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THE ROLE OF MAJOR CONSTITUENTS IN GROUND WATER QUALITY OF INDUSTRIAL AREA

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ABSTRACT

Aurangabad 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. Once the groundwater contaminated, it may remain in unusable or oven hazardous condition for decades or even centuries. The groundwater composition in this particular case is likely to vary from place to place and time to time. Therefore, representative dug wells were selected for water samples collection. Some selected dug wells were close the effluent stream and some were progressively away from it. Thus dug wells in the study area were selected for their inventory and collection of water sample. The collected water samples were brought to laboratory to carry out the chemical analysis of the constituents such as Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, TA and SO_4^{2-}. etc. The methods used for this analysis were standardized according to the procedure given in standard method or examination of water and wastewater by APHA-AWWA and WPCF (1975; Trividy and Goel, 1986;

Keywords : Dug well, Effluent, Ground water quality & Major Constituents.

Introduction:

Water is required for all the living beings, without which neither the life nor any development is possible (N.Jaiprakash et. al, 2007). The daily demand of drinking water of a man is normally 7.0% of his body weight. Thus, it is a vital for a healthy growth. But it may become harmful for life, if one uses water contaminated with harmful or toxic substances and pathogenic microbes coupled with poor sanitation (Gupta and Gupta, 1997). Water pollution disturbs the normal uses of water for irrigation, agriculture, industries, public water supply and aquatic life. It is now considered not only in terms of public health but also in terms of conservation, aesthetics and preservation of natural beauty and resources.

Aurangabad 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. Once the groundwater contaminated, it may remain in unusable or oven hazardous condition for decades or even centuries. In general, the main cause of groundwater pollution is due to discharge of effluents, which could be domestic, agricultural and industrial, or a combination of all these. 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 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 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 Eight 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. The parameters used for the analysis of water are located in industrial areas, creating certain interference in the surface water and ground water. In addition to water quality. Analysis of the samples was carried out seasonally throughout the years from 2011 to 2012. Each parameter was analysed seasonally. In order to undertake accurate estimation of water quality, The collected water samples were brought to laboratory to carry out the chemical analysis of the constituents such as Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, TA and SO_4^{2-}. etc. The methods used for this analysis were standardized according to the procedure given in standard method or examination of water and wastewater by APHA-AWWA and WPCF (1975; Trividy and Goel, 1986.) The results are expressed as mg/l.

Table 1:- Average cationic and anionic constituents of ground water from study area (2011-2012).

Well No.	Major Constituents						
	Cationic				Anionic		
	Na^+	K^+	Ca^{2+}	Mg^{2+}	Cl^-	TA	SO_4^{2-}
W1	488.50	4.15	488.57	285.58	287.14	211.45	304.13
W2	535.66	5.56	342.82	438.40	323.52	216.30	189.58
W3	658.98	5.20	982.57	394.18	299.33	213.45	155.86
W4	392.57	4.13	989.14	312.15	314.47	235.25	132.56
W5	339.11	5.19	649.77	305.36	284.81	215.89	111.59
W6	215.49	5.88	698.11	288.32	279.44	233.29	155.23
W7	656.33	7.18	572.58	236.20	285.19	259.11	215.0
W8	471.12	6.96	454.49	259.22	312.89	261.59	561.80

Note:1) All values are in mg/l. 2) TA is the total alkalinity 3) W= well number

Result & Discussion

Major Constituents (Cationic):-

Sodium: It is observed that the variations of sodium in the study area varied from well to well. Sodium concentration varied from 215.49 (W6) to 658.98 mg/l (W3). The excess sodium and chloride in drinking water may induce congestive heart failure (Brooker and Johnson, 1984); Sivagurunathan and Dhinakaran, 2005). Lower concentration is physiologically harmless (Goyal, *et, al.,* 2006)

Potassium: The potassium in the ground water in the present study shows that the variation ranging from 4.13 (W4) to 7.18 mg/l (W7).The concentration of potassium as per European directives are 12 mg/l, however, moderate quantities of it do not adversely affect the water quality (European Committee, 1976; Kiran *et.al*., 2006).

Calcium: It is observed from the study period that the variation ranging from 342.82 (W2) to 989.14 mg/l (W4). Calcium in excess may increase the total hardness of water preventing lather with soap and increases the boiling point of water (Rahul Mohan *et.al*., 2000) which induces acidosis as the cation is not readily absorbed and excess calcium ion enters the blood and displaces the plasma bicarbonate resulting non-clotting of blood (Lohani, 2005).

Magnesium: The Magnesium in the ground water in the present study shows that the variation ranging from 236.20 (W7) to 438.40 mg/l (W2). After calcium, magnesium is the most important alkaline earth metals present in the ground water. It is one of the most important contributors to the hardness of water.

Major Constituents (Anionic):-

Chloride: The chloride concentration in the water varied from the range of 279.44 (W6) to 323.52 mg/l (W2). Chloride is a major anion in waste water. The chloride concentration is higher in organic wastes and its higher level in natural water is a definite indication of water pollution from organic wastes. However, there is no any apparent source of chloride in natural waters (Karanth, 1989). A number of workers (Kodarkar *et,al*., 1995; Chandrashekhar, S.V.A. and M.S. Kodarkar 1994;) have reported chloride in water was to domestic wastes. The significance of chloride lies in its potential to regulate salinity of water and exerts consequent osmotic stress on aquatic community.

Alkalinity (AT): The total alkalinity in the study area varied from 211.45 (W1) to 261.59 mg/l (W8). Alkalinity of water measures its capacity to neutralize acid salts of weak acids usually impart the natural alkalinity in waters (Goel, 1997). The constituents of alkalinity in natural system mainly include carbonate, bicarbonate and hydroxide. The WHO acceptable limit for total alkalinity is 200 mg/l, beyond this limit taste may become unpleasant.

Sulphate: The seasonal variations of sulphate in the study area vary from 111.59 (W5) to 561.80 mg/l (W8). 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). Sulphate itself has never been a limiting factor for water bodies as it dissolves in water easily while flowing with running water. In normal level, sulphate is more than enough to meet plants need. If the concentration exceeds, above 500 mg/l it has laxative effect and cause gastro intestinal irritation.

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