

A Covariance-based Method for Fault Detection and Prediction for Online Process Monitoring

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Smart process requires advanced algorithms of identifying or predicting errors while monitoring various process variables in real time. Conventionally, multivariate non-linear time series data analysis methods based on principal component analysis (PCA), or kernel principal component analysis (KPCA) has been employed. However, the index for the error estimation in these methods such as Hotelling T<sup>2</sup> and SPE is limited in quantifying and detecting a variety of abnormalities. In this study, we developed a new and advanced index that can detect abnormal signals in multivariate time series data with different types of abnormalities. For the index, we constructed eigenvalue-based model corresponding to the highest variance contribution. From the simulations, the new index exhibited improved accuracy in measuring and detecting various faults compared with the conventional indicators. More importantly, the newly developed indicator was observed to predict the abnormality signal earlier than conventional methods. The newly developed algorithm and index are expected to work for on-line monitoring of chemical process with complicated input/output units.