Experimental evaluation of a multiple-effect distillation unit in low seawater flow conditions

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ABSTRACT

In this work, we evaluate experimentally the performance of a multiple-effect distillation (MED) unit in low seawater flow conditions and the potential of its integration with a concentrated solar power system. The innovation of this MED unit is the introduction of a flow distributor within the parallel plates of the falling film heat exchanger, designed to improve the system performance and efficiency under low seawater flow conditions. The main parameters examined were the thermal input power and the flow rate of the inlet seawater to each effect and the inlet seawater temperature of the single unit. Furthermore, the experimental results were compared with a control volume energy conservation model. The results showed that lower heat input load results to a higher value of the performance ratio (PR) of the unit and also under constant heat load, a higher temperature of the seawater lead to higher distillate product for the single effect unit. As the number of effects is increased the PR of the unit also increases approximately by 0.7 per effect. This maximum value for each effect is always observed in a constant ratio of seawater to steam flow rate.

Keywords: Multiple-effect distillation; Desalination; Solar thermal energy; Performance ratio; CSP

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