



# **Innovations in Process Engineering Conference 2022**

## **Technical Program**

*Updated as of May 25, 2022*

**June 20-23  
Hyatt Regency Miami  
Miami, Florida, USA**

**#WEFProcessEng**

*This conference is held by the Water Environment Federation and in cooperation with  
the Florida Water Environment Association.*

## **Pre-Conference Workshops**

*(Additional fees apply)*

### **Workshop A: Particles and Colloids: The Next Frontier in Intensifying Water Resource Recovery**

**Monday, June 20, 2022**

**8:30 a.m. – 5:00 p.m.**

**Moderators:** Peter Vanrolleghem, Université Laval; Kendra Sveum, Loudoun Water;  
Jose Jimenez, Brown and Caldwell

In the water industry, particles and colloids (P&Cs) are everywhere: a resource to be recovered at preliminary/primary stage (front), a driver of reaction rates for the secondary treatment (middle), and a liability to be removed in the final effluent for high-end water reuse (end). The real science and engineering of P&Cs is often oversimplified and, in most cases, poorly understood. Kinetic modeling parameters to account for particle behavior like P&C surface chemistries, size, density and composition are mostly neglected, and current methods for characterizing P&C are rudimentary at best.

This workshop seeks to advance our understanding of how best to apply modern P&C science to engineered water systems as well as identify new areas for exploration. This workshop will consider the broad problems and opportunities of P&Cs ranging from physical and chemical to biological reactions associated with P&C. In addition, the program will be focused on the most interesting and exciting P&C science and research innovation opportunities for treatment process design, operation and intensification.

## **Pre-Conference Workshops**

*(Additional fees apply)*

### **Workshop B: Developing a Framework for Successful Implementations of Digital Twin for Process Improvements**

**Monday, June 20, 2022**

**8:30 a.m. – 5:00 p.m.**

**Coordinator:** Tanush Wadhawan, Dynamita

**Speakers:** Charles Bott, HRSD; John Copp, Primodal; Varun Srinivasan, Brown & Caldwell; Bruce Johnson, Jacobs; Jeffrey Sparks, HRSD; Alyssa Mayer, Hazen and Sawyer; Simon Baker, AECOM; Sudhir Murthy, NEWHub Corp

This workshop will encourage discussion and knowledge sharing of current and innovative thought process and practice around applying digital twin for process improvements (DTPIs). The goal will be to find consensus on establishing a framework for designing, piloting, and commissioning DTPIs at wastewater treatment facilities. For decades, instrumentation and process models have played an essential role in advancement of wastewater technologies. The predictive nature of process models, which considers the physical, chemical, and biological reactions, provides insights that otherwise are difficult, time consuming and, sometimes impossible to comprehend. Recent advancements both in instrumentation, process models, and artificial intelligence-based data driven model has encouraged utilities and consultants to explore possibilities of deploying DTPIs. However, there is no clarity on the definitions, different types of implementations, and capabilities when it comes to DTPIs. There is a need to identify a unified framework for successful implementations of DTPIs. A panel of utility, consultants, and technology experts will present their experiences in designing, piloting, and commissioning DTPIs.

## **Pre-Conference Workshops**

*(Additional fees apply)*

### **Workshop C: Process Intensification – Getting 10 Gallons out of a 5-gallon Bucket**

**Monday, June 20, 2022**

**8:30 a.m. – 12:00 p.m.**

**Coordinator:** Fidan Karimova, Water Environment Federation

Over 80% of the US population currently lives in urban areas and this number is expected to reach 90% by 2050. Increased population pressure translates to increased demand on water resource recovery facilities (WRRFs) with less land available to expand to treat wastewater for an ever growing community. In addition, WRRFs located in coastal zones must contend with sea level rise shrinking the available footprint for future facilities. Process intensification at WRRFs will be key to maintain sustainable growth and continue to meet demands in smaller footprints. This workshop will highlight intensification opportunities at every step of a WRRF. This workshop will be divided into three segments, with each one covering a different area of the WRRF process, spotlighting advancements in intensification through technology, academia, and utility lenses. Each segment will have its own MC to help facilitate discussion and promote attendee interaction.

This session will be organized by the Research and Innovation Steering Engagement (RISE) Working Group and will incorporate updates from the corresponding RISE Focus Groups for mainstream wastewater treatment and solids treatment topics.

## **Pre-Conference Workshops**

*(Additional fees apply)*

### **Workshop D: The Next Generation of Nutrient Recovery**

**Monday, June 20, 2022**

**1:30 p.m. – 5:00 p.m.**

**Coordinator:** Wendell Khunjar, Hazen and Sawyer

**Speakers:** Blair Wisdom, MWRD; Gayathri Ram Mohan, Gwinnett County Department of Water Resources; Jeff Prevatt, Pima County Regional; Matthew Poe, HRSD; Roland Cusick, University of Illinois

Ten years on from the inception of the WRF Nutrient Recovery Challenge Project, numerous utilities have undertaken projects to implement full-scale nutrient recovery at Water Resource Recovery Facilities. It is therefore appropriate to revisit the state of the art with respect to the nutrient recovery paradigm and identify how advancements in technology as well as operational experience can be used to inform the next generation of utilities who will pursue this path. Accordingly, the overarching purpose of the workshop is to convey the state of science of nutrient recovery, lessons learned from the full-scale implementation of nutrient recovery systems, ongoing challenges and successful innovative process control and design strategies that can be used to enhance performance and capacity of nutrient recovery systems. Speakers in this session will focus on addressing key questions related to the following topic areas:

