PROJECT FACTSHEET

www.list.lu/en/research/project/multi-observer-based-control-in-wastewater-treatment-uncertainties/?no_cache=1&cHash=c4f97438fa89a4bfeaf60c2efd00bda9

Multi-observer based control in wastewater treatment uncertainties

Providing control and fault diagnosis strategies for complex nonlinear systems by extending linear methods to nonlinear systems, applied to waste-water treatment plants

Inspiration

Process control and diagnosis is still considered a challenging engineering problem. Technological systems have complex behavior often involving nonlinear relationships between the variables, a large operating domain, or variations of system parameters/uncertainties and external perturbations. Thus, there is a need to build systems that can operate over a wide range of operating conditions. On the other hand, in the field of the observer/controller synthesis for the purpose of fault diagnosis, the extension of linear methods to nonlinear systems is generally a difficult problem. In recent years, operating optimization and safety improvement of wastewater treatment plants (WWTPs) have become active research areas. This is not only due to the fact that water is essential to human societies, but also to an increase in environmental protection and economic requirements.

Innovation

A Benchmark, BSM1, has been proposed by the European program COST 624 for the evaluation of control strategies in WWTPs which concerns the activated sludge unit (bioreactors, secondary settler). The importance of integrated and plant-wide control has been stressed, thus WWTPs should also include the primary clarification and anaerobic digesters linked together in order to integrate additional interactions between processes in the control strategy. The most recent benchmark, BSM2, allows the evaluation of control strategies at the level of the whole plant, including primary settler and sludge treatment with anaerobic digestion, based on the Anaerobic Digestion Model No. 1.

Impact

The objective of this project is therefore to provide a methodology which enables the use of a detailed full-scale Activated Sludge Model No. 1/Anaerobic Digestion Model No. 1 based model for diagnosis and control tasks, by focusing on approaches that handle the model complexity, the possible lack of on-line measurements, external perturbations or model uncertainties. The multimodel can deal with the previously presented issues. An equivalent multimodel formulation of the ASM1/ADM1 model will be used for diagnosis and control tasks, based on the observer.

This project is co-financed by the Ministry of Research and the National Research Fund (FNR) in the context of a post-doctoral grant (AFR).

Financial Support

Fonds National de la Recherche

Contact
5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | LIST.lu

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST