

Thermodynamic analysis of humidification–dehumidification desalination cycles

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ABSTRACT

Humidification–dehumidification desalination (HDH) is a promising technology for small-scale water production applications. There are several embodiments of this technology which have been investigated by researchers around the world. However, from a previous literature [1], we have found that no study carried out a detailed thermodynamic analysis in order to improve and/or optimize the system performance. In this paper, we analyze the thermodynamic performance of various HDH cycles by way of a theoretical cycle analysis. In addition, we propose novel high-performance variations on those cycles. These high-performance cycles include multi-extraction, multi-pressure and thermal vapor compression cycles. It is predicted that the systems based on these novel cycles will have gained output ratio in excess of 5 and will outperform existing HDH systems.

Keywords: Humidification; Dehumidification; Desalination; Cycle analysis; Solar energy; Cycle optimization

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