



ICA2017

instrumentation, control & automation

**12th IWA Specialized Conference on
Instrumentation, Control & Automation**

Québec City, Québec, Canada

11-14 June 2017

**Conference
Program**

IWA
the international
water association

**Water Environment
Federation**
the water quality people®

 **UNIVERSITÉ
LAVAL**

 **CentrEau**
Centre de recherche sur l'eau
Water Research Centre

Practical information

Locations

A map of all locations of interest is available below:



<https://drive.google.com/open?id=1abdLRNg6O-QISV3NxXd4sulbpPo&usp=sharing>

Workshops are held at Pavillon La Laurentienne, Laval University. The University can be reached by many buses. The most frequent and reliable are the 800 and 801 (see rtcquebec.ca).

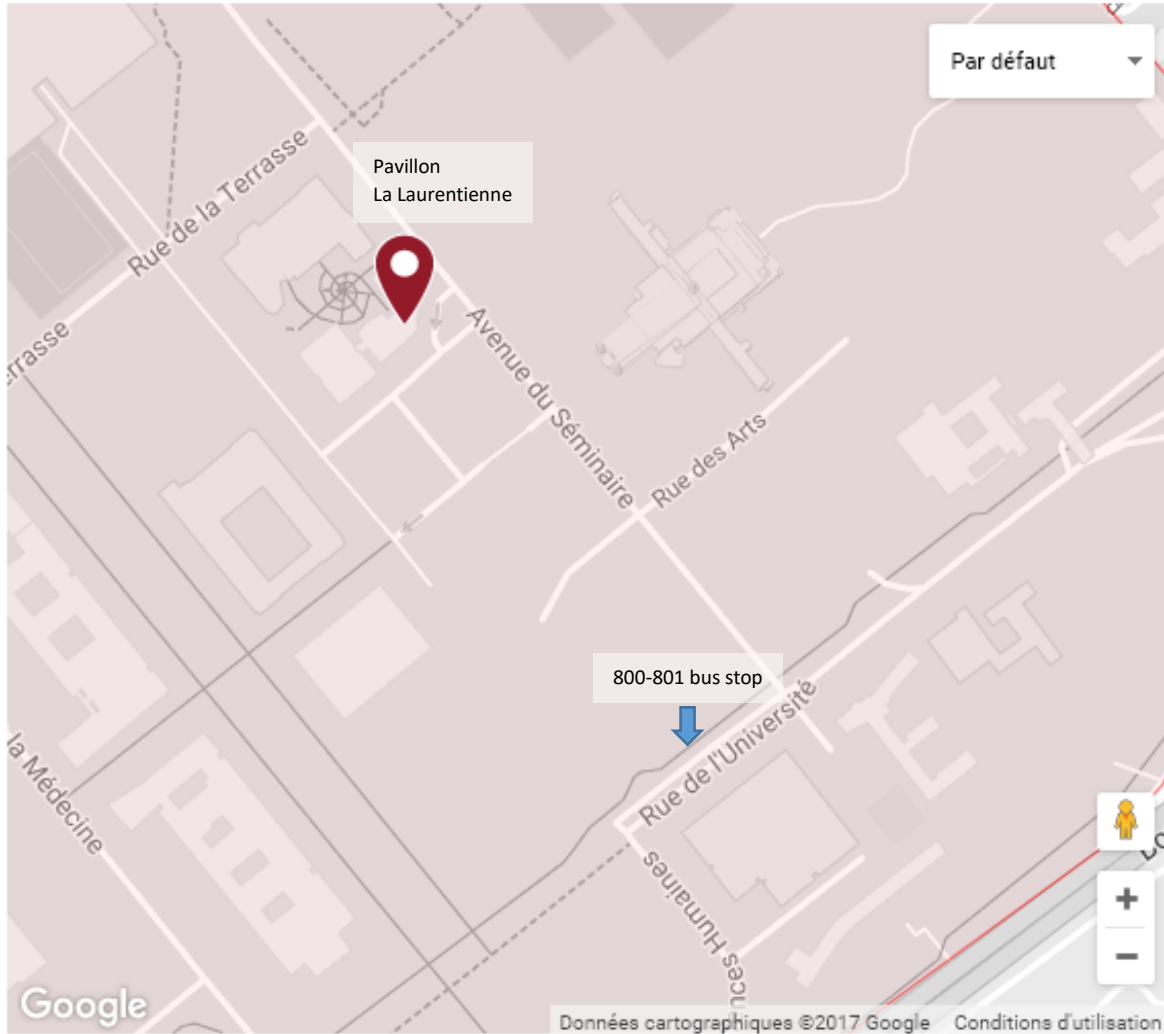
Full address:

1030 avenue du Séminaire

Université Laval

Québec (Québec) G1V 0A6

<https://goo.gl/maps/N9AV5CHMKT12>



ICA2017 is held at the Convention Center of Quebec City. Many buses reach it, including the 800 and 801.

