ASSESSMENT OF PHYSICO-CHEMICAL ANALYSIS OF THE GROUND WATER AND SURFACE WATER DUE TO THE IMPACT OF IRON INDUSTRIES EFFLUENTS IN AND AROUND MULLIPADI

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Abstract

The researcher has taken an attempt to assess the impact of Iron Industry effluent and sewage Water in Santhanavarthini River in and around Mullipadi at Dindigul. In the Study area it is observed that the people utilized the Surface water and ground water on the banks of the river, for domestic and agriculture purpose. The surface water in the Santhanavarthini River is affected badly due to the continuous discharge of the Iron Industry effluent along with the sewages. During the rainy session the surging rain water mix with the Iron Industry effluent and reaches the river and the ground water. Hence the ground water on both sides of river is polluted by percolation of the effluent. Water quality analysis of surface Water, bore water and open well water reveals that the water cannot be used for domestic and agricultural purposes. The high content of iron in the surface water and the ground water confirms the pollution caused by the discharge of untreated Iron Industry effluent from the Iron industry. Ones an aquifer is polluted by percolation of contaminated of water it is very difficult for reclamation. It is observed from the Water Quality analysis that TDS, Hardness high concentration of Chloride, causes the water to be saline. It is also observed that Iron is very high when compared to BIS Standards. The Quality reveals in the ground water with high concentration of Ca, Mg, Na and Phosphate. It is observed that neither the river water and the ground water is Portable. Very significant results are observed in the content of Iron, TDS, Ca, Mg and phosphate both in the river and in the ground water. Water quality parameters are above the limits as per BIS standards. The possibility of contributing diseases of blue baby Syndrome and Stomach cancer are to be seriously considered in the study area.

Keywords: *Iron Industry, Surface Water, Ground Water, TDS, BIS Standards R O System.*

Introduction

Water

Water sources available for drinking and other domestic purposes must possess high degree of purity, free from chemical contamination and microorganisms. The rapid growth of urban areas has further affected the groundwater quality due to over exploitation of resources and improper waste disposal practices (Rajankar P N, et al., 2009).

It is a binary compound that occurs at room temperature as a clear colorless odorless tasteless liquid; freezes into ice below zero degrees centigrade and boils above hundred degrees centigrade; widely used as a solvent. Iron Industries are the largest number compared to other industries in Tamil Nadu (A.Pandia rajan et al., 2014).

Iron is the world's most commonly used metal and can usually be found with other elements in the form of steel (Chatterjee, A., 1995).

Steel is not a single product, but more than 3,500 different products that have many different physical and chemical properties, 75 percent of which have been developed in the last 20 years (Wilson, A., 2001).

In India the production of iron ore was merely 3 million tones but it has reached 75million whereas steel production has jumped from mere 1.04 million tons in 1950-51 to 25.1 million tons in 1997-98 (Agarwal Ranjana., (2009).

Government of India vides press note no. 9 (1984 series) dated 21st June, 1984 has published a list of 20 industries causing high pollution. The list includes iron and steel industry also (Babyshakila.P et al., 2009). In view of this, it is felt necessary to go into the aspects of the

environment impact assessment of steel industry. Soil has complex function which are beneficial to human & other living organism.It act as a filter, buffer storage, and transformation system and thus protects the global ecosystem against the adverse effects of environmental pollutants (De. A.K., (2000)

The Foundry Industry

Foundries melt ferrous and non-ferrous metals and alloys and reshape them into products at or near their finished shape through the pouring and solidification of the molten metal or alloy into a mould. The foundry industry is a differentiated and diverse industry. It consists of a wide range of installations, from small to very large; each with a combination of technologies and unit operations selected to suit the input, size of series and types of product produced by the specific installation.

The Foundry Process

A general flow chart of the foundry process is depicted in the figure below. The process can be divided into the following major activities:

- Melting and metal treatment: the melting shop
- Preparation of moulds and cores: the moulding shop
- Casting of the molten metal into the mould, cooling for solidification and removing the casting from the mould: the casting shop
- Finishing of the raw casting: the finishing shop.
- Various process options can be taken, depending on the type of metal, size of series and type of product.

Scope and Objectives of the Study

The number of industries like Iron industry and sewage from residential area are discharged from the houses, located around the Santhanavarthini River and also from the other canals discharges the polluted water in to the river without any treatment. The volume of the effluent is increasing day by day. The absence of the treatment plant to treat the industrial waste water and the sewage water may lead to the spoilage of Environment. One fine morning people will not be able to get good quality of drinking water from the surface water and the ground water in and around the Santhanavarthini River Bed. The environmental damage caused by water pollution due to the discharge of Iron industry effluent and sewage water in Santhanavarthini River has not been studied so far.

Objectives

- To analyze the physico– Chemical parameters of the surface water in Santhanavarthini River at Mullipadi of Dindigul.
- To analyze the physico– Chemical parameters of the ground water present in the open wells and bore wells on the both sides river bank.
- To recommend a suitable remedial measure for the treatment of polluted Ground Water using R.O system.

