

Abstract

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Experimental Study of a Water Desalination System Based on Humidification-Dehumidification Process using a Heat pump

A huge sector of the world population is currently suffering from water shortages. With that problem continuing to be more common, water Desalination is now considered a solution for providing a sustainable source for fresh water. This study presents an experimental investigation on a water desalination unit working with humidification-Dehumidification method. A heat pump provides the energy needed for fresh water production. The system utilizes the heat rejected and the cooling effect of the heat pump for that purpose. The air is firstly heated by the heat pump condenser then it is humidified by spray humidifiers then dehumidified by condensing the humidified air by the evaporator of the heat pump. A test rig was constructed to study the performance under different operating conditions. The effect of water spraying direction (cross, counter and parallel) on the unit's production rate is studied, together with the air flow rate variation. Experiments were carried out under variable inlet air conditions. Results showed that experiments carried out by cross water spraying humidification yielded the highest fresh water production rate. The unit maximum production rate was found to be 2.8 Liters/hour at power of 1.4091 kW, i.e. 1.98 L/kW.hr.