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Analysis of the evaporator heat flow rate in a water purification process integrated to an absorption heat transformer with energy recycling

R.F. Escobar[a], J.A. Hernández[b]*, C.M. Astorga-Zaragoza[a], D. Colorado[b], D. Juárez[b], J. Siqueiros[b]

[a]*Centro Nacional de Investigación y Desarrollo Tecnológico, Int. Internado Palmira S/N, Palmira C.P. 62490, Cuernavaca, Morelos, Mexico*
[b]*Centro de Investigación en Ingeniería y Ciencias Aplicadas, Universidad Autónoma del Estado de Morelos, Av. Universidad 1001, Col. Chamilpa, C.P. 62209, Cuernavaca, Morelos, Mexico*
Tel. +52 777 329 7084; Fax: +52 777 329 7984; email: alfredo@uaem.mx

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ABSTRACT

An experimental system of an absorption heat transformer consists of four components: a helical double-pipe vertical evaporator, a helical double-pipe vertical condenser, an absorber and a generator. In a general case, the thermodynamic model estimates the coefficient of performance (COP) derived from the water purification process integrated with the absorption heat transformer, considering the heat flow rates of the absorber, the evaporator, the generator and the condenser. In this work, a theoretical evaporator model is incorporated into the thermodynamic model for the performance analysis in the absorption heat transformer with energy recycling. This model predicts the heat flow rate of the helical double-pipe vertical evaporator. It considers change of phase, equations of continuity, momentum and energy equations in the two water flows at countercurrent and heat transfer by conduction in the internal tube wall and insulated external wall. This shows the effect upon the changes of the evaporator heat flow rate in the COP estimation. This analysis of COP versus evaporator heat flow rate was done in steady state that allows knowing the quantity of heat that the evaporator needs — both from energy recycling and a thermal source. In addition, these coupling models (theoretical and thermodynamic) give the opportunity to control the performance of the system on-line.

Keywords: Water purification; Absorption heat transformer; Helical double-pipe vertical evaporator

* Corresponding author.

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