Desalination and Water Treatment
www.deswater.com
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doi: 10.1080/19443994.2012.714925

51 (2013) 1290–1295
January

Taylor & Francis
Taylor & Francis Group

Study of thermophysical properties of a solar desalination system using solar energy

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Received 1 March 2012; Accepted 18 July 2012

ABSTRACT

Salted water occupies the greatest part in the world, but we are not using all of it because of its saline character. In addition, there is an excessive consumption of energy in most systems of desalination which leads to generating gases that cause global warming. Besides, in certain countries of the world this energy is not available in great quantity. Distillation is an operation which transforms, by heating, the seawater or brackish water into vapor. Through condensation, this vapor gives water of great purity. Among the various processes, solar distillation is an interesting solution in the isolated areas. The objective of our work is to study the transfers of heat and mass in a solar distillatory. Thus, we studied the evaluation of the thermophysical properties and the effect of the properties of humid air—as binary mixture of water vapor and dry air—on the coefficient of transfer of heat by convection and the evaporative ratio of thermal coefficient of transfer and the flow of the distillate. In addition to these theoretical results, we have replicated previous experimental investigations. We have also established equations governing the operation of a solar distiller with capillary film, in the resolution based on the numerical approach based on the method of Runge–Kutta. The results obtained show that the effect of relative humidity and the differences in temperature between the pan and brine on the convective coefficient and thermophysical parameters of solar distiller.

Keywords: Humid air; Thermophysical properties; Solar distiller; Efficiency

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Presented at the International Conference on Desalination for the Environment, Clean Water and Energy, European Desalination Society, 23–26 April 2012, Barcelona, Spain

This version has been corrected. Please see Corrigendum (http://dx.doi.org/10.1080/19443994.2012.737687)