- State of challenges for Next Generation Nutrient Recovery
- Perspectives on factors that influence recovery efficiency
- Practice experience with design, and operation of nutrient recovery facilities
- Ongoing lessons and experiences with optimization efforts
- What challenges continue to exist for existing technologies
- What the next generation of nutrient recovery should look like

## **Opening General Session**

**Tuesday, June 21, 2022**

**8:30 a.m. – 10:00 a.m.**

- 8:30 a.m. Welcome and Moderator Introduction**  
Beverley Stinson, AECOM
- 8:35 a.m. WEF Welcome**  
Ifetayo Venner, ARCADIS, WEF Board of Trustees
- 8:40 a.m. Conference Co-Chair Panel: Integrating Perspectives on Challenges and Opportunities – What are the Next Solutions?**  
Charles Bott, HRSD  
Jeseth Delgado Vela, Howard University  
Jose Jimenez, Brown and Caldwell  
Blair Wisdom, Metro Water Recovery
- 9:15 a.m. The Black, the White, the Green – The Purple and Yellow... Shifting from Wastewater to Resource Recovery**  
Frank Rogalla, Aqualia
- 9:45 a.m. Facilitated Q&A**
- 10:00 a.m. Session Adjourns for Networking Break in Exhibition Hall**



The WEF Innovations in Process Engineering steering committee is very pleased to announce that Frank Rogalla will give the conference keynote. The presentation promises to be a practical and stimulating look at a resource recovery concepts. Frank is the Director of Innovation and Technology for Aqualia in Madrid, which manages water and environmental services for nearly 30 M people in 17 countries. In that position, he is leading large multidisciplinary projects, on biofuels from algae ([www.all-gas.eu](http://www.all-gas.eu)), sustainable desalination ([www.midesH2020.eu](http://www.midesH2020.eu)), decentralized nutrient recovery ([www.run4life-project.eu](http://www.run4life-project.eu)), anaerobic membrane bioreactors ([www.life-memory.eu](http://www.life-memory.eu)), purple photosynthetic bacteria ([www.deep-purple.eu](http://www.deep-purple.eu)) and smart water economy ([www.rewaise.eu](http://www.rewaise.eu)).

Previously Frank worked as a global process leader in a large engineering and construction company, Black & Veatch, coordinating technical teams between London, Kansas City and the Asian offices (Singapore, Hong-Kong, Perth). After studying Environmental Engineering in Germany, he obtained his MSc with a Fulbright scholarship in the USA. He worked for 10 years in the development center of Veolia (formerly Compagnie Générale des Eaux, CGE) in Paris, France. He collaborated with Metcalf & Eddy in New York and with Severn Trent Services in Sao Paulo, Brazil, always responsible for technology transfer in large municipal or industrial infrastructure projects.

**Session 01: Sidestream Bio-P**

**Tuesday, June 21, 2022**

**10:45 a.m. - 12:00 p.m.**

**10:45 a.m. Invited Presentation - Recent Developments in Bio-P**

More information coming soon

**11:00 a.m. Exploring the Carbon Balance in a Sidestream Enhanced Biological Phosphorus Removal (S2EBPR) Demonstration Facility**

Leon Downing, James Barnard, Patrick Dunlap, Eric Redmond, Lucas Botero Black & Veatch

**11:15 a.m. Re-calibrating our approach of modeling EBPR and S2EBPR processes**

Mark Miller, Varun Srinivasan, Jose Jimenez, Brown & Caldwell; Adam Klein; Jacqueline Jarrell, Charlotte Water; Peter Dold; James Barnard, Black & Veatch

**11:30 a.m. Facilitated Discussion**

**12:00 p.m. Session adjourns for lunch in exhibit hall**



**Session 02: Do Membrane Aerated Biofilm Reactors have an Edge for Addressing Climate Change?**

**Tuesday, June 21, 2022**

**10:45 a.m. - 12:00 p.m.**

**10:45 a.m. Process Intensification & GHG Emissions Reduction — Can they Coexist?**  
Jeff Peeters, GE Water & Process Technologies; Wayne Bagg, Water Corporation; Sylvain Donnaz, Nadine Oschmann, SUEZ Water Technologies & Solutions; Matt Reeve; Andrew Shaw, Black & Veatch; Isabel Telles Silveira

**11:00 a.m. Nitrogen Removal and Nitrous Oxide Emissions from MABR Technology: Experiences from the Ejby Mølle WRRF**  
Nerea Uri Carreño, Per Nielsen, VCS Denmark; Krist Gernaey, Danish Technical University; Xavier Flores-Alsina

**11:15 a.m. Membrane Aerated Biofilm Reactor Enables Low-SRT Nitrification and Improves Sludge Settleability: a long-term experimental study**  
Amit Kaldate, Giuseppe Guglielmi, Suez Water Technologies & Solutions; Santofabio Corsino, Michele Torregrossa, University of Palermo; Moreno Di Pofi, Matt Reeve, Suez Water Technologies & Solutions

**11:30 a.m. Technical Brief: Ten Months of Results from a Full Scale MABR Sidestream Treatment System**  
Gilad Yogev, Lotan Dagai, Neri Nathan, Ronen Shechter, Yuval Nevo, Fluence

