

Investigation on solar humidification dehumidification water desalination system using a closed-air cycle

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September 16, 2020

Abstract

This research presents a theoretical and experimental study of a solar humidification dehumidification water desalination system based on a closed-air cycle. The results show that productivity enhances with increasing air flow-rate while the gain output ratio decreases. The gain output ratio and productivity improve with raising the temperature of water. The average value of gain output ratio is 0.71, 0.74, 0.78, and 0.81, and productivity is 1.46 kg/h, 2.59 kg/h, 4.40 kg/h, and 6.99 kg/h at water temperatures of 40 °C, 50 °C, 60 °C, and 70 °C, respectively. The maximum gain output ratio of 0.86 is recorded at water to air mass flow-rate ratio of 5. Increasing the cooling water flow-rate has a positive effect on both productivity and gain output ratio. Moreover, The results indicate that the fresh water cost is 0.012 \$/L. Finally, a good agreement is noted between the theoretical and experimental results.

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