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Treatment of Groundwater Affected By Heavy Metals by Reverse Osmosis

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Abstract - *The term "Ground water Toxicity" itself suggest the combination of groundwater by natural as well as in artificial way. It is well known fact that heavy metals are mostly found in groundwater near Chemical Industries as they dispose their wastewater and thus raise metal content in Groundwater. We collected three samples from Taloja MIDC, Vashi MIDC and Kalher, Thane. These samples were analyzed regarding Physical, Chemical and Heavy Metal Parameters.*

By conducting various tests, we came to conclusion that the following samples were heavily affected by metal content. From the above three samples, Aluminum & Iron metal content were detected in Vashi MIDC Area. Aluminum & Borates were detected in Taloja MIDC. Also, Kalher area was heavily affected by Lead & Mercury metal content. By using Reverse Osmosis technique, the Aluminum & Iron metal content of Vashi MIDC was brought down to permissible limit. In short, the water was portable for drinking.

Vashi MIDC sample was chosen for RO technique as people residing near Vashi MIDC area were highly affected by Alzheimer's disease due to heavy metal content of Aluminum & Iron.

Keywords: Groundwater Toxicity, Contamination, Heavy Metals, Heavy Metal Parameters, Reverse Osmosis, Alzheimer's Disease.

1. INTRODUCTION

Groundwater is the water present underneath the Earth's surface in soil pores spaces. Water is the vital source, necessary for human being and ecosystem survival. Depending on the quality, groundwater may be used for human consumption, irrigation purpose and livestock working. The quality of groundwater varies according to the area, type of subsurface soil conditions and its sources.

Solid as well as liquid waste is being dumped near the factories which reacts with the percolating rainwater and reaches the groundwater. The percolating rainwater picks up a large number of heavy metals which are harmful for human as well as ecosystem consumption, if this water is consumed for longer period. Groundwater also gets toxicated naturally by mixing with the naturally available heavy metals present in the Earth's crust. Diseases such as hepatitis and dysentery may be caused by the consumption toxicated groundwater.

1.1 Statement of the Problem

In this project we are addressing to the contamination of ground water which are turning toxic due to the industrial effects of waste emitting into the stream line, river without proper treatment which then percolates into groundwater and raises heavy metal parameters to it. These three locations are Industrial areas which are largely based on chemical industries. In the study we found metal content which were destructive in nature, and had a high level of toxicity. The water was not portable and was causing various diseases. The study areas have a large scale factory unit and hence, water has to be treated properly before letting out into the open atmosphere or water lines.

1.2 Objectives of the Study

Objectives of the Study are as following:

- To identify the area suffering from toxicated groundwater by Heavy metals.
- To collect the samples from specific areas and analyze the samples with respect to Physical, Chemical and Heavy metal parameters.
- To rectify metal content in the sample and suggest remedial procedure to it.

1.3. Future Scope of Study

By using RO technique heavy metals parameters like Aluminum and Iron affected ground water of Vashi MIDC area were brought down to permissible limit. Reverse Osmosis made heavily affected ground water to portable

drinking ground water. Not atleast drinking water but we can use for domestic purpose. Similarly, this technique can be applied to various regions which are highly affected by heavy metal parameter.

2. Literature Review

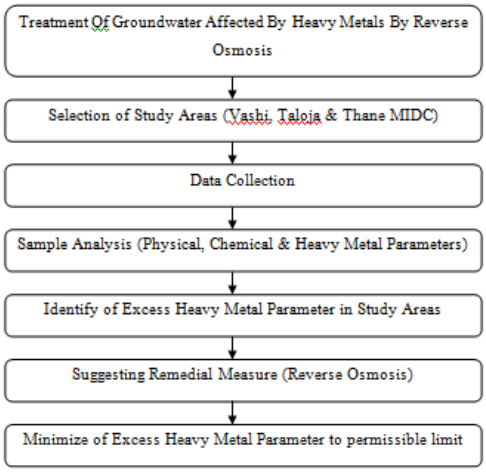
Ground water in many regions of India are contaminated with high concentration of metal and arsenic compounds .A study was performed by Dr. M V Prasanna, P Anandhan, I Jainab, C. Thivya in (2013/10/1) on significance of lithology in ground water quality which was carried out in Madhurai district which is located in Tamil Nadu basing at the southern part. In this study 54 samples were collected and were analyzed for major ions and were categorized for domestic purposes, drinking, etc. The samples were classified with sodium absorption ratio, electrical conductivity, residual sodium carbonate, sodium percentage. The samples of granite terrain are safe this study revealed that sample collected from granite and quartz terrains are compatibility better for domestic and drinking purposes.

Similar studies determine the maximum concentration of arsenic in ground water by Dipankar Das, Gautam Samanta, Badal Kumar, Mandak Tarit, Roy Chaudhary, Pratik Chaudhary on March (1996) on environment geochemistry and health . In this study they studied ground water of six districts of West Bengal in which (37) administrative blocks by the side of river Ganga and adjoining areas. In the more than 800000 people from 312 villages / wards are drinking arsenic contaminated water and 175000 people show arsenical skin lesions. Hair, nails , scales , urine , liver tissue analyses show elevated concentration of arsenic in drinking water for long period . They found that bore holes sediment analysis show high arsenic concentration. Malnutrition, poor socio economic conditions, illiteracy and intake of arsenic contaminated water for many years have aggregated the arsenic toxicity. They concluded in the end of the studies that if alternative water resources are not utilized, good percentage of 30 million people of these six districts may suffer from arsenic toxicity

3. Study Area & Data Collection

We conducted tests regarding Physical, Chemical & Heavy Metal parameters on three samples collected from Taloja, Vashi & Thane MIDC areas. In Taloja MIDC area lead, mercury, aluminum & borates were beyond permissible limit. Mercury, lead, borates & iron were beyond permissible limit in Vashi MIDC area. Also Lead, borates, aluminum & arsenic were maximum in the sample collected from Thane MIDC area. The sample was hard enough & non drinkable.

4. Methodology



5. Results

By applying RO technique on the sample collected from Vashi MIDC we came to conclusion that the heavy metals reached to permissible limit. The sample was portable, fit for drinking purpose. Also it can be used for domestic purpose.

6. Conclusion

Our project focuses on the study related to heavy metal content present in Groundwater. In this study we collected samples from different locations (Taloja MIDC, Vashi MIDC and Thane MIDC) for purpose of analyzing these samples regarding Physical, Chemical & Heavy Metal Parameters. By analyzing these samples, we concluded that the water was highly affected by heavy metals such as Aluminum, Borates, Lead, Iron, etc. which makes the water unfit for drinking purpose. Hence, in continuation with the project we suggested remedial procedure for treating this highly affected groundwater. Reverse Osmosis is one of them for treating these waters. Also, we designed a Reverse Osmosis model which was able to bring down the metal content to permissible limit. We treated sample from Vashi MIDC which was highly affected by heavy metal parameters and with the help of the Reverse Osmosis we treated groundwater and again test were carried out regarding Physical, Chemical & Heavy Metal Parameter as done before. Vashi MIDC was chosen as people residing nearby were suffering from Alzheimer's disease. By analyzing the outcome of the test, we came to conclusion that all the heavy metals which were beyond permissible limit came within permissible limit. Also the water was safe for drinking purpose if not then can be utilized for atleast domestic purpose. Similarly RO technique

can be applied for making heavy metal parameters within permissible limit in highly affected areas.

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