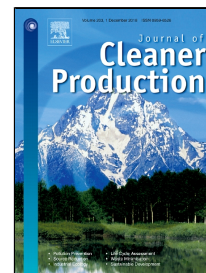


Accepted Manuscript

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PII: S0959-6526(18)32986-X
DOI: 10.1016/j.jclepro.2018.09.247
Reference: JCLP 14382
To appear in: *Journal of Cleaner Production*
Received Date: 05 May 2018
Accepted Date: 28 September 2018

Please cite this article as: R. Santosh, T. Arunkumar, R. Velraj, G. Kumaresan, Technological Advancements in Solar Energy Driven Humidification-Dehumidification Desalination Systems - A Review, *Journal of Cleaner Production* (2018), doi: 10.1016/j.jclepro.2018.09.247

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Technological Advancements in Solar Energy Driven Humidification-Dehumidification Desalination Systems - A Review

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Abstract

Water scarcity has resulted in a pressing need to develop an inexpensive and efficient desalination technology for fresh water production, especially in developing countries. Apart from other effective desalination technologies, humidification-dehumidification desalination process is predominantly adopted in the past decade to meet water deficiency due to its varied advantages in system construction, maintenance and operation. In this paper, a comprehensive review of the various advancements carried out experimentally for improving the performance of the solar humidification-dehumidification desalination system has been presented. The major factors contributing for enhanced system performance such as mass flow rate of heat transfer fluid, forced convection mechanism, multi-pass technique, recirculation mechanism, use of nano heat transfer fluid and phase change material are discussed. Further, the effect of solar intensity, ambient temperature, wind velocity, stage-wise heating and cooling on freshwater productivity is also reported. It was found that easy construction and maintenance of flat plate collector and higher performance index of evacuated tube collector make them as the predominant technologies adopted for heating the water and air heat transfer fluid's in solar humidification-dehumidification desalination system respectively. Further, it is identified that there exists a large potential for improving the fresh water yield through hybrid systems which involve use of geothermal or biomass energy, integration of solar stills with humidification-dehumidification desalination system, coupling of solar still, Fresnel lens solar collector and parabolic trough collector respectively with the flat plate collector and evacuated tube collector systems. The scope for further improvement in individual system and process parameters have been discussed.

Keywords: Humidification; Dehumidification; Solar energy technologies; Desalination; Water.

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