Materials and Methods

The River santhanavarthini passes through the village at Mullipadi from east to west, dividing the village between the north to south being connected through the bridge and causeways. The iron industry located on the northern side of the Santhanavarthini River with a distance 1 km. Water samples from the river for a stretch of about two kilometers length along

the northern and southern banks of river were collected for analysis. The river receives from the west upstream, large volume of untreated Iron industry effluent through the canals with three meters broad. River water samples were collected at two different places along the route. Ground water samples were also collected from the bore wells with a distance of about 400 to 500 meters away from the river bank.

Table 1 Physico-Chemical Analysis of Different Parameters

S.No	Parameter	Method of Analysis
1	Turbidity	Neplo turbidity meter
2	TDS	Conductivity method
3	Electrical conductivity	Conductivity meter
4	P^H	pH Meter
5	Total hardness	EDTA Titrimetric method
6	Calcium	EDTA Titrimetric method
7	Magnesium	Calculation from Total Hardness
8	Iron	Spectrophotometer
9	Ammonia	Nessler's Method
10	Nitrite	Spectrophotometer
11	Nitrate	Spectrophotometer
12	Chloride	Silver nitrate
13	Fluoride	Colorimetric meter
14	Sulphate	Turbidity method
15	Phosphate	Spectrophotometer

Results and Discussions

Water Quality study were under taken from samples of water at Santhanavarthini River. The surface Water and the ground water in and around the Santhanavarthini River at MULLIPADI village were taken for the analysis. It is therefore essential now to examine the results and interpret the findings. The purpose is to how far these samples measure up to the standards expected to fulfill the needs of a safe drinking water for the Population depending on them. There are standards set by various national bodies like the U.S.P.H. (United Stated Public Health Standards) and B.I.S (Bureau of Indian Standard) and also international bodies like the WHO (World Health Organization) and CPHEEO (Central public health Environmental Engineering organization there are essential limit on the one hand and desirable limit on the other hand

Table 2 Variation of Chemical Parameters in Different Water Samples

Sample collection	BIS Limit	SW-1	SW-2	BW/PP-1	OW/PP-2
Turbidity NT units	5	4	12	5	6
Total dissolved solids mg/L	500	840	768	986	3273
Electrical conductivity in Micro mhos/cm		1250	1159	1353	4666
Ph	7.0-8.5	7.66	8.07	8.05	7.66
Alkalinity total As $CaCO_3$ (mg/L)	200	232	304	252	256
Total hardness as $CaCO_3$ (mg/L)	300	264	400	448	900
Calcium as Ca mg/L	75	54	85	93	192

Magnesium as Mg mg/L	30	31	41	52	101
Sodium as Na	_	54	72	96	600
Iron as Fe mg/L	0.3	1.09	1.14	1.49	1.87
Ammonia as NH_3 mg/L	_	2.15	2.54	0.31	0.54
Nitrite as NO_2 mg/L	_	0.16	0.2	0.83	0.13
Nitrate as NO_3 mg/L	45	6	8	10	12
Chloride as Cl mg/L	250	94	164	262	1325
Sulphate as SO_4 mg/L	200	21	39	41	177
Phosphate as PO_4 mg/L	_	0.25	0.59	0.94	1.08

Water Quality

The results of various water samples for the various physico-chemical analysis from different sites in, the study area presented and discussed.

Sensitive Parameters

Parameters like TDS, Hardness, calcium, magnesium, free ammonia, nitrite, iron, phosphate, Sodium, chloride, fluoride and pH are taken as sensitive parameters to indicate the water pollution by industrial effluent from various sources. It is observed that the values are higher compared the BIS Standards.

Conclusion

The investigator has taken an attempt to evaluate the impact of Iron Industry effluent and sewage Water in Santhanavarthini River in and around Mullipadi at Dindigul. In the Study area it is observed that the people utilized the Surface water and ground water on the banks of the river, for domestic and agriculture. Purpose now there are 1000 to 2000 residents are living in the river bank at Mullipadi. Now the Santhanavarthini River is receiving the Iron Industry effluent and sewage from the houses. The surface water in the Santhanavarthini River is affected badly due to the continuous discharge of the Iron Industry effluent along with the sewages, during the rainy session the surging rain water mix with the Iron Industry effluent and reaches the river and the ground water. Hence the ground water on both sides of river is polluted by percolation of the effluent. The discharge of the Iron Industry effluent increases the pollution level in the river. It is observed that in the present study, that the river is naturally favorable for discharge of iron industrial effluent during rainy session. It is observed from the Water Quality analysis that TDS, Hardness high concentration of Chloride, causes the water to be saline. It is also observed that Iron is very high when compared to BIS Standards. The Quality reveals in the ground water there is a high concentration of Ca, Mg, Na and Phosphate. It is observed that neither the river water and the ground water is Portable. Very significant results are observed in the content of Iron, TDS, Ca, Mg and phosphate both in the river and in the ground water. Water quality parameters presents are above the limits as per BIS standards. But the possibility of their contributing to diseases of blue baby Syndrome and Stomach cancer are to be seriously considered. It is safe to take steps to remove these ions by suitable methods like reverse osmosis.

Acknowledgement

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