

A Review on Eviction of Fluoride from Ground Water of Particular Samples from Diverse Villages

Sanchita S. Nawale¹ Prakash A. Katdare²

^{1,2}Assistant Professor

¹Department of Civil Engineering ²Department of Mechanical Engineering

^{1,2}SVKM's Institute of Technology, Dhule, India

Abstract— Due to the manifestation of fluorine in ground water different chattels on human physiology can be seen. The increase or decrease in concentration of fluorine can make the groundwater unfit for various purposes. Due to high human population, urbanization, use of artificial chemicals and human activity water is highly dense with different harmful contaminants. Fluoride concentration above the permissible limits (1.5 mg/l) in drinking water leads to human health hazards, such as tooth and bone fluorosis. The climatic condition of action rocks, extract of soils, mining procedure and foray of rainfall through it high fluoride combination in groundwater. Different rocks have fluoride bearing minerals like apatite, fluorite, biotite and hornblende. The present investigation attempts to study the digestion of fluoride in groundwater of various areas like Dhule, Sakri village and Shindkheda. The study reveals that the consolidation of fluoride was found as 1.72 mg/l, 5.21 mg/l and 3.13mg/l in Dhule, Sakri and in Shindkheda which is higher than permissible limit. Treatment of water needs elimination of fluoride ions with a suitable and effective technique. Various types of techniques have been studied here such as Reverse Osmosis (RO), Activated Alumina, Black Carbon, electro dialysis (ED).

Keywords: Electrodialysis (ED), Reverse Osmosis (RO)

I. INTRODUCTION

Three types of water are available on earth namely rain water, ground water, and surface water. These are under dreadful hazard due to unlike diversity in properties of air, water and soil. Precipitation is clean and it is suitable for all purpose but it's too difficult to store and maintained tube wells and pit or on other ground water sources such as ESR, Reservoir, canals and stream. Due to famine of waters, the people confide on natural sources of water.

Due to urbanization, use of dressing to aid production of crops and human activity the quality of water is decreasing with different hazardous toxin. Natural water contaminates due to climatic conditions of rocks and drain of soils, mining procedure, etc. Fluoride plays the main role in it. It is needed that the quality of water is checked on regular basis to reduce the effect of fluorides. It is calculated that around 38.7 million Indians are influence by tooth and bone fluorosis yearly. The availability of good quality water is a Crucial Characteristic for Remedial measurement diseases and better quality control in life.

Different types of concentrations affect the ground water and its characters. The data related to geography and soil and metrological parameter of particular type of village or region is very much important. Generally, untreated waste gets directly discharged into river or surface or canal which contaminates its water. The various treatment method for purification has been studied here.

II. METHODOLOGY

A. Sampling

For experimental examination and determination collection of data is a step. The water was being suck and drawn continuously from the bore well and it is assumed that the pipe materials has not influenced the water sampled. Two samples were taken and labeled properly, 2-liter plastic canes were used for easy identification. The sample bottles were then sealed with sharp bottle cap.



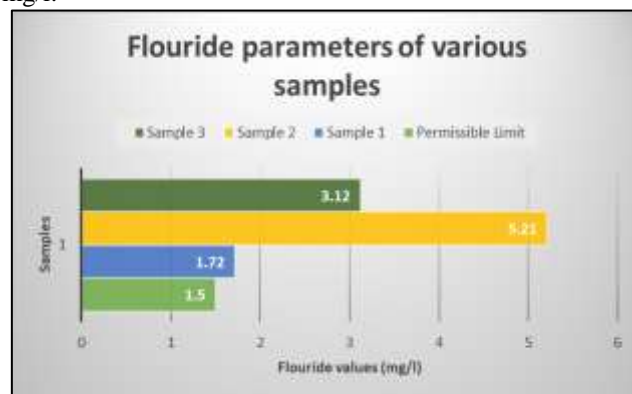
Fig. 1. Collected Water Samples

B. Laboratory Analysis

Laboratory tests were carried out at Ground Water and Development Agency (GSDA), Regional Water Testing Laboratory in SVKM IOT & Pharmacy Dhule Region for each of the sample obtained in agreement to the Standard Methods for the Examination of Water (APHA 22nd EDN, Method).

C. Test Results

The procedure of testing for Fluoride required 50ml of water sample and it is administered using the standard methods as explain in APHA 22nd EDN, Method 4500FB. The test results were then distinguished to the WHO standard value of 1.5 mg/l.



