Thermodynamic analysis of a single and two-stage solar assisted air-cooled flash evaporation desalination system for small-scale applications

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ABSTRACT

Thermodynamic analysis of a single and two-stage air-cooled desalination system assisted by solar energy is presented. The proposed single and two-stage system is simulated for various operating parameters such as incident solar radiation, pressure in the flash vessel and temperature of the feed water. The results of the analysis show that the amount of distillate yield obtained in the single-stage system in a year ranges from 2.77 to 3.61 kg/h, while the yield of the two-stage system ranges from 4.38 to 6.03 kg/h. The improvement in yield of the two-stage system is found to be about 36–40% higher than that of the single-stage system. The ambient air temperature has a significant impact on the performance of the air-cooled condenser used in the system.

Keywords: Air-cooled; Flash evaporation; Solar desalination; Two-stage; Vacuum

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