Desalination and Water Treatment
www.deswater.com

doi:10.5004/dwt.2017.20357

73 (2017) 90–100
April

Criteria for improving the traditional artificial neural network methodology applied to predict COP for a heat transformer

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Received 11 July 2016; Accepted 16 November 2017

ABSTRACT

This paper introduces three valuable criteria to reduce the number of input variables while predicting the coefficient of performance (COP) (of an absorption heat transformer with duplex components, using an artificial neural network (ANN) model developed in [1], with an experimental database of 1310 pieces of data, in which the experimental COP ranged from 0.10 to 0.36, considering 127 coefficients of adjustment (weights and bias), assuming 16 input variables and a coefficient of determination (r^2) of 0.9969. The database and COP range described above were used in this research considering 50% of data for training and 50%for testing, to present the following criteria: i) creating a correlation matrix to select the input variables in the ANN, ii)performing a residual analysis to validate the ANN models, and if there are several ANN models iii) this criterion could be used to choose the best model. These criteria were studied and included in the traditional ANN methodology proposed by authors [1], however, according to our criteria the best models only used 5 and 6 operation variables in the input layer of ANN architecture, with 33 and 37 coefficients of adjustment, respectively, besides a coefficient of determination (r^2) $r^2 \geq 0.9984$.

Keywords: Modeling; Absorption; Correlation matrix; Homoscedasticity; Normal distribution

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Presented at the EDS conference on Desalination for the Environment: Clean Water and Energy, Rome, Italy, 22–26 May 2016.