**11:35 a.m. Facilitated Discussion**

**12:00 p.m. Session adjourns for lunch in exhibit hall**

### **Session 03: Ballasted Flocculation and Encapsulated Biomass**

**Tuesday, June 21, 2022**

**10:45 a.m. - 12:00 p.m.**

- 10:45 a.m.      Biological and Physical Selectors for the Formation and Retention of Mobile Biofilms, Densified-biological Flocs, and Aerobic Granules in Continuous-flow Wastewater Treatment Processes**  
Joshua Boltz, Bruce Rittmann, Arizona State University; Glen Daigger, One Water Solutions, LLC
- 11:00 a.m.      Comparison of Ballasted Activated Sludge Technologies**  
Thor Young, Tom Biagioli, Coenraad Pretorius, GHD
- 11:15 a.m.      Advancements in Process Intensification: Utilizing biocatalysts to increase the population of beneficial microorganisms within biological treatment processes**  
Ajay Nair; Nikolaus Hlavacek; Vedansh Gupta; Fatemeh Shirazi; Ameen Razavi, Microvi Biotech Inc.
- 11:30 a.m.      Facilitated Discussion**
- 12:00 p.m.      Session adjourns for lunch in exhibit hall**

## **Session 04: Innovations in Sidestream Treatment**

**Tuesday, June 21, 2022**

**1:30 p.m. - 3:00 p.m.**

- 1:30 p.m. Full Scale Pilot of a Novel Struvite Precipitation System at the Provo WRP**  
Eric Auerbach, Mike Broyles, Arcadis; Mudit Gangal, SUEZ - Water Technologies & Solutions; Shellie Turnbow, Matt Kessler, City of Provo Utilities; James Goldhardt, Coombs Hopkins; Matthew Militello,
- 1:45 p.m. Commissioning the First Full-Scale Digester Filtrate (Sidestream) Ammonia Removal Process in the West Coast Using Microvi MNE Technology**  
Michael Falk, HDR Inc; Felipe Cartin Munoz; Nikolaus Hlavacek; Allyson Lutz; Ali Dorri; Ajay Nair; Ameen Razavi, Microvi Biotech Inc.
- 2:00 p.m. Determining Inhibition Coefficients and Studying Gene Expressions for Sulfide, Nitrite, and Recalcitrant Carbon Toxicity for Better Design of Anammox Process**  
Soklida Hong, University of Utah; Haydee De Clippeleir, DC Water; Ramesh Goel
- 2:15 p.m. Evaluating a Revolving Algal Biofilm (RAB) to treat Anaerobic Digester Centrate at the Sioux City WWTP to reduce overall plant loading.**  
Martin Gross, Max Gangestad, Jens Dancer, Gross-Wen Technologies
- 2:30 p.m. Technical Brief: Post Aerobic Digestion (PAD) for Ammonia Removal: Lessons Learned from Full and Bench Scale Studies**  
Eric Redmond, Black & Veatch; Fabrizio Sabba; Leon Downing, Black & Veatch; Patrick McNamara; Caitlin Ruff
- 2:35 p.m. Facilitated Discussion**
- 3:00 p.m. Session adjourns for networking break**

## **Session 05: Efficiency and Resource Recovery via Membranes and Biofilms**

**Tuesday, June 21, 2022**

**1:30 p.m. - 3:00 p.m.**

- 1:30 p.m.**      **Why does Proper Simulation Matter in the Acronym Soup of Biofilm Systems? AGS, IFAS, MBBR**  
Bruce Johnson, Jacobs
- 1:45 p.m.**      **An Evaluation of the Reported vs Effective Surface Area to Volume Ratios of Plastic Media Carriers**  
Megan Bachmann, Stephanie Klaus, Justin Macmanus, Michael Parsons, HRSD; Haydee De Clippeleir, DC Water; Charles Bott, HRSD
- 2:00 p.m.**      **Anaerobic Biofilm Membrane Bioreactor for Wastewater Treatment**  
Joshua Boltz, Bruce Rittmann, Robert Stirling, Arizona State University; Brian Roman, University of Washington; Yuhang Cai, Harbin University
- 2:15 p.m.**      **Potential of Using Hydrophobic Deep Eutectic Solvents as a Low Energy Extractant for Anhydrous Volatile Fatty Acid Recovery from Arrested Anaerobic Digesters for Easy Downstream Conversion and Utilization**  
Xueyao Zhang, Virginia Tech; Yuxuan Zhang, University of Kentucky; Weihua Qing, New Jersey Institute of Technology; Jian Shi, University of Kentucky; Wen Zhang, New Jersey Institute of Technology; Zhiwu Wang
- 2:30 p.m.**      **Facilitated Discussion**
- 3:00 p.m.**      **Session adjourns for networking break**

## **Session 06: Densification and Granulation**

**Tuesday, June 21, 2022**

**1:30 p.m. - 3:00 p.m.**

**Facilitator:** Chris deBarbadillo

*This is a Technology Spotlight session. Format of this session will include quick, in-depth reviews on various technologies, presented by technical experts and utility representatives. Facilitated discussion with audience participation will follow in the remaining time at the end of the session, with additional time during breaks to continue those conversations.*

### **Technology Reviews**

#### **Nuvoda**

Jason Calhoun

#### **Aqua Aerobics**

Terry Reid

#### **World Water Works**

Dan Dair

#### **Evoqua**

Brett Woods

**2:30 p.m. Facilitated Discussion**

**3:00 p.m. Session adjourns for networking break**

## **Session 07: Nitrification: How Low Can DO Go?**

**Tuesday, June 21, 2022**

**3:45 p.m. - 5:00 p.m.**

**3:45 p.m.      Invited Presentation**

More information coming soon.

