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ARX and AFMM model-based on-line real-time data base diagnosis of sudden fault in AHU of VAV system

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Abstract

On-line diagnostic testing in automated processes requires practical fault detection and diagnosis techniques. The paper presents a model based methodology for sudden online fault detection in one of the most widely used Variable Air Volume (VAV) HVAC Systems in Commercial and Institutional Buildings. Two models, Auto Regressive Exogenous (ARX) and Adaptive Forgetting Through Multiple Models (AFMM), are trained and validated on data obtained from a real building. The models are trained using normal real time operational data and validated on data obtained by inducing a fault artificially in the damper control sub-system under normal operating conditions. It may be concluded on the basis of results obtained that the variation of parameters rather than the difference between the predicted and actual output is more prominent and reflective of the sudden fault in the system. The AFMM can detect any change in the system, i.e., when a fault was implemented and when the fault was rectified. However, it requires a long window length and, therefore, may not detect faults of low magnitude. The ARX model, on the other hand, can be used with very short window length and is more robust. © 1999 Elsevier Science Ltd. All rights reserved.

Keywords: Fault detection; ARX model; AFMM model; VAV system

1. Introduction

The introduction of effective and robust fault detection and diagnosis methods in Heating Ventilation and Air Conditioning (HVAC) systems may lead to several benefits. Important among them are; low maintenance cost, energy savings, reduction in equipment down time, less

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