PNCWA2024 Technical Session Descriptions

Opening General Session: Leading with Resilience: Lessons from Major League Baseball to Wastewater Management

09/09/2024, 08:30 AM - 10:00 AM

Speaker(s): Joe Bohringer

Join us for an inspiring and insightful opening general session led by Joe Bohringer, a distinguished executive with over three decades of experience in Major League Baseball. From his humble beginnings as a student intern while pursuing a business degree at the Massachusetts Institute of Technology to becoming a key figure in historic team achievements, Joe's journey is a testament to the power of effective leadership and resilience.

In this session, Joe will share valuable lessons from his extensive career, offering unique perspectives on leadership, team-building, and achieving excellence under pressure—insights that are especially relevant to the wastewater management industry. Drawing parallels between the high-stakes world of professional sports and the critical field of wastewater management, Joe will explore how to build resilient teams, innovate under pressure, and lead with vision in the face of challenges.

Joe's experiences and insights will provide attendees with practical strategies for enhancing the resilience and efficiency of their wastewater management operations. His engaging storytelling and actionable advice will set the tone for an exceptional conference experience, inspiring you to lead with determination, adaptability, and a commitment to excellence.

Boise's Journey in Understanding Reliability and Redundancy

9/9/2024, 10:15 AM - 10:45 AM

Speaker(s): Haley Falconer;Allison Hornak

The City of Boise's Water Renewal Services (WRS) serves as a compelling case study illustrating the evolution in understanding reliability and redundancy. This journey has illuminated the interplay between infrastructure investment, operational efficiency, and regulatory compliance. Boise has transitioned from the perception of reliability as "N+1" installed redundancy to instead thinking of it as the capacity to ensure continuous and reliable water renewal operations given dynamic environmental conditions.

Redundancy exists at multiple levels within Boise's system, which includes multiple water renewal facilities connected through infrastructure, regulatory requirements, and community expectations. Redundancy for Boise begins at the equipment level and continues through the unit process and facilities all the way to the system level. The multiple levels of redundancy provide Boise a robust

and durable system, but they also present the potential for the overinvestment in redundancy at multiple levels. Developing a more holistic definition and approach to redundancy required first understanding and then connecting redundancy between the various levels to meet the overall system reliability goals.

The city recognized that while infrastructure redundancy provides a safety net against catastrophic failures, it can be capital-intensive. Instead, the city's more nuanced understanding of reliability has paved the way for a more strategic approach to defining redundancy. By defining precise conditions where redundancy is expected, the city has been able to focus its resources effectively - optimizing its response to potential failures. This strategic approach targets redundancy investments aligned with the system's critical components that enhance overall operational robustness.

In addition, investing in skilled staff, predictive maintenance technologies, and operational strategies can achieve similar levels of system reliability while being more cost-effective in the long run. Boise's experience reinforces the need for meticulous evaluation and prioritization of unit process elements, enabling a more streamlined, cost-effective approach to achieving reliability.

The city's journey serves as a valuable case study, offering insights and best practices for utility managers navigating today's complex terrain.

How WRRFs Can Benefit From Organic Landfill Waste Diversion

9/9/2024, 10:15 AM - 10:45 AM

Speaker(s): Natalie Gustafson, P.E.;Ruth Roxburgh, Ph.D.

The Pacific Northwest, along with much of North America, is facing near-term and long-term municipal solid waste (MSW) management planning challenges with decreasing landfill capacity. One of the most important solutions to increasing MSW handling capacity is through diversion of organic waste from landfills, as organic waste produces methane, which can be further recovered and processed into a renewable energy source, and the organic waste itself can be processed through composting. Water resource recovery facilities (WRRFs) can process organic waste with municipal sludge through means of codigestion in anaerobic digesters, to increase biogas production, achieve reduced solids volume, and optionally enable recovery of struvite for fertilizer.

This presentation will focus on creative ways WRRFs can partner with solid waste management facilities (SWMFs), to expand/enhance digestion capacity/redundancy and generate revenue from renewable energy credits while playing an important role in increasing MSW handling capacity through diversion of organic waste from landfills. Organic waste diversion programs are not one-size-fits-all and require coordination among public and private entities for the most robust long-term solutions.

The talk will highlight a program case study in western Canada, which included evaluating expansion of the existing composting facility and the addition of anaerobic digestion, and consisted of a partnership between the solid waste division, wastewater treatment division, and third-party entities. The anaerobic digesters will digest food and yard waste, process the biogas produced into renewable natural gas (RNG), and incorporate the digestate into downstream composting. The composting facility processes dewatered wastewater biosolids, as well as food and yard waste, in separate compost streams. The end result is two separate types of compost.

The presentation will also review the Washington State (US) 2022 Organics Management Law (HB 1799), that requires organic waste diversion from landfills, with staged reduction in organics disposed of in landfills through 2030. This law presents an opportunity for WRRFs to partner with SWMFs, in which WRRFs can utilize and/or expand existing anaerobic digestion and sludge processing capacity to codigest organic waste with municipal wastewater sludge.

Maximizing Return on Investment for your Sanitary Sewer Evaluation Survey (SSES) Program

9/9/2024, 10:15 AM - 10:45 AM

Speaker(s): Jeff Duplantis

Introduction

Sanitary Sewer Evaluation Surveys (SSES) have been a long-standing tool used by utilities in an attempt to reduce infiltration and Inflow (I&I) and sanitary sewer overflows to maintain regulatory compliance and maximize system capacities. However, traditional approaches have often resulted in high costs of assessment and rehabilitation, often with less significant performance improvements than anticipated.

Topic Background

Traditional SSES approaches have relied heavily on CCTV inspections for identification of defects followed by CIPP rehabilitation. Both of these approaches have a high cost per linear foot of pipe and when implemented on a broad basis can result in high costs on a dollar per gallon ($/gal) of removed flow basis. Based upon extensive experience, there are many lessons learned that have refined the approach to SSES that reduces both the CCTV and amount of pipeline and manhole rehabilitation to maximize returns.

Discussions of the topic will be focused on the newer methodologies and technologies being implemented to prioritize basins down to sub-basin levels and then targeting rehabilitations to give owners their lowest cost investment for the highest value improvements. Critical to this process being discussed is the verification that measures the anticipated improvements through reduced I&I flows, elimination of sanitary sewer overflows and correction of structural failures.

Presentation Summary

This presentation will review the unique approaches to implementing SSES with targeted goals that include:

1. Leveraging existing system information that includes system maps, hydraulic models, pump run times and flow data to develop a work plan and target basins for investigation.

2. Identification of priority sub-basins and initial field assessments through enhanced flow monitoring, rain fall monitoring and parametric quantification of I&I flows.

3. Defect identification and corrective action plans derived through targeted field investigations that include smoke testing, CCTV and other methods for lowest cost and highest returns.

4. Comparing traditional and emerging rehabilitation methods for collection, pumping and transmission systems that are specific to local conditions and system defects.

5. Verification achievement of performance improvements through flow metering and data analysis that is then incorporated back to owners GIS, hydraulic modeling and asset management systems.

Case Studies

The presentation will also include a range of case studies of implementing tailored SSES systems that include quantifiable results compared with costs of implementation. These case studies will discuss the challenges, unique approaches and lessons learned.

Nitrous Oxide Emissions Estimation for Better Nutrient Planning

9/9/2024, 10:15 AM - 10:45 AM

Speaker(s): Shannon Cavanaugh

In the Pacific Northwest, utilities are navigating their response to climate change in conjunction with tightening nutrient permits and the reality that introducing nitrogen removal at water resource recovery facilities (WRRFs) may increase their carbon footprint. Utilities will need to weigh nutrient reduction impacts against potential greenhouse gas (GHG) emission impacts as nutrient planning begins.

Nitrous oxide (N2O) is a GHG with a global warming potential 273 times greater than CO2 and can be the largest source of Scope 1 GHG emissions at WRRFs. As cities set carbon neutrality goals, wastewater utilities are often included in cities' GHG emissions portfolios, and there is uncertainty about the magnitude of wastewater process N2O emissions.

N2O is generated through biological nitrification and denitrification processes; however, emissions are unpredictable. In theory, plants that perform biological nitrogen removal will have greater N2O emissions than plants that do not, although there is variability in emissions both between and within process configuration types.

While N2O should be measured in-situ to estimate emissions, this is not possible for WRRFs in the planning phase. In these cases, utilities must make decisions about nutrient removal while posing the question "will introducing nitrogen removal increase my carbon footprint?"

Many utilities use a triple bottom line approach considering environmental, social, and economic factors in decision making. N2O emissions contribute to environmental impact; however, there are not yet widely used methods to predict emissions from treatment processes that are not yet constructed. Biological process models are often developed as part of planning projects and there is an opportunity to estimate N2O emissions from modeled alternatives.

This project investigates N2O emissions estimates in BioWin before and after introducing nitrogen removal at a theoretical WRRF and compares estimates to published emission factors. The theoretical WRRF is designed as a carbon removal only plant and three levels of nitrogen removal are modeled: (1) nitrification only (2) nitrification and denitrification to 8 mg TIN/L and (3) nitrification and denitrification to 3 mg TIN/L. Results from this exercise and the planning approach will provide valuable insight for utilities considering climate impacts in their nutrient planning.

Turning Equity Goals into Community Outcomes

9/9/2024, 10:15 AM - 10:45 AM

Speaker(s): Nicki Pozos, PhD, PE

Many agencies have been exploring how to integrate equity into infrastructure projects and programs. There has been a move towards getting broader representation into public engagement processes and integrating equity considerations into our engineering decision processes. The question is—are our approaches delivering meaningful benefit to vulnerable members of our communities? This presentation will explore different project elements and phases, focusing on community engagement, alternatives analysis, and preliminary design. In each phase, what approaches are being used and how can we better tie those approaches to community outcomes? The overall goal is to hold ourselves accountable to delivering on our equity promises and ideals.

Wastewater 102: Biosolids

9/9/2024, 10:15 AM - 11:15 AM

Speaker(s): Hannah Thomascall

You've got the basics of wastewater treatment figured out, but what about all those solids that we worked so hard to remove? How are they treated and where do they end up? Like water treatment, there are a lot of different options, and each facility has to select the best one for their needs and their capabilities.

We will look at some common solids treatments including aerobic and anaerobic digestion, composting, drying, thermal decomposition, and chemical stabilization with examples from here in the Pacific Northwest. Each treatment type will be compared in terms of footprint, energy use, cost, treatment level, and operational requirements. We will also discuss how the product of each treatment type is either used or disposed of (e.g. land application, soil amendment, or landfill). At the end of this presentation, you should be able to identify common solids treatment types and understand why that type was selected for the facility – and, perhaps, which technologies would be good improvements for your facility.

"Food waste – Worth the Trouble?"

9/9/2024, 10:45 AM - 11:15 AM

Speaker(s): Mario Benisch

Codigestion of food waste or residential organic waste garners a lot of attention in times of high energy prices, attractive incentives, and/or regulatory driver to divert food waste away from landfills. On paper, cogeneration seems like logical solution. In practice however, successful implementation and operation of such facilities are rare. Many are plagued by operational issues associated with contamination from rags, rocks, glass, and metal to PFAS and microplastics. From a facility design perspective, taking on municipal organic waste is akin to taking on garbage. This presentation will highlight the potential benefits and pitfalls as well as planning and design considerations, both on-site, and for a City/Utility as a whole.

In North America, 40%+/- of its organic load in municipal wastewater is food waste from in sink garbage disposals, delivered to the plant at no additional cost, and largely free or garbage and debris. In practice, the inability of kitchen disposal to shred dishes or silverware acts as an effective barrier for contamination resulting in an organic waste which is free of debris that can cause operational issues at the treatment plant. The unit process of receiving organic waste at a treatment plant or dedicated processing facility will have to perform to that same standard in order to avoid the aforementioned problem.

Implementation of co-digestion of organic wastes starts at the planning level; identifying and contractually securing sources, consolidation for scale, as well as consideration for potential contamination with water quality relevant pollutants. These can enter the liquid stream through internal recycles including micro plastics and PFAS. Facilities with nutrient limits utilities must account for the additional recycle load imported with organic waste.

Does co-digestion still make sense in light of all the potential issues? The answer as so often is – it depends. It depends on the organic waste itself, its relative load contribution to an existing facility, scale, city or county wide benefits, local regulatory framework, and incentives. Successful implementations are possible, but they require careful long-term planning, a design that protects downstream facilities from harmful debris and staff from gagging upon entry.

Collaboration Improves Hybrid Work: The Case for Treating Policy Like Design

9/9/2024, 10:45 AM - 11:15 AM

Speaker(s): Jane Vail, P.E.

Everyone strives to attract and retain employees in the current job market, but hybrid work policies can limit our success. Such policies are often too vague or dictated entirely from above. It's not surprising that workplace culture and efficiency have suffered at cities, districts, and consulting firms.

With the post-pandemic return to the office, my firm took a collaborative approach to creating a hybrid work policy. I am an engineer who owns a consulting civil engineering business. So I have much more experience working with a group of people to design infrastructure improvements than I do drafting completely new policies for personnel. But as it turns out, formulating a hybrid work policy and facilitating collaborative design decisions for infrastructure have common ingredients.

Design and policy decision-making share three key components: 1) collaboration yields a better product, 2) the method of obtaining input is critical to the quality of the input, and 3) it's best to start with the big picture before the details. Collaboration results in superior outcomes because people bring unique viewpoints to decisions, it fosters personal investment in the decision, and it promotes a shared understanding of performance expectations. Better policy (and design) comes from preparing decision-makers in advance of the decision, defining the meaning of input before asking for it, and providing a comfortable environment for input. Starting with goals and challenges is critical before refining the decision details.

During this presentation we'll discuss the benefits of using collaboration to create policy, the challenges with getting consensus, and the process and tools that work best. I'll also share how we checked in with our hybrid policy a year later, and how it's working for us currently. This presentation should be of interest to those who are advocating for better solutions to hybrid work.

Flexible Design for Resilient Biological Nutrient Removal

9/9/2024, 10:45 AM - 11:15 AM

Speaker(s): Austin Carnes;John Gonzales;Dan Hingley

Biological nutrient removal systems at WRRFs are sensitive to collection system variation and seasonal climatic conditions. Because these factors are generally outside the control of operators, flexibility in process arrangements is critical when conducting biological nutrient removal at the margins (for example enhanced biological phosphorus removal to less than 0.8 mg/L total phosphorus). This presentation will describe case studies for flexible process configurations that enhance BNR optimization.

The City of Boise adopted new basin design incorporating anaerobic mass fraction as a flexible parameter. This requires primary effluent, RAS, and mixed liquor recycle (MLR) to be introduced at multiple potential locations in the treatment train. The city has successfully managed anaerobic mass fraction in the existing tanks. Anaerobic mass fraction ranges from 12% to 30% depending on the season and influent wastewater characteristics. New design allows for higher anaerobic mass fraction to be retained in smaller footprint through use of a sidestream anaerobic zone (S2EBPR). In this configuration, anaerobic mass fraction can operate in the 25-30% range while anoxic volume is still retained for total nitrogen removal. State of practice for S2EBPR includes carbon addition in some form or another – a design for addition of thickened primary sludge to stimulate deep anaerobic conditions will be reviewed.

Similar approaches were used in Hampton Roads Sanitation District (HRSD) VIP plant and San Mateo membrane bioreactor (MBR) system. These designs will be reviewed to show the flexibility in process configurations designed into the piping and tankage. The VIP plant includes multiple locations to feed PE and MLR. The flexible operation has further allowed for low DO operation in an optimal range of 0.1 to 0.7 mg/L with lower mixing energies of ~0.08 scfm/ft2. The San Mateo MBR process includes four RAS feed points for control of DO levels in a pre-anoxic zone, and for flexibility in the total fraction of denitrifying anoxic conditions within the treatment train.

Georgetown Wet Weather Treatment Station – Leveraging Green Stormwater Infrastructure to Showcase Sustainability

9/9/2024, 10:45 AM - 11:15 AM

Speaker(s): Jesse Williams

The Georgetown Wet Weather Treatment Station (GWWTS) is a cornerstone of King County's efforts to reduce combined sewer overflows (CSOs) into the Duwamish River. Departing from the idea that industrial facilities should be hidden, King County led a collaborative process to design a facility that engages and uplifts the local community while promoting environmental and social sustainability. The incorporation of GSI was also key to the project earning the first Envision Platinum award in Washington State. This presentation will share how green stormwater infrastructure (GSI) was incorporated throughout the design to enhance this vision and will provide audience members with fresh ideas for incorporating green infrastructure in public facilities.

The GWWTS uses cutting-edge wet weather treatment technology to treat polluted combined sewer and stormwater runoff from nearly 2,100 acres of impervious area, treating up to 70 million gallons per day of CSOs that would otherwise discharge directly to the Duwamish River annually. While the treatment process is complex, Georgetown community members and businesses advised the project team on the station design including how to show the public how combined sewage is treated. The innovative site design allows the community to view the treatment process, incorporates art including lighting that is synchronized with rain events and incorporates GSI. Pursuit of the Envision Platinum award played a large role in the project being the first chosen by the Environmental Protection Agency (EPA) Water Infrastructure Finance and Innovation Act loan. The GWWTS also provides additional community education space in this historically underserved neighborhood.

This presentation will showcase the GSI features incorporated, including cisterns, bioretention, vegetated open-grid pavers, a vegetated roof, and the integrated design process and lesson learned. The presentation will also describe how contaminated soil and leaking underground storage tanks were remediated to allow infiltrating facilities. Through the site's GSI features the County has provided sustainability leadership in two ways: these features provide a model for future land redevelopment that can reduce or eliminate the need for CSO treatment and also provide physical space for community members to learn about stormwater and the benefits and challenges of GSI in a real-world setting.

Resiliency Through Applied Research into Emerging Constituents

9/9/2024, 10:45 AM - 11:15 AM

Speaker(s): Josh Baker

Emerging constituents (ECs), also called contaminants of emerging concern (CECs) are defined by the United States Environmental Protection Agency (U.S.EPA) as: "…pharmaceuticals and personal care products." It is highly likely that regulatory limits will be placed on many ECs because they tend to accumulate in the environment and biological tissues with little to no transformation. ECs pose a threat to the ecological systems of our nation and the fundamental need for clean water by all life on earth. Clean water is essential for food production, whether directly, through activities such as fishing, or secondarily, through irrigation for crop production. We have been given the responsibility by our creator to be good stewards of the earth and its resources.

Research shows that ECs pose a threat to life and have affected the endocrine systems of certain fish species throughout the United States. Some studies indicate that upward of 85% of male fish sampled had eggs growing within their reproductive organs. ECs in the United States primarily enter water bodies through water renewal facilities, whether on-site (e.g. septic systems) or centralized municipal utilities. It is unclear the extent to which ECs are removed or accumulate through wastewater treatment processes. This is further exacerbated by the abundant release of ECs into collection systems across our nation, and the rate at which new ECs are being generated for personal care and medical uses.

Our research presented here examined a targeted set of ECs within the Lander Street Water Renewal Facility (LSWRF), the older of the city of Boise's two water renewal facilities. We detected and mapped a select set ECs as they processed through the LSWRF. We will present their concentration trends through the facility and annual loading estimates, through the liquid and solids treatment streams. We must continue conducting research like ours presented here for

finding ways to prevent ECs from causing harm to our natural systems, which is the essence of good stewardship.

Choosing a Biosolids Treatment Option and Implementation

9/9/2024, 11:15 AM - 11:45 AM

Speaker(s): KEN WINDRAM

Session Title: Choosing a Biosolids Treatment Option and Implementation.

Statement: The Hayden Area Regional Sewer Board (HARSB) installed a tertiary treatment system to meet the new water quality standards for the Spokane River. Tertiary treatment will increase the amount of biosolids produced by the facility. The current biosolids handling consisted of a Waste Activated Sludge holding tank and Screw Press dewatering. HARSB needed to select a biosolids treatment process to handle the treatment plant solids.

Approach:

This presentation will provide information on how the HARSB Board evaluated the biosolids treatment options for capital costs and 20-year operations and maintenance costs. The final selected biosolids handling process was a Solar Dryer using HUBER SRT system with the HUBER Sludge Turner SOLSTICE®. The HARSB HUBER SRT system solar dryer will be the first in the Northwest. The solar dryer will also have unique design features for the north Idaho climate including insulated walls and ceilings plus a Ground to Air Heat Transfer (GAHT) system.

Results / Conclusion:

The project will be in its finishing its first year in operation. In addition to the project information, the presentation will include photos of the construction process as well as lessons learned during both design and construction plus the biosolids results.