Full address:

900 Avenue Honoré-Mercier

Ville de Québec,

QC G1A 1B4

<https://goo.gl/maps/hn7yMLxmnaF2>

The **Icebreaker** is held at Musée de la Civilisation, downtown Quebec. An optional bus will leave the Convention Center at 16h30. However, it is at walking distance from the conference (1.6km, around 20 minutes walk) and the shortest path crosses the old city of Quebec.

Full address:

27 Rue Notre Dame,

Ville de Québec,

QC G1K 4E9

<https://goo.gl/maps/W29caVhgEqv>

Transportation

The best access to Laval University (for the workshops) and to the Convention Center is through the City Bus (<http://rtcquebec.ca/Default.aspx?tabid=56&language=en-CA>). Lines 800 and 801 deserve both location at high frequency.

Quebec City is quite car-friendly, but parking space at both locations can be expensive.

The only transportation from the airport is taxi. A flat rate is charged from the airport to the city of 34.25\$.

Saturday – June 10

YWP workshop: *ICA today: exploring advances, challenges and synergies from multiple perspectives*

Laval University, Pavillon La Laurentienne – Room 1334

8:45 – 9:15

Welcome and ice breaker

9:15 – 10:00

Keynote: “Instrumentation, Control and Automation in the Global Water Industry: trends and challenges”

Eveline Volcke, Ghent University, Chair of the IWA specialist group on ICA

10:00 – 10:30

Coffee break

10:30 – 12:15

Discussion sessions: “Emerging challenges and technologies in ICA domain”

10:30 – 10:35

Introduction

10:35 – 11:25

Session 1 (topic choice 1)

11:25 – 12:15

Session 2 (topic choice 2)

Topic 1: *Sensors and instrumentation - Thomas Maere and Cyril Garneau, Laval University*

Topic 2: *Data Treatment - Janelcy Alferes, Suez Environment*

Topic 3: *Boundaries of Conventional PID Control & Beyond - Stephanie Klaus and Ali Gagnon, Hampton Roads Sanitation District*

Topic 4: *Université Laval Pilot Plant Visit*

12:15 – 13:45

Lunch

13:45 – 15:30

ICA Case-studies

Participants work together in small groups to find solutions to one out of three different case-studies.

13:45 – 14:00

Introduction

14:00 – 15:00

Discussion

15:00 – 15:30

Wrap-up

Case Study 1: *Reducing Non-Revenue Water Loss*

Facilitator: *Ken Thompson, CH2M*

Case Study 2: *Energy Reduction at a WRRF*

Facilitator: *Lina Belia, Primodal*

Case Study 3: *BNR Stability at a WRRF*

Facilitator: *Adrienne Menniti, Clean Water Services*

15:30 – 16:00

Coffee

16:00 – 17:00

Expert panel: Opportunities and Outlooks in ICA (questions prepared by YWPs)

(Lina Belia – Primodal, Adrienne Menniti – Clean Water Services, Gustaf Olsson – Lund University, Rob Smith - YSI, Ken Thompson - CH2M)

17:00 – 19:00

Social activity: Drinks @University Pub

- Workshop:** *Spectrophotometry for monitoring of the urban water cycle*
Laval University, Pavillon La Laurentienne – Room 1415
- 8:45 – 9:00** **Welcome / Introduction round**
Kris Villez (Eawag, Switzerland)
- 9:00 – 9:30** **Spectrophotometry: A gentle introduction**
Kris Villez (Eawag, Switzerland)
- 9:30 – 10:00** **Opportunities and challenges of spectrophotometry in the water industry:
field experiences using UV/Vis sensors in on-line monitoring of water systems**
Janelcy Alferes (Suez, France)
- 10:00 – 10:30** **Coffee**
- 10:30 – 11:00** **Latest developments**
Andreas Weingartner (s::can Messtechnik GmbH, Austria)
- 11:00 – 11:30** **The use of UV-VIS spectrometer probes to estimate additional loads drained
by the central storage tunnel Graz to the WWTP Graz, Austria**
Günter Gruber (TU Graz, Austria)
- 11:30 – 12:15** **Discussion**
- 12:15 – 13:45** **Lunch**
- 13:45 – 14:10** **IR and online UV-vis for VFA and algae monitoring**
Gerardo Muñoz Montoya (Universidad Nacional Autónoma de México, México)
- 14:10 – 15:05** **UV-vis spectrophotometry for wastewater resource recovery
with algae bioreactors**
Borja Valverde Pérez (DTU, Denmark)
- 15:05 – 15:30** **Spectrophotometry in high strength wastewater treatment: Tracking
the sensor state & observation of relevant backscattering effects**
Christian Thürlimann (Eawag, Switzerland)
- 15:30 – 16:00** **Coffee**
- 16:00 – 16:30** **Infrared spectroscopy and modeling for optimization of anaerobic digesters**
Jean-Philippe Steyer (INRA-LBE, France)
- 16:30 – 17:00** **Open discussion – Issues – Opportunities – Actions – Collaborations**