**4:00 p.m.      When Less is More (GHGs): Comparing the carbon impact of common nitrogen treatment processes using ASM2d models demonstrates surprising tradeoff for low-DO processes**

Jon Liberzon, Tomorrow Water; Kwangtae You, UnU Inc.; David Rhu, Tomorrow Water; Jongrack Kim, Gijung Pak, Gahee Rhee, UnU Inc.

**4:15 p.m.      Kinetic Parameterization of Nitrifiers Adapting to Low DO**

Tyler Kisling, Kyle Malin, Kester McCullough, HRSD; Tanja Rauch-Williams, Carollo Engineers; Stephanie Klaus, Christopher Wilson, Charles Bott, HRSD

**4:30 p.m.      Technical Brief: A Novel Adaptation Strategy for Mainstream Partial Nitrification at Low Dissolved Oxygen Concentrations in an SBR Operated at Ambient Temperature**

Moomen Soliman; Ahmed Alsayed; Ahmed EIDyasti, York University

**4:35 p.m.      Facilitated Discussion**

**5:00 p.m.      Session adjourns for reception in exhibit hall**

**Session 08: MABR/Membranes/Biofilms**  
**Tuesday, June 21, 2022**  
**3:45 p.m. - 5:00 p.m.**

**Facilitators:** Stephanie Klaus, Isaac Avila

*This is a Technology Spotlight session. Format of this session will include quick, in-depth reviews on various technologies, presented by technical experts and utility representatives. Facilitated discussion with audience participation will follow in the remaining time at the end of the session, with additional time during breaks to continue those conversations.*

**Technology Reviews**

**Amphibio Technologies**

Francisco Valdes

**Gross-Wen**

Jens Dancer

**Veolia**

Brad Mrdjenovich

**Suez**

Jeff Peeters

**PERC Water**

Kyle Nelson, Tanner Devlin

**Innovatreat**

Jeff Danner

**4:35 p.m. Facilitated Discussion**

**5:00 p.m. Session adjourns for reception in exhibit hall**

## **Session 09: There's Something about Densification**

**Tuesday, June 21, 2022**

**3:45 p.m. - 5:00 p.m.**

- 3:45 p.m.      Continuous Flow Sludge Densification: Biological and Physical Selection Strategies and Carbon Dynamics**  
Jose Jimenez, Pusker Regmi, Brown and Caldwell; Belinda Sturm, University of Kansas; Joshua Boltz, Arizona State University
- 3:50 p.m.      Coupling a Continuous Upflow Selector with Feast/Famine Selection for a Smooth Startup of Continuous Flow Aerobic Granulation Reactors without Performance Interruption**  
Zhaohui An, Virginia Tech
- 4:05 p.m.      Combining Metabolic, Kinetic and Physical Selection to Achieve Full-Scale Continuous Flow Densification of Activated Sludge at Robert W. Hite Treatment Facility**  
Blair Wisdom, Isaac Avila, Metro Wastewater Reclamation District; Rudy Maltos, Metro Water Recovery; Ron Latimer, Alonso Griborio, Will Martin, Wendell Khunjar, Hazen & Sawyer
- 4:20 p.m.      Successful Full-Scale Continuous Flow Densification of Activated Sludge at Crooked Creek Water Reclamation Facility Without Physical Selection**  
Ron Latimer, Hazen and Sawyer
- 4:35 p.m.      Facilitated Discussion**
- 5:00 p.m.      Session adjourns for reception in exhibit hall**



**Session 10: Carbon Management for BNR**

**Wednesday, June 22, 2022**

**8:30 a.m. - 10:00 a.m.**

- 8:30 a.m. Integrating Partial Denitrification (PD), Enhanced Biological Phosphorus Removal (EBPR) and Anammox in a Single Stage Process Bioreactor**  
Soklida Hong, University of Utah; Mari Winkler, University of Washington; Zhiwu Wang, Virginia Tech; Ramesh Goel
- 8:45 a.m. In-Tank Carbon Generation As a Primary Benefit of RAS and MLSS Fermentation for Stabilizing Biological Phosphorus Removal Performance**  
David Wankmuller; Damon Forney; Wendell Khunjar, Hazen & Sawyer; Jimmy Pridgen, City of Wilson
- 9:00 a.m. Quantifying the Contribution of P Assimilation versus Polyphosphate Accumulation in High-rate EBPR Reactors**  
Howard Truong, Northwestern University/DC Water
- 9:15 a.m. Compressed Gas Mixing and Inline Fermentation Enhances Biological Phosphorus Removal**  
John Koch
- 9:30 a.m. Facilitated Discussion**
- 10:00 a.m. Session adjourns for networking break**

**Session 11: Thermal Hydrolysis**

**Wednesday, June 22, 2022**

**8:30 a.m. - 10:00 a.m.**

- 8:30 a.m.      Invited Presentation – Thermal Hydrolysis as a Solution for Utilities**
- 8:45 a.m.      Reducing Retention Time and Cost of Anaerobic Digestion Using Thermal Hydrolysis & Experiences and Lessons Learnt from Food and Organic Co-Digestion with Thermal Hydrolysis**  
William Barber; Matthew Higgins, Bucknell University
- 9:00 a.m.      Application of Thermal Hydrolysis to Intensify Methane Production in Anaerobic Co-Digestion of Biosolids and Grease Interceptor Waste**  
Francis De Los Reyes, North Carolina State University; Seraphim Falterman; Erika Bailey, City of Raleigh
- 9:15 a.m.      Evaluating Factors Impacting Hydrothermal Hydrolysis of Sludge Prior to Fermentation and Anaerobic Digestion**  
Farokh Laqa Kakar; Steven N. Liss, Ryerson University; Elsayed Elbeshbishy
- 9:30 a.m.      Facilitated Discussion**
- 10:00 a.m.      Session adjourns for networking break**

