

Extracting Value from Data in Real-Time

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ABSTRACT

The operation of water resource recovery facilities (WRRF) relies on the use of reliable and timely data that are collected from various sensors and laboratory samples. Data are used to monitor processes, in control loops, and in modeling and design studies. While data are essential to proper plant operation, the quality of sensor outputs is often taken for granted and minimal effort is spent on sensor maintenance and calibration. Over time, sensors often exhibit faults that can negatively impact the operation of systems such as control loops that use the sensor data directly or as part of process control models and algorithms (Thomann et al., 2002). These faults obscure useful information and can therefore prevent beneficial manual and automated changes to plant operations that increase efficiency and reduce operating costs.

An automated, software-based system has been developed to aid in the collection, storage, analysis, and use of plant data. This software-based system relies on a systematic monitoring methodology for sensors (and related devices), characterization of the (measurement) devices, storage and retrieval of data, documentation of maintenance procedures and staff role assignments. This system provides an ability to (1) detect sensor and other faults in real-time with algorithms that are specific to certain fault or symptom types, (2) controller performance monitoring, and (3) automated controller tuning tools. A discussion of applications of the system in projects for full-scale WRRF's is included.

REFERENCES

Thomann, M., Rieger, L., Frommhold, S., Siegrist, H. and Gujer, W. (2002). An efficient monitoring concept with control charts for on-line sensors. *Wat. Sci. Technol.*, **46**(4-5), 107-116.

ABOUT THE AUTHORS

Oliver Schraa, M.Eng., is the CTO at inCTRL Solutions, and has over 22 years of experience in WWTP design and costing, process modeling and simulation, optimization, and process control. He is the chair of the WEF Biofilm Interest Group, vice-chair of the WEF I&C Workgroup, vice-chair of the WEFTEC facility operations symposia, a member of the WEF Modeling Expert Group, and an expert member of the IWA Design and Operations Uncertainty Task Group. Oliver contributed to the following WEF publications: Operation of Municipal Wastewater Treatment Plants – MOP 11, Wastewater Treatment Process Modeling – MOP No. 31, Nutrient Removal - MOP No. 34, and Solids Process Design and Management. Contact: schraa@inctrl.ca

Leiv Rieger, Ph.D., P.Eng., CEO of inCTRL Solutions, specializes in instrumentation, monitoring, modelling, and control of wastewater treatment. Leiv received his Ph.D. from EAWAG/ETH Zurich in Switzerland. He chairs WEF's sub-committee MEGA and is member of the MRRD, AIT, and POM committees. Within IWA, Leiv chairs the Task Group on "Good Modelling Practice", is Vice-Chair of the ICA Specialist group and member of the Management Committee of MIA. He chaired the first two IWA/WEF WWTmod seminars. Leiv is the 2015 recipient of WEF's Eddy Wastewater Principles/Processes Medal and is a Fellow of the International Water Association (IWA).

Ivan Miletić, M.Eng., P.Eng., MBA, holds master's degrees in both Chemical Engineering and in Business Administration and has over 20 years of experience in the fields of modeling, simulation, control, and optimization of complex systems. At inCTRL he focuses on the development of tools for sensor and process fault detection, data-driven models, and process optimization procedures. His process experience includes steelmaking, food processing, fuels, pharmaceuticals, and wastewater treatment. These projects were directed at the application of predictive models, process fault detection, and soft-sensor technology and have provided significant financial and operating benefits to clients. Ivan holds two industrial patents, one on the application of multivariate empirical batch modeling methods for fault detection for a steel casting machine, and the other for closed-loop control for a food fryer.