Energy and Resource Efficient Biological Nutrient Removal via Internal Stored Carbon (ISC) and Partial Nitrification Denitratation Anammox (PdNA/PANDA) for Achieving Stringent Effluent TN Limit

9/9/2024, 11:15 AM - 11:45 AM

Speaker(s): Yewei Sun;Bryce Danker

Many Water Resource Reclamation Facilities (WRRFs) in Pacific Northwest Regon face regulatory pressures to treat to lower effluent total nitrogen (TN) levels. For utilities needs to meet stringent effluent TN limit (<3 mg/L), post anoxic zones within the secondary processes or tertiary polishing processes (e.g. MBBR or biological filters) are needed, where large amounts of external organic carbon are needed to support denitrification. Anaerobic storage of internal carbon (ISC) can be used to support post-anoxic denitrification, which can eliminate or significantly reduce external carbon usage. In addition, by converting conventional BNR process to Partial Nitrification Denitratation Anammox (PdNA/PANDA) process, additional energy savings and chemical savings of up to 60% and 80% can be achieved, because of aeration reduction via partial nitrification and

carbon reduction via partial denitrification (PdN). Although ISC driven denitrification has been observed for over a decade, limited full-scale studies are available. Also, the mechanism behind and operational methods to optimize ISC driven denitrification remain largely unknown. For PdNA/PANDA, previous studies only focused on using external carbon sources (e.g., methanol or glycerol), but the capability of using PE or ISC for achieving PdNA /PANDA remains largely unknown. More importantly, the possibility of leveraging ISC driven denitrification, EBPR, and PdNA /PANDA has not been systematically investigated. This presentation will highlight the experience and lessons learned from three utilities:

1. A full-scale utility (Durham, NC) achieved stable internal stored carbon driven post anoxic denitrification for more than two years. An average effluent TN of 1.9 mg/L was achieved and up to 85% of denitrification in the post anoxic zone is due to internal stored carbon. Batch tests and mathematical modeling was used to understand the mechanism behind.

2. A pilot scale system (Los Angles, CA) achieved PE and ISC driven PdNA /PANDA in a tertiary step feed MBBR downstream of a high pure oxygen secondary process. The COD addition/N removal ratio is around 1.1 by leveraging PE, ISC and Glycerol driven PdNA, which is equivalent to over 70% of carbon savings. Mechanism behind PE- and ISC- driven PdNA was also investigated.

3. A pilot scale system (Everett, WA) leveraged ISC driven denitrification, EBPR, and PdNA /PANDA. This system can achieve effluent TIN) ≤ 3 mg/L and orthophosphate phosphorus (OP) ≤ 0.1 mg/L, in which 44.5% influent TIN was removed through endogenous denitrification and 39.5% influent TIN was polished by PdNA. The pilot results showed that 100% carbon and 55.5% oxygen could be saved in the secondary process and another 45.2% carbon could be saved in the tertiary process.

Water Resource Reclamation Facilities (WRRFs) in the Pacific Northwest Region encounter regulatory demands to achieve lower effluent total nitrogen (TN) levels. Meeting stringent effluent TN limits (<3 mg/L) necessitates post-anoxic zones within secondary or tertiary processes, such as Moving Bed Biofilm Reactors (MBBR) or biological filters. These zones require substantial external organic carbon for denitrification. Utilizing Anaerobic Storage of Internal Carbon (ISC) can support post-anoxic denitrification, substantially reducing external carbon usage.

Converting conventional Biological Nutrient Removal (BNR) processes to Partial Nitrification Denitratation Anammox (PdNA/PANDA) yields additional energy and chemical savings. Aeration reduction via partial nitrification and carbon reduction via partial denitrification (PdN) can achieve savings of up to 60% and 80%, respectively. Despite over a decade of observed ISC-driven denitrification, limited full-scale studies exist. The operational methods and mechanisms behind ISC-driven denitrification remain largely unknown.

This presentation shares insights from three utilities:

- Durham, NC: A full-scale utility achieved stable internal stored carbon-

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Mitigating Risks in Urban Storm and Sewer System Upgrades: A Case Study in Hydraulic Resilience

9/9/2024, 11:15 AM - 11:45 AM

Speaker(s): Patrick Vandenberg;Ruby Mohammadi

Upgrading existing storm and sewer systems to provide resilient infrastructure poses risks and challenges that owners must overcome to safeguard public health and safety. The risks associated with construction of underground infrastructure are magnified by congested urban environments, steep topography and challenging geotechnical conditions.

A case study will be presented for replacement of an aging critical sewer trunk that crosses beneath a major interstate highway, focusing on the risks associated with system hydraulics. The project utilized the Construction Manager/General Contractor (CM/GC) delivery method for design of a dual crossing of two large diameter storm and sewer pipelines. Due to the major highway, trenchless construction is required.

The design team collaborated with the CM/GC to evaluate multiple trenchless storm and sewer installation methodologies against a variety of criteria including constructability, cost, public impacts, and resiliency.

Initial geotechnical information indicated use of a deep microtunnel within a deep bed rock layer. This allowed the use of a single deep hydraulic drop structure to address the steep topography, and resulted in pipeline slopes consistent with the owner's design guidelines. Lagging geotechnical data resulted in higher than anticipated construction risks for this approach. To mitigate construction risk, the project team evaluated a shallower profile, which would require two drop structures and steeper pipe slopes that would require a design exception for high velocities. This reduced the risk for construction but increased the risk associated with the conveyance system hydraulics.

The hydraulic risks were evaluated to determine impacts on the design, pipeline layout and system operations and maintenance. The design team used analysis tools to evaluate the velocities, hydraulic grade lines and air entrainment. The results of the analysis, impacts to the design, and resulting risk mitigation will be discussed.

Strategic Energy Master Planning in a Complex and Dynamic Landscape

9/9/2024, 11:15 AM - 11:45 AM

Speaker(s): Alison Nojima;Preeti Thimmaraju

Utilities and municipalities often identify improvements for aging infrastructure or capacity limitations at their facilities by preparing a conventional Facility Plan solely focused on the wastewater treatment processes achieving compliance with permit requirements without consideration of potential energy opportunities. The two are not necessarily mutually exclusive. The preparation of Energy Master Plans either as standalone efforts or as supplemental to the more conventional Facility Plans often highlight opportunities to reduce carbon footprint, improve energy resilience, and reduce overall energy consumption while achieving permit compliance at WWTPs.

This presentation will guide the audience through the key components of an effective energy master plan based on a case study implemented at a WWTP in California. We will focus on a strategy and approach for energy master planning—considering facility specific demands, biogas utilization, and alignment with climate action plan goals. By adopting a holistic approach, WWTPs can enhance operational resilience, reduce emissions, and reduce risk against energy price fluctuations. A description of decision-making processes that many WWTPs utilize for selecting biogas utilization technologies and how plants evaluate on-site cogeneration versus gas upgrading for pipeline injection will be highlighted.

Wastewater to Waterways: Nurturing Diversity, Equity, and Inclusion in Pacific Northwest Communities

9/9/2024, 11:15 AM - 11:45 AM

Speaker(s): J'reyesha Brannon

Join us as we delve into the unique DEI challenges faced by communities across the Pacific Northwest in wastewater management and explore best practices for establishing DEI initiatives to foster a sustainable and equitable future. Discover key areas of growth and improvement that are relevant to the region and learn how organizations can overcome hurdles to achieve their goals.

When the Mood Sours: A Digester Upset and Recovery Case Study

9/9/2024, 11:15 AM - 11:45 AM

Speaker(s): Bryce Figdore

The City of Mount Vernon, WA has a conventional mesophilic anaerobic digestion process for stabilization of primary and waste activated sludge. In December 2023, the City experienced a month-long digester upset. A boiler failure resulted in short-term loss of digester temperature control approximately three days. Despite only a minor absolute change in temperature, the temperature change was relatively rapid and appeared to be the cause of digester upset and sour digester conditions that immediately followed the boiler failure. This scenario was particularly high-risk for the City because it has only one digester and would otherwise need to find alternative outlets for sludge at low lead time and high costs.

The City recognized the worsening digester conditions and took immediate actions to ward off a worst-case digester failure involving the complete emptying of digester contents and alternative sludge disposal. Despite immediate actions, volatile acids climbed as high as 6000 mg/L, and the situation appeared tenuous. The City's response actions included lime addition, enhanced monitoring, seeding of anaerobic sludge from a nearby manure digester, and purchase of trace elements (which were ultimately not required). With the City's systematic response, careful monitoring, and patience, the digester ultimately recovered within approximately one month of the initial boiler failure.

This presentation will cover anaerobic digester fundamentals, recommended response actions to sour digesters, and the specific case study around the City's digester upset and recovery.

Energy Resiliency Master Planning - Planning For Long Term Resiliency

9/9/2024, 11:45 AM - 12:15 PM

Speaker(s): Bryan Lisk PE, CEM

The need for energy resiliency is a rapidly growing area in the water and wastewater sector. Driven by climate change and the desire to do more with less, many water and wastewater utilities are embarking on long-term plans to implement energy resiliency projects to diversify energy supplies and improve the level of service to the rate payers. This presentation will provide an overview of the methodology and components of a comprehensive energy resiliency plan. Key components include:

- Energy supply diversification including utility supply, onsite power generation, energy storage and renewable energy integration (i.e. solar).
- System redundancy and flexibility to maintain operations during equipment failures.
- Emergency response readiness including proper system documentation, communication protocols and standard operation procedures during emergency conditions.
- Diagnostic capabilities including failure location and testing equipment/ procedures and power monitoring systems.
- Equipment condition and critical equipment obsolescence, spare parts and support availability.
- Alignment with other facility master plans and planned capital projects.

The plan methodology and key recommendations for two (2) long term energy resiliency master plans will be presented. These case studies include the Long Beach Utilities Department (CA) Energy Management Master Plan and the Parker Water Sanitation District (CO) Energy Resiliency Master Plan. The purpose of these studies was to develop a strategic energy resiliency plan that prioritizes resiliency needs and integrates the projects into the utility's CIP.

Evaluating Tertiary Treatment Technologies at the Rock Creek WRRF Under Regulatory Uncertainty

9/9/2024, 11:45 AM - 12:15 PM

Speaker(s): Nick Guho;Peter Schauer

With the EPA's establishment of aquatic life criteria for aluminum, future tertiary treatment requirements at Clean Water Service's (District) Rock Creek Water Resource Recovery Facility are uncertain. Currently, Rock Creek can meet a TP limit of 0.1 mgP/L with a combination of chemically enhanced primary treatment with alum, enhanced biological phosphorus removal (EBPR), tertiary treatment with alum and granular media filters. The District is working to update the Tualatin River Phosphorus TMDL after an extensive modeling, data collection, and experimental campaign showed that due to managed water releases, increased flow and changes to downstream impoundments, algal growth in the river may no longer be phosphorus limited. If successful, the

District may be able to meet a TP limit without tertiary alum addition. However, if an aluminum limit is established and the current TP limit remains, the District will likely need to balance phosphorus removal with achieving aluminum limits which may require significant plant upgrades.

Tertiary treatment requirements at Rock Creek were evaluated for three scenarios as part of the District's West Basin Facility Plan Project: Current limits (0.1 mgP/L and no aluminum limit), a presumed TP limit of 0.5 mgP/L consistent with EBPR, and a TP limit of 0.1 mgP/L with an aluminum limit. A screening of available tertiary treatment technologies identified granular media filters and tertiary membrane filtration as the most promising technologies given the anticipated range in effluent requirements and the District's current tertiary treatment processes. It was found that the constrained site could accommodate both technologies for the planning period, however, the near-term technology selection will impact operational costs and the options for future expansion. The 0.1 mgP/L and aluminum limit scenario required the largest expansion in tertiary treatment infrastructure, including tertiary clarification on the facility's west side. Planning level net present worth cost estimates found that meeting 0.1 mgP/L and an aluminum limit would cost approximately $60M more than meeting a 0.5 mgP/L limit. For membrane filtration, the cost differential was significantly higher ($130M to $160M). This analysis helped the District develop proactive plans for near-term testing and capital improvement projects in the face of an uncertain regulatory future.

Forging a Resilient Team: Intentional Stakeholder Engagement

9/9/2024, 11:45 AM - 12:15 PM

Speaker(s): Josh Baker;Tyler Resnick;Jeff Hodson;Mike Zeltner

To forge a more resilient tomorrow, we must begin by communicating our vision of what that tomorrow looks like to all stakeholders involved. This means that everyone, from the PhD who invents the new innovative process to the elected official paying for the process to the engineer designing the process to the young carpenter swinging the hammer must be engaged in the process. This is no easy feat in the modern era where communication comes in many different forms and is so prevalent. The Lander Street Water Renewal Facility (LSWRF) Phase 1 team undertook this challenge and saw it as an opportunity to further enhance our collaborative delivery model. The presentation will discuss our approach to stakeholder engagement in four main areas:

Owner's stakeholders such as City Council and Executive Management.

Delivery team stakeholders such as management team from owner, engineer, and contractor.

Subcontracting community who would be doing the actual construction of the project.

Nearby property owners and the regulatory community.

This presentation will discuss lessons learned and how we together forge a resilient team through intentional stakeholder engagement. Accomplishing our goal has required us to implement many different water community solutions and strategies. The LSWRF Phase 1 team completely bought into the need for all stakeholders to succeed to make the project a success. One of the chief goals of the project was for each member of the team to desire to work with one another on subsequent projects. This takes an incredible amount of engagement to accomplish and we used many and varied tools to accomplish this. Everything from management team book clubs, to asynchronous communication vlogs. This became even more difficult during the pandemic when communication

became more difficult than normal. The team has many lessons and tools that would be beneficial to conference participants.

Intensification of Anaerobic Digestion Through Vacuum Evaporation

9/9/2024, 11:45 AM - 12:15 PM

Speaker(s): Christopher Muller

Anaerobic digestion (AD) is applied for sludge stabilization to decrease volume and minimize environmental risks associated with biosolids disposal. In AD, organic matter is converted into biogas (methane) in the absence of oxygen, with a concurrent decrease in solids content. During digestion, however, nitrogen in the form of ammonium ions and phosphorus ions are released. While typically these nutrients are recycled to the front of the liquid treatment process, recovering the nitrogen and phosphorus can decrease nutrients loads improving treatment economics.

Integration of vacuum evaporation with anaerobic digestion is a promising approach for recovery of water and ammonia, thickening sludge, and mitigating ammonia toxicity which enables high organic loading rates (OLR). Side-stream vacuum evaporation involves applying vacuum after digestion and recirculating the thickened sludge back to the digester. In this configuration, the solids retention time (SRT) can be decoupled from the hydraulic retention time (HRT) to lower the reactor footprint and achieve a higher quality of recovered water and ammonia compared to conventional digesters. As a result of ammonia stripping, reduction of ammonia inhibition can be achieved at high organic loads, leading to more stable operation of the anaerobic process. This process, IntensiCarbTM can be operated in an AD mode or fermentation mode, which is the first phase of anaerobic digestion, where organic wastes are converted to volatile fatty acids (VFAs). VFAs produced during fermentation through the biological route can be used as a carbon source for biological removal of nitrogen or phosphorus.

This presentation provides an overview of 5 years of research on IntensiCarbTM. This technology has been proven to achieve anaerobic digestion intensification, which has potentially significant implications on the economics of increasing digester capacity while improving resource recovery. To date, research has demonstrated the following benefits:

- We can load a digester at least 3 times higher than current systems
- Ammonia toxicity is limited
- The microbiology of the system is different following an acclimation period
- In anaerobic digestion mode, volumetric methane yield is 3.5X than a conventional system
- In fermentation mode, high quality VFAs open opportunities for new recovered products, such as bioplastics precursors providing new revenue opportunities

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Odor Control Breakthrough Using A Low-Hazard Form Of Ferrous Chloride

9/9/2024, 11:45 AM - 12:15 PM

Speaker(s): Tam Truong;Ian Watson

Faced with increasing costs for controlling hydrogen sulfide in its wastewater collection system, the City of Bakersfield, California commissioned an evaluation of its program in 2019. The existing program using Calcium Nitrate dosing stations was becoming cost-prohibitive, particularly in sensitive areas where chemical demands and community sensitivities were highest. A consultant recommended evaluating the use of a more efficient treatment, such as ferrous chloride, in place of certain Calcium Nitrate dosing stations to reduce costs and improve the system's overall performance.

The City commissioned a study in 2021 to evaluate the performance of ferrous chloride dosing using SulFeLox, a low-hazard form of ferrous chloride that is less corrosive than other ferrous chloride products. The study consisted of 12 days of monitoring the baseline Calcium Nitrate scenario, followed by 60 days of SulFeLox dosing at different feed rates, and concluding with 14 days of no chemical dosing to establish the true baseline scenario.

The interceptor segment selected for the test was a 10-mile long (5-6 hour retention) trunkline leading to the City's Plant. Wastewater flows increase from approximately 0.3 mgd at the beginning to 12 mgd downstream.

The SulFeLox dosing station was able to replace two Calcium Nitrate stations. Comparing the Calcium Nitrate and SulFeLox results showed 66-83% lower vapor-H2S peaks upstream and at the treatment plant sites, with less benefit at a downstream site where vapors were impacted by H2S from other flows into the station.

Following the field test, the City continued to feed SulFeLox at these sites and replaced seven other Calcium Nitrate sites with three SulFeLox sites, reducing the total number of chemical feed sites from nine to four. The City is now spending approximately $663k/yr for SulFeLox to meet its system-wide performance targets, where it was previously spending $990k/yr for Calcium Nitrate. Additionally, with a year's experience with dosing iron into the collection system, the treatment plant has observed operational benefits including the elimination of the ferrous chloride feed to their digesters for sulfide control. Future work is planned to evaluate iron regeneration ahead of the treatment plant to provide additional benefit to treatment plant operations.

PFAS in Biosolids Update

9/9/2024, 11:45 AM - 12:15 PM

Speaker(s): Scott Buecker;Scott Schaefer

The wastewater sector anxiously awaits to see what the EPA and various states do to address the risk to public and environmental health from PFAS compounds in biosolids.

This presentation will present an update on the latest developments regarding PFAS in biosolids, with a specific focus on developing regulations (national (EPA) and state-level) regarding agricultural land application, but also with an eye towards impacts on agencies land-filling of biosolids.

Litigation examples will be discussed, along with potential implications. Treatment technologies will be discussed at a very high level with an emphasis on costs versus benefit.

The primary goal here is to help public works departments understand the risks and costs involved in addressing PFAS, and the challenges of planning long-term biosolids treatment and handling in this time of uncertainty.

Biological Fundamentals of Denitrification Intensification

9/9/2024, 01:45 PM - 02:15 PM

Speaker(s): Frederick Tack, PE, BC.WRE, ENV SP

The much-anticipated increasing regulatory requirements potentially introducing additional denitrification requirements will provide a public service that benefits the health and well-being of our communities and environment. However, the optimization of those processes to reduce both the initial capital cost and long-term cost to operate is required to provide a sustainable solution, and to meet current and future needs deserves focus and increased awareness to those who will operate and make decisions for implementing denitrification solutions.

This presentation will derive and demonstrate proofs of the core factors that contribute to the success of efficiencies in traditional and shortcut nitrogen removal techniques in wastewater treatment, focusing on the natural microbiological processes, including the thermodynamic, kinetic, and environmental dominant factors. The outcomes include decision matrices derived from the insights from a variety of wastewater treatment process configurations modeled and operational experiences.

Various nitrogen shortcut techniques have potential and actual benefits to address the challenges at hand. Whether implemented in a mainstream or sidestream configuration, or to an existing or new wastewater treatment plant, this process can provide significant reduction in the long-term cost to operate, due to lower energy and consumable requirements, fast reaction times resulting in shorter solids retention times, and improvement efficiency in nitrogen removal from wastewater.

Learning outcomes for the audience will include a greater comprehension of the microbiology ecological, kinetics, and thermodynamic processes in wastewater treatment and nitrogen removal, supportive of their efforts in the design, analysis, or during operations in wastewater treatment. Improving our shared knowledge of these biological processes is paramount to achieving and sustaining the savings and improved performance projected with the implementation of nitrogen shortcut techniques.

Other key take-aways include a broader perspective on potential and actual decreases in the resiliency of our wastewater treatment facilities, which needs to be accounted for in the design of new facilities, or optimization and expansion of existing facilities.

Engaging Governing Bodies to Achieve a Clean Water Mission

9/9/2024, 01:45 PM - 02:45 PM

Speaker(s): Yarrow Murphy;Loralyn Spiro;Craig Borrenpohl;Jennifer Coker, PE

Wastewater agencies, whether private or public, are subject to the direction and decision-making of governing bodies. The support of these boards, councils, or commissions can be lukewarm if it is not developed and strong relationships cultivated by the utility leadership staff.

This panel is comprised of utility leaders in our region who have successfully gained their decision-making stakeholders support for budgets, projects, organizational structure and overall mission. Each panelist has a unique story about the accomplishments of their work as well as recommendations for others who may be building those relationships in their organization.

The City of Post Falls, Idaho is developing a facilities plan for its Water Reclamation Facility. Craig Borrenpohl will talk about the process of bringing the mostly new six-member city council up to speed on the work that the city's wastewater utility does and building trust between the staff and council, all in preparation for adoption of the new plan, but also laying the groundwork for future stakeholder engagement.

Jenny Coker engaged the City of Sandy Oregon's council in consent decree-mandated wastewater treatment plant stress testing and making several large investments in the wastewater system. She will share how she has coached the oversight committee and City Council and leveraged unique skillsets of individuals on the council to successfully gain support of both the non-technical councilors and fiscal watchdogs.

Bill Owen supported Multnomah County Drainage District's transition from a group of districts into a single consolidated organization under a new governance model. The Oregon State Legislature formed the Urban Flood Safety and Water Quality District (UFSWQD) to replace four special districts. The Governor appointed 17 members to an interim Board to establish a revenue structure and an initial operating budget for this new district. Staff adopted tools to support board deliberations and decisions regarding revenue options, potential legal challenges, referral of a general obligation bond, and a debt distribution plan. Steps involved establishing mission and vision, identifying messengers to deliver topics at public meetings, forming a government affairs coalition to change state statute, polling, and negotiating compromises with local agencies and interest groups.

