"Impact of Industrial Effluents in the Physico- Chemical Parameters of Ground Water of Dhule MIDC (INDIA) Area"

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Abstract: A Significant number of today's ground water contamination problems from mans activities is one of the major source of groundwater contamination mainly due to various types of industries as they were disposes waste water effluents without treatment to the ground water bodies. This research work was carried to investigate the contamination level of groundwater by determination of physical and chemical properties of groundwater. It was observed that the groundwater quality is deteriorated because of higher concentration of acidic and alkaline, ions and higher concentration of various salts. Thus the ground water of study area was not useful for the drinking purpose. The industrial effluents also content high concentration of various salts , carbonates, bicarbonates, pH, conductivity. Thus the result suggested that effluents discharged from the various industries showed variable characteristics and potential threat to the ground water contamination. .

Keywords:- Industrial Effluent, physico-chemical parameter, water characteristics, ground water analysis.

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I.   INTRODUCTION

During the past few decades Indian industries have significantly grow, which has contributed to high economic growth but simultaneously it has also given rise to severe environmental pollution. Consequently, the water quality is seriously affected which is far lower in comparison to the international standards. Waste water from manufacturing or chemical processing industries contributes   to water pollution. Industrial waste water usually contains specific and readily identifiable Chemical compounds. It is found that one-third of the total water pollution comes in the form of effluent discharge, solid wastes and other Hazardous wastes. Out of this a large portion can be traced to the processing of industrial chemicals and to the food products industry. The surface water is the main source of Industries for waste disposal.   Untreated   treated effluents have increase the level of surface water pollution. Strict guidelines are given by Central Pollution Control Board (CPCB) but still the environmental situation is far from satisfactory. Different norms and guidelines are given for all the industries depending upon their pollution potentials. Most major industries have treatment facilities for industrial effluents.

But this is not the case with small scale industries, which cannot afford enormous investments in pollution control equipment as their profit margin is very slender. As a result in India there are sufficient evidences available related with the mismanagement of industrial wastes[2-4]. Most of these defaulting industries are   petrochemical industries, sugar mills, distilleries, leather processing industries, paper mill, agrochemicals and pesticides manufacturing industries and pharmaceutical industries. Consequently, at the end of each time period the pollution problem takes menacing concern. The problem of water pollution has become still worse due to toxic heavy metals[12]. The increasing trend in concentration of heavy metals in the environment has attracted considerable attention amongst ecologists globally during the last decades and has also begun to cause concern in most of the major metropolitan cities. Untreated or allegedly treated industrial effluents and sewage water contains variable amounts of heavy metals such as arsenic, lead, nickel, copper, mercury, zinc and chromium[12, 13], which have the potential to contaminate crops growing under such irrigation. The present day by day increasing tremendous industrial pollution[14] has prompted us to carry the systematic and detail study of pollution due to toxic heavy metals in water samples collected from Dhule MIDC area.

II.   MATERIALS AND METHODS

2.1. Area of Study
The study was carried at Dhule MIDC area. The industrial area is spread over 284.41 hectares of land consisting of large and medium scale industries like engineering units, steel processing industries, chemical units, pharmaceutical units, textile industries etc. The study area lies between latitude 20^0 38' to 21^0 61' N & longitude 73^0 50' to 75^0 11' E. Dhule climate is a local steppe climate, in Dhule there is little rainfall throughout the year. This study was initiated to evaluate the various industrial effluents for physic-chemical characteristics at the discharge point and assess the quality of ground water in the surrounding area to

659

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know if the industrial effluents had any effect on the contamination of such water used for drinking or irrigation purposes.

2.2 Sampling of effluent and underground water
The effluents and water samples were collected from different areas like Venkatesh chemical , Supreme metals, R.M.Chemical (detergent) , rolex engineering (Electro plating), Kiran tiles, rubber industry. During the same period ground water samples also collected from different tube wells and dug wells from nearby villages of study area. The samples were collected in clean plastic container of 1 L. volume in such way that no bubbles were formed in the containers. A total of 19 samples including 6 from industrial effluents and remaining are the ground water samples from tube wells and dug wells.

