5. Fluoride Free Drinking Water: Household Chemo-Defluoridation Unit

Preamble:

One of the major challenges faced by mankind today is to provide safe drinking water to a vast population around the world. In India, 85% of rural water supply depends on groundwater. Groundwater quality may be impaired by many natural constituents such as fluoride, arsenic, iron, nitrate and salinity of which fluoride stands first as a pollutant of geogenic origin. Chronic exposure to high fluoride containing drinking water can result in dental, skeletal and non-skeletal fluorosis. Health effects caused by excess daily intake of fluoride with drinking water as the major contributor, has affected people in 20 states of India. There are many defluoridation options. Defluoridation technologies based on chemical separation are sorption on solid filter media, chemical precipitation and coagulation; Physical separation processes for defluoridation include electro-dialysis, reverse osmosis and Nano-filtration. However, in poor rural settings, many technologies have failed in the field due to high costs, non-availability of skilled operators, unpalatable taste of treated water and impractical operational requirements. A simple and affordable technology that is acceptable to users is a need of the hour.

National Environmental Engineering research Institute (CSIR-NEERI) Nagpur has developed the NEERI-ZAR chemo-defluoridation process for treatment of potable water with high fluoride content under a project sponsored by the Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra, Mumbai. The household unit was field tested over a long duration in tribal villages of Sakhara and Chichkavatha in Nagpur district which have water sources with fluoride contamination.

Chemo-Defluoridation Unit:

NEERI-ZAR defluoridation domestic unit consists of a steel/plastic container with sand filter at the bottom of the container. A fluoride bearing water (30 L) is added in the container followed by dosing of the salts of calcium and phosphorous chemical coagulants with manual stirring. When salts of calcium and phosphorous are added to fluoride bearing water, the chemicals react with each other to form the chemical complex which is precipitated out absorbing the fluoride from water. After 15 to 20 minutes of mixing of the chemicals, water is allowed to flow by gravity through the sand filter at the rate of 300 – 400 ml/min. Filtered water with fluoride concentration less than 1 mg/L is collected in the container and can be used for drinking and cooking purposes. After about one-month use of the unit, efficiency of the filter get reduces due to settling of chemical precipitate on the sand filter which can be manually cleaned by removing the top layer of the precipitate settled on the sand bed.

A guidance manual is provided with each household unit. It guides about how to operate, how to take care and what precaution should be taken while handling the unit. The manual has been prepared in simple Marathi language and could be easily understood by villagers.

Salient Features:

- Process involves formation of insoluble fluoride complex with salts of calcium and phosphorous and filtration through sand filter
- Reduces the fluoride concentration in water to <1 mg/L
- The household defluoridation unit is suitable for treating the water upto fluoride concentration of 5-6 mg/L
- Taste of the treated water is palatable
- Cost of treatment with fluoride concentration of 5 mg/L and treated water with fluoride concentration of <1 mg/L is Rs. 0.20 per liter
- The units are suitable for the small fluoride affected villages where community water supply schemes are not economically feasible

Technology is available for wider use.

FOR DETAILS, CONTACT:

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CHEMO-DEFLUORIDATION UNIT

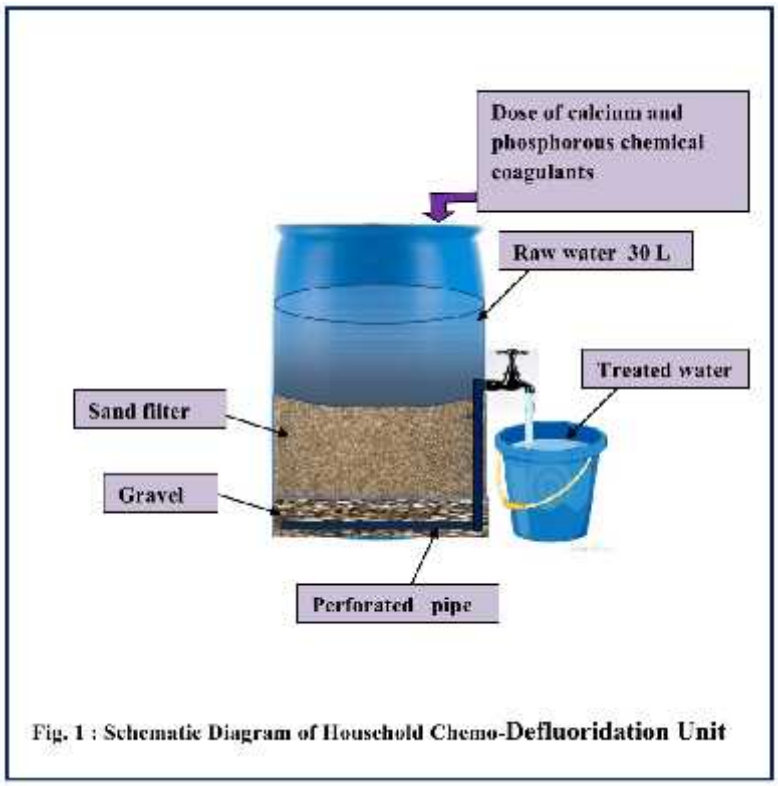

Fig. 1 : Schematic Diagram of Household Chemo-Defluoridation Unit

Chemo- Defluoridation Units installed in Sakhara and Chichkavatha villages