Implementation of Machine Learning for Detection of VFA Depletion

9/9/2024, 01:45 PM - 02:15 PM

Speaker(s): Brandon M. Boyd;Erik R. Coats

Wastewater treatment plants (WWTPs) necessarily maintain a critical focus in treating wastewater to maintain regulatory compliance and protect the water environment. Beyond this vital role, however, there remains more potential. Specifically, WWTPs should be envisioned as water resource recovery facilities (WRRFs) that treat incoming wastewater while simultaneously recovering valuable raw materials and producing products of economic value. Products include reclaimed water, fertilizers, biosolids, and electricity, all of which can be accomplished concurrently with the removal/recovery of nitrogen and phosphorus by the WRRF. Beyond the raw wastewater received by WRRFs, integrating external organic-rich waste substrates could expand resource recovery opportunities. Carbon rich waste streams such as dairy cow manure, sugar beet wastewater, and other agro-industrial waste streams, if fermented, could produce volatile fatty acid (VFA) rich liquor. In addition to enhancing biogas production and phosphorus recovery via enhanced biological phosphorus removal, a VFA rich substrate fed to the right mixed microbial

consortium could enable the production of bioplastics. Specifically, VFAs could be microbially polymerized into polyhydroxybutyrate-co-valerate (PHBV). While the PHBV process has been tested and has been proven to work both at bench and pilot scales, a key challenge in process implementation has been process control. In particular, the challenge has been determining the correct dosing strategy (timing, organic loading rate) for VFAs. Real-time process control may potentially be realized using conventional process probes that monitor dissolved oxygen (DO), oxidation reduction potential (ORP), and pH. However, strategies for integrating this real-time data to actively inform process control strategies remain undeveloped. Research was undertaken to investigate the use of machine learning with recorded measurements to actively train, and then control, the PHBV production process. The use of machine learning will help in the development of process control strategies through relationships in the data that are otherwise not observable. With proper process control development, this technology could be implemented in WRRFs to enhance their role in resource recovery. Results from this research will be presented and discussed.

Laramie WWTP Upgrades Project: Energy Efficiency Improvements Design And Regulatory Strategies

9/9/2024, 01:45 PM - 02:15 PM

Speaker(s): Ben Miller

A review of modernization and energy efficiency of the City of Laramie Wastewater Treatment Plant (WWTP) identified several treatment components nearing the end of their use life, as well as opportunities to optimize energy consumption via process improvements and technology upgrades. As such, the City embarked on the 2021 WWTP Upgrades Project (Project) with the goal of updating assets while reducing energy consumption by a minimum of 20% . This presentation will explore the Project's unique approaches to blower sizing and arrangement, process control optimization, and regulatory approval.

The WWTP experiences large diurnal fluctuation in flow and load and cannot turn aeration down enough during the low periods. Existing 200 HP and 250 HP oxidation ditch blowers will be replaced with new high-speed turbo (HST) blowers in a duty/ jockey arrangement to better accommodate low load periods – three 200 HP duty blowers and two 120 HP jockey blowers. The Wyoming Department of Environmental Quality (DEQ) granted a variance to the Water Quality Rules and Regulations to allow this reduced capacity arrangement based actual peaking factors calculated from 25 years of operational data. On/off aeration control of the new blowers will further reduce blower runtime and optimize denitrification performance .

Since biosolids are ultimately composted, additional energy reduction will be achieved by converting the aerobic digesters to aerobic sludge holding tanks (ASHTs) and replacing existing 250 HP digester blowers with 60 HP screw centrifugal blowers. DEQ granted a variance to allow for ASHT airflow design to provide minimum mixing energy in place of traditional aerobic digestion requirements.

Proactive PFAS Management: National Solutions for Regional Utilities

9/9/2024, 01:45 PM - 02:15 PM

Speaker(s): Dave Clark;Austin Walkins;Tyson Schlect;Zach Conde

Chemical bonds between fluorine and carbon in per- and polyfluoroalkyl substances (PFAS) are resilient to high temperature and pressure, making them hard to remove and destroy, especially at a wastewater resource recovery facility (WRRF). For utilities to remain similarly resilient, source control of PFAS and other emerging contaminants of concern is a key strategy to maintain sustainable operation of WRRFs and biosolids land application programs.

This presentation includes a national perspective on strategies for PFAS management using source control, including meeting requirements arising from the Environmental Protection Agency's (EPA) PFAS strategic roadmap. This includes a showcase of the conference host city's industry leading work to proactively manage emerging contaminants withing the pretreatment program.

Key considerations for wastewater utility managers to protect effluent quality and sustainable biosolids recycling include the following:

PFAS Monitoring. This provides quantitative data that's needed for wastewater influent, effluent, and biosolids to quantify sources and understand PFAS fate and transport and land application loadings. This data allows wastewater managers to begin to quantify risks and formulate plans in anticipation of developing regulation.

Industrial Pretreatment Programs. Industrial pretreatment is key to identification of potential source reduction opportunities. This allows wastewater managers to identify PFAS dischargers and potentially reduce source loading to alleviate regulatory pressures.

Chemical Action Plans (CAP). Engaging in state chemical action plans provides a venue for wastewater managers to engage in the broader policy discussions about how to manage PFAS in ways that utilities cannot do alone because of the widespread commercial use of these chemicals, the vast number of stakeholders involved, and the challenging commercial and public health issues at stake.

Biosolids Risk Assessment. EPA's Risk Assessment is anticipated to release in late 2024, however utilities have benchmarked biosolids PFAS levels against other metrics such as Maine's PFOS application criteria. Properly benchmarking biosolids risk and executing contingency planning are essential to mitigate against solids disposal regulatory and public relations risk.

Strategic Communications. Implementation of strategic communications plans is important to convey accurate, reliable, science-based information to utility customers, especially when PFAS data are subject to public records requests.

Small Community Planning: What To Do When Your Assumptions Change

9/9/2024, 01:45 PM - 02:15 PM

Speaker(s): Pamela Villarreal, P.E.;Eric Roundy, P.E., BCEE

Nestled in the Magic Valley of South-Central Idaho, the City of Gooding has grown from a group of sheep ranchers to a small, bustling city. Faced with aging infrastructure and new permit limitations, the city recognized the need to make improvements and have treatment capacity for more growth. During the preliminary phases of the project, the city focused on high-level improvement costs and funding opportunities. However, lurking behind the scenes, assumptions were being made based on the notion that the data was representative. When additional data was taken during the design,

unusually high influent flows and loading were observed. This data could significantly impact the design and efficiency of the improvements.

By taking a systematic approach, the city was able to identify the root causes of the spikes. Although the issues were fixable, they required some creative solutions at the plant. However, once the changes were made, representative samples were taken, and the project could proceed. Since then, the city has received the necessary funding, designed and bid on the project, and the improvements are nearing completion. In this presentation, we will discuss the city's steps to collect data, identify the root causes of the spikes, and find innovative solutions to obtain more reliable data. The data collection efforts ensured the city constructed improvements that were the right size to keep the city growing.

Decarbonization and Recycling of Sewage Sludge to Renewable Natural Gas (RNG) using an Innovative and Cost-effective technology

9/9/2024, 02:15 PM - 02:45 PM

Speaker(s): Birgitte Ahring

Sewage sludge is a wet organic waste produced continuously in all Waste Water Treatment Facilities (WWTF) throughout the US as well as the rest of the World. In the US a total of 7.2 million metric dry metric ton of sewage sludge is produced yearly. To reduce the organic load of sewage sludge, anaerobic digestion (AD) has been implemented in approximately 50% of US WWTF such as our model plant in Walla Walla, Washington. Still 4.5 million dry metric ton is left after AD of which ca. 2 million metric dry ton is disposed in landfills, resulting in significant contributions to greenhouse gas (GHG) emissions into the atmosphere. A main problem of today's waste water treatment facilities is that only ca. 50% of the sewage sludge in converted during conventional AD resulting in too little biogas production to warrant the use as a renewable energy source in small WWTF's. This further mean that the mass of sewage sludge still needing final disposal is major, which is becoming a serious problem for municipalities due to increasing regulatory pressures around disposal of sewage sludge as well as the increased cost for disposal.

In the presentation we will show our latest results on Improving the Carbon Conversion Efficiency (CCE) of sewage sludge resulting in several times higher production of renewable fuels in the form of Renewable Natural Gas. Besides the APAD process results in over 80% reduction of the original sludge significantly reducing the cost of landfilling of the residual product.

From Northeast to Pacific Northwest - How PFAS regulations may impact Biosolids Beneficial Reuse Programs

9/9/2024, 02:15 PM - 02:45 PM

Speaker(s): Kenneth C Hui

This presentation will review the cost to manage biosolids in various New England states and the impact that PFAS has had on utilities operating budgets and operations for biosolids management. Maine's moratorium and growing negative public perception. Positive experience in source control

and collection system monitoring at Nantucket will be presented. Study results on PFAS treatment will be discussed.

Tacoma's Solid Future

9/9/2024, 02:15 PM - 02:45 PM

Speaker(s): Greg Mockos

Due to capacity, footprint limitations, and aging infrastructure, the City of Tacoma (City) has decided to take a new direction in their approach to solids. This presentation will walk through the process the City took to evaluate options, their decision-making process, and the development of the Implementation Plan to support this new direction. The new on-site solids processes paired with the off-site Tagro facility will support Tacoma's capacity and growth needs through 2050.

In 2020, the City began a process to evaluate the capacity and improve performance of its solids handling processes at the Central Treatment Plant (CTP). CTP digestion capacity was found to be limited given the City's preferred redundancy condition and Orange Book guidance. Through a multiple-criteria decision analysis process, the City narrowed its focus down to four main alternatives to address CTP solids handling capacities ranging from rehabilitation of existing facilities, replacement of the digestion process, to off-site relocation. The City decided to move forward with relocating the existing Tagro facility and operations off-site and constructing a new solids handling complex in its place. The new solids handling process will be designed around a Temperature Phased Anaerobic Digestion (TPAD) with Class A batch tank process and include new thickening/dewatering and digestion facilities. This will be one of the first TPAD systems in Washington. Extensive modifications to the existing on-site process piping and utilities will be required to streamline the process flow of the reconfigured plant as well as maintain its full operation during the course of the CTP Solids Program implementation. Given the size of the modifications identified, the City began to develop the Implementation Plan to deliver the estimated $360M program over the next two decades. The Implementation Plan is a roadmap for the City's future vision on the CTP solids processes and outlines a detailed plan to assist in the allocation of staff, funding, and resources to deliver the multiple component program.

Waste to Energy on Steroids: A Simple Solution to Multiple Utility Challenges in Alaska

9/9/2024, 02:15 PM - 02:45 PM

Speaker(s): Mark Spafford

In this discussion you will learn about a potential mass-burn waste to energy project for Southcentral Alaska that would produce 20-30 MW of renewable power for the electrical grid as well as potentially solve other Alaska utility issues. These issues include significantly extending the life of the Anchorage Regional Landfill, offsetting the need for natural gas to produce electricity; disposing of sludge generated from wastewater treatment in Anchorage, potential thermal treatment of PFAS/PFOA containing materials, overall decreasing the amount for the per ton disposal of solid waste in Alaska.

“DAS a good idea!”: Leveraging Intensification during Facility Planning for Cost Savings

9/9/2024, 02:15 PM - 02:45 PM

Speaker(s): Kelley Florence;Riley Murnane

Activated sludge processes perform in a range of settling conditions - Densified Activated Sludge (DAS) represents the upper range of settling, generally characterized as having rapid, stable settling. The enhanced settleability provided by DAS allows operation at higher mixed liquor (MLSS) concentrations clarifier solids loading rates compared to conventional flocculent activated sludge. These improvements, achieved through specific tank configuration and operating conditions, allow for greater treatment capacity per volume than standard activated sludge systems. DAS can provide benefits to utilities by:

- Increasing the capacity of existing WRRFs within existing footprints, allowing for cost-savings during upgrades.
- Positioning utilities to have flexibility to coordinate capacity increases and nutrient limits changes.
- Strengthening confidence in settling reliability.

To fully leverage existing infrastructure, utilities should consider DAS as they plan for long-term improvements to secondary treatment. Case studies are presented to provide project specific considerations for implementation of DAS and how future benefits can vary under differing drivers.

Case #1

An Iowa WRRF anticipates significant flow and loading increases to the WRRF over the upcoming 20-years. A phased facility plan that could meet increasing loads and effluent limitations of 66% TN removal and 75% TP removal was developed. Early phases of the facility plan include the necessary provisions for the facility to demonstrate implementation of DAS to achieve intensification. Based on preliminary modeling, demonstrating intensification could allow their future facility to be re-rated for an additional ~25,000 pounds of BOD5 capacity (approximately 25% capacity increase) without a significant addition of infrastructure, saving the City millions in capital and operational costs.

Case #2

A study using process modeling showed that an Ohio WRRF was close to capacity in part due to poor settling MLSS. Implementation of a selector was recommended to improve the settling characteristics. An anaerobic selector also promotes enhanced biological phosphorus removal (EBPR). Several scenarios were evaluated, and a series of buildout options were developed, ranging from adding selectors for increased treatment capacity within the current footprint to the addition of a third aeration tank to expand treatment capacity and meet future nutrient limits.

Achieving Cold Weather Biological Nutrient Removal with Aerobic Granular Sludge

9/9/2024, 03:00 PM - 03:30 PM

Speaker(s): Paula Dorn

The Aerobic Granular Sludge (AGS) technology has been successfully implemented for nearly 20 years with more than 100 plants either in operation or under construction globally. Introduced to the North American market in 2017, there are now 15 plants in the United States. A number of these plants, in addition to some pilot work, have experienced operation under cold weather conditions in temperatures less than 8 °C while still maintaining strong nitrogen removal capabilities. This session will examine such plants, including the circumstances that led them to adopt the AGS technology. It will also include a brief summary of the technology history and its operating principles.

This session will examine cold weather installations, including the circumstances that led them to adopt the AGS technology, and the performance of each plant since startup. It will also include a brief summary of the technology history and its operating principles.

Growing our SCOPE and Industry Engagement in STEM Education

9/9/2024, 03:00 PM - 03:30 PM

Speaker(s): Maricris Orama, EdD, PE, PMP

In the last several years, the Supportive Community of Professional Engineers (SCOPE) has developed from a small passion project to a local network of science, technology, engineering, and mathematics (STEM) professionals dedicated to empowering students to explore careers in engineering and technology.

SCOPE has partnered with several higher educational programs throughout Pierce County, Washington focused on serving students traditionally underrepresented in STEM with the intent to bridge the gap between education and industry. SCOPE partners have created unique STEM educational content, activities, and engineering design competitions, as well as various coding and artificial intelligence workshops, grounded in transparency and equity, so our future engineers can feel confident in identifying their career path in STEM.

This session explores four key areas: (1) The significance of industry involvement in the STEM student educational experience, which is critical in preparing students for real-world challenges and opportunities; (2) An overview of SCOPE and developed partnerships, highlighting the great support our community partners provide for their scholars; (3) Lessons learned and next steps for SCOPE, as we continue to create engaging, unique educational content that blends introducing students to engineering disciplines while learning to code; and (4) Recommendations for professionals and companies to build and foster more meaningful and equitable support and engagement for our future workforce beyond traditional outreach.

The following are three Learning Objectives for this session: (1) Understand the changing dynamics of current undergraduate engineering and technology degree programs and identify a few barriers students face for higher-education degree attainment; (2) Discuss the value of supporting and engaging higher-educational programs that have a mission to serve historically underrepresented students in engineering and technology; and (3) Describe actions that professionals or companies can foster to initiate more meaningful and equitable connections with local students and higher-education programs.

How and Why We Built a Successful In-House Trace Organics Lab for PFAS at a Wastewater Utility

9/9/2024, 03:00 PM - 03:30 PM

Speaker(s): Summer L. Sherman-Bertinetti;Daniel Marrin

PFAS are a contaminant of major concern for Water Resource Recovery Facilities (WRRFs) due to current and imminent state and federal regulations as well as increasing concern from the public about the impacts of land application of biosolids, discharge of effluent, and reuse of water for potable and non-potable purposes. For WRRFs, it is imperative to understand PFAS loadings from different sources as well as the fate of PFAS discharged from the WRRFs in effluent, biosolids, and reuse in order to make cost-effective, data-driven decisions for addressing coming regulations. Since 2019, Clean Water Services (CWS) has been conducting regular PFAS monitoring at the WRRFs, the collection system, and industries to identify and track down sources of PFAS as well as soil, groundwater, and surface water studies for understanding the fate of PFAS in our discharges. For the >700 samples collected from 2019-2023, CWS already invested ~$400,000 in analytical costs to a commercial laboratory. Though CWS would like to collect more samples by expanding the locations and types of matrices being sampled, analyzing these samples by the commercial laboratory is hindered by high costs, long turnaround times, and frequent data quality assurance issues. As such, in late 2022 CWS conducted a cost-benefit analysis on building an in-house trace organics laboratory to enhance our ability to analyze PFAS and other emerging contaminants by solving the hindrances above. This estimate predicted that the ROI for creating this laboratory would be < 3 years with the current scope of PFAS samples planned. In addition, the ability to analyze other compounds, form collaborations, and better prepare for coming regulations added additional benefits beyond just analytical cost savings. In early 2023, CWS went out for bid on instrumentation to begin building this laboratory and by October 2023, had the new instrumentation installed, a new analyst hired, and training of lab staff well underway. CWS successfully completed method development and validation of EPA 1633 for all matrices in June 2024 and began analyzing all samples in-house. This talk will discuss the business case development as well as lessons learned during the lab and method development process.

Sludge Densification: An Innovative Approach to Enhance Secondary Treatment Capacity

9/9/2024, 03:00 PM - 03:30 PM

Speaker(s): Chris Machado;Skylar Watnick

The activated sludge process has been a technology of choice for the water industry to treat domestic wastewater for more than a century. This technology has improved and evolved for better performance, lower costs, and more sustainable operations. Its basic principle remains unchanged: biological treatment followed by physical separation of biomass flocs. However, new process innovations are creating more compact, streamlined, and effective activated sludge systems. This technological transformation is often called “process intensification”.

Sludge densification or densified activated sludge is a growing technology for activated sludge process intensification. This technology enhances the biological floc settling characteristics, optimizing treatment capacity. Sludge densification is achieved by creating favorable conditions for forming and retaining denser activated sludge flocs while wasting less dense particles. These conditions include feast and famine cycles, high food-to-microorganism ratio, and waste stream

physical separation. The benefits of sludge densification include increased treatment capacity, reduced capital costs, and improved effluent quality.

This technology is becoming attractive to water resource recovery facilities facing challenges expanding treatment to meet more stringent regulatory requirements. This presentation consists of a review of the basic principles, applications, and industry trends of sludge densification, as well as examples of facilities adopting this technology.

Using a Watershed Restoration Lens to Rethink Urban Water Management

9/9/2024, 03:00 PM - 03:30 PM

Speaker(s): Brian Busiek

Wastewater Symbiosis

9/9/2024, 03:00 PM - 04:00 PM

Speaker(s): Rhys Roth;Frank Dick, P.E.;Christina Davenport

Wastewater Symbiosis Panel for Proposal

The Center for Sustainable Infrastructure (CSI) proposes a 60-minute panel discussion on the topic of “wastewater symbiosis”. The panel would include three panelist-presenters (including Rhys Roth, Executive Director of CSI, and a TBD expert in the Danish wastewater sector’s application of industrial symbiosis practices).

Industrial symbiosis (IS), pioneered in Denmark, is a ground-breaking, triple-bottom-line approach to infrastructure and economic development, where one sector’s wastes – energy, water, materials – become valuable resources for other businesses. For many communities, wastewater treatment plants are among their biggest and most important capital assets. Denmark is showing how wastewater plants can serve as platforms for local IS innovation.

For example, In Billund, Denmark, home to the international headquarters of Lego, their wastewater plant is known as the Billund Biorefinery. The Biorefinery converts not only wastewater, but other organic waste streams from households, industry, and agriculture into green energy and other valuable co-products, reducing overall costs to the local water and wastewater system by $800,000 per year, while generating $1.5 million from green energy sales.

The panel will take place in the lead up to a CSI-led PNW Wastewater Symbiosis Study Tour in Denmark. This Study Tour, planned for September 2024, will bring 25 leaders from innovation-ready PNW wastewater utilities and companies on a weeklong tour to meet and learn from Denmark’s top Wastewater Symbiosis innovators. It will kick off a year-long knowledge exchange featuring

activities that build valuable connections between leaders and innovators in Wastewater Symbiosis from the PNW and Denmark.

Background on the PNW-Denmark Symbiosis Exchanges

Since 2017, CSI has joined three dozen Washington state legislators – evenly distributed between Republicans and Democrats -- on study tours in Denmark where they observed IS in action. These bipartisan legislators found significant common ground in seeing the potential to adapt Denmark's IS model to benefit a wide range of Washington communities, supporting substantial economic, environmental, and social benefits for Washingtonians. Working collaboratively, these legislators have led successful efforts in six consecutive legislative sessions, making strategic investments to seed and grow IS in Washington. In 2021 they launched the nation's first statewide IS program at the Department of Commerce. In the 2022 and 2023 legislative sessions, they secured over $9 million in new investments for IS programs and projects.

In June 2022, CSI led a delegation of industry and local government leaders from Portland on study tour in Denmark that helped inform the City's clean industry initiative. In June 2024, CSI will lead a bipartisan delegation of Oregon state legislators, as well as Oregon businesses on an industrial symbiosis study tour.

