

Investigate the Suitability of Pre-Chlorination with Rapid Sand Filtration as the Treatment Method to Remove Selected Physical and Chemical Parameters from Groundwater – A Pilot Study

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Abstract

Groundwater sources are very vital in the global drinking water supply as it holds around thirty percentage (30%) of the freshwater quantity of earth. The Murunkan aquifer is one of the most utilized aquifer systems in the Northern Province that catering approximately forty percentage (40%) of potable water demand of the Mannar district. Groundwater intakes of Murunkan have very high yields and daily average extraction is around 10,000 cubic meter per day from several deep wells for drinking water supply. A few physical and chemical properties from the individual wells have occasionally deviate the maximum permissible limit stipulated based on the Sri Lankan Standards for potable water SLS 614:2013. The scope of the pilot study is to investigate the suitability of pre-chlorination with rapid sand filtration as the treatment method to remove selected physical and chemical parameters such as colour, turbidity, pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness, total alkalinity, fluoride, nitrate, nitrite, total phosphate and sulphate from groundwater. A rapid sand filter model was erected at the water intake site and raw water was conveyed through the filter model with pre-chlorination. The pilot filter consists of particle sizes of 25mm, 16mm, 10mm, 2-5mm with layer thickness of 75 mm, 50mm, 30mm, 50mm, respectively, and a filter media with 700 mm layer thickness. Sieved ordinary silica sand was used as filter media and Effective size (D10) and uniformity coefficient (Cu) was found to be 0.425 mm and 2.77 respectively. The chlorine solution is conveyed by a small feeder mechanism, into the water at the inlet point of the rapid sand filter model. A retention time, is maintained between 20-25 minutes to allow oxidation to take place above the sand bed within the rapid sand filter model. The effluent from the filter model was tested for selected parameters based on APHA and SLS standards for 15 trials. Colour removal was observed in 67% of samples while the colour parameter of 93% of treated water samples were within the SLS 614:2013 standards. Turbidity parameter of all treated water samples were within the SLS 614:2013 standards while turbidity removal was observed as 60% of samples. The findings suggest that there is no considerable reduction in pH, EC, TDS, total hardness, total alkalinity, fluoride, total phosphate and sulphate in the treated water by using this treatment method.

Keywords: *Oxidation, chlorination, potable water, rapid sand filtration (RSF), water treatment*

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