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IMPACT OF INDUSTRIAL EFFLUENTS ON GROUNDWATER QUALITY IN NAGOTHANE INDUSTRIAL AREA, DIST. RAIGAD, MAHARASHTRA, INDIA

V.R.Jadhavar

Department of Chemistry, K.E.S.Anandibai Pradhan Science College,Nagothame,Dist.Raigad.402106.

Abstract:

In the present study physicochemical parameters like pH, hardness, TDS, chloride, sulphate, nitrate, fluoride, DO, COD and conductivity were first analyzed in effluent water of industrial area phase-II and then groundwater of near by areas. Obtained values of effluent water were compared with ISI standard for effluent water discharge and groundwater values were compared with ISI and WHO drinking water standards.

The result shows that discharge of untreated effluents by the industries is leading to contamination of groundwater of the surrounding areas. Subsequent analysis of groundwater of nearby areas was rated as unacceptable for drinking because of presence of fluoride in all the samples above the desirable limit.

Keywords: *COD, DO, TDS, Physicochemical analysis, Nagothane.*

***Corresponding Author:**

V.R.Jadhavar

Department of Chemistry,
K.E.S.Anandibai Pradhan Science College,
Nagothame,Dist.Raigad.402106.
E-Mail:*vilas_jadhavar1974@rediffmail.com*

QR code

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INTRODUCTION:

It is evident that many parts of the industrial area in India are colonized and are in very close vicinity of the industries and are using groundwater for drinking, cleaning and bathing purposes. In India groundwater is used for domestic and agricultural purposes. Many physicochemical parameters play an important role in determining the quality of water.The excesses concentration of these may cause various ill effects.Present work was carried in the Nagothane industrial area in the year 2016-17. In the close vicinity of this industrial area there is dense population of residents who generally use underground water for most of the domestic purposes.

In this paper physicochemical parameters have been studied in effluent water and subsequently in groundwater of this locality.

EXPERIMENTAL:

The procedure followed for analysis was from APHA[4]. All the samples were collected in polypropylene bottles which were properly washed with 20% nitric acid and subsequently with deminierialized water. Chemicals used in the analysis were of grade 'A', acids, modifiers are of suprapure grade.

The samples of effluent and groundwater were collected from different locations of the Nagothane industrial area. The samples collection bottles were uniquely labeled before collection. Groundwater samples were labeled starting with alphabet G (G-1 to G-10). The industrial effluent water was labeled starting with alphabet E (E-1 to E-10). The analysis of the sample was carried immediately after the collection of the samples[6,7,8] . Sample collection locations are listed in Table 1 shown below.

Table 1: Sample collection locations.

Effluent water, Site	Sample No.	Groundwater, Site	Near by areas Sample No
A-Block	E-1	Wakan Bridge	G-1
B-Block	E-2	MIDC Water supply	G-2
C-Block	E-3	Varvathane	G-3
D-Block	E-4	Nagothane	G-4

RESULTS AND DISCUSSION:

Results show considerable variation in the amount of physicochemical parameters for different industrial effluents samples. The results are summarized in Table 2 & 3. These results are compared with standards for effluent water discharge (12) IS10500.

The results of physicochemical studies for the same effluent water samples shown in Table 2. There is a slight variation in the pH of these samples which ranges from 5.9-8 and is well within the desirable limit. The desirable limits of total hardness, T.D.S., chloride, nitrate, DO, conductivity is not established for effluent waste water but its effect on groundwater has been studied. The amount of sulphate in the effluent water is above the desirable limit. The range of fluoride is varying from 2.4-22 mg/L which is above the desirable limit. The value of COD is well within the prescribed desirable limit

Table 2: The results of physicochemical studies for the effluent water samples.

S.No.	Parameters	Std.Limits	E-1	E-2	E-3	E-4
1	pH	5.5-9.0	8	7.4	8	8.4
2	Total Hardness, mg/L	-	300	485	485	436
3	TDS, mg/L	-	1025	1045	700	645
4	Chloride, mg/L	-	350	452	650	421
5	Sulphate, mg/L	10	20.5	40.8	45	25
6	Nitrate, mg/L	-	10.5	8.5	14.8	4.8
7	Fluoride, mg/L	2.0	2.4	3.5	15	22
8	DO, mg/L	-	4.5	3.4	4.9	3.6
9	COD, mg/L	250	100.5	78.5	68	45
10	Conducitivity, mS/cm	-	8.65	7.65	5.8	4.7

Table 3: The results of physicochemical studies for the groundwater samples.

S.No	Parameters	Std.Limits	G-1	G-2	G-3	G-4
1	pH	6.5-8.5	6.8	7.0	6.7	7.0
2	Total hardness, mg/L	300	120	95	200	145
3	TDS, mg/L	500	245	180	210	100
4	Chlorides, mg/L	250	330	248	250	300
5	Sulphate, mg/L	200	350	150	330	274
6	Nitrate, mg/L	45	8.8	6.5	8.5	3.0
7	Fluoride, mg/L	1.0	0.8	1.1	0.9	1.4
8	DO, mg/L	> 5	8.0	8.8	7.8	9.5
9	COD, mg/L	10**	10.0	9.0	10.0	8.0
10	Conducitivity,µmhos/cm	1.400**	0.37	0.28	0.57	0.4

*Desirable limit as per IS:10500 **WHO Standard value

The standard followed for groundwater is IS 10500 and 'WHO' drinking water standard. The groundwater results also show a considerable variation in the values of physicochemical parameters.Values of pH, TDS, Total Hardness, and nitrate are within the desirable limit Table 3.

Chloride is above desirable limit in sample G1andG3,while it is normal in other samples. Sulphate is high in sample G1, G3 and G4 sample. The value of fluoride has varied from 1-3.1, four sample of sulphate is on borderline side and six are well above desirable limit. Two values of COD are on borderline (G1 and G3) and rests are well within desirable range.Conductivity has shown variation 0.28-1.7 only one sample is above desirable range [5].

The high values of physicochemical parameters have severe health consequences.The pH values are with in the range as prescribed by IS: 10500, and WHO. Total hardness and total dissolved solids are well with in the desirable range. The elevated values of chloride may cause change in the taste of water, corrosion and palatability are also effected. Elevated level of sulphate causes gastro intentional irritation when magnesium and sodium are present. The upper range of fluoride causes fluorosis and effects bone and teeth [1-3].

CONCLUSION:

The groundwater of the studied area near the Nagothane industrial area has been found
to be unfit for drinking because fluoride has been detected in some samples above desirable limit. People from this area should drink water only after treatment process. But subsequent review and checking of water should be taken care.

The industry should discharge there effluent water only after proper treatment. Blood,
urine hair are the most accessible tissues in which to measure an exposure or dose, as they are sometimes referred to as indicator tissue.

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