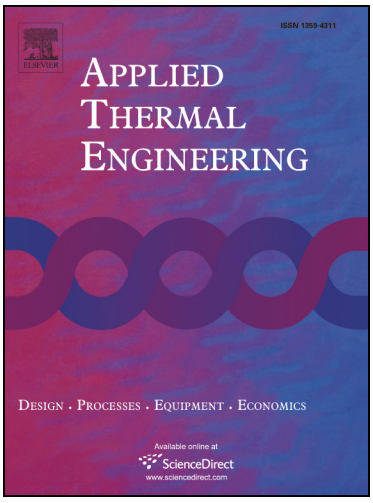

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Xianhua Ou, Wenjian Cai, Xiongxiong He, Yiming Wu

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Dynamic model development of heat and mass transfer for a novel desiccant regeneration system in liquid desiccant dehumidification system

Xianhua Ou[a,b], Wenjian Cai[b,*], Xiongxiong He[a], Yiming Wu[c]

[a] *Zhejiang Key Laboratory for Signal Processing, College of Information Engineering, Zhejiang University of Technology, Hangzhou 310023, China*
[b] *EXQUISITUS, Centre for E-City, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore 639798, Singapore*
[c] *School of Cyberspace, Hangzhou Dianzi University, Hangzhou 310018, China*

Abstract

In this paper, from the control point of view, a simplified dynamic model of the Desiccant Regenerations System (DRS) is proposed. The DRS is a serial system of the heat pipe heat exchanger and regenerator whose models are developed by writing the thermal and moisture balance equations, and the heat and mass transfer rates of each subsystem are derived by using the effectiveness-NTU and hybrid modeling approach. The unknown Model parameters are identified through the nonlinear least squares method and unscented Kalman filter algorithm with commissioning information. The dynamic model of the whole system is obtained by integrating the subsystem models to predicts the system performance. Compared with the existing DRS models, the presented model not requires iterative computations and also can be easily transformed into a state-space model. The proposed model accurately reflects the transient and steady state performance of the DRS over the wide operating condition in the experimental validation and is expected to work well for intelligent dynamic control and optimization applications.

Keywords: Desiccant regeneration system, Heat pipe heat exchanger, Regenerator, UKF

*Corresponding author
Email address: ewjcai@ntu.edu.sg (Wenjian Cai)