## **Session 12: Optimization Using Sensors and Control**

**Wednesday, June 22, 2022**

**8:30 a.m. - 10:00 a.m.**

- 8:30 a.m.      Development of Total Solids Prediction Using Passive Acoustic Sensors**  
Han Nguyen, Haydee De Clippeleir, Ryu Suzuki, Nicholas Passerelli, Aklile Tesfaye, Elkin Hernandez, DC Water; Arash Massoudieh, Catholic University of America
- 8:45 a.m.      Addressing Nutrient Sensor Cost, Reliability, and Performance at HRSD**  
Arba Williamson, Joshua Walker, HRSD
- 9:00 a.m.      Bringing Aeration Control into the 21st Century & How to Right-size Your Blowers to Realize Expected Savings**  
Dale de Kretser, Coenraad Pretorius, GHD
- 9:15 a.m.      Energy Savings and Increased BOD Removal Through Improved Aeration Basin Blower Control**  
Eric Hovland; David Hatfield, Hatfield EATS
- 9:30 a.m.      Facilitated Discussion**
- 10:00 a.m.      Session adjourns for networking break**

## **Session 13: Harnessing Internal Carbon Sources**

**Wednesday, June 22, 2022**

**10:45 a.m. - 12:00 p.m.**

**10:45 a.m. Invited Presentation**

**11:00 a.m. Demonstration of SND, Post Denitrification with Internally Stored Carbon and Anammox Potential at a Mainstream Full-Scale BNR Facility**

Pusker Regmi, Brown and Caldwell; Marty Johnson, WSSC Water; Caroline Nguyen; Ahmed Al-Omari; George Wells, Northwestern University Library; Brad Yeakle, Washington Suburban Sanitary Commision

**11:15 a.m. Kinetics, Biofilm Profile and Microbial Composition of a Fixed Rope Partial Denitrifying Reactor: Case for External vs. Internal Carbon Sources**

Lin Sun; Wudneh Shewa; Christine Gan; Kevin Bossy; Martha Dagneu

**11:30 a.m. Technical Brief: Investigating the Use of Internally Stored Carbon in Post-Anoxic Denitrification**

Kayla Bauhs, Brown and Caldwell; Alexandria Gagnon, Charles Bott, HRSD

**11:35 a.m. Facilitated Discussion**

**12:00 p.m. Session adjourns for lunch in exhibit hall**

**Session 14: Blazing Solids**

**Wednesday, June 22, 2022**

**10:45 a.m. - 12:00 p.m.**

**10:45 a.m.      Could Thermal Processing be the Answer? Fundamentals of Pyrolysis, Gasification, and Incineration**

Stanley Chilson, CET-GHD; Charles Winslow, GHD

**11:00 a.m.      Decarbonization Using Pyrolysis - A Burning Question**

Per Nielsen, Niels Askjær, VCS Denmark

**11:15 a.m.      Full Scale Pyrolysis for Biosolids: Reducing Contaminants and Closing The Loop**

Valentino Villa, Elizabeth Bridges, Garrett Benisch, Bioforcetech; Rob Kerschner, Kerschner Environmental Technologies, LLC

**11:30 a.m.      Facilitated Discussion**

**12:00 p.m.      Session adjourns for lunch in exhibit hall**

## **Session 15: Advances in Process Modeling**

**Wednesday, June 22, 2022**

**10:45 a.m. - 12:00 p.m.**

- 10:45 a.m.     Application and Field Verification of CFD Modeling for Clarifier Optimization**  
Alonso Griborio, Hazen & Sawyer
- 11:00 a.m.     Virtual Piloting and Development of a Digital Twin of a Novel Membrane Bioreactor Technology**  
Miguel Daza, AM-Team; Naoya Tamura, Maezawa Industries Inc.; Katsuki Kimura, Hokkaido University; Wim Audenaert, AM-Team; Usman Rehman
- 11:15 a.m.     One and the Same: Linking Collection System and Resource Recovery Facilities through Sewer Process Models**  
Adrian Romero, Jacobs; Mark Holstad, Albuquerque Bernalillo County Water Utility Authority; Matthew Ward, The WATS Guys; Jes Vollertsen, Aalborg University; Tom Johnson, Jacobs
- 11:30 a.m.     Technical Brief: Performance Assessment of a Full-Scale Disinfection Unit of a WWTP Using CFD Modelling**  
Cesare Piacuzzi, Giacomo Bellandi, Alejandro Claro Barreto, Wim Audenaert, AM-Team; Roberta Muoio; Roberto Di Cosmo, Davide Scaglione, Gruppo CAP; Usman Rehman,
- 11:35 a.m.     Facilitated Discussion**
- 12:00 p.m.     Session adjourns for lunch in exhibit hall**

