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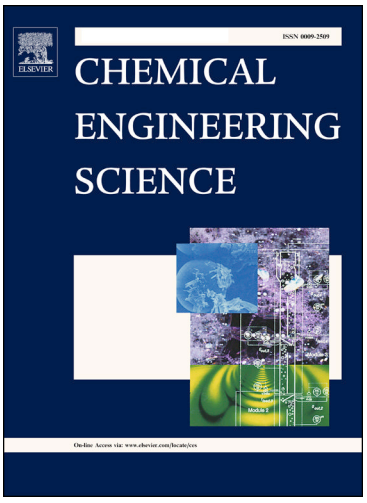

A Combined Monitoring Scheme with Fuzzy Logic Filter for Plant-Wide Tennessee Eastman Process fault detection

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A Combined Monitoring Scheme with Fuzzy Logic Filter for Plant-Wide Tennessee Eastman Process fault detection

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Abstract

Principal Component Analysis (PCA) is the most common Multivariate Statistical Process Control (MSPC) method that is widely used for Fault Detection and Diagnosis (FDD). Since early abnormality detection with high accuracy is required for safe and reliable process operation, False Alarms Rate (FAR), Missed Detection Rate (MDR) and the detection time delay are the major factors that must be taken into consideration when developing any process monitoring scheme. Unfortunately, the PCA performance, with fixed limits, is weak in terms of the stated factors. In contrast, conventional Moving Window PCA (MWPCA) is an adaptive technique which updates both the PCA model and the thresholds once a new normal observation is available. Yet, MWPCA methodology still does not reduce the MDR and the detection delay. In this paper, a Modified MWPCA (MMWPCA) with Fuzzy Logic Filter (FLF) is proposed to enhance the monitoring performance of PCA. It is an adaptive approach with a fixed model that combines both aforementioned techniques. The aim of using FLF is to ensure robustness to false alarms without affecting the Fault Detection (FD)

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