## Abstract

Principal Component Analysis (PCA) model is constructed from measured data and used to monitor new testing samples. In fact, the statistical independency assumption between observations is true only for long sampling intervals. Nowadays, industrial systems are sophisticated and fast for which this assumption becomes no longer valid and the current observation becomes highly dependent on the past observations. In another hand, Dynamic PCA (DPCA) is a PCA extension to deal with the aforementioned problem, but monitoring process using this method with fixed control limits showed a high False Alarms Rate (FAR), high Missed Detection Rate (MDR) and long Detection Time Delay (DTD). In this paper, a Modified Moving Window DPCA (MMW-DPCA) with Fuzzy Logic Filter (FLF) is proposed to address the above issue. The developed monitoring scheme continually updates control limits throughout an obtained DPCA-based model. The adaptive thresholds are established by moving a fixed size window over the data. The dynamic behavior of the data is handled by DPCA, whereas the sensitivity enhancement and the FAR reduction are handled by the developed adaptive thresholds for which the FLF is employed to ensure robustness to outliers and noise without affecting the fault detection performances. The proposed technique has been tested on Tennessee Eastman Process (TEP). It has been compared to other well-known fault detection methods. The obtained results demonstrate that the MMW-DPCA with FLF detects different types of faults with high accuracy and in a short time delay. The experimental application of the MMW-DPCA with FLF has been carried out on cement rotary kiln. The obtained results illustrate that the proposed method has successfully detected a real fault.