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Analysis of Residual Chlorine Concentration in Water Distribution System in Vavuniya District

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Per Aru reservoir is located in Vavuniya District and water from the reservoir is treated through the water treatment plant. Chlorine is used as a disinfectant and it should ensure that there is a constant minimum residual chlorine level (RCL) in all the parts of a distribution system. Further, the factors that influence chlorine decay should be identified. On this basis, the study was aimed to analyze the RCL concentration along the distribution system and find the locations with lower RCL concentration than the acceptable range (0.2 - 0.5 mg/L) and possible reasons for lower concentrations. A field study was conducted at the water distribution system connected to the Marakkampalai overhead tank by collecting water samples at different locations. Totally 31 locations in the distribution system were selected. Water samples were analyzed for RCL concentration, pH, dissolved oxygen (DO) and temperature at the site itself. Collected data on RCL were statistically analyzed with one sample *t*-test, paired *t*-test and Duncan multiple range test. Information on the water distribution system; age of the pipe, pipe materials and diameter and distance from the overhead tank was collected. Results revealed that there was no significant difference in RCL concentration measured in different time periods however a significant difference was observed among the data collection points on the same day. The RCL concentration among the Marakkampalai distribution system varied from 0 mg/L to 1.01 mg/L. Pattanichurpuliyankulam and Thirunavatkulam areas showed very low RCL concentration. Temperature of the collected water sample varies from 27.4 °C to 33.8 °C. Temperature range from 31 °C to 32 °C shows the acceptable RCL concentration. Higher temperature causes high RCL decaying which results in low RCL in consuming water. The pH and DO do not influence on RCL in consuming water. There was no any clear relationship recorded for pH and DO against RCL. Pipe age, Pipe material and Pipe diameter have no influence on residual chlorine decaying in this distribution system. Further, nearby areas to overhead tank shows sufficient amount of RCL in consuming water. However, the areas which are far away from the overhead tank and complex designed areas show lower amount of RCL in consuming water. Hence, actions need to be taken to ensure drinking water supply with acceptable range of chlorine in this water distribution system.

Keywords: Disinfection, Drinking water treatment, Residual chlorine