

Accepted Manuscript

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PII: S0360-1323(18)30272-5

DOI: [10.1016/j.buildenv.2018.05.012](https://doi.org/10.1016/j.buildenv.2018.05.012)

Reference: BAE 5450

To appear in: *Building and Environment*

Received Date: 28 January 2018

Revised Date: 25 April 2018

Accepted Date: 5 May 2018

Please cite this article as: Xu X, Huang Z, Zhang X, A novel humidity measuring method based on dry-bulb temperatures using artificial neural network, *Building and Environment* (2018), doi: 10.1016/j.buildenv.2018.05.012.

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A Novel Humidity Measuring Method Based on Dry-Bulb Temperatures Using Artificial Neural Network

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Abstract: Effective humidity measuring method is important for humidity monitor, detection and control. There are many humidity sensors mainly utilizing the changes of material characteristics after adsorption (or absorption) of water molecules, which may suffer problems such as high-cost, high-complexity, contamination sensitivity and hysteresis according to their materials. On the other hand, techniques for dry-bulb temperature measuring are relatively more mature. In this study, a novel method to measure the inlet humidity of an evaporator based on dry bulb temperatures at the inlet and outlet of that evaporator was developed. The variation of humidity can be derived by the variation of dry-bulb temperatures because the heat and mass transfer are highly coupled on the evaporator. The mechanism of this novel humidity measuring method was firstly analyzed. To simplify and accelerate the complex derivation process, artificial neural network (ANN) technology was then adopted and an ANN-based model was developed. When compared to experimental results, the absolute errors of the prediction results of the ANN-based model were lower than 5% (*RH*), with most of them being lower than 3% (*RH*), suggesting that this novel method has high accuracy and can be widely used in humidity measurement in air-conditioners and dehumidifiers.

Key Words: Humidity; Measurement; Dry-bulb Temperature; ANN

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