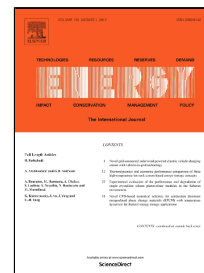


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Design and analysis of a forward feed multi-effect mechanical vapor compression desalination system: An exergo-economic approach

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ABSTRACT

The paper presents an exergo-economic based design and analysis of a forward-feed multi-effect mechanical vapor compression desalination system. The analysis is focused on estimating the energy consumption, exergy destruction, Second Law efficiency, and product cost for a different number of evaporation effects. In addition, a detailed heat exchanger design is also presented to estimate the heat transfer coefficients, areas, and pressure drop in the evaporators and feed preheaters. Finally, the cost flow diagram is provided to highlight the monetary cost of each stream as well as product cost which is compared with a conventional method. The values of specific energy consumption, Second Law efficiency and product cost from the current analysis are observed to be ranging from 7.67 to 11.36 kWh/m³, 7 to 10.96 % and 0.862 to 1.186 \$/m³, respectively. Furthermore, the effect of a number of evaporators, compressor efficiency, evaporation temperature, interest rate, cost index factor and unit electricity cost on the plant performance is also discussed in the paper.

Keywords: forward feed, mechanical vapor compression, exergo-economic, seawater, desalination

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