

Chemical Investigation of Drinking Water of Bokaro Township and Steel Plant

(SHORT COMMUNICATION)

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Summary

SAIL is India's largest steel producer which constitutes five integrated steel plants, "Bokaro Steel Plant" being one of them. It is situated in the rich coal belt of eastern India and symbolizes India's advancement in the design, engineering and construction of steel plants. The main source of water supply for Bokaro steel plant and township area is Damodar River. Being an industrial area the level of contamination in the drinking water is expected to be high.

The research work included the investigation of the drinking water from the township as well as peripheral areas around Bokaro.

The major area of study included analysing the quality of drinking water being supplied and suggestive technical recommendations for improving the drinking water quality for the people around Bokaro Steel Plant. Further presence of microbes was also detected in the drinking water.

Regular monitoring of drinking water quality is essential as it is an important factor that has direct effect on human health.

To understand the problems of people regarding drinking water a questionnaire was prepared by which it came out that the people of Bokaro were quite fed up with the common digestive problems. The incidence of jaundice, chickenpox and typhoid among the residents was very high. People of peripheral areas had problems in cooking when they used the tap water. The problem was that time taken to cook vegetables, rice and cereals was too much. The clothes specially white clothes had streaks of yellow colour. Gastroenteritis was a common problem.

The incidence of Jaundice, Typhoid and Gastroenteritis increased manifold during the rainy season.

To get a solution to these problems research was conducted.

Samples of water were collected from different locations which included the workshops inside the plant and also from the township as well as places located on the periphery.

The collection of the samples was done after thorough sterilization of the bottles.

Initially the physical parameters were checked which included pH of the samples, turbidity and Iron content in water alkalinity, total hardness, total suspended solids, sulphates, cyanide, chlorides and fluorides.

The methods used for the estimation of the variables were standard methods of APHA.

A high content of Iron was found to be present in the peripheral areas specially Chas locality which was possibly due to old and rusted pipes being used in the water distribution system. High content of Iron in the water was possibly the cause of staining of laundry.

Iron depositions also promote undesirable bacterial growth resulting in the deposition of a slimy coating on the piping which could be the reason for enhanced stomach related diseases in this area. A possible suggestion would be immediate changing of rusted pipes.

Hardness in drinking water implies the aesthetic water quality factor. Dissolved Ca^{2+} , Mg^{2+} , Fe^{2+} and Mn^{2+} ions satisfy the definition of hardness. The hardness in water was found to be high in the peripheral areas of Bokaro Township.

The drinking water was not good in taste due to increased hardness. There was gray staining of washed clothes, reduced lathering of soaps, accumulation of whitish grey scales in tea kettles and other containers which were being used to boil water.

A possible suggestion for removing hardness from drinking water could be installation of a water softener which replaces the calcium and magnesium molecules with sodium molecules. Another alternative method could be by the addition of slaked lime called as lime- soda ash treatment.

Another effective way could be the use of RO (Reverse Osmosis) system.

Alkalinity is a measure of the capacity of water to neutralize acids. Alkalinity was measured in the given sample using the method of titration. It was found to be higher than its limits.

Too much alkaline water was upsetting the digestive system by raising the pH of the stomach hence increasing the acidity in the stomach. Thus the reason for digestive problems was unfolded.

High alkalinity in water causes excessive drying of the skin due to the fact they tend to remove skin oils. Troublesome amounts of alkalinity can be removed by reverse osmosis.

Other methods of water treatment also remove total dissolved solids and alkalinity but they are somewhat less suitable for household use compared to reverse osmosis. These methods are distillation and deionization. The feed of a mineral acid will also neutralize the alkalinity of water. Hydrochloric acid, Sulphuric acid or a combination of these can be used. This process converts the bicarbonates and carbonates present into the carbonic acid. At this point it is advisable to provide some method to permit the resulting carbon dioxide gas to escape into the atmosphere. It is important to have precise control of the process and caution in handling the strong acid.

Hence use of RO system is recommended to reduce the alkalinity.

Lead, Arsenic, Fluoride, Cadmium and Mercury are the five elements which are very dangerous if present in drinking water. Therefore they were checked in winter as well as summer season but thankfully were absent in the drinking water.

Another serious concern was the absence of ample amount of a disinfectant which was the cause of microbial diseases. The amount of chlorine being infused in drinking water should be immediately enhanced or addition of ozone could be taken as an alternative, specially during the rainy seasons because microbial contamination was found to be very high during this season.

The findings of the research work show that the study has contributed in understanding the problems that are caused by contaminated drinking water. The study has been conducted in one of the industrial areas of India, and its findings and suggestions can be compared with and implemented for providing pure drinking water in urban and rural areas across India. Keeping view of the rural areas where filtration techniques cannot be easily afforded usage of herbs and solar heater has been suggested.