

12th IWA Specialised Conference on Instrumentation, Control and Automation (ICA2017)
11-14 June 2017, Québec City, Québec, Canada
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ICA2017 in Numbers

The quadrennial ICA conference series, started in 1973, reached its 12th occurrence this year, a monumental achievement of the community. The 2017 meeting was organized in Québec City, Canada and was chaired by Peter Vanrolleghem (Université Laval) and Leiv Rieger (inCTRL Solutions). The conference was attended by over 160 participants from 24 countries. There were a total of 52 platform presentations delivered in 2 parallel sessions, and 46 posters presented in 2 dedicated poster sessions.

Vision and Concept of ICA2017

A major goal of the conference was for each sector of ICA to be well represented. Specific attention was paid during the review process and in the conference program to mobilize the various groups. This strategy was well reflected by a balanced scientific committee (composed of 12 utility members, 8 members of the manufacturing industry, 9 academics and 8 consultants) as well as by three diverse keynote presenters, with Gustaf Olsson representing Academia, and Stefan Weijers from Waterboard De Dommel and Maureen O'Shaughnessy from Prince William County Service Authority, both representing the view of utilities.

An innovative set-up was applied to maximize interaction among the various sectors: focused sessions facilitated in-depth discussions within organization type (in the Sunday Forums for Utilities, Manufacturers, Consultants and Academics) and application field (in dedicated technical sessions). These sessions were alternated with specific method sessions, where experts having diverse backgrounds exchanged views on each sector's role in ICA. To further promote these interactions, each 90 minute technical session was closed by a high level discussion of the topic at hand, proposing its relevance to the ICA field in general. The poster sessions also facilitated fruitful discussions among groups with diverse backgrounds.

An extended young water professional (YWP) mentoring program was developed for ICA2017, benefitting 47% of the conference participants. Dedicated YWP activities and mentoring initiatives included:

1. A joint scientific committee that paired YWPs and experienced water professionals (EWPs), to provide guidance for YWPs through the abstract review process and give YWPs a voice in the conference program make-up.
2. A dedicated YWP workshop built around active participation in discussion of emerging challenges and opportunities in the ICA field.

3. Thematic discussions during the conference's coffee breaks, fostering exchange between YWPs and EWPs on career development topics, such as tips for preparing publications, mentorships, and opportunities in professional organizations.
4. One-on-one mentoring opportunities between YWPs and EWPs, including YWP-EWP teams co-chairing sessions and evaluating poster presentations.

Bringing an international storm and wastewater conference to North America benefitted from involving the Water Environment Federation (WEF), with over 35,000 mainly North American members. WEF volunteered to organize a Stormwater Seminar back-to-back to the ICA conference, focusing on the use of smart systems/big data for innovative approaches to stormwater management. Over 50 people participated in the single track discussion-focused seminar. Also, in between the conference and the seminar (early in the morning, after the conference gala dinner ;-)), a two-hour technical visit of the Québec City wastewater transport and treatment system was organized, with a very appreciated detailed explanation of TetraTech's model-based predictive control of the sewer system that minimizes untreated wastewater emissions under storm events.

Technical Content

For many, the conference began early on Saturday, June 10th with a specialised workshop on "Spectrophotometry for monitoring of the urban water cycle". Collection of representative, numerous and high quality data was identified as the most important challenge, whereas model calibration was considered a fairly trivial task for most applications. The discussed applications covered conventional processes, as well as novel processes, for resource recovery, including fertilizer production via urine nitrification and algae production with processed wastewater. Another topic of interest was the use of infrared spectrophotometry.

The YWP workshop was also conducted on Saturday, June 10th. The workshop kicked-off with a keynote presentation by Eveline Volcke identifying and providing context for the current trends and challenges in ICA today. The day was focused on active participation and interaction among the YWPs, which was conducted through YWP-led discussions on emerging ICA topics and case study sessions, where small groups developed solutions to three different challenges. The day concluded with a diverse expert panel that shared their outlooks for ICA. Overall, the day's activities stressed the importance of data quality, management, and proper interpretation. In addition, the importance of communication skills and ability to "speak the language" of the various sectors was emphasized. The YWPs wanted to take this opportunity to publicly thank all the EWPs that took time to develop content for the workshop, facilitate discussions, and mentor during the conference.

The Sunday forums were characterized by a strict separation of participants within their respective sector. Some impressions were:

- Utilities: The major obstacle for ICA was identified as being about people and mindsets. On a society level, citizens demand more transparency and interaction but also within the utilities' organization, awareness of control and automation is often lacking. To move forward, there needs to be investment in brains rather than concrete (replace grey matter by grey matter). However, people are genuinely interested and concerned about the state of water and appreciate what the utilities do. A group of utility control engineers are

planning to set-up a Working Group under WEF's *Automation & Information Technology* (AIT) committee, which will soon be renamed to *Intelligent Water Technologies committee*. This initiative is chaired by Elkin Hernandez (Elkin.Hernandez@dcwater.com).

- Academics: The discussion was centered around 15 short presentations on the (lack of) practical experiences with various aspects of ICA. This led to the decision to start an IWA Task Group about handling and managing meta-data, which will be chaired by Dr. Kris Villez (EAWAG, Switzerland, Kris.Villez@eawag.ch).
- **Manufacturers**:
- Consultants: The consultants concluded that the main barriers to successful implementation of ICA projects are the existence of silos within and between organizations and the lack of training in the soft skills required for collaboration. The consultants believe their role is to bring together the various stakeholders – to advise the utility on available technologies and also identify opportunities for a manufacturer's technology. The main challenges identified with current instrumentation, especially sensors, were maintenance requirements (especially cleaning and calibration) and reliability. Innovations required for the future were identified as A) better data management and analytics, B) new or improved sensors for pathogens, emerging contaminants, and bacterial populations, C) better training in communication, D) new software tools for integrated design, modelling, and testing of control systems, and E) advancements in automation.

The technical sessions were categorized into the following ICA topics: Methods, Instrumentation, Water Reclamation and Recovery (WRR) Applications, and Sewer Applications. Within each of the categories, the following subjects were addressed:

- Methods: Fault detection, data analytics, data replacement, soft sensors, and process monitoring
- Instrumentation: Principles and operation
- WRR : Control of anaerobic treatment, control to mitigate greenhouse gas emissions, ammonia-based aeration control, novel control concepts, models for aeration control, integrated control of the sewer and WRR, and control of sedimentation
- Sewer: Monitoring and control

As an outcome of the technical sessions, special issues of three international peer reviewed journals (Water Science and Technology, Water Environment Research, and the Water Quality Research Journal) are being prepared on the basis of a selection of papers that will each undergo peer review. The first papers are expected to be published by early next year.

Dedicated poster sessions facilitated discussion on a wide variety of ICA topics. Lively discussions were held, perhaps encouraged by distribution of drink tickets by the poster presenters. By combined votes of the EWP and YWP mentoring teams, the CentrEau best poster prize was awarded to Lluís Corominas (ICRA, Girona, Spain) for his work on "Turning passive data into knowledge - a review of wastewater treatment monitoring methods".

Finally, this year's ICA conference gave birth to the ICA Blooper challenge, since embarrassing mistakes often lead to some of the most valuable lessons. The blooper award went to Cyril

Garneau (Université Laval, Québec, Canada) for teaching us about the multi-purpose use of sensor cables. Who knew they would make for such popular components in beaver dams!

The next ICA conference, ICA2021 will be held in Fragrant Hill, Beijing, China and will be chaired by Zhiguo Yuan and Hanchang Shi.