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Analysis of an evaporation–condensation desalination system in vacuum driven by geothermal energy

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ABSTRACT

A new multiple-effect desalination system in vacuum powered by geothermal energy considered as clean and renewable natural energy resource is proposed. Every effect includes an evaporator and a condenser which are composed of heat pipes to work in vacuum. The performance of one effect was studied by employing a mathematical model based on energy and mass balance equations. The performance of system was evaluated through several indicators: performance ratio, heat transfer area of per-water production, and coefficient of performance. The results showed that freshwater production ratio increased with the geothermal water flow and geothermal temperature, but could not increase with the condensation vacuum enhancing. In conclusion, the analysis has shown that geothermal resource in the temperature range of 50–100°C has a good potential to power seawater vacuum desalination system. It would be beneficial for people in the areas with abundant seawater/brackish water resources and good geothermal conditions.

Keywords: Geothermal energy; Desalination; Heat pipe

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