Multivariate Analysis and Monitoring of Sequencing Batch Reactor Using Multiway Independent Component Analysis

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Abstract
This contribution describes the monitoring on a pilot-scale sequencing batch reactor (SBR) using a batchwise multiway independent component analysis method (MICA) which can extract meaningful hidden information from non-Gaussian data. Given that independent component analysis (ICA) is superior to principal component analysis (PCA) to extract features from non-Gaussian data sets, the use of ICA may improve monitoring performance. It was successfully applied to an 80L SBR for biological wastewater treatment, which is characterized by a variety of disturbance sources with non-Gaussian characteristics. The MICA supervision is used as a tool to monitor the stability of the sludge using simple on-line measurements. The monitoring results of a pilot-scale SBR for biological wastewater treatment showed the power and advantages of MICA monitoring in comparison to conventional monitoring methods.

Keywords: Batch monitoring, Fault detection and isolation (FDI), Multivariate statistical process monitoring (MSPM), Multiway independent component analysis (MICA), Sequencing batch reactor (SBR)