## **Session 16: It's All About Carbon**

**Wednesday, June 22, 2022**

**1:30 p.m. - 3:00 p.m.**

- 1:30 p.m.      Impacts of Advanced Primary Treatment Technologies on Performance of Water Resource Recovery Facilities**  
Onder Caliskaner, Caliskaner Water Technologies; Lilly Imani; George Tchobanoglous; Yihan Zhang, University of California Davis; Brian Davis, Linda County Water District
- 1:45 p.m.      A Swiss-Army Knife Approach: Application of High-Rate Contact Stabilization at Blue Plains**  
Maryam Sabur, District of Columbia Water and Sewer Authority; Nam Ngo; Margaret Anderson, Northwestern University; Bernhard Wett; Charles Bott, HRSD; Arash Massoudieh, Catholic University of America; Aklile Tesfaye, DC Water
- 2:00 p.m.      Converting Rectangular and Circular Primary Tanks into the AAA Biologically Enhanced Settler**  
Sudhir Murthy, NEWhub Corp; Bernhard Wett
- 2:15 p.m.      To Remove or to Redirect - The Impact of HRT and SRT on the Performance of the Novel AAA Process for Carbon Management**  
Ahmed Alsayed; Moomen Soliman; Ahmed EIDyasti, York University
- 2:30 p.m.      Technical Brief: Enhanced Primary Treatment for Carbon Redirection to meet Utility's Long Term Sustainability Goal**  
Bikram Sabherwal, Leon Downing, Black & Veatch; Brian Shoener, University of Illinois At Urbana-Champaign
- 2:35 p.m.      Facilitated Discussion**
- 3:00 p.m.      Session adjourns for networking break**

## **Session 17: Advances in Solids Treatment**

**Wednesday, June 22, 2022**

**1:30 p.m. - 3:00 p.m.**

- 1:30 p.m.      Biogas Harvester Recovers Dissolved Biogas for Energy Production, GHG Reduction, and H<sub>2</sub>S Collection**  
John Willis, Brown and Caldwell; Ashwin Dhanasekar, The Water Research Foundation; Robert Fergen, Miami Dade County Florida; Debbie Griner; Melissa Jauregui; Fabian Rangel-Rojas, Brown and Caldwell
- 1:45 p.m.      Biosolids the Hidden Treasure: Current and future trends in biosolids resource recovery technological and market maturity**  
Prithviraj Chavan, Ross Wilson, Richard Lancaster, Esme Piechoczek, Andrew Thompson, Atkins; Garry Strange, Thames Water, UK; Sarah-Jane Westlake, Atkins
- 2:00 p.m.      A Method for Determining When an Anaerobic Digester Needs Mixing**  
Coenraad Pretorius, David Solley, GHD; Duncan Taylor; Laura Roff
- 2:15 p.m.      Performance and Lessons Learned for Digestion with Recuperative Thickening and High Solids Mixing**  
Daniel Chien, Rick Chan, Carollo Engineers; Rashi Gupta; Nicholas Talbot; Brian Schumacker; Manuel Santos
- 2:30 p.m.      Facilitated Discussion**
- 3:00 p.m.      Session adjourns for networking break**



## **Session 18: Sensors to Data to Knowledge to Action**

**Wednesday, June 22, 2022**

**1:30 p.m. - 3:00 p.m.**

- 1:30 p.m. Using Data-Driven Models To Answer Operatorâ€™s Questions About Their WRFs, And Future Applicability Of Data-Driven Modeling To The Water Industry**  
Katya Bilyk, Javad Roostaei, Wendell Khunjar, Hazen & Sawyer; Ankit Pathak
- 1:45 p.m. It's OK to be a Control Freak: Deploying machine learning algorithms and model-based controllers for WRRF optimization**  
Jeffrey Sparks, HRSD; Tanush Wadhawan, North Dakota State University; Peter Vanrolleghem, Modeleau Université Laval; Charles Bott, HRSD
- 2:00 p.m. Defining Resilience under Wet Weather Events Using Long-Term Sensor-Based Performance Data**  
Isaac Musaazi, Howard University; Lauren Stadler, Rice University; Jeseth Delgado Vela, Howard University; Moriah Brown; Dylan Christenson, Texas Tech University Health Sciences Center; Priyanka Ali; Lu Liu, Iowa State University
- 2:15 p.m. Mantis.AI - a Digital Twin for Forecasting and Optimizing Future Plant Performance in Real-Time**  
Jacob Barclay; Nick Piccolo; Rajeev Goel, Spencer Snowling, Hydromantis ESS, Inc.; Houssam Eljerdi, Pima County Regional
- 2:30 p.m. Technical Brief: Third Party Validation of Artificial Intelligence for Water Reclamation and Reuse**  
Kyle Thompson; Andrew Salveson, Carollo Engineers; Yasuhiro Matsui, Mika Kawata, Yokogawa Electric Corporation; Kevin Hardy, Encina Wastewater Authority; Amos Branch; Jason Assouline, Carollo
- 2:35 p.m. Facilitated Discussion**
- 3:00 p.m. Session adjourns for networking break**