Sunday – June 11

Centre de Congrès de Québec

Utility Forum (Room 308B)

Chairs: Pernille Ingildsen
Christine deBarbadillo

Topic: *Is your Utility Ready for the Future?*

Manufacturer Forum (Room 307A)

Chairs: Xin Gao
Andreas Weingartner
Tom DeLaura

Consultants Forum (Room 307B)

Chairs: Oliver Schraa
Phill Yi

Academic Forum (Room 308A)

Chairs: Eveline Volcke
Jean-Philippe Steyer

Daily Schedule

8:00 – 8:30	Morning coffee (Espace Urbain)
8:30 – 8:45	Welcome by the conference chairs, Peter A. Vanrolleghem and Leiv Rieger
8:45 – 10:00	Forum discussions
10:00 – 10:30	Coffee break (Espace Urbain)
10:30 – 12:00	Forum discussions
12:00 – 13:00	Lunch (Hall Vidéotron)
13:00 – 14:30	Forum discussions
14:30 – 15:00	Coffee break (Espace Urbain)
15:00 – 16:00	Forum discussions
16:30	Optional bus departure to opening reception (Entrance Av. Honoré-Mercier)
17:00	Icebreaker Welcome and Keynote "Looking at ICA in water through a power engineering lens" by Gustaf Olsson (Musée de la Civilisation)

Monday – June 12									
8:30	Opening Session – Keynote “ICA and optimization in sewer, WRRF and river at Waterschap De Dommel – A strategic decision with impact on several fronts” by Stefan Weijers (Room 306A)								
10:00	Coffee break (Espace Urbain)								
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15:30	Forum Reports and Discussions (Room 306A) <ul style="list-style-type: none"> • Manufacturer Forum Summary • Utility Forum Summary • Academic Forum Summary • Consultant Forum Summary 								
17:00	Poster Session I (Espace Urbain)								
18:30	ICA Specialist Group – Open Session (Room 307)								
19:00	Evening free Consider the “Foodie Tour” activity								

