

비선형 생물학적 폐수처리공정 감시를 위한
다차원 필터링 및 바이오 모니터링

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On-line ecological monitoring of biological wastewater treatment process is crucial to the sustainable treatment of incoming wastewater. However, biological processes tend to have nonlinear behavior patterns that depend on the influent loads, temperature, microorganism activity, and so on. Moreover, since biosystems are generally operated under process control systems, the data of such systems tend to be characterized by autocorrelation and dynamic patterns. In this paper, we propose a new dynamic nonlinear monitoring method that combines a nonlinear kernel PCA (KPCA) and exponentially weighted moving average (EWMA) in order to better monitor bioprocesses undergoing small mean shifts with autocorrelation. The proposed method is applied to two case studies: a simple dynamic nonlinear process and a simulation benchmark of a biological wastewater treatment process. The simulation results clearly show that the proposed method outperforms other static and linear methods, especially for detecting small shifts in processes.