Digital Polymerase Chain Reaction (dPCR) and Genomic Sequencing in Wastewater Surveillance

9/9/2024, 03:30 PM - 04:00 PM

Speaker(s): David Mickle;Oumaima Hachimi;Anirudh Bhatia

Wastewater surveillance is the identification and quantification of pathogens in wastewater to monitor disease burden in a community. It has been successfully applied as a reliable and non-invasive epidemiological tool to benefit public health. In 2020, Oregon State University, in collaboration with the Oregon Health Authority (OHA), initiated wastewater surveillance for viral pathogens, including COVID-19, at nearly 40 sites across Oregon. This effort has yielded a significant dataset comprised of viral concentrations used for trend analysis and variant detection through sequencing. The workflow is comprised of sample collection, filtration, extraction, PCR for viral concentration, and next generation sequencing (NGS) for variant identification. Following the pandemic's conclusion, OHA requested expanded surveillance, incorporating influenza A and B, as well as RSV. To accommodate the additional targets, we transitioned from droplet digital PCR (ddPCR) to digital PCR (dPCR) technology in July 2023 to enhance throughput and resource efficiency.

Next generation sequencing is performed on the Illumina Nextseq platform which generates millions of short DNA sequences. These sequences are analysed using bioinformatic tools, which include quality filtering, aligning, comparing to known variant sequences, and other processes. Bioinformatic analysis is a continuously changing field, and we frequently incorporate new methodologies. Through these efforts we are able to quantify the relative abundance of the SARS-CoV-2 variants and subvariants present in the wastewater and build correlation models to assess their association with viral subtypes shown in clinical specimens. Our future projects involve

expanding our current knowledge base and workflow to sequence respiratory viruses (e.g., RSV and influenza) in wastewater samples.

This abstract clarifies the project's methodology, scale, historical context, and advancements in PCR and sequencing technologies, crucial for comprehending spatial and temporal viral concentrations and new variants, with broad implications for public health and environmental management.

Gift of Flow: Continuous Aerobic Granular Sludge Process Boosts Sustainable and Resilient Upgrades at WRRFs

9/9/2024, 03:30 PM - 04:00 PM

Speaker(s): Amit Kaldate

Water Resource Recovery Facilities (WRRFs) are faced with the challenge of meeting stringent nutrient goals, while minimizing carbon footprint. The existing intensification processes have three shortcomings. WRRFs utilize biological processes to remove BOD, nitrogen and phosphorus. However, this results in high energy costs and high reactor volumes. In recent years, aerobic granular sludge (AGS) has emerged as one solution for removing nitrogen and phosphorus simultaneously. However, the existing granular sludge processes require batch operation as well as new construction, increasing the size and carbon footprint. Also their sequenced batch operation makes them less suitable for handling peak flows. A new type of granular sludge process called BeFlow® was developed in Belgium to overcome these shortcomings. It utilizes granules in the range of 0.2 to 4 mm and operates in continuous flow mode unlike the existing AGS processes. This makes it versatile for implementing in any secondary biological treatment. It has the advantage of maintaining healthy concentrations of both floccular sludge as well as granular sludge, thus providing advantages of both. It also provides benefits of quick settling, higher biomass concentrations and handling peak flows. It reduces biological reactor volumes and settling surface areas significantly. Conversely, it provides higher treatment capacity in the existing reactors and better SVI30 values for sludge settling. On-site demonstration tests in Belgium proved that it reduces the SVI30 to less than 50 mL/g. This has helped reduce the footprint of new designs by 50%. The treatment efficiencies were 98% for BOD, 96% for TSS, 79% for nitrogen and 78% for phosphorus. Granular sludge was formed and maintained under both constant and variable flow conditions. The success of this process is based on a combination of biological and physical selection strategies. This paper presents design considerations, process configuration, control strategies and results from implementation at multiple plants.

Increasing Water Renewal System Resilience in the City of Boise with WIFIA Financing

9/9/2024, 03:30 PM - 04:00 PM

Speaker(s): Mary Fasano;Heather Buchanan

The Water Infrastructure Finance and Innovation Act (WIFIA) program is a government bank operated by EPA headquarters that provides supplemental, flexible, low-cost credit assistance to

public and private borrowers for all types of wastewater, drinking water, and stormwater projects. The WIFIA program offers long-term loans that can be combined with State Revolving Fund assistance, municipal bonds, and federal and state grants to help communities deliver more critical water infrastructure projects for a lower cost with less impact on rate payers.

In this session, we will provide an overview of the WIFIA program and describe WIFIA's water infrastructure-related eligibilities and priorities, including addressing the impacts of climate change and mitigating the impacts of drought. Additionally, we will discuss the benefits and flexibilities of WIFIA financing, including customized repayment schedules, coordination with other types of debt, the option to fund multiple projects through a single loan, and the ability to finance a combination of staggered projects, like those in a capital improvement plan, under a "master agreement". Finally, we will hear from the City of Boise about their water renewal services capital investments project, funded with a $263 million WIFIA loan. This project will protect Boise River water quality, expand wastewater treatment capacity, support compliance with anticipated regulatory requirements, and increase resilience to the impacts of climate change.

Investigation of kenaf as a physical carbon substrate in a lab-scale mobile organic biofilm reactor

9/9/2024, 03:30 PM - 04:00 PM

Speaker(s): Brian Roman

The mobile-organic biofilm (MOB) process is a wastewater treatment process that offers an alternative to existing, commercially available aerobic granular sludge systems. The key difference is that the MOB process utilizes a lignocellulosic plant-based carrier made of kenaf plant. The kenaf material is fully mobile and free to circulate throughout the process and bacteria can grow in a stratified biofilm facilitating simultaneous biological nutrient removal. This research work aims to explore and understand what impact the addition of kenaf has on a system. Here we successfully developed a lab scale reactor system that simulates a continuous-flow system using kenaf. After the reactor reached steady-state it was used to obtain biomass for batch tests to study the rate of kenaf degradation and its ability to serve as a continuous/additional electron donor for denitrification hence providing process stability. The batch experiment tested this degradation/decay capacity under anaerobic and aerobic conditions with kenaf and without kenaf (with just biomass) as a control. Ion chromatography results showed production of acetate and propionate under anaerobic conditions highlighting that fermentation of kenaf can provide additional organic acids to stabilize denitrification. Prior full-scale operation and our lab reactor has shown that granules and flocs develop next to kenaf in a MOB system. Therefore, it is important to investigate the impact of all three sludge fractions on the process stability and efficiency. Future pilot operation in collaboration with King County in Washington will aim to investigate the nitrification and denitrification performance as well as settling characteristics of the MOB process. These lead to benefits for practical application such as lower usage of caustic due to alkalinity gain through denitrification, stabilization of phosphate accumulating organisms because of production of organic acids, which in turn leads to smoother biofilms, improved settling, and better effluent quality.

The Guide To PFAS: How Water Reclamation Utilities Can Control The PFAS Narrative

9/9/2024, 03:30 PM - 04:00 PM

Speaker(s): Teigan Gulliver

Per- and polyfluoroalkyl substances (PFAS) is used since the 1940's in non-stick, water repelling, and fire resistant applications. Due to their persistence in the environment, PFAS are present in the air, groundwater and surface water with little insight to cost-effective removal and destruction of these contaminants. The regulation, media, and public involvement of PFAS is a fast-pace environment, leaving Water and sanitation utilities handing in the air with looming potential regulations for water sources, waste sources, re-entry into waterways, and waste disposal.

The majority of PFAS presentations at conferences discuss treatment technologies. However, there are several steps before jumping to treatment that should be taken to plan for PFAS. This session provides municipalities with techniques that can be used to develop a PFAS management plan, engage in the national conversation of PFAS, stay up to date with regulations, and facilitate the PFAS conversation with stakeholders.

The session will present:

-Fate and transport of PFAS in wastewater treatment processes to better understand which regulatory drivers may impact utilities on a case-by-case basis

-Techniques to PFAS Sampling to ensure accurate results

- What to do with the samples once they are received.

- Next step strategies for utilities with PFAS in effluent or biosolids

- Industrial discharge and pretreatment programs

- Committees that utility personnel can engage with to take part in the PFAS conversation nationally

- Location for information on PFAS regulations nationally on a state and federal level, including pending regulations

This session raises the awareness of other steps and options other than PFAS removal technologies, and helps water reclamation utilities form their own plan for PFAS management.

Biosolids Biochar: Net Zero Drying and Pyrolysis with Bioforcetech

9/9/2024, 04:00 PM - 04:30 PM

Speaker(s): Valentino Villa

Bioforcetech is a California company supplying a patented two step process that includes a biological drying step known as the BioDryer, and a unique hybrid pyrolysis technology. The Bioforcetech system transforms digested or undigested dewatered sludge, as well as any other type of organic waste into useful OurCarbon biochar at net zero energy.

The Bioforcetech BioDryer uses air and bacteria to dry biosolids in a three phase process. This living process is so effective that our BioDryer system is able to process biosolids from 20% to 90% solids in as little as 60 hours with only 50% and 30% of the thermal energy and electricity that belt and drum drying require. The result is class A dry solids.

The BFT Sigma Hybrid Pyrolysis is a proprietary technology by Bioforcetech that allows for continuous organic waste carbonization at scale with scientific precision. The reactor's unique design receives heat from two sources: thermal fluid powered by the exhaust gas and electrical resistors. The combination of these two heating methods delivers a consistent temperature and residence time without demanding high levels of external energy. The BFT pyrolysis can process digested/undigested biosolids, manure, green waste, wood waste, food waste, and any combination of these feedstocks.

The BFT system has been shown to reduce PFAS, PFOA, and PFOS compounds from a significant presence in input biosolids to non-detect levels through independent testing by BFT and through testing conducted and published by the US EPA. New testing of this process including the most up to date methods available is planned for Q3 2024 to be presented to the industry as soon as the data is reviewed and available.

BFT has multiple systems in the PNW located in Washington and Oregon. The use of OurCarbon from biosolids in concrete has been pioneered by Bioforcetech partner Solid Carbon, a company based in Oregon. The thirteen commercial concrete pours completed to date have all been completed in Oregon and Washington, making the PNW a new hub for this sustainable material in concrete. Case studies of OurCarbon's use in concrete will be shared during the presentation.

Decoding the Federal Funding Alphabet Soup for Resilient Infrastructure

9/9/2024, 04:00 PM - 04:30 PM

Speaker(s): Kim Colson

In the face of increasing environmental challenges and the imperative to adapt to climate change, resilient water infrastructure has emerged as a critical priority for communities nationwide. This presentation presents a comprehensive analysis aimed at identifying federal funds available for development and enhancing resilient water infrastructure projects. Through a review of relevant government programs, grants, and initiatives at the federal level, this presentation provides an overview of the diverse funding opportunities accessible to municipalities, utilities, and stakeholders involved in water resource management.

The search for funding employs a multi-dimensional approach, encompassing various sectors such as wastewater treatment, stormwater management, and potable water systems. By examining funding sources from agencies including the Environmental Protection Agency (EPA), the Federal Emergency Management Agency (FEMA), the Department of Agriculture (USDA), the Department of Housing and Urban Development (HUD), and more. This analysis summarizes the eligibility criteria, application processes, and funding priorities associated with each program.

Furthermore, this presentation will investigate the alignment between federal funding opportunities and the specific needs and challenges faced by communities in bolstering their water infrastructure resilience. By identifying potential gaps and overlaps within the funding landscape, this presentation aims to provide valuable insights for policymakers, decision-makers, practitioners, and stakeholders seeking to optimize resource allocation and maximize the impact of investment in resilient water infrastructure.

Overall, this presentation contributes to the ongoing dialogue on enhancing water infrastructure resilience and attendees will have a better understanding of federal funding mechanisms and their

implications for sustainable development and climate adaptation efforts at the local, regional, state, and national levels.

Developing a PFAS Response Plan to Maintain Public Trust: Salem's Case Study

9/9/2024, 04:00 PM - 04:30 PM

Speaker(s): Tyler Kane;Libby Barg Bakke

Nationwide, recent actions related to PFAS in wastewater and biosolids have caused concern for many utilities. Some states have set limits on PFAS concentrations in biosolids and receiving water bodies. Other states are adopting guidelines for source identification and mitigation. Many utilities are worried about CERCLA liability implications associated with receiving PFAS through their collection systems. Plus, federal drinking water regulations related to PFAS are forthcoming, leading many to wonder when federal limits in biosolids or wastewater will become reality. For utility leadership, it can be difficult to manage these uncertainties while needing to communicate with elected officials, community members, and interested stakeholders on what is being done to solve the problem.

The City of Salem, Oregon is taking a broad approach to managing uncertainty by preparing for regulatory changes related to PFAS across their utilities. Although Salem is meeting all current PFAS regulations in drinking water and wastewater, a holistic PFAS response plan is being developed to prepare for the uncertain road ahead. Salem's PFAS response plan uses sampling results and expert technical know-how to understand and rank PFAS-related risks and opportunities. The result is an adaptive document that is continuously being developed and refined to help utility leadership respond to PFAS-related challenges, leverage partnerships with peer agencies and organizations, and communicate progress via a comprehensive communications strategy. The response plan is developed collaboratively between the City and Carollo and serves to help maintain stakeholder support as PFAS-related decisions are made. It ultimately gives City Staff a method to gain consensus on near-term actions and strategies to prepare for future regulations and potential funding needs.

This presentation will detail the process that was used to develop the City's response plan and communications strategy, and discuss how the City used this process to gain City Council support. It will detail considerations for other utilities looking to develop a response plan. A focus will be on the importance of gathering robust data and developing a communications strategy. Attendees will be more prepared to respond to and communicate with the public about the challenges with PFAS and our water and wastewater systems.

Implementing AGS For The Wolcott Wastewater Treatment Plant Upgrade, Brandon Coleman

9/9/2024, 04:00 PM - 04:30 PM

Speaker(s): Brandon Coleman

The Wolcott Wastewater Treatment Plant (WWTP) upgrade project for the Unified Government (UG) of Wyandotte County replaced the existing package WWTP with a new 2.0 MGD greenfield facility.

The project was driven by anticipated growth within the service area throughout the 2035 planning period as well as more stringent treatment requirements in the future.

This unique project combined a collaborative project delivery method (Construction Manager at Risk (CMAR) with the use of an emerging wastewater treatment process known as aerobic granular sludge (AGS). The AGS process incorporates “granules” (small spheres) of biomass that are selectively formed via specific feeding and sludge wasting conditions. The process is cyclic in nature and eliminates the need for separate secondary clarification and sludge pumping facilities. It also provides increased settling rates and improved nutrient removal as compared to traditional treatment processes.

The project delivery method was selected due to its ability to shorten the overall project duration, incorporate constructability reviews during design, and to provide regular cost models at specific design milestones to keep the project on budget.

Startup and commissioning was completed in early 2022 and has been in service for over 2 years.

Using Algae to Recover Nutrients at the Pasco Resource Recovery Center

9/9/2024, 04:00 PM - 04:30 PM

Speaker(s): Max Gangestad

The Pasco Resource Recovery Center (PRRC) plays a critical role in managing influent process wastewater, primarily relying on land irrigation

and winter storage lagoons. To address existing deficiencies and accommodate anticipated growth, the implementation of biologic pretreatment

before storage and irrigation is imperative. Regulated by State Waste Discharge Permit ST0005369, the facility adheres to specific influent

design criteria and discharge regulations, including limitations on flow, Biochemical Oxygen Demand (BOD), and total nitrogen.

The City of Pasco extends its wastewater management efforts to include the treatment and reuse of food process wastewater, irrigating a

substantial 1,856 acres under the existing permit. However, challenges such as limited nearby land and undesirable water characteristics make

expanding the land treatment system (LTS) alone impractical. To overcome these challenges and enable the discharge of projected process

water to the expanded LTS, the adoption of a comprehensive pretreatment solution is paramount.

The algae-based treatment solution emerged as a promising approach, involving an anaerobic digester system followed by aerobic algae

treatment for nitrogen reduction. This solution is particularly lauded for its cost-effectiveness, with lower life-cycle costs and reduced operational

expenses for aeration, chemical addition, and solids handling.

Moreover, the integration of algae into the project offers additional benefits through the potential for beneficial reuse. The algae, cultivated

during the treatment process, can be repurposed for sustainable algae-based fertilizers, composts, and soil amendments, thereby contributing

to the enhancement of agricultural practices. Beyond agriculture, there's promising potential for algae use in biofuels and bioplastics, aligning

with broader sustainability goals and diversifying environmentally friendly applications.

In conclusion, the inclusion of algae in the wastewater treatment project presents a sustainable and economically viable solution. The algae-

based treatment, encompassing an anaerobic digester and aerobic algae treatment, not only ensures compliance with regulatory standards for

safe irrigation but also contributes positively to broader ecological and sustainability objectives. The added dimension of beneficial reuse

positions the project as a holistic and forward-thinking initiative, addressing environmental concerns and supporting sustainable practices

across various sectors.

Washington Wastewater-Based Epidemiology Program: The scoop on your poop

9/9/2024, 04:00 PM - 04:30 PM

Speaker(s): Matthew Feck

During the COVID-19 pandemic, wastewater-based epidemiology gained popularity as a useful tool for monitoring disease prevalence at a community level in near-real time. To this end, in 2020, the Centers for Disease Control and Prevention launched the National Wastewater Surveillance System (NWSS) to supplement public health efforts to address the COVID-19 pandemic across the United States. NWSS provides coordination, funding, and support for State government-led wastewater-based epidemiology programs nationwide. In October 2021, Washington State Department of Health began testing wastewater samples for SARS-CoV-2, the virus that causes COVID-19.

As of May 2024, Washington's Wastewater-Based Epidemiology (WAWBE) program samples from 31 wastewater treatment plants across 18 different counties in the state. Testing capabilities of wastewater-based epidemiology continue to expand. WAWBE now provides genome sequencing data for SARS-CoV-2 and tests for additional pathogens—RSV and influenza. This presentation will educate the audience on how wastewater-based epidemiology works, why it is important, and the future of WAWBE.

A Solid(s) Planning Process to Build Support for A Generational Investment in Climate Action

9/9/2024, 04:30 PM - 05:00 PM

Speaker(s): Tim Mills, PE;Frank Dick, P.E.

In 2022 the City of Vancouver, WA Climate Action Framework set a commitment for the City to reach carbon neutrality by 2040 and identified resource recovery from wastewater solids as a key strategy to support this. The City currently incinerates solids and landfills the ash, but burning solids and emitting carbon dioxide (CO2) contradicts the values of Vancouver's community and City organization. The benefits of resource recovery must be carefully considered to justify the cost in light of a changing regulatory environment, shifting community expectations, and technology advances, as well as concerns over Per- and Polyfluoroalkyl Substances (PFAS) and land application. Shifting to resource recovery requires a generational financial investment larger than the public works department has managed in decades.

The City sought a planning process driven by City values and priorities. Planning started by establishing boundary conditions around financial capacity, treatment demands, asset performance, community expectations, and climate impact. The planning process engaged multiple City departments to coordinate with broader city planning efforts including the Climate Action Framework and the Comprehensive Plan. The values guiding investment in solids was presented to City Council along with a refresh of the encompassing capital investment needs for water infrastructure.

With this foundation, alternatives could be developed with benefits that matter. Alternatives include attributes for biosolids land application, renewable energy, greenhouse gas reduction, PFAS treatment, and using resources in the local economy. The process to select an alternative is presented where planning tightly aligns benefits with values, leading to a durable decision.

Elevating Sludge Process Design: The Significance of Plant-Specific Rheology Data

9/9/2024, 04:30 PM - 05:00 PM

Speaker(s): Luke Thompson;Elaine Leonard

RELEVANCE

Wastewater sludges have fluid characteristics that differ from clean water and exhibit non-Newtonian behaviors that require specific hydraulic analyses. Rheology, the study of matter deformation and flow, can quantify rheological characteristics and improve the hydraulic design of wastewater sludge systems. Onsite rheology testing and hydraulic modeling was used as part of a solids process improvement project at Kitsap County's Central Kitsap Treatment Plant (CKTP) to design various thickened sludge pumps and systems. The results from this design approach support using plant-specific rheological data when designing solids process systems as compared to conventional design approaches.

CASE STUDY

New primary sludge, septage, and waste-activated sludge (WAS) thickening equipment and associated process system design will be designed as part of the improvements at CKTP. Rheological data collected from the plant was used to design new systems and evaluate the adequacy of existing systems for process modifications.

RESULTS

Test results suggest a positive correlation between shear stress and total solids; viscosity measurement increased with colder sludge temperatures, resulting in more conservative design criteria. Figure 1 depicts shear rate and shear stress results for thickened waste activated sludge (TWAS), thickened primary sludge and septage (TPSS), and digester sludge. Figure 2 shows the rheometer during a sampling event. Traditional design methods differed in modeled results as compared to the alternative approach of rheological testing and modeling. Table 1 compares the TDH for typical and alternative design approaches.

APPLICABILITY

Using an alternative design approach to characterize plant-specific sludges allows for more detailed design and mitigates hyper conservative assumptions that could result in inefficient design of sludge systems.

Collecting data from various plants will allow the establishment of a database to evaluate characteristics and behaviors in different sludges. An internal best practice document is being developed in collaboration with Matt Higgins at Bucknell University to develop standard rheology testing criteria, data analysis methods, and design approaches for future applications. This effort focused on municipal sludges but could also be applied to industrial sludges and other non-Newtonian streams.

