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DETERMINATION OF DISSOLVE OXYGEN (DO), BIOLOGICAL OXYGEN DEMAND (BOD) AND CHEMICAL OXYGEN DEMAND (COD) OF WATER IN SELECTED INDUSTRIAL AREAS OF GWALIOR DISTRICT, MADHYA PRADESH

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Abstract
Groundwater was collected from the industrial areas situated in Gwalior District, Madhya Pradesh. Samples were collected determined the following parameters, chemical oxygen demand (COD), Biological oxygen demand (BOD), and dissolved oxygen (DO).The groundwater sample were analyzed by standards methods (APHA).The ground water samples showing moderate values of DO,BOD &COD. Domestic and industrial waste should be properly disposed and or recycled. Relevant agencies should make continuous effort to control, regulate and educate populace on indiscriminate waste disposal from domestic and industries within the study area
Keywords: Dissolve Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand

Introduction
The most common parameters chemical oxygen demands (COD), Dissolve Oxygen and biological oxygen demand (BOD) are used to assess the aquatic organic pollution. The amount of oxygen consumed by organic compounds and inorganic matter that were oxidized in water is referred to as the Chemical Oxygen Demand (COD). Biological Oxygen Demand (BOD) is the amount of oxygen consumed by organic and inorganic compounds oxidized by biological oxidation in a given condition (Chinese government standard, 1989; JG Zhan, G Wei, and RC Xiong, 2007; HB Yu, et al., 2007). All of these parameters reflect the degree of pollution in the water and provide a comprehensive index of the relative content of organics. COD and BOD are important in the control of total pollution and the management of the water environment because they are the main comprehensive indexes of organic pollution.

Materials and Method

Sample area and Sampling Points

To assess the DO, BOD & COD of the groundwater water samples were collected in and around the Old Industrial Area Birla nagar (OIABN), Industrial Area Gospura (AIG), Industrial Area Maharajpura (IAM) and Industrial Baraghata (IAB) of Gwalior District, Madhya Pradesh. The groundwater samples were also collected from the selected industrial units having maximum water pollution load.

Sample Collection

Total of 60 (sixty) numbers of groundwater samples (from 12 selected stations) (@ 5 samples from each station were collected in and around the Old Industrial Area Birla nagar (OIABN), Industrial Area Gospura (IAG), Industrial Area Maharajpura (IAM) and Industrial Area Baraghata (IAB) during pre-monsoon (March-May) and post-monsoon (October-December) seasons in 2018-2020.TheDissolved Oxygen, Bio chemical Oxygen Demand and Chemical Oxygen Demand were analyzed for groundwater to assess the water quality. Standard methods were followed in determining the above variables (APHA, 1998).

Results and Discussion

Dissolved Oxygen

Dissolved Oxygen (DO) plays a significant role to assess the water quality in regards to physical as well as biological processes in the water and determines the extent of pollution level in the water bodies (Devi S. & Prem kumar R, 2012). The values of DO in groundwater samples in and around the Old Industrial Area Birla nagar (OIABN), Industrial Area Gospura (IAG), Industrial Area Maharajpura (IAM) and Industrial Area Baraghata (IAB) are summarized in Table-1. The DO values in groundwater varied from 0.22to 1.64 mg/ltr in pre monsoon season and varied 0.40 to 1.64 mg/ltr in post monsoon season. The seasonal variation of DO have been observed which might be due to difference in temperature and the depth level of ground water (Malik D. S., Kumar P. and Bharti U,2009).

Table -1: Dissolved Oxygen (mg/ltr) in groundwater samples in and around the Old Industrial Area Birla nagar (OIABN), Industrial Area Gospura (IAG), Industrial Area Maharajpura (IAM) and Industrial Area Baraghata (IAB).

Sampling Station	2018		2019		2020	
	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon
Groundwater						
GW 1-OIABN	0.68	0.44	0.84	0.66	1.12	1.36
GW 2-OIABN	1.10	1.60	1.42	0.82	0.98	1.10
GW 3-OIABN	0.58	0.52	0.62	0.78	0.84	0.82
GW 4-IAG	0.52	1.63	0.36	0.62	0.56	0.46
GW 5-IAG	1.22	1.10	0.88	0.44	1.22	1.24
GW 6-IAG	0.40	0.46	0.86	0.64	1.32	1.10
GW 7-IAM	0.80	0.86	1.24	0.54	1.46	1.64
GW 8-IAM	0.88	1.12	0.22	0.48	0.86	0.78
GW 9-IAM	1.16	1.20	0.44	0.86	0.56	1.38
GW 10-IAB	0.40	0.46	0.82	0.40	1.24	0.48
GW 11-IAB	0.60	0.40	0.62	0.80	1.64	0.66
GW 12-IAB	0.62	0.70	0.94	0.45	0.54	0.86
Mean	0.73	0.85	0.76	0.64	1.01	1.00
Minimum	0.40	0.40	0.22	0.40	0.54	0.46
Maximum	1.22	1.63	1.42	0.86	1.64	1.64

Bio Chemical Oxygen Demand

Biochemical Oxygen Demand (BOD) is the quantity of dissolved oxygen required by microorganism to decompose organic substances under aerobic conditions at certain temperature. Low BOD value is an indication of good water quality(Selvarajan G. & Punitha S,2018; Malik D. S., Kumar P.,2009 ; Deshmukh et al.,2012) The BOD values in groundwater samples in and around the Old Industrial Area Birla nagar (OIABN),

Industrial Area Gospura (IAG), Industrial Area Maharajpura (IAM) and Industrial Area Baraghata (IAB) are summarized in Table 2. The BOD values for groundwater samples ranged from 0.26 - 2.64 mg/ltr during pre monsoon and from 0.42- 2.64 mg/ltr during post monsoon season.