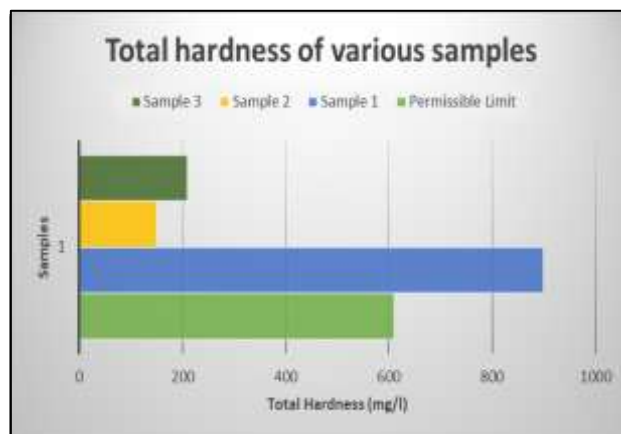
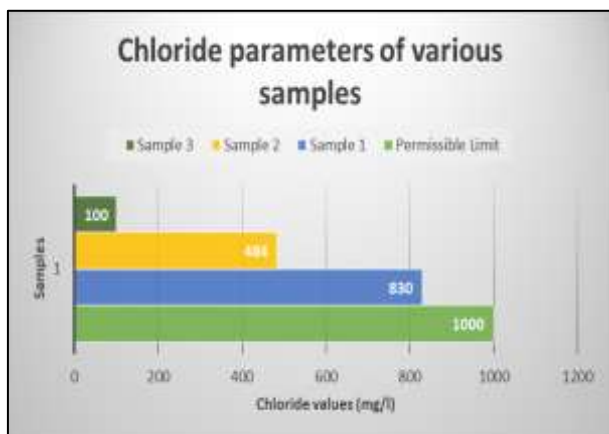


Fig. 2: Comparative study of Fluoride, Chloride parameters and Total Hardness of various samples in mg/l

S.N.	Test Parameters	Measurement Units	Test Methods	Requirement as per IS 10500:2012 (Drinking Water Specifications) Including Amendment No. 1		Test Results		
				Acceptable Limit	Permissible Limit	S1	S2	S3
1	Fluoride	mg/l	APHA 22NEDDN, METHOD, 4500FB	1	1.5	1.72	5.21	3.12
2	pH		APHA 22NEDDN, METHOD, 4500	6.5 TO 8.5	No Relaxation	6.9	7.5	7.7
3	Electrical Conductivity	uS/cm	APHA 22NEDDN, METHOD, 4500FB	-	-	4130	2030	954
4	Temperature	°C	-	-	-	25	25	25
5	Turbidity	-	-	-	-	0.5	0.4	0.7
6	Chloride	mg/l	ALPHA METHOD	250	1000	830	484	100

Table 1: Test Results of Different Samples for Various Parameters

From the above comparative analysis fluoride content is found to be maximum than its legal limit.

III. TREATMENT METHOD FOR FLOURIDE REMOVAL

A. Reverse Osmosis

Reverse osmosis (RO) represents the image of reversal of normal osmotic subject by series of actions to achieve desired results. It has confidence on pressure and a semi-permeable membrane to remove contaminants from H₂O. RO can be used as a stand-alone treatment for all type water. Other molecules are safe expected fluorides.

B. Activated alumina

Fluoride removal can be powerfully done by using activated alumina (corundum/aluminum oxide) which has a heavy surface area with a huge array of inner cuts like pores. For this reason, activated alumina is generally used as fluoride removal media.

C. BC-Carbon

Since ages Bone-Char (BC) Carbon has been used to remove naturally-occurring fluoride from surface water. It has same mechanism similar to the way bones in the homo body are affected by fluoride. Bone Char Carbon contains a porous structure from which another structure originates that is rich in surface ions.

D. Electrodialysis (ED)

Electrodialysis (ED) is a membrane procedure similar to RO, different is that ED application uses DC potential (electric current), alternatively of pressure, to separate ionic impurity from water. Because water does not physically pass through the membrane in the ED procedures, granular matter is not clean. Thus, ED membranes are not technically considered grit chambers. The EDR process produces water quality comparable to RO, and may require post treatment counterpoise. The EDR process is frequently used in treating blackish water to make suitable for drinking.

Sr.no.	Treatment Method	Removal performance	Cost	Advantages	Disadvantages
1.	Reverse Osmosis	90%-95%	Very High	RO is EPA- listed Best Available Technique for both F and As.	High treatment technology increased capital costs, Skilled operator required
2.	Activated alumina	98%	Medium	Proven effectiveness, will treat current F and S.	Spent regeneration solution contains high F concentrations
3.	BC-Carbon	90%	Low	Locally available, simple and easy to build.	may give taste; degenerates not universally accepted.
4.	Electrodialysis (ED)	85%-90%	Very High	Familiarity with membrane separation system.	Water loss, high costs, brine discharge.

Table 2: Comparison of Different Treatment Methods

IV. CONCLUSION

It was found that the above three samples collected had fluoride content above the permissible limit i.e. 1.5mg/l. For removal of fluoride, Reverse Osmosis (RO) was found as most appropriate method as distinguish to other treatment methods. But, the disadvantage of RO is, it is very costlier than others. It has been seen for removal of small quantity of fluoride Bone-Char (BC) Carbon is used at domestic level which is most economical.

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