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Engagement between Wastewater Utilities, Oregon State University, and Public Health Agencies in Oregon's Wastewater Surveillance Program

9/9/2024, 04:30 PM - 05:00 PM

Speaker(s): Wendy Woothtakewahbitty;Leslie Dietz

Wastewater surveillance (WWS) in Oregon is a collaborative triad between Oregon State University (OSU), public health agencies, and wastewater utilities. The Oregon Health Authority funds the state-wide WWS program and makes the data accessible on a public website, thereby empowering public health decisions to be informed by WWS data. Providing the samples is voluntary on the part of the wastewater utilities and yet is essential to the program. OSU is responsible for maintaining relationships and communication for the triad. To facilitate that goal, OSU has employed numerous communication tools ranging from building a website to autogenerated results emails. We have implemented multiple ways to submit flow data including a Google form on the website, a chain of custody form, and email submission to a dedicated WWS mailbox. To express gratitude to wastewater utilities for their role in public health and WWS, we executed an appreciation outreach

event. To garner feedback on best practices, we conducted interviews of wastewater utility staff in both leadership and laboratory/sample-collecting roles. To increase awareness of the use of WWS data, we craft monthly updates for wastewater utilities and county public health. Moving forward, we aim to strengthen the county public health/ wastewater utilities leg of the triad. Our challenges include having limited staff assigned to this work, balancing between irritating and encouraging utilities to participate, the variety of hierarchical structures and nomenclature used at wastewater utilities, wastewater utility staff turnover, and varying receptiveness to the concept of WWS. Additionally, our challenges include our own organization and responsiveness, and a lack of feedback from wastewater utilities on our improvement attempts. This is the status of engagement between wastewater utilities, OSU, and public health agencies in WWS. We invite input and ideas from wastewater utilities to move the program forward.

Mitigating PFAS in Biosolids through New Stabilization Technologies

9/9/2024, 04:30 PM - 05:00 PM

Speaker(s): Todd Williams

This presentation will provide an update of the rapidly changing regulatory process at both the US EPA and State agency levels regarding PFAS. This presentation will also provide information regarding measured concentrations of PFAS in wastewater solids, dried biosolids, pyrolyzed biosolids, incinerator ash and biosolids based compost products. PFAS precursor analyte presence and concentrations in the input solids as well as the wastewater treatment process used to generate these products will also be presented. This information will be useful for those considering methods to reduce or eliminate PFAS in wastewater solids at existing or planned biosolids management operations to ensure the lowest feasible PFAS concentrations in end products can be achieved. This information will help utility planners, operators, engineers and administrators better understand the nature of the PFAS issue, how these compounds are introduced into biosolids, the rapidly changing regulatory landscape, and the effectiveness of various technologies to reduce or eliminate these compounds from wastewater biosolids products.

Ride the Funding Wave: How to Get Paid for Your WRRF Renewable Energy Projects

9/9/2024, 04:30 PM - 05:00 PM

Speaker(s): Matt Noesen, P.E.;Natalie Gustafson, P.E.;Brittany Park, P.E.

There has never been a better time to invest in renewable energy at water resource recovery facilities (WRRFs). This tidal shift in funding priorities better recognizes the intrinsic value of transforming recovered resources into energy to build more sustainable climate resilient communities. The Infrastructure Investment & Jobs Act (IIJA) and the Inflation Reduction Act (IRA) of 2022 amplify financial assistance at the federal, state, and local levels. This presentation will discuss how to navigate numerous funding opportunities available for WRRFs, assess project eligibility, and offer strategies for crafting winning applications.

IIJA has appropriated $5.5 billion to the Water Infrastructure Finance & Innovation Act (WIFIA) program and $11.7 billion to the Clean Water State Revolving Fund. These programs represent

robust capitalized wastewater infrastructure financing options. The CWSRF program also offers loan forgiveness, which is a grant equivalency, to qualified applicants. There are also state and local funding opportunities that exist through grants and low-interest loans that do not come with federal compliance strings attached. Public-private partnerships are another source of project funding support where applicable, in which natural gas utilities such as NW Natural have programs in place that provide funding for a WRRF project that produces renewable natural gas (RNG). Understanding how to leverage this impressive suite of funding opportunities enables communities to expedite implementation.

Recurring revenue and tax credits further improve the return on investment of renewable energy projects. One such program by the Environmental Protection Agency (EPA) is the Renewable Fuel Standard (RFS) Program, which grants credits to alternative fuel producers. WRRFs with anaerobic digesters can generate Renewable Identification Number (RIN) credits directly tied to biogas production. Updates to the RFS made in June 2023 increases the value of RINs for WRRFs that co-digest municipal sludge with food waste. Other markets include Low Carbon Fuel Standard (LCFS) market in California, clean fuel markets in states such as Oregon, as well as voluntary markets. The presentation will demystify each of these markets, and explain project eligibility, benefits and drawbacks for WRRFs for each market.

The State of Direct Potable Resue

9/9/2024, 04:30 PM - 05:00 PM

Speaker(s): Jason Flowers

As states throughout the West are dealing with growing stress on their freshwater resources, they are starting to develop regulations to implement and permit direct potable reuse (DPR) as an alternative source for potable water. To date, Colorado, Texas, and California have adopted plans to regulate DPR, and Arizona is in the process of developing regulations. Most regulations are written for facilities to construct an advanced water treatment (AWT) plant that treats wastewater treatment plant (WWTP) effluent to drinking water standards. The mentioned states have developed specific approaches to protect human health through both pathogen and chemical control, and each of these states have taken a different approach to achieve the required level of protection. For instance, in the AWT facility, Texas requires a 6, 5.5, and 8-log reduction for Giardia, Crypto, and Viruses. In contrast, California requires 14, 15, and 20-log reduction for the same organisms measured from the WWTP influent to the AWT facility effluent. In addition, some states allow for a more varied treatment process to meet the required pathogen or chemical reduction. In contrast, other states require specific technologies, like California, which requires reverse osmosis to be included in any AWT facility. The presentation will provide a high-level summary of the different approaches each state takes to regulate DPR and what can be learned from these regulations.

Commissioning the Largest Water Quality Improvement Project in Idaho: Creating Operator and Maintenance Friendly Facilities

9/10/2024, 08:00 AM - 08:30 AM

Speaker(s): Alex Yoffie, PE;Barry Garcia;Logan Branscum;William Leaf

The City of Nampa (City) and Jacobs have partnered using the progressive design build delivery model to complete the largest water quality improvement project in Idaho that will both increase the facility's capacity and produce Class A reuse water for irrigation. The project increases the plant's average day design capacity to 18.6 MGD and provides the means to reliably meet seasonal total phosphorus effluent limits. The plant will discharge to Indian Creek in the winter and provide Class A reuse water to Phyllis Canal in the summer to improve the City's water resiliency. The project totals $187 million dollars in construction and includes increased secondary treatment capacity, the addition of tertiary filtration, UV disinfection, post aeration, flexible final effluent pumping or gravity discharge, new chemical dosing capabilities, and a struvite sequestration sidestream treatment process.

Phosphorus removal is provided by multiple different processes including enhanced biological phosphorous removal, chemically enhanced flocculation and filtration, and struvite sequestration. The system will reliably provide an effluent total phosphorus less than 0.35 mg/L throughout the year. The progressive design build approach empowers the City, Design-Builder (Jacobs), and sub-contractors to work in partnership during the design, construction, and commissioning phases. Close coordination during the commissioning phase has resulted in more operator and maintenance friendly facilities for the City of Nampa. Routine walks and meetings were conducted with the City to receive their input on items ranging from valve orientation to control strategy implementation.

The purpose of this presentation is to highlight how the progressive design build model has encouraged collaboration between the City O&M staff and the Design Builder's commissioning team. This presentation will focus on the following topics:

- Collaborative planning for process startup and acceptance testing.
- Process for mechanical and controls testing of new facilities with temporary clean water recirculation loops.
- Routine walks with City O&M staff during clean water testing to let staff "play" with the systems prior to process startup.
- 30 day acceptance test with process flows to demonstrate whole plant performance under City operations and Design-Builder monitoring and guidance.
- Lessons learned during commissioning.

Not Your Great, Great, Grandfathers Clarifier - Secondary Adjustable Inlet (abstract number 163)

9/10/2024, 08:00 AM - 08:30 AM

Speaker(s): Todd Latchaw

Abstract:

Title: Not your Great, Great, Grandfathers Clarifier: Clarifier optimization using sludge blanket filtration and online monitoring in real time to improve foot print capacity of 30% or more and reduce total effluent phosphorous without downstream filtration to 0.3 mg/l and less:

Subject: Clarifier Optimization

The standard clarifier design has been around for decades. Although there has been some minor changes to the design to help achieve better performance (think sidewall baffles, or fixed EDI inlets for example), in general the EDI design has not become flexible since its original implementation. But on the opposite. the loading of clarifiers is flexible in a wide range – in fact leading from hour to hour to highly varying optimal EDI shapes for one and the same clarifier. In order to achieve significantly better clarifier performance, a smarter clarifier is needed. A smarter clarifier that will change the EDI design continuously with changing influent conditions. The presentation will go through multiple case studies of facilities who have implemented the load adapting EDI technology with online monitoring and automatic inlet design change to achieve maximum performance through sludge filtration. Case studies, CFD's, from both the United States and Europe will show significant capacity increases, total suspended solids reduction, as well as reduction in total phosphorus – in some case down to < 0.2 mg/l total avg effluent phosphorous, NTU < 2-3 water reuse standards, and thus resulting, in some cases, in the elimination for the need of downstream filtration in European installs..

One Water: The Hidden Benefits of Collaborative Water Management

9/10/2024, 08:00 AM - 08:30 AM

Speaker(s): John Rehring

Population growth and climate change pose considerable challenges for water supplies and ecosystems. Meanwhile, the communities we serve increasingly value the recreational and environmental benefits of urban waterways. "One Water" approaches for managing the urban water cycle are being implemented across agencies and departments in cities small and large to unlock hidden benefits from what might otherwise be narrowly focused projects.

One Water plans can focus on integrated water supply planning, water policy, or both. The Denver One Water Plan provides a case study of inter-agency and inter-departmental collaboration to align policies, link land and water planning, and institutionalize collaborative dialogue and project execution. Denver's One Water Leaders (OWLs) comprise a coalition of water management leaders from water, wastewater, stormwater, and flood control agencies working together to implement the vision and achieve the specific goals of the plan.

The OWLs formed topical collaborations around:

- Regional salinity management through the urban water cycle.
- Opportunities for increased use of recycled water.
- Urban redevelopment projects that present new opportunities for wise water management with multi-benefit community and ecological outcomes.
- A water footprint awareness initiative, broadening the community's perspective on how their actions affect water supplies and quality.
- Landscape transformation opportunities, local projects supported with state-level initiatives and funding.

- Denver's Waterway Resiliency Program, with ecosystem restoration and flood mitigation improvements along the urban South Platte River corridor.

Illustrating a different type of plan, the City of Aspen's Integrated Water Resources Plan uses a one water mindset to increase water supply resilience while respecting the community's strong environmental ethic. The Aspen plan is founded on protecting voluntary instream flow targets.

These initiatives provide an inspirational foundation for communities of any size to transform how they manage water. Every community has different agencies or departments at the local and state level with defined roles for managing water. These examples show how collaborative partnerships can broaden the impact of planning and implementing water policies and projects. The presentation will also highlight the Water Research Foundation's new One Water Cities Self-Assessment protocol to help establish a one water program in a community of any size.

Tracking Puget Sound Nutrient Loading Trends and Water Quality Response

9/10/2024, 08:00 AM - 09:00 AM

Speaker(s): David L. Clark;Joel E. Baker

The Puget Sound region has long been recognized for its ecological significance, serving as a vital marine ecosystem and supporting diverse aquatic life. This presentation will focus on trends in wastewater nitrogen loadings and the resulting water quality response in Puget Sound. The objective is to quantify the extent of nitrogen inputs from wastewater sources and their subsequent effects on measures of water quality. The Puget Sound Nutrient General Permit (PSNGP) calls for optimization efforts to reduce nitrogen loadings from wastewater facilities. Annual performance reports for 58 marine wastewater dischargers provides a data set to initiate a trends analysis of nitrogen loadings for the years 2020/21/22/23. In this presentation, trends in the cumulative point source loadings from wastewater dischargers will be compared with receiving water quality measures in Puget Sound.

Puget Sound water quality depends on many factors, including not only point and non-point nutrient loadings but also the extent of mixing of nutrient-rich, oxygen-poor ocean water within the estuary. Historical characterizations over the past century, contemporary monitoring data for key parameters, elaborate simulators such as the Salish Sea Model (SSM), and potentially water quality indices provide an aggregate characterization of conditions. A comprehensive water quality index integrates multiple parameters to provide an overall assessment. Consideration will be given to comparison of nitrogen loading trends with key water quality metrics, available water quality indices, and other characterizations of interest. The Puget Sound Partnership's Puget Sound Vital Signs includes multiple water quality characteristics, although its development is incomplete (dissolved oxygen, nutrients, marine benthic index, acidification, sediment chemistry index, etc.). The Department of Ecology's Marine Waters Condition Index (MWCI) is outdated, but focused on changes in nutrients, eutrophication, the oxygen budget, and environmental conditions of lower trophic levels.

Sustaining this analysis underscores the importance of tracking nutrient loadings and the water quality response to guide management efforts, prioritize investments, and make adjustment to adapt to the most effective means of preserving and enhancing the health of the marine ecosystems for future generations.

Turning Nuisance Scaling into Resource Recovery – A Tale of Struvite, Brushite and Vivianite

9/10/2024, 08:00 AM - 08:30 AM

Speaker(s): Shubhashini Oza

Mineral scaling is a common problem in numerous industries. It significantly increases operations and maintenance costs due to issues around reductions in heat transfer efficiency, pipe occlusion, and scale precipitation in process equipment. However, the type of scaling compounds formed vary by industry. Municipal wastewater plants observe scaling due to struvite, vivianite and brushite; membrane desalination facilities observe various type of silicate and phosphate scaling on the membrane; surface landfills experience calcium carbonate, calcium sulfate, and iron scales; and drinking water distribution systems observe calcium carbonate in the pipelines.

Although historically a nuisance, these minerals can be transformed into valuable resources by incorporating sidestream phosphorus removal technologies at municipal water resource recovery facilities (WRRFs). Processes like Ostara Pearl®, WASSTRIP®, or CalPrexTM can recover valuable phosphorus a saleable fertilizer while also improving biosolids dewaterability, providing multiple benefits to operations and maintenance.

To most efficiently address both scaling and the optimum processes for resource recovery, the chemistry of wastewater must be better understood. While the microbiology of wastewater and solids treatment is better known, there is a knowledge gap related to inorganic chemical speciation and the reactions that occur during solids processing and handling. This study presents a systematic evaluation of scaling challenges at an (anonymized) WRRF and emphasizes the importance of chemical thermodynamic modeling as a tool to access and address mineral scaling issues. Liquid samples were collected from the WRRF where management is evaluating phosphorus recovery alternatives. Chemical modeling was performed with the liquids data collected, while samples of the scale were collected and accessed using X-ray powder diffraction and scanning electron microscopy to validate the model predicted scaling. The initial modeling outputs demonstrated that the assumptions regarding scaling type were flawed: neither the acid-phase digester nor the methane-phase digester tends to form struvite as originally assumed by WRRF, but instead the samples had a higher tendency for iron and calcium phosphate precipitates. The result of this analysis enables a WRRF to determine the best approach more accurately to both minimizing scaling and maximizing resource recovery

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WateReuse Association- National and Regional Update

9/10/2024, 08:00 AM - 08:30 AM

Speaker(s): Natalie Monro; Pat Sinicropi

This session will provide an update of water reuse news and accomplishments from a national and regional perspective. Attendees will learn about federal advocacy to advance water reuse and the communication tools, peer networking and reuse technical learning opportunities provided by the WateReuse Association. The session will then shift gears to highlight accomplishments and work within the Pacific Northwest to advance reuse through advocacy, legislation, and communications

in the states of Oregon, Washington and Idaho, including the second successful Oregon Water Reuse Summit held in June 2023. Attendees will learn about advocacy, networking and information sharing opportunities for water professionals in the Pacific Northwest.

Wastewater Treatment Aeration Applications and Blower Technologies

9/10/2024, 08:00 AM - 08:30 AM

Speaker(s): Trey Poer

1) Purpose of Aeration

2) Methods of Aeration

1. Packed Tower Aeration
2. Surface/Splash Aeration
3. Bottom Aeration
4. Coarse Bubble Aeration
5. Fine Bubble Aeration

3) Wastewater Treatment Aeration Applications

1. Equalization Basins
2. Aerated Grit Chambers
3. Channel Aeration
4. Aeration Basins
5. Secondary Clarifiers
6. Aerobic Digesters
7. Sludge Holding Tanks
8. Filter Air Scouring
9. Post Aeration

4) Waste Treatment Energy Consumption

5) Blower Technologies

1. Positive Displacement
2. Helical Screw
3. Centrifugal
4. Integrally Geared Turbo
5. High-Speed Turbo

6) Design Considerations

Design Strategies to Support Reliable Operations and Effective Maintenance at the Flamingo Water Resources Center

9/10/2024, 08:30 AM - 09:00 AM

Speaker(s): Chris Machado;Skylar Watnick

The Clark County Water Reclamation District (CCWRD) collects and reclaims water from over 240,000 business and residential accounts in Southern Nevada, one of the fastest-growing areas in the country. CCWRD's main treatment facility, the Flamingo Water Resource Center (FWRC), can treat 130 million gallons/day (MGD) and is being expanded to 150 MGD to accommodate growth. Project 19007 Secondary Treatment Aeration Basins and Secondary Clarifiers (Project) is part of this expansion. It entails the first phase of a new 50 MGD secondary treatment complex, the West Secondary Treatment (WST), including three biological nutrient removal (BNR) trains and supporting facilities. The treatment process targets stringent phosphorus and ammonia effluent concentrations set by Lake Mead's waste load allocations. These effluent targets challenge operations and maintenance to perform consistently and reliably year-round with a high level of process flexibility. The design of the WST is complete, and the facilities are currently under construction. Design strategies like Reliability Centered Design (RCD) provided forums for design enhancements with ample participation of CCWRD's Engineering and O&M staff. This engagement positively influenced and guided the design all steps of the way. Some design directives adopted to facilitate O&M and increase reliability included: BNR process flexibility and centralized supporting facilities. The BNR design allows process flexibility and performance optimization by including swing zones and options for mixed liquor recycling. The aeration basins were designed to operate in many configurations, including A/O, A2O, Johannesburg, and 5-Stage Bardenpho. In addition, supporting systems like electrical gear, blower systems, and pumping systems, were designed to be centralized and connected by service tunnels to facilitate O&M. This presentation will provide an overview of the new WST and its design approach while discussing strategies adopted by the project team to deliver the O&M staff tools for reliable operation and effective maintenance.

Microscreening for Advanced Primary Filtration – Pilot Testing in the U.S. and Europe

9/10/2024, 08:30 AM - 09:00 AM

Speaker(s): Bryce Kerney

Due to rising energy costs and innovation in sludge digestion technology to produce biogas, anaerobic sludge treatment is gaining importance in advanced wastewater treatment. A process change from aerobic to anaerobic sludge stabilization generally includes a traditional primary clarifier, which can be expensive, requires a large footprint, and creates significant costs downstream due to aeration processes. Population increases lead to overloaded water resource recovery facilities, space limitations, and an increased cost of land. It is often critical to upgrade within existing footprints, provide solutions for improving energy efficiency, and increase gas yield for a better energy balance and management of wastewater treatment plants.

Microscreening systems offer a promising alternative to conventional primary settling tanks, achieving comparable or superior removal rates with a fraction of the footprint. These systems

provide better process control during fluctuating influent conditions and storm events, lower investment costs, and reduce energy demands compared to activated sludge and biological nutrient removal processes, making them an emerging and effective solution.

The key feature of the horizontal drum screens as a primary filter, is the simple mesh screening basket installed in either concrete channels or stainless-steel tanks. Water passes through the screen from inside to outside, utilizing a large filter surface area due to the horizontal orientation of the screen drum. As water levels rise upstream, a filter carpet develops on the mesh, facilitating a deep bed filtration effect. When the water level reaches a predefined set point, the drum rotates, and a fixed spray bar cleans the surface with high-pressure wash water, discharging fine screenings to downstream treatment via a closed sluice channel.

This primary filtration technology has been tested in numerous pilot studies in both the United States and in Europe. Results of this testing with regards to removal rates, energy savings, footprint reduction, and operational reliability will be presented. In addition, several full-scale projects from Europe will be presented highlighting the drivers for the implementation of this technology, as well as the operational data collected.

Tackling the Struvite Headache, What is the Best Approach?

9/10/2024, 08:30 AM - 09:00 AM

Speaker(s): Heather McKenna;Jeff Semigran;Corey Klibert

The Portland Bureau of Environmental Services (BES) Columbia Boulevard Wastewater Treatment Plant (CBWTP) has historically experienced excessive struvite buildup in anaerobic digesters, sludge transfer pipes, dewatering equipment and piping, and lagoon supernatant system. Struvite removal has been labor intensive - handled by taking equipment down, jetting and physically cleaning accessible areas.

CBWTP is under construction for a new solids processing facility (SOFA) that will migrate dewatering from belt filter presses to centrifuges. To prepare for the transition, a pilot centrifuge was installed to gain operating experience and identify potential operational issues. The high degree of struvite formation in the centrate pump and piping due to higher concentrations of struvite forming constituents with the lack of wash water contributed to low uptime for the centrifuge skid. This challenge instigated a review of alternative struvite mitigation strategies that could be applied to the centrate system and the facility more wholistically (dewatering feed tanks, dewatering, lagoon, and plant returns).