## **Session 19: It's Not All About Carbon**

**Wednesday, June 22, 2022**

**3:45 p.m. - 5:00 p.m.**

- 3:45 p.m. Unexpected Journey in Tertiary NDN: Challenges, Solutions, and Opportunities**  
Michael Liu, LA County Sanitation District; Paul Pitt; Artin Laleian; Rachel Deco, Eric Krikorian, LA County Sanitation District; Joyce Lehman, Metropolitan Water District of Southern California
- 4:00 p.m. Mitigating Volatile Sulfur Compound Emission from Primary and Secondary Activated Sludge Systems Using New Low-Cost Operational Strategies**  
Nam Ngo; Margaret Anderson, Northwestern University; William Albrittain, Chris J. Reilly, DC Water; Arash Massoudieh, Catholic University of America; Nicholas Passarelli, Ryu Suzuki, DC Water
- 4:15 p.m. Zeolite Incorporated Technologies for Enhancing Shortcut Nitrogen Removal Processes in Mainstream Wastewater Treatment**  
Anndee Chester, University of Minnesota
- 4:30 p.m. Technical Brief: Impact of Seawater Infiltration on Biological Phosphorus Removal, Chlorine-Based Disinfection, and Settling**  
Alexandria Gagnon, Charles Bott, HRSD; Tanush Wadhawan, North Dakota State University
- 4:35 p.m. Facilitated Discussion**
- 5:00 p.m. Session adjourns**

## **Session 20: Today's Alchemy Miracle: Hydrothermal Liquefaction Turns Sludge into Diesel and Jet Fuel**

**Wednesday, June 22, 2022**

**3:45 p.m. - 5:00 p.m.**

**Moderator:** John Willis, Brown and Caldwell

**Presenters:** Michael Thorson, Pacific Northwest National Laboratory; David Blair, Metro Vancouver; Glenn Fuller, Kern Oil

While many Water Resource Recovery Facility residuals are beneficially reused as biosolids, many wastewater solids are still disposed of in landfills or by incineration. The Pacific Northwest National Laboratory (PNNL) has conducted decades of research on hydrothermal liquefaction (HTL) to re-form waste carbon into biological crude oil (Bio-crude) and renewable methane as energy products. Much of this work has been funded by the US Department of Energy (US-DOE) to reduce the country's dependency on foreign oil while lowering the carbon intensity of the transportation sector.

Within the wastewater sector, initial Water Research Foundation (WRF) work at Metro Vancouver was foundational to US-DOE awarding WRF funding to pilot a Genifuel 10-to-15 wet-ton/day HTL demonstration at Central Contra Costa Sanitary District's plant. That HYPOWERS project completed Phase-1 in spring 2019 but has since been on hold while resolving funding and contractual issues. In parallel, metro Vancouver began procuring their own similarly sized unit with their efforts now ahead of the HYPOWERS project. Parallel research has been commissioned with the University of British Columbia including a literature review (Basar, et. al, 2021) and investigations on non-catalytic treatment of HTL aqueous phase.

This session includes presentations from leading technology, utility, and industry experts on the above projects and topics followed by a panel discussion.

*A detailed agenda for this session is coming soon.*

## **Session 21: Sensors and Instrumentation**

**Wednesday, June 22, 2022**

**3:45 p.m. - 5:00 p.m.**

**Facilitators:** Tanja Rauch Williams, Isaac Musaaazi

*This is a Technology Spotlight session. Format of this session will include quick, in-depth reviews on various technologies, presented by technical experts and utility representatives. Facilitated discussion with audience participation will follow in the remaining time at the end of the session, with additional time during breaks to continue those conversations.*

### **Technology Reviews**

**Hach**

Bob Dabkowski

*Additional presenters will be added as soon as they are confirmed.*

**4:30 p.m.      Facilitated Discussion**

**5:00 p.m.      Session adjourns**

**Session 22: PdNA: What's in it for me? Part 1**

**Thursday, June 23, 2022**

**8:30 a.m. - 10:00 a.m.**

**8:30 a.m. Moderator Introduction**

**8:45 a.m. Partial-denitrification/Anammox as a Path to Infrastructure and Operational Savings for WWRFs Facing Stringent Nitrogen Limits**

Kester McCullough, Stephanie Klaus, Michael Parsons, HRSD; Ahmed Al-Omari; Christopher Wilson, Charles Bott, HRSD

**9:00 a.m. Current State of Knowledge on Operation and Implementation of Partial Denitrification — Anammox (PdNA) Filters**

Rahil Fofana, DC Water; Megan Bachmann, HRSD; Kimberly Jones; Jeseth Delgado Vela, Howard University; Benay Akyon; Wenjun Liu, Xylem; Stephanie Klaus, HRSD

**9:15 a.m. Success at Pilot-Scale leads to the Full-Scale Application of PdNA in MBBR and IFAS and the Inadvertent Development of Mainstream PNA Along the Way**

Megan Bachmann, Stephanie Klaus, Justin Macmanus, Michael Parsons, HRSD; Haydee De Clippeir, DC Water; Charles Bott, HRSD

**9:30 a.m. Facilitated Discussion**

**10:00 a.m. Session adjourns for networking break**

## **Session 23: Treatment of Emerging Contaminants**

**Thursday, June 23, 2022**

**8:30 a.m. - 10:00 a.m.**

**8:30 a.m.      **Virtual Full-scale Ozonation Plant to Minimize Piloting Efforts and Efficient Micropollutant Removal for Safe Water Discharge****

Giacomo Bellandi, AM-Team; Roberta Muoio; Miguel Daza, AM-Team; Usman Rehman; Peter van Dijk, Ruud Schemen, Tom Weijtmans, Waterboard De Dommel

**8:45 a.m.      **Anoxic Granular Activated Sludge Process Bioreactor for the Simultaneous Reduction of Perchlorate and Nitrate****

