



Assessment of Heavy Metal Concentration in the Vicinity of Industrial Area, Srikakulam Dt. (A.P.)

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Abstract Ground water samples (for heavy metals) were analyzed from five sampling stations during the different seasons in 2015 in the vicinity of industries, Visakhapatnam Dt.(A.P.). The study includes the analysis of parameters such as pH, temperature, copper, chromium, iron, lead and zinc. It is observed that all the metals reported low concentration as per Indian standards. Hence it can be considered that this water is suitable for both domestic as well as irrigation purposes.

Keywords Pollution -Heavy metals - M/s. Samkerg pistons & Rings Ltd.,Varisham, (V), Ranasthalam (M), Srikakulam District.

Introduction

Industrial effluents releasing from mining and metal plating factories contain dissolved heavy metals. The term "heavy metals" include chromium (Cr), iron (Fe), manganese (Mn), lead (Pb) and zinc (Zn) etc. are the most toxic to aquatic organisms. These metals when discharged on land without proper treatment contaminate drinking water resources [1]. Levels of exposure to these toxic metals are up to several thousand times higher than in primitive man [2]. Unlike organic pollutants, heavy metals do not decay, not degradable and thus pose a different kind of challenge for remediation. In view of this, it is proposed to carry out physico-chemical analysis of water samples from industrial area

M/s. Samkerg Pistons & Rings Ltd., Varisham (V), Ranasthalam Mandal, Srikakulam, A.P., India.

Materials and Methods

The sampling stations selected for the analysis of bore well waters belonging to the above mentioned industrial area - :S1-Laveru, S2- Murapaka, S3-Venkatapuram, S4 -Appapuram and S5- Ranasthalam. The samples were collected in 1 lt. 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 during different seasons in 2015. All the chemicals and reagents used were of analytical grade. D.D water was used for the preparation of solutions. Atomic absorption spectrophotometer type- SVL Spectronics-205 Model was used for carrying out metal analysis. The pH of water samples was determined by a digital pH-meter. The results obtained were compared with WHO and Indian standards for drinking water [3-5].

Results and Discussion

The results obtained on the analysis of heavy metal concentration from different sampling stations are summarized in Tables-1 to 4.

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 26.32 - 28.90 °C.



Acid base reactions are important in ground water because of their influence on pH and the ion chemistry. Higher levels of pH and alkalinity tend to reduce toxicity of metals in water. The pH values of the present investigation were within the prescribed standards (7.56 – 8.02).

Chromium (Cr)

Both the forms Cr(VI) and Cr(III) are biologically important. Cr(VI) is more toxic [6] than Cr(III). Trivalent chromium is found to be essential to human beings and animals as it plays vital role in insulin metabolism as the glucose tolerance factor (GTF).

The maximum concentration of Cr(VI) permitted in domestic water supplies [5] is 0.05 mg/l. Several industries release chromium in the environment are electroplating, leather textiles, dyes, metal finishing and metallurgical operations etc. Cr content of the present study varied between ND to 0.062 mg/l.

Copper (Cu)

Copper is both essential and potentially toxic element. Too much copper causes necrotic hepatitis and hemolytic anaemia [6]. When present in excess limit (>1.0mg/l) imparts undesirable taste to drinking water and irritates stomach. Values of copper are found to range between ND to 0.047mg/l.

Iron (Fe)

Iron deficiency anemia is widespread nutritional problem affecting both developed and developing countries. Standards of iron in drinking water [7] are 0.3mg/l. In the present study iron content varies between ND and 0.22 mg/l.

Lead (Pb)

Symptoms of lead toxicity are headache, numbness, arthritis, and vertigo [8]. Its toxicity is attributed to the fact that it interferes with the normal function of enzymes. Contamination of feeds is mostly by surface contamination of particulate matter. Concentration of lead in the present study varied between ND and 0.005 mg/ l.

Zinc (Zn)

Industrial sources containing higher amounts of zinc may cause health problems [9]. The Low concentration of zinc in drinking water could be due to the fact that pH of water samples was slightly alkaline and its solubility is a function of decreasing pH. In the current study Zn content varied between BDL to 0.070 mg/l.

Table 1: Heavy metal concentration in water samples (spring season)

Station No.	Temperature (°C)	pH	Cr	Cu	Fe	Pb	Zn
S1	27.70	7.72	0.034	0.006	0.055	0.0073	0.045
S2	27.75	7.56	0.015	0.031	0.035	0.0011	0.026
S3	28.16	7.78	ND	0.019	0.029	ND	0.016
S4	28.52	7.46	ND	ND	ND	0.0024	ND
S5	27.96	7.80	0.026	ND	0.043	0.0062	0.035

ND = Not Detectable : BDL = Below Detectable Limit

Table 2: Heavy metal concentration in water samples (summer season)

Station No.	Temperature (°C)	pH	Cr	Cu	Fe	Pb	Zn
S1	29.70	7.63	0.062	0.008	0.11	0.019	0.047
S2	29.83	7.56	0.057	0.047	0.085	0.003	0.059
S3	28.82	7.90	0.015	0.038	0.040	ND	0.070
S4	28.90	7.78	0.031	0.031	0.035	0.09	0.063
S5	28.78	7.98	0.036	ND	0.22	0.031	0.055

Table 3: Heavy metal concentration in water samples (rainy season)

Station No.	Temperature (°C)	pH	Cr	Cu	Fe	Pb	Zn
S1	27.82	7.85	0.033	0.007	0.078	0.023	0.043
S2	27.75	7.72	0.038	0.012	0.053	0.035	0.018
S3	28.02	7.68	ND	0.021	0.083	0.050	0.025
S4	28.62	7.78	0.015	BDL	0.084	ND	0.028
S5	27.90	8.02	ND	ND	0.17	BDL	BDL

Table 4: Heavy metal concentration in water samples (winter season)

Station No.	Temperature (°C)	pH	Cr	Cu	Pb	Fe	Zn
S1	26.39	7.65	BDL	BDL	ND	0.052	0.008
S2	27.01	7.89	0.038	BDL	0.016	0.097	0.015
S3	26.63	7.82	0.028	0.018	0.032	BDL	0.024
S4	26.40	7.83	0.042	0.014	0.029	0.049	BDL
S5	26.32	7.85	BDL	BDL	ND	0.082	BDL



Conclusions

Higher concentration of metals in industrial effluents indicates negligence of industries towards waste-water treatment. However, in the present case, analysis of various water samples for metals namely- Cu, Fe, Pb and Zn during different seasons revealed that all the values obtained are of low concentration except chromium in certain samples (S1 and S2) particularly in summer season probably due to evaporation of water at high temperature. These indicate proper care needs to be taken to protect ground water resources for future generations.

It can be concluded that water samples belonging to those places are suitable for human consumption and irrigation purposes (Table 1-4).

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