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Evaluation of Ground water quality in the vicinity of Jindal ferroalloys corporation, Visakhapatnam Dt.(A.P.)

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ABSTRACT

Physico-chemical analysis of ground water samples has been carried out from nine sampling stations for a period of 6 months (ie. Sep 2010 to Feb 2011) in the vicinity of Jindal Ferro Alloys corporation ,Visakhapatnam Dt.(A.P.). The parameters such as pH, temperature, hardness ,alkalinity, chlorides , iron, manganese and chromium have been analyzed. The study reveals that water is suitable for both domestic as well as irrigation purposes.

Key words : Water quality, Pollution, Ferroalloys corporation, Visakhapatnam.

INTRODUCTION

Water is essential component of life and it is consider to be useful to drinking as well as industrial purposes. Today mankind is exposed to the highest levels in recorded history of lead, mercury, arsenic, aluminum, copper, chromium ,tin, antimony and vanadium. Metals are not degradable. Toxic metals replace nutrient minerals in enzyme binding sites. When this occurs, the metals inhibit, over stimulate or otherwise alter thousands of enzymes. An affected enzyme may operate at 5% of normal activity. This may contribute to many health conditions[1,2]. Infections that are difficult or impossible to eradicate until this cause is removed. In view of this , it is proposed to carry out physico- chemical analysis of water samples from Jindal ferroalloys corporation ,Visakhapatnam Dt.(A.P.).

EXPERIMENTAL SECTION

Water samples collected from nine sampling stations selected for the analysis were given bellow: S_1& S_2 – Jindal nagar (Bore Well& well water), S_3 – Bridge area (Bore Well), S_4 –

Opp. to School (Bore Well), S_5 –Main road (Bore Well), S_6 & S_7–Rayaparaj peta (Bore well& well water), S_8 & S_9 .Temple street (Bore Well & well water) . The samples collected in 1lt. sterilized bottles were preserved with 2 mL nitric acid to prevent the precipitation of metals They were then concentrated and subjected to nitric acid digestion. The samples were analyzed on 12^{th}/ 13^{th} of each month during Sep 2010 to Feb 2011. All the chemicals and reagents used were of analytical grade. D.D water was used for the reparation of solutions. Heavy metal analyses were carried out using Atomic absorption spectrophotometer. The pH of water samples was determined by a pH-meter and conductivity was measured by a conductivity meter (Systronics). The results obtained were compared with WHO(1984) and Indian standards(1983) for drinking water.

RESULTS AND DISCUSSION

The results obtained on the analysis of water samples (at different stations) are presented in Tables – 1 to 4 Temperature of water is basically important because it effects bio-chemical reactions in aquatic organisms. A rise in temperature of water leads to the speeding up of chemical reactions in water, reduces the solubility of gases and amplifies the tastes and odors.. The average temperature of the present study ranged from 26.46 - 28.22 C.

It is known that pH of water (6.5 to 8.5) does not has no direct effect on health. acid base reactions are important in ground water because of their influence on pH and the ion chemistry.. The pH values of the present investigation were within the prescribed standards (7.0 – 8.5) .The values obtained are within the permissible limits. Water with electrical conductivity less than 0.7 mS/cm is considered to be safe but in the range of 0.7-3 mScm-1 may cause little to moderate salinity problems. However in the present study, the conductivity values of waters are in the range of 0.17-0.54 mS/cm and are suitable for crop production in the same area. (Table -1).

Chromium (Cr)

Both the forms namely Cr (VI) and Cr (III). are biologically important. Trivalent chromium is found to be essential to human beings and animals .It plays vital role in insulin metabolism as the glucose tolerance factor (GTF). Cr (VI) is more toxic than Cr(III) .It is also responsible for chrome ulcer and kidney damage[3]. The maximum concentration of Cr(VI) permitted in domestic water supplies is 0.05 ppm[4]. Other sources of contamination of chromium in the environment are Chlor-alkali, electroplating, leather textiles, pigments, dyes, metal finishing, mining and metallurgical industries. The ash from thermal plants of burning of coal as fuel in various industries contain significant amount or Cr which seeps through earth and affects the fertility of land. Cr content of the present varied between BDL to 0.046 ppm

Copper (Cu)

Since copper is both essential and potentially toxic element, there may be risks to living being if there is too little or too much of copper in the environment. Large doses of copper irritate stomach [5]. When present in excess limit (>1.0mg/lt) imparts undesirable taste to drinking water. The values obtained are within the permissible levels recommended by Indian standards [6] (BDL to 0.068 ppm).

Manganese (Mn)

It is one of the most important trace elements essential for organisms. Manganese effects occur mainly in the respiratory tract and in the brains [7]. Chronic manganese poisoning may result from prolonged inhalation of dust and fume.

