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On-line LiBr+H_2O estimation for the performance of a water purification process integrated to an absorption heat transformer

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ABSTRACT

On-line LiBr+H_2O concentration is estimated and used to predict the coefficient of performance (COP) of a water purification process integrated to an absorption heat transformer (WP–AHT) applying a number of different algorithms developed in Matlab. The COP is a very important parameter for the performance of the WP–AHT. In this process the working fluid for the absorber and generator is LiBr+H_2O, whereas for the evaporator and condenser it is H_2O. The LiBr+H_2O is an important mixture to increase the energy in the absorber of the heat transformer. Two temperatures (absorber and generator) and two pressures (absorber and generator) are measured on-line to estimate the different concentrations of the absorber and the generator in steady-state on-line. An optimization method is taken to fit the unknown composition (X_{sol}) resulting from the equations. Through these on-line X_{sol} estimations, we can predict on-line COP values from a thermodynamic model. These results (X_{sol}) are satisfactory to estimate on-line the COP and to obtain the system operating conditions for each measured set of temperatures and pressures. Furthermore, with these algorithms that were developed, it is possible both to reduce costs of energy production and to allow a process control. Finally, the elapsed time to calculate the COP from this algorithm is 0.5 s, which is sufficient for the performance prediction of the system and it allows for automatic control.

Keywords: On-line LiBr+H_2O estimation; Water purification; Absorption heat transformer

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