



Performance study of a rotary vane pressure exchanger for SWRO

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ABSTRACT

In this study, models of a rotary vane pressure exchanger (RVPE) which is expected to be used as an energy recovery device in seawater reverse osmosis system were newly developed to study the performance of the proposed structure. The suitable design of the cylinder profile in RVPE was conducted. The leakage between brine stream and seawater stream, and the flow rate considering the leakage were studied. The contact performance between the cylinder and vane was discussed. Energy performance analysis was conducted to illustrate the energy saving potential of RVPE. The results show that the matching design of the cylinder profile and vane number can eliminate the short-circuit leakage and reversed flow, and reduce the energy loss in the energy recovery process. The interior leakage was controllable, and the flow rate presented periodic flow fluctuations. A careful selection of the device parameters, such as rotor speed, vane material density, vane thickness and vane radial length, is critical in order to ensure the contact performance between the cylinder and vane. According to the results, the RVPE is of reasonable structure, reliable performance and high energy saving potential to be a new type of energy recovery device.

Keywords: Pressure exchanger; Desalination; SWRO system; Energy recovery; Contact performance

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