Table 2 : BOD (mg/ltr) in groundwater samples in and around the Old Industrial Area Birla nagar (OIABN), Industrial Area Gospura (IAG), Industrial Area Maharajpura (IAM) and Industrial Area Baraghata (IAB) .

Sampling Stations	2018		2019		2020	
	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon
Groundwater						
GW 1-OIABN	0.32	0.46	0.52	0.64	0.68	0.72
GW 2-OIABN	0.54	0.78	0.64	0.92	0.72	0.86
GW 3-OIABN	2.36	2.64	1.86	2.22	2.42	2.54
GW 4-IAG	0.86	0.98	0.66	0.92	0.72	0.84
GW 5-IAG	2.12	2.44	1.56	1.84	1.88	1.66
GW 6-IAG	0.52	0.44	0.36	0.48	0.46	0.66
GW 7-IAM	1.24	1.68	0.98	2.24	1.56	1.74
GW 8-IAM	0.26	0.42	0.42	0.56	0.32	0.64
GW 9-IAM	0.92	1.10	0.78	0.98	0.62	0.88
GW 10-IAB	0.76	0.46	0.64	0.76	0.56	0.82
GW 11-IAB	2.64	2.42	2.12	2.44	2.44	2.12
GW 12-IAB	0.78	0.86	0.68	0.88	0.76	1.10
Mean	1.17	1.29	0.91	1.20	1.11	1.24
Minimum	0.26	0.42	0.36	0.48	0.32	0.64
Maximum	2.64	2.64	2.12	2.44	2.44	2.54

Chemical Oxygen Demand

The Chemical Oxygen Demand (COD) determines the amount of equivalent oxygen needed for oxidation of organic matter by a strong chemical oxidant. Their value expresses the amount of dissolved oxidisable bio degradable as well as non-biodegradable organic matter. COD is a significant parameter which assesses the total pollutant materials in water (Rokade N., Sankpal S. & Naikwade P., 2014). The COD values in groundwater samples in and around the Old Industrial Area Birla nagar (OIABN), Industrial Area Gospura (IAG), Industrial Area Maharajpura (IAM) and Industrial Area Baraghata (IAB) are summarized in Table 3. The COD values for groundwater samples ranged from 1.12 – 7.88 mg/ltr during pre-monsoon and from 1.86 - 8.46 mg/ltr during post-monsoon season.

Table 3 : COD (mg/ltr) in groundwater samples in and around the Old Industrial Area Birla nagar (OIABN), Industrial Area Gospura (IAG), Industrial Area Maharajpura (IAM) and Industrial Area Baraghata (IAB) .

Sampling Stations	2018		2019		2020	
	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon
Groundwater						
GW 1-OIABN	2.82	3.52	3.46	4.12	4.46	5.12
GW 2-OIABN	3.92	5.22	4.24	5.68	4.86	5.32
GW 3-OIABN	6.26	7.10	5.86	6.12	7.24	8.46
GW 4-IAG	5.12	6.58	4.86	5.64	5.24	5.38
GW 5-IAG	6.86	7.18	5.26	6.46	6.86	6.22
GW 6-IAG	2.86	2.56	2.46	3.24	2.68	3.14
GW 7-IAM	5.28	7.46	4.86	6.68	6.36	7.64
GW 8-IAM	1.12	1.86	1.56	2.22	1.26	3.34
GW 9-IAM	5.46	6.58	4.52	5.64	4.12	5.24
GW 10-IAB	5.26	5.11	4.36	5.28	4.14	5.28
GW 11-IAB	5.64	6.48	5.11	4.68	6.22	5.68
GW 12-IAB	5.13	6.52	5.10	5.82	5.62	6.82
Mean	4.66	5.53	4.30	5.12	5.15	5.62
Minimum	1.12	1.86	1.56	2.22	1.26	3.14
Maximum	6.86	7.46	5.86	6.68	7.88	8.46

References

1. Chinese government standard GB11914, Determination of COD in water by dichromate titration method [S] (1989)
2. Deshmukh J.U., Mali R.P. & Ambore N.E., Study of Biochemical Oxygen Demand In Godawari River at Nanded City Due to Impact of Industrial Pollution, Jr. of Industrial Pollution Control, Vol.28(2), 115- 118, (2012).
3. Devi S. & Premkumar R., Physico-chemical Analysis of Groundwater samples near Industrial Area, Cuddalore District, Tamilnadu, India, International Journal of Chem Tech Research, Vol.4(1), 29-34, (2012).
4. HB Yu, H Wang, et al. Electrochem Comm ;9(9):2280–2285,9,(2007)
5. JG Zhan, G Wei, and RC Xiong. J Beijing Uni Chem Technol ;34(7):389-392, (2007)
6. Malik D. S., Kumar P. and Bharti U, A study on ground water quality of industrial area at Gajraula (U.P.), India, JANS, Vol.1(2): 275-279 (2009).
7. Rokade N., Sankpal S. & Naikwade P., Drinking water quality index of Avashi village of Lote Parshuram Indufstrial Area (LPIA) of (MS) India, Science Research Reporter, Vol.4(1), 94-100, (2014).
8. Selvarajan G. & Punitha S., Estimation of physico–chemical parameters of ground water in Kilvelur Taluk, Nagapattinam District,Tamilnadu, India, Int. res. j. environ. Sci., Vol. 7(3), 37-40, (2018).