This presentation will walk through the efforts to prepare for an increase in struvite deposition: 1) Design improvements to the SOFA dewatering processes for enhanced cleanout and redundancy to take equipment offline for cleaning, 2) PHREEQC modeling to understand struvite forming potential and dillution/pH adjustment requirements with different available water sources, 3) pilot testing of localized centrate cleaning with struvite removal chemicals and 4) pilot testing of ferric chloride injection into a dewatering sludge feed digester. The modeling and pilot test results were used to establish a cost benefit analysis tool to inform decision making for struvite control.

Attendees will gain an understanding of the technical engineering involved in evaluating alternatives to address struvite, as well as the creative problem-solving and collaborative effort between all parties.

What got us here won't get us there: building alignment around a (one) water resiliency strategy to prioritize, fund and communicate CIP needs

9/10/2024, 08:30 AM - 09:00 AM

Speaker(s): Frank Dick, P.E.;Holly Tichenor

The rapidly growing City of Vancouver, Washington, serves more than 200,000 wastewater, drinking water and stormwater customers. Until recently, utility finance staff used a six-year project planning horizon, financing projects with a "pay as you go" model. In the face of new challenges such as aging infrastructure, changes in regulations, PFAS, wastewater solids system needs, and surface water quality protection needs, the traditional project planning and funding model no longer held up.

Public Works developed a new 15-year project planning and financing vision to build understanding and alignment with City leadership and Council to change course. This support was needed for significant system-wide investments to improve and maintain service, update infrastructure to achieve economic, climate, safety, and seismic resiliency goals, and safeguard community health and livability.

The City worked with Brown and Caldwell (BC) to develop a coordinated internal approach that applied outreach and strategic planning best practices. With input from a cross-functional team including finance, communications, utility department leaders, and City leadership, BC developed a Water Resiliency Strategy and Framework that conveyed a one water story and aligned the City's three utilities around shared goals and needs.

The Water Resiliency Strategy and Framework guided Public Works' updated Capital Improvement Program, community engagement planning, and Council communications, and informed the City's strategic planning processes. The Framework bolstered Council and broader support for long-term infrastructure investments that led to clear financing strategies and rate stabilization recommendations.

Through this progressive series of workshops over eight months, Council adopted policies to adjust system development charges, modestly increase utility rates, and adjust rates for customers outside of City boundaries. These changes set the City in a better position to meet the demands and achieve results needed.

Summary of benefits:

- Bring value and visibility to a holistic one water management needs
- Improve internal alignment around critical funding needs
- Build community trust and alignment to City strategic plans
- Support informed and timely decision-making by elected officials

- Make needed investments affordable for ratepayers

A Summary of the Active Research and Innovations Around Reuse Happening in the Pacific Northwest

9/10/2024, 08:30 AM - 09:00 AM

Speaker(s): Scott Mansell

Reuse applications are rapidly growing across the nation and the world as we struggle with drought, water scarcity, population growth, a changing climate, and increasing water quality concerns. The need for reuse and the challenges around it have driven myriad research studies and innovations around the globe. Here in the Pacific Northwest, reuse is also growing but generally at a lower clip than some other parts of the world. The concerns around water scarcity have not yet affected much of the Pacific Northwest to the same degree as the US Southwest, for example, and many unique attributes of the Pacific Northwest, such as the climate and presence of salmon, mean that the drivers and challenges for reuse are often different than those in other places. As such, there are many recent and active research projects and innovative applications of reuse being done across the Pacific Northwest by utilities, universities, professional groups, and others. In this talk, we will introduce and summarize the research projects and innovative reuse applications taking place across Idaho, Oregon, and Washington at a variety of institutions. Attendees will come away with an understanding of what research topics are being studied, what novel and innovative applications are taking place, what institutions are conducting these projects, and what the current challenges are specific to the Pacific Northwest.

Sludge Settleability Control Strategy Using Migrating Carriers and Hydrocyclones

9/10/2024, 08:30 AM - 09:00 AM

Speaker(s): Jason Calhoun

This study introduces a novel control strategy utilizing migrating carriers composed of hemp fibers, binder, and an inert densifier, in conjunction with hydrocyclones, to facilitate the retention of biofilm biomass (BB) and densified activated sludge (DAS) in main-stream wastewater treatment processes. The miGRATE™ process, patented by WWW-Arxtera, is specifically engineered to promote biofilm growth, improve sludge settleability, and enable simultaneous nutrient removal (SNR). This is achieved by tailoring the carriers' specific gravity and shape, optimizing their settleability and mobility in continuous flow or Sequencing Batch Reactor (SBR) configurations, without the need for screening in main bioreactors or settling phases.

Furthermore, the integration of physical solids selectors, including static screens, drum screens and hydrocyclones, in a proprietary series allows for precise control over the ratio of biofilm biomass (BB), densified activated sludge (DAS), and conventional suspended growth (CSG). This strategic manipulation enhances overall process capacity and stability. Importantly, this approach aims to minimize the need for extensive retrofitting modifications and process control restrictions

in main-stream SNR applications, making it a promising solution for sustainable and cost-effective wastewater treatment practices.

On Site Non-potable Water Resuse

9/10/2024, 09:45 AM - 10:45 AM

Speaker(s): Jocelyn Jones; Paula Kehoe

This session will include an overview of onsite non-potable water reuse from understanding the benefits and drivers, best practices, state of the science, LRTs, markets, visionsfor the future – water resilient communities. San Fransico has an onsite program and requires new commercial and multi family buildings to collect and treat water onsite for non-potable applications. San Francisco has developed a risk-based approach for the installation of onsite water treatment systems to protect public health. The health-risk based approach includes the development of log reduction targets for the removal of pathogens (bacteria, viruses and protozoa) and continuous online monitoring requirements. San Francisco also chairs the National Blue Ribbon Commission for Onsite Non-potable Water Systems (NBRC). The NBRC is a collaboration of public health regulators and water and waste water utilities from 15 states across the United States. The NBRC promotes the health risk-based approach to the collection and treatment of water for non-potable applications. The session will also include lessons learned and case studies. Additionally, in the Pacific Northwest, Washington State's On-site nonpotable water systems rulemaking will be discussed. Attendees will learn about the unique features of Washington's approach, including the use of DALYs, state-level implementation of an ONWS program, and lessons learned. As onsite water reuse interest in growing this overview with case studies provides insight for responsible charge operators.

Case Study: Meridian Reduces Phosphorus Recycle (struvite)

9/10/2024, 09:45 AM - 10:15 AM

Speaker(s): Nick Webber;Stuart Hurley;David Briggs;Clint Dolsby

The City of Meridian (City) Wastewater Resource Recovery Facility (WRRF) provides treatment for all the City's wastewater for discharge to Fivemile Creek or for distribution as recycled water for irrigation. Since implementing biological phosphorus removal, the WRRF experienced a significant buildup of struvite in digested sludge piping, dewatering centrifuges, and centrate return stream piping and equipment.

Struvite is a crystal precipitate composed of ammonia, phosphate, and magnesium ($NH_4MgPO_4 \cdot 6H_2O$). Magnesium is found in the City's groundwater supply while ammonia and phosphate are released during anaerobic digestion, creating ideal conditions for struvite formation. Through pilot testing and detailed evaluation of side stream treatment technologies, the addition of a side stream phosphorus treatment system on the digested sludge stream was determined to be the best treatment alternative to both control struvite buildup and reduce phosphorus recycling at the plant.

The side stream phosphorous treatment system installed at Meridian WRRF is known as the MagPrex system, as supplied by Centrisys/CNP. The process was installed in a new building and involves the addition of magnesium chloride ($MgCl_2$) and aeration into reactor tanks containing anaerobically digested sludge (digestate). The magnesium chloride provides excess magnesium and the aeration strips the digestate of carbon dioxide, which in turn slightly raises the pH. These conditions, along with the ammonia and phosphate present, allows the struvite to precipitate out of solution and form crystals in a controlled environment.

The MagPrex hydraulic residence time is short enough to keep precipitated struvite in suspension with the rest of the digested sludge, so it can be dewatered and hauled off site with the biosolids. Through the first few months of operation, this system has reduced dissolved phosphorus in the recycle stream by over 90%, and offers 10-20% nitrogen removal as well, prior to being returned to the head of the plant. Operations updates as well as lessons learned during construction and startup will be presented.

Embracing Failure - How to Learn from our Mistakes

9/10/2024, 09:45 AM - 10:15 AM

Speaker(s): Jeff Schmidt, PE, PMP

Society rewards success and criticizes failure, and rightly so, but in the real world we are constantly dealing with failures, both large and small. We avoid talking about failures, and as a result, we fail to use these experiences as growth opportunities. Although major catastrophic failures can occur in engineering, we can often learn more from the common failures in our work that lead to project cost overruns, schedule problems, or quality issues. With most failures classified as predictable and preventable, we should work to constantly improve our failure recognition and prevention skills to reduce these potential issues before they start. To fix the problem, however, we also need to acknowledge that failure will continue to play some part in our water industry. We need to look for ways to encourage each other to examine these failures, learn from these past experiences, and better prepare for them in the future.

Many times, our failures result from a sequence of other minor failures that can lead to bigger problems. While it may be easy to point blame at one person or one group, the truth is that it is frequently a breakdown at several steps in the process and the result of multiple individual failures that can lead to the bigger problems. When this occurs, we need to understand the breakdowns along the way, and acknowledge the 'team effort' that produced the unacceptable outcomes. This can be achieved through various techniques such as risk planning, pre- and post-mortem evaluations, and robust project reviews.

This is especially challenging for those just starting their careers who may feel additional pressure to succeed. To support these early-career team members, it falls upon senior leaders to talk about their own failure and to build a culture of trust and support to better prepare for failure and thereby increase everyone's chance of success.

This presentation will use both published analysis of failures along with more personal anecdotes to demonstrate these concepts and strategies for reducing future failures.

Improving MBR Performance Through Continuous Flow Densification

9/10/2024, 09:45 AM - 10:15 AM

Speaker(s): Matt Reeve

Biomass densification is an efficient way to intensify conventional activated sludge by improving mixed liquor settling characteristics. External selection via hydrocyclones combined with adequate biological selection in continuous flow bioreactors helps to maximize densification performance. Although Membrane Bioreactors (MBR) are not directly impacted by settling characteristics, preliminary work indicates that continuous flow densification can improve mixed liquor filterability, which could have a positive impact on MBR operation. This presentation explores the coupling of densified biomass with continuous flow MBR: process concept, modelling, full-scale demonstration plant and expected benefits for MBR design and operation including decreased OPEX, improved sludge quality, and improved performance.

Rebranding for Resilience – Nampa's One Water Journey toward a Sustainable Water Future

9/10/2024, 09:45 AM - 10:15 AM

Speaker(s): Erin Cox;Jeff Barnes

Nampa, Idaho, is a full-service water resources utility, which offers a unique opportunity to manage water in a comprehensive manner to support resilient water supplies. Nampa's newly upgraded Water Renewal Facility and One Water Plan will enhance the City's ability to manage resources holistically to mitigate impacts of rapid growth and provide a comprehensive approach to conserving and improving the community's rich water resources. Through a case study discussion, we will share insight and ideas for how others can adopt similar, integrated approaches to rebranding wastewater facilities to reflect Class A Recycle Water, resilience, and a One Water approach to managing water resources.

"One Water" is an integrated approach to water resources management that treats all forms of water as a single, interconnected resource to promote resilience and holistic water planning. As Nampa works to meet demands driven by rapid urban development, One Water strategies will provide efficiencies and other long-term community benefits. There are numerous strategies that are being implemented to protect and benefit Nampa's water resources, such as constructed wetlands and green stormwater infrastructure, which will support a healthy city while benefitting water quality, fish, and downstream users.

Nampa is also completing a tertiary upgrade to its water renewal facility to provide Class A Recycled Water for irrigation and other reuse purposes. Recycled water is an essential tool to support regional water resilience. A new outfall pipe will direct recycled water for irrigation users via the Phyllis Canal. The outfall's original design included a simple pipe with concrete block energy dissipation. The City is now implementing a creative, beautiful, and engaging outfall design that reflects the cleanliness of class A recycled water, and educational kiosks will inform people about One Water, recycled water, and how the city is managing water to support resilience. Nampa's rate payers have invested heavily in water infrastructure and should have the opportunity to learn about the benefits and outcomes of the improved assets and how they support water resilience and improved water quality. Effective renaming and branding for all the City's water resources divisions is supporting effective community outreach and educational materials.

Shrinking the MBR Footprint Even More

9/10/2024, 09:45 AM - 10:15 AM

Speaker(s): Rick Kelly

Membrane bioreactor (MBR) treatment systems produce a high-quality effluent that affords multiple options for reuse. Furthermore, this technology is known to be on of the most space-saving technologies available in the market today. Traditionally, the membranes of submerged MBR systems are in separate tanks from the bioreactors and are assumed to operate for liquid/solid separation only. However, these tanks contain a significant volume of activated sludge, up to 30 percent of the active liquid volume, under highly aerated conditions, which allows for biological reactions to occur. It is not standard design practice in North America to account for membrane tank volume in treatment. If this volume is accounted for in treatment, we could further reduce the required aerated volume of the bioreactors and reduce treatment footprint.

To test this assumption, Brown and Caldwell, along with the City of Tacoma and Kubota Membrane USA Corporation (Kubota), operated a pilot system at the Central Treatment Plant (CTP) in Tacoma from May 2023 through December 2023. Results showed the pilot system capable of solids separation and biological treatment within the membrane tank.

Kubota designed and constructed the pilot system based on the CTP's influent characteristics. The system was designed to operate in an A2O process configuration with both biological phosphorus and nitrogen removal. After operating and monitoring the system in this mode for four months, the pre-aeration tank was removed from service and the system was operated with the membrane tank providing all aerobic reactions for the system. Initial lab results have shown that removing the pre-aeration tank provided sufficient aerobic treatment volume to achieve more than 95% ammonia conversion, less than 0.5 mg/L total phosphorus and less than 10 mg/L total inorganic nitrogen. This presentation will review the pilot system operation and results, which indicate we can use the active membrane tank volume for treatment, further reducing MBR system volume.

What's Old is New Again – Lessons Learned from the Nampa Wastewater Program

9/10/2024, 09:45 AM - 10:15 AM

Speaker(s): Matthew Gregg;Shannon Johnson;Andy Zimmerman

The City of Nampa's Wastewater Program has spanned nearly 15 years and invested nearly $250M in the Nampa Wastewater Treatment Plant (WWTP). The Nampa community has invested nearly $250M to address stringent regulatory requirements, replace aging infrastructure, and provide system capacity to support the continued growth of the City. Beyond the physical infrastructure installed, this program has reshaped the City's approach to water management and shifted the community value and mindset around wastewater.

The Nampa Wastewater Program has been precedent setting in nearly every way conceivable. When it is completed in late 2024, It will result in the largest recycled water program in Idaho with a capacity to produce 20 MGD of recycled water for use within the Nampa community. It was funded with two of the largest State Revolving Fund loans ever issued in Idaho, the latter of which was

supported by over 80 percent of the Nampa community. It included the first large-scale wastewater project to leverage a progressive-design build approach in Idaho. It developed a community- and regulator-supported strategy to leverage the value of recycled water in existing surface water canals. It established an industrial incentive policy that provided financial flexibility for industrial expansion to support economic development goals while also reducing the amount of unused industrial capacity in the system. It has provided the platform to elevate the performance and prominence of the City's operations and engineering staff. Most importantly, it has allowed for a generational investment in the Nampa WWTP that will serve the community for decades.

While many of the approaches used in the Nampa Wastewater Program are novel, the foundations of these approaches rests on fundamentals that have served as the basis of our industry for decades. This presentation will share insights and lessons learned from the from the years of effort on this program. Through these lessons learned, it will explore the intersection between delivering innovative and novel solutions to today's challenging problems and the foundational elements used to deliver large infrastructure projects for millennia.

Exhibit Hall Showcase Demonstrations Pt. 1

9/10/2024, 09:45 AM - 10:15 AM

Speaker(s): Andrew Christy

We will showcase our thermal hydrolysis technology. This technology is a solids treatment process used to enhance anerobic digestion. The process exposes sludge to high temperatures and pressure, by the use of steam. By pressure cooking the sludge, we induce a high level of biological breakdown which in turns enhances digestion by increasing thruput, biogas production, and cake dry solids. We have 14 installations in the US, with 31 combined years of operating experience. We will also share two brief case studies from plants highlighting the benefits our process has had on these facilities.

Assessment of RO Fouling in MBR-RO Trains using Flat-Plate MBR Membranes

9/10/2024, 10:15 AM - 10:45 AM

Speaker(s): Katerina Messologitis;Michael Adelman

There is growing interest in using membrane bioreactors (MBR) for potable reuse because of their improved effluent quality and pathogen removal compared to conventional secondary processes. Therefore, using an MBR as the main treatment process upstream of reverse osmosis (RO) is often desirable for advanced treatment facilities. A common operational challenge for MBR-RO trains is RO fouling. While well-developed models exist to predict mineral scaling in RO systems, the biological and colloidal fouling that often dominates in MBR-RO trains is less understood.

A 12-month study was conducted to evalaute biological and colloidal fouling of RO membranes employing a flat-plate MBR upstream of the RO skid. The study evaluated RO performance under varying operational parameters such as RO and MBR flux conditions, biological process conditions in the MBR, and chloramine dose in the RO feed. The RO system was also subject to known MBR membrane breaches. The two-stage RO system was operated at ~70% recovery to avoid mineral

scaling so the effects of fouling driven by MBR filtrate quality could be observed. RO permeate flux values of 10-14 gfd were used in the typical range for reuse. Key monitoring parameters included MLSS, TMP, and filtrate water quality for the MBR as well as normalized RO specific flux. A novel online integrity monitor was also used to detect small colloidal particles in the RO feed using differential pressure across a filter.

Normalized RO data has shown periods with both higher and lower rates of fouling. RO flux decline was plotted against key MBR operating and filtrate quality parameters. The MBR filtrate turbidity, TMP, and integrity monitor data showed notable correlations. Lowest RO fouling rates were observed with lower filtrate turbidity, higher TMP, and lower differential pressure from the integrity monitor. RO autopsy results showed mostly organic material as the foulant with minimal biofilm coverage suggesting instead that colloids were the main driver of fouling with biological growth as a secondary factor. This presentation will summarize the experimental conditions & results of the study while providing insights into the drivers of RO fouling.

Benefits of Incorporating Primary Effluent Equalization at a Large Membrane Bioreactor Facility

9/10/2024, 10:15 AM - 10:45 AM

Speaker(s): Anthony Benavidez;Hannah Thomascall;William Leaf

The Spokane County Regional Water Reclamation Facility (SCRWRF), which has been in operation since 2011, meets one of the most stringent sets of nutrient removal effluent limits in the nation - (seasonal limits for effluent ammonia (<0.25 mg/l) and total phosphorus (<0.05 mg/l) prior to discharge into the Spokane River. A unique aspect of the SCRWRF is that it has essentially operated at its design flow capacity since startup. The facility had challenges in the winter months in meeting the design flow capacity of the membrane systems, as the peak hour and maximum day throughput was limited as a result of lower membrane fluxes due to lower wastewater temperatures. Alternatives were evaluated and it was determined that primary effluent flow equalization should be installed to mitigate the flow-through capacity issues.

The primary effluent flow equalization system, which was brought into service in January 2020, provided benefits immediately. The plant has seen improved nutrient removal, particularly with increased nitrification efficiency. Spreading the primary effluent ammonia-nitrogen loads, which include the dewatering centrate returns, throughout the day provides significant benefits as opposed to seeing peak loads. The overall health of the secondary process biomass has improved, with a more stable biology in the system. The membrane performance, measured in permeability, trans-membrane pressure, and the operating flux rate, is improved with the equalized flow. This allows SCRWRF to maintain its design capacity consistently throughout the year. Prior to flow equalization, equipment would go into standby during the low-flow periods of the night which made them more susceptible to freezing. The equipment has less stops/starts throughout the day which saves on wear. Chemical feed systems are operated at a more consistent, stable flow which has also improved system efficiencies. The cost-effective benefits of the equalization system have yielded significant savings, which will be documented in the presentation. The primary effluent flow equalization system cost approximately 4 percent of the total project cost. Overall, incorporation of primary effluent equalization has proved to be a very beneficial, cost-effective asset, and provides a good case study for others considering flow equalization to improve the efficiency of their facility.

From Data to Action: Alderwood's Journey Towards Informed Decision-Making

9/10/2024, 10:15 AM - 10:45 AM

Speaker(s): Kevin Cook, PE;Don Ranger, PE

Alderwood Water and Wastewater District (AWWD) is the largest special purpose provider of water and wastewater service in Washington. They are nearing completion of their sewer capacity analysis that will drive improvements and support development of their Capital Improvement Program. A concurrent analysis of their water service will be ultimately incorporated, and the outcomes and recommendations of these analyses will drive an integrated approach to providing consistent service to their customers.

The sewer capacity analysis involved several key steps: developing and calibrating hydraulic models, forecasting future population growth and flow rates, assessing responses to wet weather and climate change, conducting risk assessments for different deficiency classes, and formulating improvement recommendations and prioritization criteria. Each step had key elements of data and information sharing that required close coordination between the project team and District to develop useful data and products. Technical elements of this discussion will range from modeling processes for climate change assumptions and their impact on risk assessment, as well as the use of multi-level surcharge criteria for evaluating different system areas. Additionally, we'll explore how technical data was summarized and shared using various tools and methods, considering its intended use and audience.