Table –1: Physico – Chemical Parameters of Water Samples Collected on 13-09-2010

Station No.	Temp. (^{0}C)	pH	EC ms	Cr	Cu	Mn	Fe
S1	28.05	7.22	0.32	0.027	0.023	BDL	BDL
S2	26.90	7.29	0.19	0.009	BDL	BDL	BDL
S3	28.03	7.64	0.26	0.017	0.031	0.051	0.029
S4	27.84	7.50	0.21	BDL	0.025	BDL	0.038
S5	28.32	7.14	0.31	BDL	0.014	0.023	BDL
S6	27.23	7.68	0.39	0.022	0.019	BDL	BDL
S7	27.82	8.20	0.32	0.038	BDL	0.058	0.22
S8	27.40	8.04	0.18	0.025	BDL	BDL	BDL
S9	26.83	7.93	0.22	BDL	0.036	0.027	0.16

Table-2 : Water samples collected on 12-10-2010

Station No.	Temp. (^{0}C)	pH	EC	Cr	Cu	Mn	Fe
S1	27.2	7.28	0.26	0.006	BDL	BDL	0.25
S2	28.03	7.45	0.38	0.016	0.055	0.027	BDL
S3	27.81	7.51	0.29	BDL	BDL	0.045	0.19
S4	27.62	7.65	0.23	BDL	BDL	0.029	BDL
S5	27.59	8.05	0.17	0.028	0.068	0.045	0.23
S6	28.20	8.12	0.23	BDL	BDL	BDL	BDL
S7	27.85	8.03	0.29	0.016	0.027	BDL	0.32
S8	27.65	7.48	0.26	0.033	BDL	0.036	BDL
S9	27.4	8.44	0.402	0.022	BDL	BDL	0.17

BDL = Below Detectable Limit

Table-3: Water Samples Collected on 13-11-2010

Station No.	Temp. (^{0}C)	pH	EC	Cr	Cu	Mn	Fe
S1	28.15	7.16	0.38	0.025	BDL	BDL	BDL
S2	26.80	7.24	0.34	0.042	BDL	BDL	BDL
S3	28.03	7.84	0.29	0.019	0.051	0.032	0.072
S4	27.84	7.53	0.36	BDL	BDL	0.056	0.30
S5	28.22	7.64	0.345	0.032	0.023	0.044	BDL
S6	27.23	7.61	0.36	0.024	BDL	0.019	0.077
S7	27.82	8.20	0.43	BDL	0.058	BDL	0.059
S8	27.42	8.44	0.312	0.008	BDL	BDL	0.017
S9	27.82	7.86	0.46	BDL	0.043	BDL	0.12

The central nervous system is the chief site of damage from the disease, which may result in permanent disability. Symptoms include languor, sleepiness, weakness, emotional disturbances, recurring leg cramps, and paralysis. Mn is found to vary between BDL to 0.088 ppm.

Iron(Fe)

Although it is abundant in earth's crust, it is absorbed in different forms at different rates. Iron deficiency is quite common among people throughout the world. However iron exposure results in siderosis [8] Long term consumption of drinking water with high concentration of iron may

lead to liver diseases. Standards of iron in drinking water is 0.3 ppm The concentrations of Fe in the present study varied from BDL to 0.28 ppm

Table-4: Water Samples Collected on 13-12-2010

S1	26.81	6.93	0.402	0.027	0.036	0.027	BDL
S2	27.2	7.21	0.349	0.02	BDL	BDL	BDL
S3	28.03	7.54	0.342	BDL	0.045	0.027	0.20
S4	27.81	7.51	0.32	0.046	BDL	0.045	0.063
S5	26.96	7.21	0.35	BDL	BDL	BDL	0.085
S6	27.5	8.05	0.34	0.026	0.068	BDL	BDL
S7	28.20	8.21	0.35	0..019	BDL	0.088	0.056
S8	27.84	8.24	0.32	BDL	0.047	BDL	0.072
S9	27.52	8.02	0.31	0.037	BDL	BDL	BDL

BDL = Below Detectable Limit

Table 5: Water Samples Collected on 12-01-2011

Station No.	Temperature (^{0}C)	pH	EC	Cr	Cu	Mn	Fe
S1	28.15	7.16	0.344	0.032	0.042	0.033	BDL
S2	26.94	7.24	0.292	BDL	0.026	BDL	BDL
S3	28.03	7.84	0.362	0.034	0.060	BDL	0.022
S4	27.33	7.53	0.345	0.019	0.021	0.037	0.31
S5	28.11	7.64	0.360	BDL	0.037	0.015	BDL
S6	27.35	7.61	0.512	BDL	BDL	BDL	0.27
S7	27.54	8.20	0.312	0.026	0.019	0.042	0.039
S8	27.43	8.44	0.402	BDL	BDL	BDL	0.017
S9	26.85	6.93	0.349	0.037	0.02	0.032	BDL

Table 6: Water Samples Collected on 12-02-2010

S1	27.21	7.21	0.342	BDL	0.044	BDL	BDL
S2	28.03	7.54	0.322	0.008	BDL	0.042	0.034
S3	27.8	7.51	0.357	0.042	0.062	0.043	0.019
S4	26.92	7.21	0.326	BDL	BDL	0.075	0.042
S5	27.54	8.05	0.462	BDL	0.048	BDL	BDL
S6	28.22	8.21	0.256	0.026	0.036	0.056	BDL
S7	27.81	8.24	0.387	0.036	BDL	0.026	0.024
S8	27.36	8.05	0.326	BDL	BDL	BDL	BDL
S9	27.69	7.96	0.356	0.034	BDL	0.045	BDL

BDL = Below Detectable Limit

CONCLUSION

The analysis of surface as well as ground waters for different parameters including metallic species namely. Fe, Cr, Cu, and Mn revealed that all the samples have very low concentrations of these elements and are suitable for drinking as well as other purposes.

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