Tuesday – June 13		
8:30	Method – Soft Sensors (Room 307)	WRR – Ammonia-Based Aeration Control - Case Studies (Room 308)
	Soft-sensing nitrite in a urine nitrification system for resource recovery. <i>Villez Kris, Eawag, Switzerland</i>	Full-scale demonstration of novel nitrification control system with feed-forward and feedback control. <i>Nishida Yoshinori, Hitachi, Ltd. Research & Development Group, Japan</i>
	Predicting influent PO ₄ using a multivariate soft sensor. <i>Miletic Ivan, inCTRL Solutions Inc., Canada</i>	Case studies of ammonia based aeration control at multiple advanced water resource recovery facilities. <i>Yi Phill, Hazen and Sawyer, United States</i>
	Advanced on-line monitoring at wastewater treatment plants: Coupling e-nose technology and modelling. <i>Alferes Janelcy, Cirsee - Suez, France</i>	Utilizing in-situ nutrient sensors and feedback PID controllers to implement and operate ammonia-based aeration control. <i>Uprety Kshitiz, Hampton Roads Sanitation District (HRSD), United States</i>
10:00 Coffee break (Espace Urbain)		
10:30	Method – Process Monitoring (Room 307)	WRR – Ammonia-Based Aeration Control - Challenges and Solutions (Room 308)
	Development and validation of a novel monitoring system for batch flocculant solids settling process. <i>Valverde-Pérez Borja, DTU, Denmark</i>	Anti-windup design for supervisory ammonium controllers in nitrifying activated sludge processes. <i>Carlsson Bengt, Uppsala University, Sweden</i>
	A simplified approach for activity monitoring in complex wastewater treatment processes. <i>Mauricio-Iglesias Miguel, Universidade de Santiago de Compostela, Spain</i>	Achieving simultaneous nitrification denitrification in ammonia based aeration control. <i>Klaus Stephanie, Virginia Tech, United States</i>
	Prediction of performances and optimization of anaerobic digesters through near infrared spectroscopy and modeling. <i>Steyer Jean-Philippe, INRA, France</i>	Ammonia-based aeration control with optimal SRT control: improved performance and lower energy consumption. <i>Schraa Oliver, inCTRL Solutions Inc., Canada</i>
12:00 Lunch (Room 306B)		
13:30	Method – Fault Detection II (Room 307)	WRR – Control of Sedimentation (Room 308)
	Failure prediction of multimedia filters by using a hybrid clustering method. <i>Bagheri Behrad, University of Cincinnati, United States</i>	Control of chemically enhanced primary treatment based on microsieving. <i>Väänänen Janne, Lund University, Sweden</i>
	Data validation and gross error detection in monitoring wastewater treatment process – application to a SHARON reactor. <i>Volcke Evelyne, Ghent University, Belgium</i>	Return activated sludge flow control and sludge settling properties at Henriksdal WWTP. <i>Laurell Christer, Stockholm Vatten, Sweden</i>
	Validating data quality for water quality monitoring: Objective comparison of three data quality assessment approaches. <i>Alferes Janelcy, modelEAU, Canada</i>	Balancing the sludge blanket and flow distribution in final settlers secures stable operation and max hydraulic capacity. <i>Rønnow Thomsen Henrik A., Krüger A/S, Denmark</i>
15:00 Coffee break (Espace Urbain)		
15:50	Method – Data Replacement (Room 307)	WRR – Novel Control Concepts (Room 308)
	A stochastic method to manage delay and missing values for in-situ sensors in an alternating activated sludge process. <i>Stenoft Peter, DTU, Denmark</i>	Qualitative control for stable and efficient urine nitrification. <i>Thürlimann Christian, Eawag, Switzerland</i>
	Improved on-line simulations of wastewater treatment plants using time series methods. <i>Miletic Ivan, inCTRL Solutions Inc., Canada</i>	Wastewater Disinfection by Peracids: Advanced Dose Control Technology Validation with Pilot and Modeling Studies. <i>Santoro Domenico, Trojan Technologies, Canada</i>
16:30 YWP Report and Short wrap-up (Room 306A) – Poster session II (Espace Urbain)		
19:00 Evening free Consider the “Foodie Tour” activity		

Wednesday – June 14		
8:30	WRR – Models for Aeration Control (Room 307)	Sewer – Monitoring (Room 308)
	Control strategies using dynamic alpha factors for oxygen transfer optimization in WRRFs. <i>Garrido-Baserba Manel, University of California, Irvine, United States</i>	Highly distributed long-term monitoring of in-sewer dynamics using low-power radio technology. <i>Blumensaat Frank, Institute of Environmental Engineering, ETH Zurich / Swiss Federal Institute of Aquatic Science and Technology, Eawag, Switzerland</i>
	Exploring the potential of dynamic aeration models to evaluate control strategies: the experience at the Girona WRRF. <i>Juan-García Pau, Atkins UK, United Kingdom</i>	A preliminary study of real-time monitoring and control of biofilters for stormwater harvesting. <i>Shen Pengfei, Monash University, Australia</i>
	Advanced control system based on pH, ORP and DO sensors for optimisation of full-scale WWTPs. <i>Robles Ángel, Universitat de València, Spain</i>	Identifying industrial wastewaters discharged to sewers from UV-Vis spectroscopy data. <i>Liu Yanchen, State Key Joint Laboratory of Environment Simulation and Pollution Control, School of Environment, Tsinghua University, China</i>
10:00	Coffee break (Espace Urbain)	
10:30	Instrumentation – Principles (Room 307)	Sewer – Control (Room 308)
	Nitric oxide production interferes with aqueous dissolved oxygen sensors. <i>Klaus Stephanie, Virginia Tech, United States</i>	Online control of chemical dosing in sewers for sulfide abatement. <i>Zhiguo Yuan, The University of Queensland, Australia</i>
	Experiences from using acoustic soft sensors in wastewater treatment – results from pilot studies. <i>Åmand Linda, IVL Swedish Environmental Research Institute, Sweden</i>	Reinforcement learning-based control of storm water networks. <i>Mullapudi Abhiram, University of Michigan, United States</i>
	Inline VFA monitoring using a mid-infrared spectroscopy based sensor: Validation in lab-scale and full-scale AD reactors. <i>Zhang Xuedong, Delft University of Technology, Netherlands</i>	An efficient formulation of overflow structures for Model Predictive Control of urban drainage systems. <i>Halvgaard Rasmus, DHI, Denmark</i>
12:00	Lunch (Room 306B)	
13:30	Instrumentation – Operation (Room 307)	Sewer / WRR – Integrated Control (Room 308)
	Instrumentation at Swedish WWTPs – a survey and interview study. <i>Åmand Linda, IVL Swedish Environmental Research Institute, Sweden</i>	Local water-level-driven the discrete control for sewer-WWTP integrated optimization operation. <i>Liu Yanchen, State Key Joint Laboratory of Environment Simulation and Pollution Control, School of Environment, Tsinghua University, China</i>
	One utility's approach to evaluating new instrumentation and ongoing maintenance and validation. <i>Menniti Adrienne, Clean Water Services, United States</i>	Coordinated control of collection systems using market-based optimization to maximize performance. <i>McDonnell Bryant, EmNet LLC, United States</i>
	Sensor location in WRRFs: easy change, big win. <i>De Mulder Chaim, Ghent University, Belgium</i>	Experiences Using the Dynamic Volume in a Sewer Network to Optimize the Wastewater Treatment Plant and Sewer Network. <i>Poulsen Troels, Kruger A/S, Denmark</i>
15:00	Coffee break (Espace Urbain)	
15:30	Closing session – Keynote “Dealing with full-scale monitoring and control issues” from Maureen O’Shaughnessy (Room 306A)	
16:45	Bus departure to Conference Dinner (Entrance Av. Honoré-Mercier)	

