in summer, from 18.12 (well no 5) to 23.34 mg/l (well no 2) in rainy and from 27.66 (well no 6) to 31.61 mg/l (well no 2) in winter season. The estimation of COD is of great importance for water having unfavorable condition for the growth of microbes. The COD determine the oxygen required for chemical oxidation of degradable matter with the help of strong oxidizing chemicals (Moore, et al., 1951). It is the fact that most of the degradable compounds with little exception can oxidize in the presence of strong oxidizing agents under strong acidic condition.

Total Dissolved Solids: The total dissolved solids vary from 1875.63 mg/l (well no 1) to 3050.38 mg/l (well no 2) in summer, from 1814.31 mg/l (well no 6) to 3632.41 mg/l (well no 2) in rainy season and from 1467.86 mg/l (well no 1) to 2491.44 mg/l (well no 2) in winter season. Total dissolved solids are determined as the residue left after evaporation of the filtered sample. Water containing more than 500 mg/l of TDS is not considered desirable for drinking water supplies but in unavoidable cases 1500 mg/L is also allowed. Hence 500 mg/L is the desirable limit and 1500 mg/L maximum permissible limit (ICMR, 1975; Sarojini, et al., 1997).

Chloride: The chloride concentration varied from 206.16 (well no 1) to 487.63 mg/l (well no 9) in summer, from 171.31 (well no 1) to 376.67 mg/l (well no 9) in rainy and from 184.53 (well no 1) to 331.76 mg/l (well no 3) in winter season. Sinha (1986) recorded that high concentration of chloride are indicators of large amount of organic matter in the water eutrophic condition. Sarojini et.al. (1997) pointed out that high amount of chloride influences the amount of dissolved oxygen in water bodies which may adversely affect the number of aquatic organisms those are beneficial.

Sulphate: The seasonal variations of sulphate (in mg/l) in the study area varied from 20.21 (well no 9) to 217.29 mg/l (well no 1) in summer, from 20.11 (well no 9) to 211.68 mg/l (well no 1) in rainy and from 19.84 (well no 9) to 213.65 (well no 1) in winter season. Sulphate is found in appreciable quantity in all natural waters, particularly in arid and semiarid regions where natural water in general have high salt content (Saxena, 1989).

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