2.3 Chemical analysis

Industrial Effluents and ground water of the surrounding area were analyzed for various important characteristics such as pH, electrical conductivity (APHA, 1998), calcium, magnesium, sodium, potassium ,carbonate, bicarbonate, chlorides, sulphate, sodium absorption ratio (SAR), residual sodium carbonate(RSC) and heavy metals concentration such as zinc, copper, ferrous, manganese (APHA, 1998).

III.   RESULTS AND DISCUSSION

To evaluate the pollution load in the industrial effluents and in ground water of Dhule Industrial Estate, the samples were analyzed for different physic-chemical parameters and results were compared with values of National Environmental Quality Standards (NEQS, 2000) for industrial effluents similarly values of ground water were compared with the standards

Table 1:- Physico-Chemical Characteristics of Industrial Sample

Parameter	Units	S1	S2	S3	S4	S5	S6
PH.	-	3.5	9.7	6.5	12	13	1.1
Conductivity	mhos/cm	1.0	1.0	1.001	1.807	1.0	1.0
Calcium	meq/lit	0.0	6.4	0.0	5.4	3.0	0.0
Magnesium	meq/lit	0.0	0.0	0.0	5.4	5.0	0.0
Sodium	meq/lit	3.88	1.72	9.66	1.7	2.1	2.1
Potassium	meq/lit	0.07	0.07	0.04	0.06	0.03	0.05
Carbonate	meq/lit	0.0	66.0	00	12	86	00
Bicarbonate	meq/lit	00	91	24	4.4	4.7	0.0
Chlorides	meq/lit	52	117.6	50	34	70	38
Sulphate	meq/lit	51.05	26.64	70.51	97.86	192.88	35.85
Sodium Abso. Ratio	-	0.0	2.4	0.0	2.04	1.02	00
Residual Sodium Carbonate	-	2.85	155.2	20.31	14.66	103.8	2.15

Table 2:- Physico-Chemical Characteristics of Ground Water Sample

Parameter	Units	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
PH.	-	6.6	8.4	6.6	9.5	7.9	7.4	7.5	7.7	7.8	7.5	4.7
Conductivity	mhos/cm	1.0	1.0	1.0	0.88	1.0	1.35	0.51	1.08	0.62	1.0	1.0
Calcium	meq/lit	5.2	6.2	9.0	11.4	3.8	10.6	5.6	5.8	8.2	7	12.8
Magnesium	meq/lit	3.0	12.2	3.2	00	11.4	6.4	00	00	3.0	1.0	00
Sodium	meq/lit	0.86	1.02	0.42	1.27	0.72	1.5	2.10	0.59	0.79	0.37	1.05
Potassium	meq/lit	0.04	0.06	0.05	0.02	0.02	0.02	0.02	0.04	0.01	0.03	0.09
Carbonate	meq/lit	12	00	00	00	00	00	00	00	00	00	00
Bicarbonate	meq/lit	12.2	3.4	4.0	13.4	11	8.4	11	00	00	00	00
Chlorides	meq/lit	2.4	0.0	3.0	98.4	2.0	0.0	18	2.0	2.4	2.0	0.0
Sulphate	meq/lit	17.50	16.08	21.34	99.11	2.94	10.19	-21.2	6.5	9.60	6.5	13.88
Sodium Abso. Ratio	-	2.75	2.38	6.61	5.02	2.21	4.21	1.93	4.94	4.58	4.94	6.16
Residual Sodium Carbonate	-	83.3	2.32	3.54	12.11	10.26	6.81	8.89	0.50	0.80	0.50	-1.80

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S9	0.92	0.03	0.07	5.36
S10	0.34	0.03	0.19	8.42
S11	0.57	0.14	0.27	5.12

of World Health Organization (WHO,1981) and United State Environmental Protection Agency (US-EPA,1998) for drinking water. The results obtained on characteristics of effluents and ground water from tube well, dug well are presented and discuss.