Thursday – June 15

7:45 – 9:45

Optional Technical Tour (Québec City Water Resource Recovery Facility)

Free tour – need to register separately

The tour will explore the combined sewer system of the city of Quebec. It will discuss the wastewater treatment facility with focus on measurement and control and the other will discuss the sewer system and its global real-time control system. The global control system was developed to deal with the storm impacts. Also at the treatment plant their main control issues are to deal with wet weather overloads.

Bus departure at 7:45 at the Av. Honoré-Mercier entrance.

Poster presentations (Espace Urbain)

Instrumentation, monitoring and network

Cofactor F430 in AnMBRs: a potential biomarker for methanogenic activity? *Smets Ilse, KU Leuven, Belgium.*

On-line filterability measurements in anaerobic membrane bioreactors. *Lousada-Ferreira Maria, Delft University of Technology, Netherlands.*

Long-term behavior of fibre optic sodium optodes with a comparison with sodium electrodes. *Caron Serge, INO, Canada.*

On-line monitoring of a microbial electrolysis cell using a simple electrical equivalent circuit model. *Tartakovsky Boris, National Research Council, Canada.*

Soft sensor application for real-time monitoring of a Norwegian wastewater treatment plant. *Wang Xiaodong, Norwegian University of Life Sciences, Norway.*

Data-driven status diagnosis of sewerage system operation. *Liu Yanchen, Tsinghua University, China.*

Evaluation of rainfall-derived inflow and infiltration based on wastewater quality and quantity in sewerage system. *Liu Yanchen, State Key Joint Laboratory of Environment Simulation and Pollution Control, School of Environment, Tsinghua University, China.*

Novel, non-intrusive microwave sensors for water analysis. *Koutsospyrou Vasiliki, Loughborough University, United Kingdom.*

Turning passive data into knowledge - a review of wastewater treatment monitoring methods. *Corominas Lluís, ICRA, Spain.*

Flow prediction for urban drainage system real time control using artificial neural network: A case in Kunming City. *Dong Xin, Tsinghua University, China.*

In-situ UV-Vis probe to monitor algal photobioreactors treating municipal wastewater. *Valverde-Pérez Borja, DTU, Denmark.*

Hybrid linear observer for an activated sludge process with alternate phases. *Feudjio Christian, Université de Mons, Belgium.*

Crossflow filtering of fluids is a must for enhanced use of spectrometers. *Lopata Vincent, Aquatic Life Limited, Canada.*

Spectral Sensors Shine Light on Nitrite Accumulation. *Smith Robert, YSI / Xylem, United States.*

Observability issues and unknown inputs in microalgae cultures. *Feudjio Christian, Université de Mons, Belgium.*

