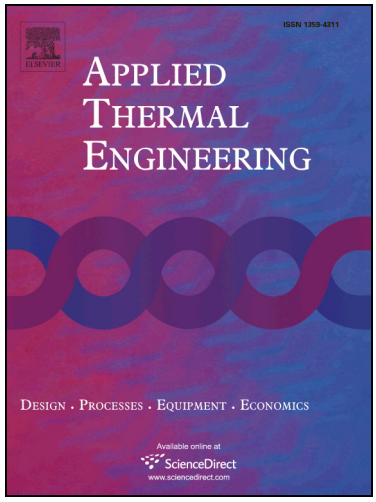

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PII: S1359-4311(16)31250-9
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2016.07.117
Reference: ATE 8715

To appear in: *Applied Thermal Engineering*

Received Date: 19 January 2016
Revised Date: 14 July 2016
Accepted Date: 17 July 2016

Please cite this article as: X. Qi, Y. Liu, Q. Guo, S. Yu, J. Yu, Performance prediction of a shower cooling tower using wavelet neural network, *Applied Thermal Engineering* (2016), doi: http://dx.doi.org/10.1016/j.applthermaleng.2016.07.117

Performance prediction of a shower cooling tower using wavelet neural network

Xiaoni Qi[1], Yongqi Liu[1*], Qianjian Guo[2], Shanshan Yu[2], Jie Yu[2]

(1 College of Traffic and Vehicle Engineering, Shandong University of Technology, Zhangzhou Road 12,Zibo 255049,China

2 College of Mechanical Engineering, Shandong University of Technology, Zhangzhou Road 12, Zibo 255049, China)

ABSTRACT

This paper develops an application of a wavelet neural network (WNN) based model to predict the performance of a shower cooling tower (SCT). In order to gather data to train and test the proposed WNN model, an experimental shower cooling tower was operated at some steady state conditions. Some of the experimental data are utilized for training. The model was used to predict various performance parameters of the system, namely the temperature difference of the outlet and inlet water stream and the dry bulb temperature, relative humidity of the outlet air stream, the water evaporative ratio and the cooling efficiency of the system. The performances of the WNN predictions were tested using experimental data not employed in the training process. The predictions yielded good agreement with the experimental values with correlation coefficients in the range of 0.9906–0.9986, mean relative errors in the range of 1.39–2.28% and very low root mean square errors. The results show that the WNN technique can be used effectively for predicting the performance characteristics of SCT under various operating conditions, then providing the theoretical basis on the research of heat and mass transfer inside SCT under any conditions, which is important for design and running control of the SCT system.

Keywords: Wavelet neural network; Back-propagation algorithm; Shower cooling tower