The presentation will also address the importance of how data is presented, shared, and understood through maps, charts, tables, etc., and lessons learned from sharing and reviewing data at key milestones will be discussed, including the shift from a "black box" modeling narrative to a more transparent approach to convey useful information to a broad audience. The data and information being developed required a fluid dialogue between the project team to adaptively course correct as information was shared with engineers, operators, board members, asset managers, and project managers. Insights will be shared from both the consultant and owner perspectives, highlighting positive outcomes and lessons learned through the project, and how this will be incorporated into a larger integrated planning program.

Sucking the Air out of the Party:A Novel Approach to Phosphorous Sequestration

9/10/2024, 10:15 AM - 10:45 AM

Speaker(s): Merima Beganovic

Sucking the Air Out of the Struvite Party: A Novel Approach to Phosphorous Sequestration

Wastewater treatment plants with anaerobic digestion benefit from the sludge stabilization step, which, combined with additional treatment, can offer various avenues for energy recovery. With benefits, however, come unintentional consequences. Anaerobic digestion negatively impacts the facility's operational demands by releasing nutrients from the sludge, including phosphates. Even worse, plants that employ more intensive digestion methods such as thermal hydrolysis will see much greater increase in ammonia and phosphate. High concentrations of nutrients pose many

challenges, such as nuisance struvite formation leading to operational disruptions and greater difficulty in meeting regulatory compliance of the effluent discharge limits.

The patented process, EloVac-P, demonstrated its ability to provide a cost-effective solution to all these challenges through a year-long full- scale pilot at the Provo Wastewater Treatment Plant (WWTP) in Provo, Utah. Unlike the conventional method of using air injection to strip CO2 and raise the pH in the digestate, as an innovation in the industry, EloVac-P uses vacuum degassing to increase pH in the reactor to promote struvite precipitation, with an efficiency of 90%. Provo WWTP saw issues with struvite formation post anaerobic digestion in piping, pumps and dewatering equipment, causing operational interruptions, leading to down-times. The plant had recently received a new nutrient permit with an upgrade expected to exacerbate the phosphorous load into the digestate stream, subsequently making struvite formation and dewatering bigger challenges. A consideration for digestate based phosphorous sequestration technologies was made and, after bench- scale testing, the EloVac-P process was chosen for pilot testing.

A small footprint of 13'x 4'x 8' for the 21MGD system also worked in Provo's advantage as space is a valuable commodity on site. Within a week of start-up, the plant site saw noticeable reduction in phosphate in the digestate and resulting centrate. The staff also noted better dewatering performance downstream. Effluent Phosphate levels consistently remained below the mandated 30 mg/l both in the EloVac-P system effluent as well as the centrate, indicating controlled struvite precipitation was occurring in the reactor. Additionally, no further struvite formation was seen in all previously prevalent locations, showing a successful implementation of this novel, nutrient removal technology.

Water Recycling Through Managed Aquifer Recharge – What Do We Need To Know About Geochemistry?

9/10/2024, 10:15 AM - 10:45 AM

Speaker(s): Dan Stanaway;Katherine Y. Bell

There are > 1200 managed aquifer recharge (MAR) projects around the world (American Geosciences Institute, 2017). In the US, there are > 500 direct injection wells, in addition to numerous aquifer infiltration projects (American Groundwater Trust, 2009). Many of these projects leverage water recycling and MAR of recycled water addresses a plethora of issues, including declining groundwater levels, saltwater intrusion, declining or seasonally available surface water supplies, environmental opposition to surface reservoirs, storage and treatment, and increasing concerns regarding global climate change and the need for large-scale storage, and more fully integrated water resource management.

Despite the reliance on MAR, dissemination of our deep understanding of this practice is lacking. This presentation describes key challenges that can occur when water is introduced into aquifers and reacts with native aquifer matrices, changing equilibrium conditions of native groundwater. Key concerns are related to precipitation of minerals that could "clog" the aquifer and reduce groundwater transmissivity, and mobilization of trace metals. With respect to trace metal mobilization, a description of the most common trace metals of concern, including arsenic, and mechanisms of mobilization will be provided. Trace metal mobilization in MAR varies based on site specifics but are often released from naturally occurring minerals. Trace metals in normal pH ranges in aquifers is highly dependent on the oxidation-reduction potential (ORP or Eh) of the groundwater. Additionally, previously released and resorbed trace metals can be found in iron and

manganese oxyhydroxide coatings on saturated sediments; and, these coatings can desorb or dissolve from the aquifer matrix, releasing trace metals to the groundwater upon pH or Eh changes.

With decades of MAR implementation, there are numerous approaches to managing these challenges. This presentation will also describe commonly used strategies involving pretreatment of recharge water to provide compatibility between the recharge and native groundwater, which limits adverse geochemical interactions. Treatment schemes that have been deployed include deoxygenation or reduction of ORP to avoid oxidation of minerals in suboxic to anoxic aquifers, pH adjustment to prevent desorption of oxyanions from metal oxyhydroxide surfaces and adjusting calcium concentrations to prevent calcite dissolution and/or secondary pH impacts.

Solids Handling Pump Guidelines for Municipal Collections Systems

9/10/2024, 10:15 AM - 10:45 AM

Speaker(s): Richard Barile

The application and selection of solids-handling submersible wastewater pumps in municipal collections. Proper operation of solids-handling pumps under varying flow conditions.

Learning Objectives:

1) Recognize key terms of solids-handling pump selections, applications and operations.

2) Understand solids-handling pump range and limitations of performance.

3) Understand the characteristics of VFD operations on solids-handling pumps and how to apply them properly.

Recycled Water Use in the Beet Sugar Industry

9/10/2024, 10:45 AM - 11:15 AM

Speaker(s): Kyle Bair

Successfully managing excess water from sugarbeet processing facilities requires a significant effort to operate and monitor sophisticated water reuse and treatment systems. Sugarbeets are comprised of 75% water and are generally processed from the months of September to April in the Pacific Northwest. This relatively short window to process the crop requires a robust recycled water management program to consume, store, and treat excess water each year. Amalgamated Sugar Company (ASC) operates three sugarbeet processing facilities in Idaho which process beets from over

180,000 acres of prime irrigated land in Idaho, Oregon, and Washington. During processing, these facilities generate and apply recycled water at agronomic rates to more than 1,000 acres of farmland. In all, ASC generates over 450 million gallons of water which is applied for beneficial reuse. This pesentation will discuss the overall production, management, and application of recycled water within the company and some of the challenges encountered in managing recycled water.

Building Resiliency Into Tertiary Phosphorus Removal At The West Boise WRF: Enhancing Micro And Ultra-Filtration Membrane Efficiency And Reliability Through Tertiary Clarification

9/10/2024, 10:45 AM - 11:15 AM

Speaker(s): Taylor Romenesko, PE

Water reclamation facilities in the Pacific Northwest are receiving increasingly stringent total phosphorus permit limits, many must meet limits of 0.1 mg P/L or lower. Utilities are investigating methods to provide cost effective and reliable treatment to address the new permit limits. The coagulation and tertiary membrane filtration process (C+TMF) has been shown through pilot testing and full-scale installations to effectively remove phosphorus to less than 0.1 mg/L, while providing nearly 100% TSS and bacteria removal. While the water quality benefits are well documented, successful implementation of MF/UF membranes requires careful consideration of secondary water quality, coagulant dose and application points, and chemical solids removal strategies. This presentation will describe pilot scale investigations Carollo and the City of Boise performed to select a configuration for a C+TMF process at the City's West Boise Water Renewal Facility.

Pilot scale testing focused on a process train consisting of coagulation, flocculation, and membrane filtration. Membrane performance at the coagulant dosing rates required to meet the City's TP goals can be characterized as high fouling, low loading rate (flux) and requiring intensive chemical cleaning. The poor performance was attributed to the accumulation of organic-rich metal hydroxides (which are formed in the coagulation process) within the membrane modules. The solids were inefficiently removed by backwashing alone and required consecutive acid and high pH/sodium hypochlorite cleaning cycles to restore membrane productivity. Membrane systems operated in this way have high life cycle costs, lower life spans, and come with a significant risk of capacity shortfalls.

Pilot test findings led the City and the design team to an alternative configuration that utilizes pretreatment with dedicated tertiary clarifiers to remove "sticky" chemical solids upstream of the membranes. Regional facilities that have adopted similar strategies (e.g. Spokane, Post Falls and Hayden Lakes) operate at significantly higher loading rates with less membrane fouling. This promotes simpler operational strategies, lower operating costs, and higher resiliency under a wide range of secondary effluent water quality. Due to higher allowable flux rates, the required membrane surface area was reduced by approximately 50%, which reduced the overall capital cost of the project.

Embracing the Uncomfortable: Navigating Complex Decisions

9/10/2024, 10:45 AM - 11:15 AM

Speaker(s): Topher Jones

A stakeholder-driven decision support process was applied towards aiding water and wastewater planning projects. The process incorporated a focus on engaging stakeholders in workshops and through surveys to inform a structured decision-making process to prioritize water supply alternative configurations. Engagement efforts resulted in organizational alignment around priority

water and wastewater infrastructure where stakeholders could see how their insight may directly influence decision-making. To this end, water utilities often need to make decisions using both cost and non-cost factors to identify priorities (e.g., supply reliability, local control, ease of implementation).

A stakeholder-driven multiple criteria decision analysis (MCDA) was used to prioritize water supply alternatives. MCDA is often used to evaluate multiple dimensional decisions where trade-offs between alternatives may become unwieldly. However, these analyses often fall short because they focus more on the tools in a black-box than making sure stakeholders are aligned with the process. Well established MCDA methods were employed to use information gathered on alternatives and criteria to identify which alternatives were associated with the highest value and why.

This presentation explores the benefits of orienting stakeholders to a decision-making process early and engaging the right stakeholders throughout the process at the right time. The project teams leveraged workshops with stakeholders to solicit their feedback in real-time to demonstrate how their feedback was incorporated in each step of the analysis, along with subsequent implications. This approach allowed the project team to build consensus around areas of stakeholder agreement, and structure discussion around areas of stakeholder disagreement. Focus on areas of disagreement was particularly helpful in demonstrating whether differences mattered to final decision-making and served to maintain individual stakeholder feedback. The process also highlighted areas where utility goals could be fine-tuned or where alternatives needed refinement. While the decision-support process was structured and defensible for each use case, it can empower stakeholders with agency and confidence to make decisions as opposed to telling them what they must choose.

Equipment Preselection – How, Why and Lessons Learned

9/10/2024, 10:45 AM - 11:15 AM

Speaker(s): Chris Baersten

Preselection with assignment is a procurement process that solicits proposals from manufacturers and selects a manufacturer prior to completion of design. Preselection of equipment allows the design team to complete the design around a single selected manufacturer. The chosen manufacturer is included in the contract documents for the general contractor to purchase and install. The price quote, scope of work, and terms and conditions are included in the bid documents and assigned to the general contractor.

This procurement approach is used in instances where highly specialized equipment is required, where a traditional bid advertisement process may not result in the best value for the customer.

This presentation will address the why, how, advantages and disadvantages, and other details of a preslection procurement approach. Case studies from equipment preselection on two projects (Brightwater UV preselection, Ventura MBR/UV preselection) will be included with lessons learned.

Exploring Environmental DNA: Piloting A Novel Method For Monitoring Biological Characteristics Of Surface Waters In The Tualatin River Watershed

9/10/2024, 10:45 AM - 11:15 AM

Speaker(s): Hannah Ferguson

Environmental DNA (eDNA) refers to DNA shed by organisms into the environment, and can be captured in water, soil or air samples. By identifying DNA captured in a sample, we can infer species present within a given environment. As such, eDNA is a promising tool for understanding spatial and temporal variation in biodiversity across a watershed. Clean Water Services (CWS) is a water resource and recovery district serving Washington County, Oregon. CWS discharges to the Tualatin River, a meandering, valley-floor river, sensitive to nutrient inputs and stream flow augmentation. Accordingly, our watershed-based NPDES permit directs CWS to monitor the biological characteristics of 15 sites within the watershed each permit cycle. This work is typically completed using macroinvertebrate surveys, which are costly and limited in biological scope, and therefore provide limited information. Given eDNA's promise as a means for characterizing broader biodiversity between sites, we are piloting eDNA as a novel method for gaining detailed biological information to possibly be used in place of macroinvertebrate surveys in the future. The first phase of a multistep project has been to monitor nine sites representing diverse habitats within the Tualatin River Watershed. Water and sediment eDNA samples were collected on a quarterly or monthly basis, and taxa presence was analyzed using a six-marker metabarcoding approach. Preliminary results show changes to community composition both spatially and temporally, and that sample type (i.e. water versus sediment) represents a small, but significant proportion of the variance in beta diversity across all markers (R2 = 6.56% - 17.78%). This presentation will discuss the observed differences in biodiversity between sites over the course of a year, effect of sample type on beta diversity, and whether eDNA metabarcoding can be used to assess temporal shifts in species-use at a particular site or habitat area. We will conclude our talk discussing our plan for incorporating these data to develop a framework for regularly monitoring biological characteristics in fulfillment of our NPDES permit.

Innovative AD Recycle Yields More Gas, Less H2S, Struvite, Nutrients

9/10/2024, 10:45 AM - 11:15 AM

Speaker(s): Matthew Williams

While popular as a source of renewable energy, traditional Anaerobic Digestion (AD) processes can create undesirable challenges at WWRFs. These problems increase chemical and energy costs and create many operational challenges.

By adding an Acid Digester before and an Aerobic Reactor after AD, some significant improvements in plant, digester and dewatering performance can be realized. These proven processes are well-established but, when they are used in concert with an innovative recycle loop, the solids process is enhanced in many ways while providing nutrient control to benefit the liquid stream. The denitrification step inhibits H2S and Struvite Production and produces more and cleaner gas, reduces odor and ensures robust digester performance. This can be accomplished without addition of FeCl, adding further savings and optimization.

The Better Cake - Enhancing Digestion with THP to Achieve a Desirable End Product

9/10/2024, 10:45 AM - 11:15 AM

Speaker(s): Andrew Christy

To date, Cambi THP has 31 years of combined operational experience in the US, with 7 plants in service and 7 more on the way. Facilities with Cambi THP in operation are seeing their annual biosolids costs decrease by over 50% due to improved dewaterability, higher VSR, and the creation of a desirable Class A material. This presentation will focus on how THP can help utilities upgrade their digestion process to create a desirable biosolids product which can open up land bank, generate additional beneficial reuse opportunities, and reduce biosolids hauling costs. Case studies from existing facilities will to showcased to provide real world examples of how this can be accomplished.

Restored Wetland Irrigation as a New Beneficial Use for Reuse in Oregon: Thomas Dairy as a Case Study

9/10/2024, 11:15 AM - 11:45 AM

Speaker(s): Jared Kinnear; Blythe Layton; Scott Mansell

Reuse is a key component of meeting the water quality challenges of the future for many wastewater utilities. However, in parts of Oregon, traditional demands for reuse water, such as crop irrigation, landscape irrigation, and industrial reuse are not feasible. In these areas, other forms of reuse

are needed, but are not yet currently available. One of these is restoring wetland hydrology of impaired wetlands using reuse water for irrigation. Many jurisdictional wetlands in Oregon have been impacted for decades by agriculture and development which has cut off their traditional sources of flow. To

restore these areas back to functioning wetlands, a reliable source of flow is needed. Class A reuse water can potentially fill that need while providing a novel avenue to reduce thermal and pollutant loads on receiving waterbodies from effluent, but it is not currently recognized as a beneficial use for reuse water in Oregon. Since 2021, Clean Water Services, in agreement with DEQ, has been applying Class A reuse as dry season irrigation to restore an impaired urban wetland (Thomas Dairy) near the Tualatin River and closely studying the effects of the application on the soils, groundwater, and vegetation in the wetland. These research studies include continuous sensing of soils and groundwater, observing any effects of irrigation on the microbial community, monitoring PFAS and tracers in soil and groundwater, testing for AMR genes and microbes, and many more. In this talk, CWS will discuss the research studies occurring at Thomas Dairy, what has been learned regarding the effects of irrigation on restored wetlands, and how this information is being used with DEQ to establish native wetland irrigation as a beneficial use in Oregon.

Frankenstein Chaos Creations – Commissioning & Operational Lessons Learned from Modifying "Standard" Vendor Equipment Package Systems

9/10/2024, 11:15 AM - 11:45 AM

Speaker(s): Kiersten Lee, P.E., PMP

The purpose of this presentation is to share lessons learned from modifying a vendor equipment package to meet specification… and the chaos that ensues.

It starts innocently enough, during the design an engineer, owner or operator suggests adding a switch here, or an interlock there, not understanding these small "improvements" could result in major modifications for the respective vendor equipment package. How does this happen?

Vendor equipment packages are comprised of valves, instrumentation, pumps etc., typically made by other manufacturers. How the vendor package operates relies on the standard functionality of the equipment. However, if the project specifications require functionality that is not included in their "standard" design, for example position feedback on a modulating valve, then the vendor must source a new actuator for the system. Why does this matter?

The new actuator might provide all the specified functionality, but the reliability, material compatibility, troubleshooting ease or long-term operation may be significantly different. As the system is commissioned and put into normal operation these system modifications can result in serious project delays or system failures. Prove it…

A case study this presentation will highlight are system modifications to a "standard" waste gas flare vendor equipment package. For example, the specification required position feedback on a modulating actuator, causing the vendor to source a different actuator than their "standard" to meet specification. During commissioning the actuator had multiple issues causing schedule delays and within 6-months of operation failed rendering the waste gas flare inoperable. Ultimately, the Owner decided system reliability was more important and the actuators were replaced with the manufacturer's "standard". How can we avoid this?

This presentation will provide a series of case studies, where MWH served as the general contractor and the Commissioning Manager. Each case study will capture a vendor package "standard" that was modified to meet specifications and resulted in significant commissioning and operational challenges post installation. The purpose of this presentation is to share lessons learned, help all project stakeholders better understand when a system modification brings value or may result in chaos and the questions we should be asking during the submittal process.

Internally Stored Carbon for resilient Enhanced Biological Phosphorus Removal with efficient Biological Nutrient Removal

9/10/2024, 11:15 AM - 11:45 AM

Speaker(s): Edward Black

Enhanced biological phosphorus removal (EBPR) is an engineered process that can be employed to sustainably recover phosphorus from dilute wastewater solutions. While EBPR is operated quite successfully, process upsets occur. In considering potential sources of EBPR instability, the effects of the requisite anaerobic zone are at the top of the list. Exposing mixed liquor to anaerobic conditions initiates critical EBPR metabolic responses, including storing/cycling internally stored carbon (ISC – polyhydroxyalkanoates (PHA) and glycogen). However, engineering design guidance for the anaerobic zone remains generic at best with most being rules of thumb that do not explicitly incorporate influent wastewater characteristics such as volatile fatty acids (VFAs) concentration or the carbon fraction/form [i.e., guidance principally centers on minimum hydraulic or solids

residence time]. VFAs play a pivotal role in EBPR where anaerobically phosphorus accumulating organisms uptake and store VFAs as PHA, which kickstarts the EBPR process. The fraction or form of carbon is also important. Some waste streams have little to no VFAs, increasing EBPR instability; to supplement VFAs side stream fermentation is used to convert slowly biodegradable carbon from primary solids and produce the necessary VFAs. Instead of increasing the treatment plant's footprint with fermenters, longer EBPR anaerobic hydraulic retention times could be used to achieve in-line fermentation of the slowly biodegradable carbon fraction. This could allow more PHA to be accumulated, which could help stabilize EPBR. Additionally, the PHA could be utilized aerobically to produce more glycogen that could then be used in a post anoxic environment to denitrify. Having the culture accumulate carbon anaerobically that can be used post anoxically would increase efficiency of BNR and reduce or eliminate extracellular carbon addition. To elucidate these hypotheses, batch testing was conducted using sludge from multiple EBPR systems. Experimental factors included anaerobic HRT, sludge source, carbon substrate (raw wastewater, rbCOD rich, and sbCOD rich), and initial ISC concentration. Results from this research will be presented and discussed, with a focus on batch testing results and the effects of ISC accumulation, AN HRT, forms of substrate uptake and fermentation, and denitrification on ISC. Investigations employed molecular-level methods coupled with conventional water chemistry data.

Pump or Treat? Decision-making based on utility values

9/10/2024, 11:15 AM - 11:45 AM

Speaker(s): Dana Devin-Clarke, P.E.;Samantha Salvia, P.E.

Municipalities are increasingly looking further than capital costs for making project decisions. They need to replace aging infrastructure while also safely and reliably providing services in full regulatory compliance, protecting and enhancing the environment, improving climate and seismic resiliency, providing equitable community benefits and maintaining safe operations and maintenance (O&M) conditions for staff.

Portland's Bureau of Environmental Services (BES) is implementing a new integrated planning process intended to develop long-term solutions that create environmental, community, and system benefits.

BES has identified developing a long-term solution for the Inverness System as one of its highest priorities. The major components of the Inverness System, a 22 MGD pump station and approximately 9 miles of 36" force main, are nearing the end of their useful life and are at risk of failure. The Inverness system serves some of the City's most vulnerable population and is adjacent to the environmentally sensitive Columbia Slough. The 11,000-acre service area represents 12% of the City of Portland and is the 3rd largest of all non-CSO pump stations operated by BES. Portions of the Inverness system are also in a highly vulnerable location with respect to seismic effects. This new planning approach was applied to evaluate long-term solutions for replacing the Inverness System.

