Application of Solar Desalination Technology to Provide Safe Drinking Water for Water-scarce Areas in Jaffna Peninsula

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Jaffna is fully depending on ground water or ground water for their entire water demand. The available water is contaminated by sea water and other anthropogenic contaminants. Due to this, the people of the area are facing severe water quality issues. Alternative sources should be adopted to rectify the problem. Reverse osmosis is one of the solutions, but it is very expensive. Solar desalination technology is the cheapest method for desalination. A solar desalination plant utilizes solar energy, converting it to heat energy. A special nano cloth was used as solar collector and Polythene cover was used as condenser. The nano cloth captures water that evaporates during the sunshine and then it condenses and collects into outlet grid. Water source, temperature of the raw water and flow rate of raw water were changed to determine the rate of desalination. Saline water, brackish water and ground water sources were used. The Electrical conductivity of the desalinated water was observed to be in the range of 200 µS cm^{-1} -205 µS cm^{-1} for sea water, 34 µS cm^{-1}-150 µS cm^{-1} for brackish water and 25 µS cm^{-1} -70 µS cm^{-1} for groundwater. Raw water temperature was changed as 305 K, 310 K and 315 K, the rate of desalination were observed as 0.37 L h^{-1} m^{-2},0.47 L h^{-1} m^{-2} and 0.54 L h^{-1} m^{-2} respectively. Inlet flow rate was changed as 2 L h^{-1},2.85 L h-1 and 3.33 L h^{-1}, the rate of desalination was observed as 0.61 L h^{-1} m^{-2}, 0.67 L h^{-1} $m^{-2}$and 0.62 Lm^{-2} respectively. Rate of desalination of the ground water, brackish water and saline water were 0.35 L h^{-1} m^{-2}, 0.39 L h^{-1} m^{-2} and 0.37 L h^{-1} m^{-2}, respectively. These results indicate that there is no significant difference of efficiency with the water matrix, increasing with raw water temperature. This solar desalination system can produce 10 L —15 L desalinated water per day in dry season. Therefore, it is suggested that, this method is suitable for mainly isolated islands of Jaffna which are facing severe water scarcity.

Keywords: Solar desalination, Solar collector, Rate of desalination, Electrical conductivity, Reverse osmosis