Modelling for control

Non-linear modelling of the dissolved oxygen to ammonium dynamics in a nitrifying activated sludge process. *Carlsson Bengt, Uppsala University, Sweden.*

Modelling ammonia based aeration control in real time with online instrumentation. *Dabkowski Bob, Hach, United States.*

Experience from implementing automatic dosage of coagulant at four drinking water plants. *Hallgren Fredrik, IVL Swedish Environmental Research Institute, Sweden.*

Utilizing dynamic simulation to optimize controls and reduce risk. *Nading Tyler, CH2M, United States.*

Benchmarking of control strategies implemented in a dedicated control platform for wastewater treatment processes. *Ruano María Victoria, Universitat de València, Spain.*

The META-ASM model: validation in full-scale WWTPs and performance comparison with ASM2d, *Santos Jorge, Universidade NOVA de Lisboa, Portugal.*

Field Scale Test Bed Development of Integrated Storm Water Runoff Management System for Urban River Water Quality Management. *Seo Dongil, Chungnam National University, Korea, Republic of.*

Model-based evaluation of nutrient and energy recovery control strategies in wastewater treatment systems. *Solon Kimberly, Lund University, Sweden.*

Conceptual quality modelling and integrated control of combined urban drainage system. *Sun Congcong, Institut de Robòtica i Informàtica, Spain.*

Towards a domain-based framework for use of rainfall forecasts in control of integrated urban wastewater systems. *Vezzaro Luca, DTU, Denmark.*

Control and optimisation

Simulation of alternative temperature control structures of a biogas reactor in a wastewater treatment plant. *Attar Shadi, University College of Southeast Norway, Norway.*

Controlling biogas desulfurization in aerobic biotrickling filters through trickling liquid velocity regulation. *Baeza Juan, Universitat Autònoma Barcelona, Spain.*

Autonomous process control algorithms for optimum filtration. *Dominiak Dominik, Grundfos Holding A/S, Denmark.*

Robustness evaluation of control strategy for activated sludge system with simultaneous nitrogen and phosphorus removal. *Dong Xin, Tsinghua University, China.*

Optimization of the microbiological population using precise sludge age (srt) control. *Ekster Alexander, Ekster and Associates, United States.*

MPC and PI control of the level of the inlet basin of a wastewater treatment plant. *Haugen Finn, University College of Southeast Norway, Norway.*

Advanced process control - meet the future treatment needs in existing SBRs. *Henriksson Åsa, Xylem Inc, Sweden.*

Developing real-time decision support systems for improved control of stormwater and wastewater infrastructure. *Kertesz Ruben, EmNet, LLC, United States.*

Obtaining nitrogen discharge using online control for mainstream deammonification coupled with partial denitrification. *Le Tri, The Catholic University of America, United States.*

Towards smart CSO control in Gothenburg - balance between recipients, plant loading and operational safety. *Lumley Douglas, Gryaab AB, Sweden.*

A neural network based predictive controller for wastewater treatment process. *Nair Abhilash, Norwegian University of Life Science, Norway.*

Simplified control of rotating disks and effluent weir in Orbal ditch by feedforward-feedback strategy. *Qiu Yong, Tsinghua University, China.*

ICA of an anaerobic MBR (AnMBR) industrial prototype plant for urban wastewater treatment. *Robles Ángel, Universitat de València, Spain.*

Full scale experience with standby control of continuous activated sludge lines for energy savings. *Thomsen Henrik, Krüger A/S, Denmark.*

PHA production from wastewater using simple process control. *Vargas Alejandro, Universidad Nacional Autónoma de México, México.*

Selecting locations for real-time control in urban stormwater systems. *Wong Brandon, University of Michigan Ann Arbor, United States.*

Plant-wide control for enhancing nutrient removal, GHG emission and CH₄ production under varying influent loadings. *Yoo ChangKyoo, Kyung Hee University, Korea, Republic of.*

Fault detection and early warning

Assessment and interpretation of fouling progress in MBR plants using functional machine learning technique. *Yoo ChangKyoo, Kyung Hee University, Korea, Republic of.*

Diagnosis and decision support

Deep learning-based fouling diagnosis of a pilot-scale MBR. *Yoo ChangKyoo, Kyung Hee University, Korea, Republic of.*

Cybersecurity

Water/wastewater process control systems data security governance in the cloud. *Novkovic Goran, City of Toronto, Canada.*

Automation, communication and data handling

Full integration of automation systems. *Garcia Del Rio Javier, Canal de Isabel II, Spain.*



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