Nathaniel Stein; Ramesh Goel; Aditi Podder

**9:00 a.m.      **Design and Implementation of a Moving Bed Bioreactor for Sulfolane Treatment****

Srinivasa Varadhan, Richard Hodges, Geosyntec Consultants; Janet Goodfellow; Scott Forbess, Geosyntec Consultants

**9:15 a.m.      **Development of BioLargo Water's innovative AOS technology for disinfection and removal of pharmaceutical products from municipal wastewater****

Rimeh Daghrir, Centre des Technologies de l'eau; Jenny Boutros, Richard Smith, Laura Patterson-Fortin, Biolargo Water Inc

**9:30 a.m.      **Facilitated Discussion****

**10:00 a.m.      **Session adjourns for networking break****

**Session 24: Invited Session (DE&I)**  
**Thursday, June 23, 2022**  
**8:30 a.m. - 10:00 a.m.**

*More information about this session is coming soon.*

**Session 25: PdNA: What's in it for me? Part 2**  
**Thursday, June 23, 2022**  
**10:15 a.m. - 11:45 a.m.**

- 10:15 a.m. Smart System Automation of Modified 4-Stage Bardenpho Process by Incorporating Partial Nitrification/Denitrification/Anammox (Pdna/PANDA) for Mainstream Municipal Wastewater Treatment with Frequent Storm-Related Fluctuation**  
Yewei Sun, Hazen and Sawyer; Jiefu Wang; Wendell Khunjar, Hazen & Sawyer; Mari Winkler; Ramesh Goel; Zhiwu Wang
- 10:30 a.m. Developing Application Guidelines for Mainstream Partial Denitrification-Anammox Application with Raw Fermentate**  
Mojolaoluwa Ladipo-Obasa; Alexander Seidel, Rumana Riffat, George Washington University; Charles Bott, HRSD; Christine Debarbadillo, Haydee De Clippeleir, DC Water
- 10:45 a.m. Polishing Tertiary Effluent Nitrogen via the Synergy Between Methanol-Driven Partial Denitrification and Anaerobic Ammonia Oxidation in Moving Bed Biofilm Reactors**  
Jiefu Wang; Wendell Khunjar, Hazen & Sawyer; Gregory Pace, Manhattan College; Ankit Pathak; Michael McGrath, Fairfax County; Mujahid Ali; Yewei Sun, Hazen and Sawyer
- 11:00 a.m. R-Strategy Taken by Glycerol-Driven Partial Denitrification in Moving Bed Biofilm Reactors Applied for Anaerobic Ammonia Oxidation of Tertiary Effluent**  
Jiefu Wang; Wendell Khunjar, Hazen & Sawyer; Gregory Pace, Manhattan College; Ankit Pathak; Michael McGrath, Fairfax County; Mujahid Ali; Yewei Sun, Hazen and Sawyer
- 11:15 a.m. Facilitated Discussion**
- 11:45 a.m. Conference adjourns**

## **Session 26: Advanced Treatment in Potable Reuse**

**Thursday, June 23, 2022**

**10:15 a.m. - 11:45 a.m.**

- 10:15 a.m.     Enhancing 1,4-Dioxane Removal Through Co-Metabolic Biofiltration in Advanced Water Treatment Systems for Potable Reuse**  
Hannah Stohr, HRSD; Ramola Vaidya, HDR; Germano Salazar-Benites, HRSD; Amy Pruden, Virginia Tech; Christopher Wilson, Charles Bott, HRSD
- 10:30 a.m.     Identification and Removal of Performance- and Health-Based Indicator Chemicals in a Mobile, Carbon-Based Direct Potable Reuse Pilot**  
Kyle Thompson; James Rosenblum, Colorado School of Mines; John Rehring, Jason Assouline, Carollo; Tzahi Cath, Colorado School of Mines; Christophus Bellona; Kirk Olds, Colorado Springs Utilities
- 10:45 a.m.     Leveraging Process Intensification and Next Generation Nutrient Removal within an Integrated Advanced Water Treatment Facility for Large-Scale Potable Reuse**  
Bryce Danker, Hazen and Sawyer; Paul Pitt; Wendell Khunjar, Ron Latimer, Yewei Sun, Hazen and Sawyer; Nikos Melitas, Michael Liu, LA County Sanitation District
- 11:00 a.m.     Technical Brief: Blended Reuse Biofiltration Treatment Plant Startup and Process Monitoring, a City's Approach to Continuous Improvement of Drinking Water Treatment Processes**  
Jonathan Campos, Jackie Solis Armenta, John Meyers, City of Thornton
- 11:15 a.m.     Facilitated Discussion**
- 11:45 a.m.     Conference adjourns**



**Session 27: Invited Session**  
**Thursday, June 23, 2022**  
**10:15 a.m. - 11:45 a.m.**

**Facilitators:** Jeanette Brown, Dru Whitlock, Adam Parmenter

*This is a Technology Spotlight session. Format of this session will include quick, in-depth reviews on various technologies, presented by technical experts and utility representatives. Facilitated discussion with audience participation will follow in the remaining time at the end of the session, with additional time during breaks to continue those conversations.*

**Technology Reviews**

**GEA - Granulator Technology**  
Todd Marshall

**Centrisys - Centrifugation technology**  
Josh Benoit

**Anaergia - Sludge Screw Thickener**  
Sacha Rollings

**11:15 a.m. Facilitated Discussion**

**11:45 a.m. Conference adjourns**