The physico-chemical characteristics of the industrial effluents and ground water show that have great variability. The physico-chemical characteristics of all samples differed substantially from one another with respect to chemical characteristics.

The water quality analysis of different samples have been carried out for pH, conductivity, calcium , potassium, carbonates, bicarbonates, chlorides, sulphates, zinc, copper, ferrous, manganese.

The pH of the industrial effluents ranged from 1.1-13 and electrical conductivity (EC) from 1.0-1.807 m mhos/cm, the calcium and potassium ranged from 3.0-6.4 mg/L. the carbonates and bicarbonates ranged from 66.0-86 mg/L and 0.03-0.07 mg/L respectively. The chlorides and sulphate ranged from 34-117.6 mg/L and 26.64-192.88 mg/L respectively as shown in Table No.1. Also the heavy metals like zinc ranged from 0.21-0.92 ppm. the copper concentration ranged from 0.02-0.23 ppm. The manganese concentration ranged from 3.95-9.25 ppm. also ferrous ranged from 0.01-0.27 ppm as shown in Table No.3. All the concentration of the effluents show a wide variation.

Table 3:- Heavy metal concentration in Industrial Effluents

Parameter	Zinc	Copper	Ferrous	Manganese
Unit	ppm	ppm	ppm	ppm
S1	1.08	0.26	0.14	13.52
S2	0.58	0.27	0.02	3.26
S3	0.97	0.12	0.28	6.23
S4	0.74	0.23	0.23	6.23
S5	1.06	0.31	0.06	4.82
S6	0.82	0.12	0.16	6.23

Table 4:- Heavy metal Concentration in Ground water sample from near by area of Dhule MIDC

Parameter	Zinc	Copper	Ferrous	Manganese
Unit	ppm	ppm	ppm	ppm
S1	0.51	0.17	0.26	7.41
S2	0.21	0.06	0.01	4.16
S3	0.42	0.02	0.23	6.15
S4	0.42	0.02	0.23	5.09
S5	0.74	0.23	0.09	4.82
S6	0.43	0.06	0.2	4.9
S7	0.48	0.13	0.14	3.95
S8	0.21	0.02	0.31	9.25

The ground water samples were collected from adjoining area of Dhule MIDC area such as Laling, Mohadi, Avadhan village and other nearby areas , it also shown great variation in physico- chemical properties. The pH of ground water samples ranged from 4.7- 9.5 and EC from 0.51 – 1.35m mhos/cm, also the calcium and potassium ranged from 2.6-12.8 meq/lit and 1.0 to 13.4 meq/lit respectively. The carbonates and bicarbonates ranged from 0.0-12 meq/lit and 1.0-13.4 meq/lit respectively, the chloride and sulphate ranged from 2.0-98.4 meq/lit and -21.2-99.11 respectively as shown in Table No.2. Also heavy metal concentration in ground water sample such as zinc ranged from 0.21- 0.92ppm, copper ranged from 0.02-0.23ppm , ferrous ranged from 0.01- 0.31ppm and manganese ranged from 3.95-9.25ppm. as shown in table no.4. all the concentration of heavy metal of ground water samples shows wide variations.

IV. CONCLUSION

The characteristics of industrial effluents varied with the industries, as well as the characteristics of ground water in the surrounding area of Dhule MIDC also varied .the pH of some effluents and ground water samples were beyond the limits and of the remaining within the permissible limit. The alkaline substances of some industrial effluents and ground water samples were within and remaining above the permissible limit comparing with the WHO and NEQS . the heavy metals of some industrial effluents and ground water samples were within and others above the permissible limit. The concentration of manganese was highest as compare with other metals. From above discussion, it can be said that the quality of ground water in the study area is polluted, it is directly affected to underground water bodies so the ground water of the study area is not useful for drinking and irrigation purpose.

