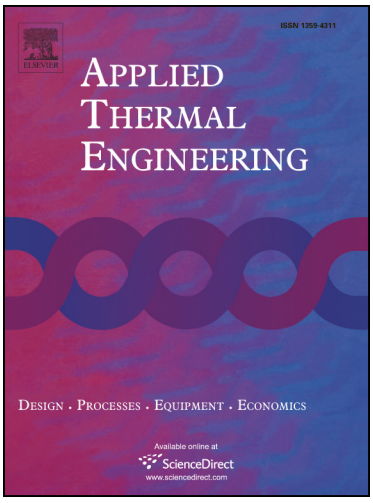

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Zhanwei Wang, Lin Wang, Kunfeng Liang, Yingying Tan

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Enhanced chiller fault detection using Bayesian network and principal component analysis

Zhanwei Wang[a], Lin Wang[a*], Kunfeng Liang[a], Yingying Tan[a]

*Corresponding Author：Lin Wang, Email：wlhaust@163.com

[a] *Institute of Refrigeration and Air Conditioning, Henan University of Science and Technology, Luoyang 471023, China*

Abstract: Applying the fault detection (FD) techniques to chiller is beneficial to reduce energy use in buildings and to enhance the energy efficiency of refrigeration plants. The purpose of this study is to propose an enhanced chiller FD method with higher accuracies for field applications by combining Bayesian network (BN) and principal component analysis (PCA). The key paths are as follows: first, the data space represented by the normal data is decomposed into two subspaces by the PCA, i.e., principle component (PC) subspace and residual (R) subspace; second, instead of PC subspace, the score matrixes in R subspace are used to develop the BN model. The performance of the proposed method is evaluated by using the experimental data from ASHRAE RP-1043. Test results show that the accuracies are significantly improved by 43% at most (for condenser fouling at Level 1), especially for these faults at slight severity levels.

Key words: Bayesian network; Chiller; Combination; Fault detection; Principal component analysis; Residual