

Multivariate Monitoring, Control and Optimization for a Sustainable Biological Treatment Operation

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Due to increasing environmental constraints, efficient modeling and monitoring methods are becoming more and more important. Reliable process engineering tools for sustainable biological operation are necessary to maintain the system performance as close as possible to optimal conditions. The ultimate objective of this research is to suggest the integrated framework of modeling, process monitoring, control and optimization for a sustainable biological treatment operation. Under the proposed approach, process information obtained from statistical monitoring techniques is utilized to monitor the biological treatment process, to monitor a microbial population dynamics, to design the supervisory control, and finally to optimize the operating condition. Specially, we developed a new long-term monitoring technique by integrating process engineering data and microbiology tool, which can monitor and may manipulate the various microorganisms community to enrich the organisms distribution and maintain uniform sludge properties. Finally, a study to provide an integrated framework is attempted and has been applied to a pilot-scale sequencing batch reactor (SBR).