REFERENCES

[1] APHA, AWWA, WEF (1995) Standard Methods for the Examination of water and waste water. 19th ed., American Public Health Association, Washington DC

[2] A. Abdul Jaeel, J. Sirajudeen & R. Abdul Vahith, "studies on heavy metal pollution of ground water sources between

Tamilnadu & Pondicherry, India online journal of applied sciences research, 2012,3(1),424-429.

[3] Lokhande, R.S., and Kelkar, N., , Studies on heavy metals in water of Vasai Creek, Maharashtra, Indian J. Environ. Protect, 1999, 19(9), 664-668

[4] M.Tariq, M.Ali & Z. Shah, "Characteristics of Industrial effluents &their possible impact on quality of underground water",online journal on soil & Environment 25(1):64-69,2006.

[5] M. Balkrishnan & R.K. Natarajan, " Impact of Dyeing industrial effluents on the ground water quality in Kancheepuram in India". Indian journal of science and technology,2008.

[6] NEQS. 2000. National Environmental Quality Standards for municipal and liquid industrial effluents.

[7] N.S. Tiwana, N. Jerath, G. Singh, M. Ravleen, (Eds.) 'Heavy metal pollution in Punjab rivers', in Newsletter Environmental Information System (ENVIS), Vol. 3, No. 1, pp.3–7, Punjab State Council for Science and Technology, India ,2005.

[8] Nidhi Joshi & Ashwini kuwar, "physic-chemical analysis of soil & industrial effluents of sanganer-region of jaipur & rajasthan , online journal of agricultural sciences, 2011,2(2);354-356.

[9] "Physical Accounting of Water Resources", in Volume I - Natural Resources Accounting of Water Resources, Capacity 21 Programme, Madras Institute of Development Studies, Chennai,1997.

[10] P. S. and J. S. Samra, "Wastewater Use in Peri-Urban Agriculture: Impacts and Opportunities", Central Soil Salinity Research Institute, Karnal, India,2004.

[11] Pathak, H., H. C. Joshi, A. Chaudhary, R. Chaudhary, N. Kalra and M. K. Dwiwedi "Soil Amendment with Distillery Effluent for Wheat and Rice Cultivation", Water, Air and Soil Pollution,1999, Vol. 113, Nos. 1-4, pp. 133-140.

[12] Rajkumar NS, Pangavhane SM and Patil SF Assessment of physico-chemical characteristics and status of heavy metal concentrations of different irrigation water sources. Indian J. Environ. Prot. 23(3), 266-273,2003.

[13] R.K., Agrawal, M., and Marshall, F.M., , Effects of waste water irrigation on heavy metal accumulation in soil and plants., Paper presented at a National Seminar, Bangalore University, Bangalore, Abst. no. 7, pp. 8,2004.

[14] R.D. Kaplay & H.S. Patode, "Ground water pollution due to industrial effluents at Tuppa, New Nanded, Maharashtra, India". Online journal of Environmental Geology, Vol.46,2004.

[15] Rizwan ullah, Riffat Naseem Malik & Abdul Quadir, "Assesment of groundwater contamination in an industrial city , Sialkot, Pakistan". Online journal of Environmental science vol.3(12)pp 429-446,2009.

[16] Salunke, K. J. and S. M. Karande, "Effect of pulp and paper mill effluent on the seed germination and early seedling growth in Mungbean", Chapter 68 in R. K. Trivedy (ed.), "Industry and Environment", Delhi, Daya Publications,2002.

[17] Singh, K. P. and H. K. Parwana, "Groundwater Pollution due to Industrial Wastewater in Punjab State and Strategies for its Control",   Indian Journal of Environmental Protection,1998, Vol. 19, No. 4, pp. 241-244.

[18] Sastry KV, Vineeta Shukla and Sharda Abusaria "Impact assessment of industrial pollution on groundwater". Indian J. Environ. Prot. 2003, 23(3), 250-255.

[19] Pandey SN, Nautiyal BD, Sharma CP Pollution level in distillery effluent and its phototoxic effect on seed germination and early growth of maize and rice. J. Environ. Biol. 29:267-270, 2008.