In this presentation, we'll share the planning process that BES is utilizing. We'll describe how workshops with multi-departmental teams established levels of service, initial concepts for alternatives, and decision criteria. We'll share challenges in advancing planning decisions in a large, consensus-driven organization.

The planning approach utilized a multiple criteria decision analysis (MCDA) method that merges quantitative and qualitative criteria into a weighting and ranking system that is repeatable and transparent. This approach helped minimize schedule impacts and avoid difficulties in monetizing all decision-making criteria (e.g. equity, resilience, environmental health). Representatives from O&M, Engineering, Planning, and Regulatory worked together to evaluate the alternatives. The MCDA method helped advance discussions among these groups that had initial preferences around alternatives by focusing on tradeoffs and meaningful differences among options. Results of this planning analysis are enabling BES to make an informed decisions across workgroups based on BES goals.

Tetrad Discovery by Microscopic Analysis at the RPWRF, City of Spokane, Washington

9/10/2024, 11:15 AM - 11:45 AM

Speaker(s): Joni Meyer

The Riverside Park Water Reclamation Facility, "RPWRF" in Spokane, Washington began full time next-level treatment via its newly built microfiltration membrane facility in February 2022. After a series of weather events in late December 2022 through early January 2023, observations were made by plant personnel that something happening in the system was affecting the appearance of the clarifiers and causing atypically high laboratory results. Clarifiers appeared green, opaque, and filmy while composite samples from middle steps of the treatment process displayed high results in settability, total suspended solids, biochemical oxygen demand, phosphorus, and most noticeably nitrite, suggesting that stress to the system was impacting nitrification and other removal efficiencies. Investigations began to determine the potential cause(s) of these issues and to ensure continuing compliance with RPWRF's NPDES permit. Bright-field microscopic examination was performed on numerous samples from different points in the treatment process over a three-week period, revealing a preponderance of grid-like structures in many of the samples. Through combined efforts of experimentation, investigation, research, and outreach to other members of the local wastewater community, the grid-like structures were determined to be tetrads, a subgroup of cyanobacteria. Prior to microfiltration, RPWRF was not able to remove tetrads during the treatment process. RPWRF discovered not only that the membrane filter was able to trap them, but also that the routine rinsing of the membrane filter was unintentionally refeeding them back into the system via the backwash return, "BWR". A combination of factors, including the tetrad-laden BWR feeding into headworks, high MCRT, and weather events around that time created an environment for tetrads to flourish throughout the system while simultaneously stressing the microorganisms essential to treatment and encouraging the growth of filamentous bacteria. With this discovery, RPWRF was able to conclude that the problem was internal to the system and began adding bleach to the BWR tank and secondary clarifiers to restore balance by addressing the abundance of tetrads. Microscopic evaluation was essential in determining the source, spread, and behavior of the tetrads so that measures could be taken to monitor and address the emergence and proliferation of tetrads going forward.

The Great Bug Migration: Keeping Them Happy and Healthy from Washington DC to a new Digester Home in Dallas - Thermal Hydrolysis Anaerobic Digester Seeding

9/10/2024, 11:15 AM - 11:45 AM

Speaker(s): Esther Nadarajan, PE

The Trinity River Authority (TRA) undertook construction on a major solids management upgrade to the Central Regional Wastewater System (CRWS) in Dallas, TX in 2017. The first phase of the Project culminated in the seeding and commissioning and startup (C&SU) of three new 2.7 million gallon (MG) anaerobic digesters, thermal hydrolysis process (THP), pre-dewatering centrifuges, and other ancillary systems. This presentation will focus on the specifics of commissioning the digesters, specifically the hauling of 961yd3 hydrolyzed dewatered cake from Blue Plains Advanced Wastewater Treatment Plant (AWTP) in Washington DC that was trucked to Dallas and re-hydrated to seed the first digester over the course of our 10-day seeding activity.

These 3 new digesters are the largest digesters in the country to be seeded by re-hydrating anaerobically digested hydrolyzed cake instead of converting conventional anaerobically digested sludge from another facility. As the Contractor and Commissioning Manager, MWH planned and executed an entire temporary facility to offload the cake, re-hydrate it, heat it, add alkalinity, sample the slurry, and then pump it into the Digester. This facility included temporary concrete pads, frack tanks, pumps, piping, valving, and heating to maintain schedule and the viability of the microbial population during the entire activity.

This presentation will outline the planning and preparation steps that were critical to the seeding success as well outlining the process and implementation of the plans. It will review the means and methods, and review critical lessons learned throughout the process.

Unveiling the Science of Polymer Activation: Best Practices for Performance

9/10/2024, 11:15 AM - 11:45 AM

Speaker(s): Haley Goddard

The optimization of polymer use in water and wastewater treatment processes remains a challenge, leading to high recurring expenses and sub-optimal process performance. This presentation emphasizes the critical role of polymer activation and its direct impact on process efficiency. By selecting suitable polymer and employing appropriate mixing technologies, polymer activation can reduce polymer usage and enhance the downstream separation process, resulting in improved overall performance and substantial annual cost savings.

Idaho Recycled Water Panel

9/10/2024, 01:30 PM - 02:30 PM

Speaker(s): Royce Davis; Joe Payne; Tom Points

Idaho remains one of the fastest growing states in the United States with 78 percent of the population growth attributed to migration. The influx of people in recent years has given growth to community development and urban sprawl within Idaho’s communities. The expansion of these Idahoan communities has created the need for additional water supplies to meet demand. Additionally, community expansion has caused existing wastewater treatment plants to reevaluate

discharge options for their treated water due to permit limits. In view of these two factors coupled with an increasing drive towards sustainability, Idahoans are increasingly turning to reclaimed water as a means of solving these growth and permit related issues. This Idaho Panel discussion will focus on unique drivers relevant to the Gem State and how water reuse strategies are being implemented now to solve both current and future challenges.

Coatings, Concrete, & Sludge. A Digester Renewal Story

9/10/2024, 01:30 PM - 02:00 PM

Speaker(s): Frederick Tack, PE, BC.WRE, ENV SP

The renewal of wastewater treatment infrastructure is an ongoing investment, with continual planning effort across the industry. Each wastewater treatment plant and unit process is unique, and requires a specific and holistic approach with the efforts to renew, and optimize.

Sludge digestion structures and processes may be some of the most demanding portions of infrastructure, having anaerobic conditions, a variety of pumping, mixing, and mechanical equipment, generates highly corrosive atmospheres and inherently potentially explosive conditions.

These facilities require unique approached to concrete restoration, protective coatings, improved operational and maintenance conditions, safety improvements, and process improvements, in addition to the implementation of sustainable initiatives, such as renewal natural gas capture and use, energy reduction, co-digestion, and the need for redundancy.

This presentation will provide real world insights relating to digester renewal and rehabilitation of over a dozen large anerobic digesters across the western US, ranging from <1 MGD facilities to 200+ MGD facilities.

Learning outcomes for the audience will include a greater comprehension of the approach to foundational infrastructure renewal and repair, coating selection and application, design considerations, construction oversights, and will focus on what operators and managers need to know as they plan and deliver such improvements.

Connection Through Demonstration: City of Boise's Advanced Water Treatment Pilot

9/10/2024, 01:30 PM - 02:00 PM

Speaker(s): DeAnn Brown;Abby Haydin

The City of Boise is pilot-testing new water recycling technology. The Advanced Water Treatment Pilot serves as a demonstration for the community, stakeholders, and regulators to ensure the technology is cleaning our water to meet expectations. This presentation will showcase using pilot demonstrations for community engagement and education.

Cultivate skills for building trust in water recycling through demonstration projects. Develop the ability to translate complex technical information into easily digestible content for residents using visual and tactile demonstrations. Build techniques for enhancing public acceptance and trust in

water recycling through a range of communication channels. Gain skills required to connect with key stakeholders to advance the implementation of water recycling initiatives within their communities.

Innovation Below the Surface: The Success of Retrievable Aeration Grids in Municipal Wastewater Treatment

9/10/2024, 01:30 PM - 02:00 PM

Speaker(s): McKenna Pearson;Ben Miller

The City of Fruita operates a Wastewater Reclamation Facility (WWRF) rated for 2.3 MGD which came online in 2012. During and following the 2020 pandemic, the City saw unprecedented growth. Historically, WWRF average flows ranged around 30% of overall design capacity, allowing facility staff to operate a single aeration basin. The rapid growth will require the WWRF to operate both of their oxidation ditches within the next 3 to 5 years, limiting their ability to address aeration grid maintenance

The oxidation ditches were originally equipped with fine-bubble membrane diffusers fixed to the floor of the basin. The only way to maintain the original diffusers was to take one basin out of service, alternating on a yearly basis. The City requested that Tetra Tech find a solution for repairing their aeration grids when they inevitably have to bring both of their ditches online.

Retrievable aeration grids were identified as a viable solution to add flexibility and access for the Fruita WRRF. These retrievable grids are able to be lifted from the full basins and maintained without taking the oxidation ditch out of service. The City decided to proceed with replacement of their existing grids with a retrievable system in 2023.

This project was delivered using the Construction Manager at Risk (CMAR) approach who started providing construction services at the 60% level. CMAR's collaborative nature allowed for value engineering and design coordination to make the best use out of existing infrastructure. The resulting schedule and cost efficiencies of this collaboration greatly contributed to the project's success.

This presentation will focus on how the City was able to extend the up-time reliability of the oxidation ditches and delay a larger, more expensive capital improvement project by enabling maintenance of the aeration grids without the need to take the oxidation ditch out of service. The case study will also investigate the specific vendor coordination intricacies associated with a generally unusual approach. Finally, the presentation will provide insight into the successful implementation of alternative delivery.

Leveraging Collaborative Delivery Today for a Resilient Tomorrow

9/10/2024, 01:30 PM - 02:30 PM

Speaker(s): Shelby Smith;Guy Voss;Nick Martin;Michelle Green; Michael Neher

The water and wastewater industry are challenged with delivering critical capital projects faster, within tight budget constraints, utilizing lean organizations, in light of market uncertainty, and in

some cases, with stringent regulatory requirements and/or political and social scrutiny. The notion of using collaborative delivery methods such as progressive design-build (PDB) and construction manager at-risk (CMAR) or general contractor/construction manager (GC/CM), instead of traditional design-bid-build, can seem foreign and daunting to those who have not used these collaborative methods before. However, the growing utilization of collaborative delivery in the water sector is a testament to its success and efficacy. This panel discussion will showcase that collaborative spirit via a facilitated dialogue that will include you, the audience. You will hear PNW-based perspectives from a municipal owner, program manager/owner advisor, consulting engineer and contractor/design-builder regarding the best practices, benefits, challenges, and lessons learned when planning for, publicly procuring, and implementing a collaborative delivery contract. Each panel member has recently completed or is currently participating in a project utilizing a collaborative project delivery method. The panelists will share how they leveraged the core principles of collaboration, innovation, and transparency at various points in the project delivery life cycle to optimize project outcomes.

My Digester is Full and Mixing Pump Suction Valve is Stuck – Here is What We Did

9/10/2024, 01:30 PM - 02:00 PM

Speaker(s): Nick Martin;John Koch

Catastrophes typically strike at the end of the week, and this was no exception. At the Central Kitsap WWTP, the 3-way suction isolation valves on the digester mixing pumps, which allow flexibility to mix either digester with either mixing pump, had been difficult to operate. The east valve was now stuck partially open. Digester temperatures were dropping as operations sounded the alarm of potentially losing the digestion process in the eastern digester. Maintenance personnel also noted that the same valve on the western digester was difficult to operate.

On Friday afternoon, the wheels were set in motion to find a solution to get the valve to function or a method to replace it. Luckily, the plant had two 16-inch 3-way plug valves in their warehouse from a previous project where the cost to dewater the site outweighed the benefits of replacing the valves (given that the County planned to have new digesters operational in the next 3 years). Staff scrambled over the weekend to cull through workable solutions for isolating the digester without having to empty and haul its contents to landfill. Drawing the digester down presented two problems given the high groundwater:

1. A dewatering contractor would need to install wells would and then have a place to dispose of the water.

2. Hauled waste (septage, FOG and offsite biosolids), which comprises only 1% of the liquids entering the plant, but a staggering 40% of the solids fed to the digester, would need to find another disposal location - a very unpopular scenario both operationally and politically.

A site visit Monday morning revealed there was 12 inches of pipe between the digester wall and the 3-way valve flange. Over the weekend, staff had considered PeteStop® as a line stop to isolate the digester without drawing it down to allow for the valve replacement. By Thursday, an installation contractor was on-site and confirmed PeteStop® was a viable option.

This presentation will cover the challenges of handling this crisis, working through a solution, keeping the plant operational and in compliance, and performing the valve replacement.

Threat Mapping To Aide In Cyber Risk Prioritization

9/10/2024, 01:30 PM - 02:00 PM

Speaker(s): David Brearley

Utilities are challenged by competing demands impacting constrained budgets and limited workforce. Dependency on technology to support operations further complicates the balance through the addition of cybersecurity as a competing demand. Cybersecurity is similar to all other utility risks; a utility can mitigate the risk to acceptable levels or accept the potential consequence related to an incident.

Cybersecurity is an emerging risk which may not be fully understood by the utility and detailed cybersecurity risk assessment can be both complex and expensive. Detailed assessments require a complete inventory of all software, firmware, and hardware (PLCs, PCs, Servers, Firewalls, Virtual Machines, etc.) as well as a comprehensive diagram of all network traffic data flows, protocols, ports, services, remote access connections, VLANs, etc. This kind of documentation rarely exists already and is even more rarely up-to-date. Given these challenges how can a utility effectively plan for cybersecurity costs, mitigations, and impact to staffing?

This presentation is focused on assisting Water and Wastewater utilities in using threat mapping exercises in planning for risk reduction in a phased approach aligned to financial capability, staff capability and the utility's unique risk tolerance. The key is in understanding the ranked business ROI of the needed mitigation and documentation deliverables that "actually" reduce risk. We will utilize threat mapping methodologies to demonstrate defense in depth concepts that have been utilized by peer utilities for successful reduction in risks and planning / training techniques for when an event occurs.

A Comparison of Interventions, Order of Magnitude Costs and Co-benefits for Reducing Nitrogen Pollution to the Puget Sound

9/10/2024, 01:30 PM - 02:30 PM

Speaker(s): Tony Orlando; Dustin Atchison;Jacque Klug;David Primozich

Puget Sound does not meet the Marine Water Quality Standards for dissolved oxygen due to naturally low dissolved oxygen concentrations and anthropogenic loading from point and watershed sources. Costs for upgrades and optimization at wastewater treatment plants (WWTP) to remove nitrogen will cost billions of dollars in capital and operating budgets. This presentation reviews agricultural, stormwater and wastewater nitrogen control interventions and provides a comparison of costs expressed as dollars per pound of total inorganic nitrogen (TIN) removed, as well as identified co-benefits of the interventions.

Established wastewater intervention technologies were selected based on technical applicability in the Pacific Northwest, cost effectiveness, data availability and their ability to achieve year-round TIN reductions to 8mg/L, or seasonal reduction to 3 mg/L. Costs for these technologies are grouped according to plant capacity. Similarly, stormwater interventions were selected based on local applicability and the cost and performance data available. Potential modifications to current best

management practices (BMPs) to enhance nitrogen removal are suggested. Agricultural interventions were selected in consultation with local agricultural and dairy experts and as livestock operations account for a considerable percentage of agricultural land in western Washington, the selected interventions focus on livestock and manure management. A summary of the co-benefits as well as the assumptions and limitations of the data will be provided.

Identifying regionally specific WWTP point source, stormwater and nonpoint agricultural interventions and each intervention's cost-benefit profile is a foundational step toward developing a comprehensive nutrient management strategy for Puget Sound. The information presented to support stakeholders in developing integrated county- or region-wide nitrogen control strategies and assess potential costs and expected performance in their efforts to produce the best water quality outcomes for Puget Sound.

On-Site Sodium Hypochlorite Generation: A Safe and Cost-Effective Solution for Disinfection

9/10/2024, 01:30 PM - 02:00 PM

Speaker(s): Haley Goddard

The adoption of on-site hypochlorite generation (OSHG) systems for disinfection has experienced significant growth in recent years, driven by safety concerns associated with chlorine gas usage in water and wastewater utilities. However, recent disruptions in the supply chain and rising costs of bulk 12.5% sodium hypochlorite have further accelerated the adoption of OSHG systems for economic reasons. This presentation highlights the economic advantages of OSHG, including excellent return on investment, better cost control, and enhanced operational planning for utilities. By utilizing safe and readily available raw materials such as electricity and salt, OSHG systems offer consistent operating costs over time, in contrast to the unpredictable cost of bleach deliveries.

Assured Water Supply Implementation for a Resilient Tomorrow: A Case Study of Boise

9/10/2024, 02:00 PM - 02:30 PM

Speaker(s): Eric Dodds;Robin Lee-Beusan

The City of Boise, host City of the PNCWA 2024 Annual Conference, and the largest City in Idaho, continues its innovative climate action path toward resiliency, a key theme for the conference. Boise has a vision to balance urban growth with responsible water management. As part of this commitment, Boise recently adopted a modern zoning code that integrates water supply considerations into development planning. This abstract explores how Boise's forward-thinking approach aims to secure a resilient water future while accommodating growth.

Background

Water availability is a critical factor in shaping Boise's urban landscape. With continued population growth and development pressures, the city sought a solution to ensure an assured water supply for current and future water customers. Incorporating water supply requirements into the Boise zoning code requires those who provide water within the city to demonstrate an assured water supply. In recognition that private water companies provide most of the drinking water to City

residents and businesses, Boise developed a comprehensive implementation guide for demonstrating assured water supply. Although assured water supply requirements exist in other parts of the country, the implementation guide is the first of its kind in the State of Idaho.

Key Elements

1. Modern Zoning Code Integration: Boise's new zoning code seamlessly incorporates water supply considerations. By aligning development guidelines with water availability, the city aims to strike a delicate balance between development aspirations and responsible water supply management.

2. Designated Water Providers: The implementation guide outlines a framework for collaboration between Boise and Designated Water Providers (DWPs) and delineates the roles and responsibilities of these providers in ensuring a reliable water supply within their service areas.

3. Application Options: The guide presents three distinct Assured Water Supply (AWS) application pathways:

a. Application A: For DWP service areas.

b. Application B: For development projects seeking AWS within a DWP's jurisdiction.

c. Application C: For on-site water systems or wells.

4. Demonstration of Assured Water Supply: The application forms require DWPs and applicants to address:

a. Basic information: Applicant information, service area, and water demand analysis.

b. Physical and legal water availability: Analyzing reasonable population projections within the existing service area.

c. Continuous water availability: Ensuring water availability over time.

d. Adequate delivery and quality: Providing reliable delivery and maintaining water quality.

e. Compliance with state groundwater management district standards.

5. Progress Update: The implementation date for the AWS requirement is July 2024. A progress report will be included in the presentation at the PNCWA 2024 Annual Conference.

Conclusion

Boise's Assured Water Supply Implementation Guide represents a pivotal step toward a resilient and water-wise future. By integrating water supply considerations into its zoning code, Boise demonstrates its commitment to sustainable development and a resilient future. As Boise navigates growth, it does so with a clear vision: to build a thriving community while safeguarding its precious resources and ensuring that growth does not exceed available water supply.

Benefits of Hydrocyclones for WRRF Performance: Better Settling, Improved Nitrification… and Reduced E. coli?!

9/10/2024, 02:00 PM - 02:30 PM

Speaker(s): Jenny Strehler;Samir Mathur

The aerobic granular sludge activated sludge process using batch reactors has received attention for the potential it offers to intensify activated sludge. Intensification allows WRRFs to improve effluent quality with a smaller footprint. Alternate technologies like hydrocyclones have become commercially available, which help to retain faster settling particles while the slower-settling particles are wasted out of the system. This type of technology can be more easily incorporated into plug flow reactors. At some plug flow facilities that have both hydrocyclones and unaerated high food-to-microorganism (F/M) selector zones, a relatively high fraction of the activated sludge can become granules producing a “densified sludge”.

In 2020, the City of Wichita installed a four-cyclone skid (180 gpm of return activated sludge [RAS]) on one of six nitrifying activated sludge trains at the Plant 2 WRRF (rated 54 million gallons per day [mgd]). The benefits to settleability through reductions in the sludge volume index (SVI) of the mixed liquor and improved water clarity in the test basin was observed. The SVI in the main basins averaged 120 mL/g compared to 91 mL/g in the hydrocyclone pilot basin. The City has started sampling E. coli in its secondary effluent prior to ultraviolet (UV) disinfection. Initial sampling has indicated about a 0.5-log reduction in E. coli counts in the hydrocyclone train compared to the non-cyclone trains.

Current biological nutrient removal (BNR) improvements project at the Plant 2 will incorporate a full-scale hydrocyclone system. This presentation will present the design criteria and layout of the new hydrocyclone facility and BNR facilities, a 5-stage Bardenpho process with high F/M selector zones and 19 cyclones for sludge wasting. Design considerations for the ancillary support facilities will also be presented, including a cyclone feed sludge (RAS) pumping, discharge of the cyclone underflow into the selector zones of the BNR process, and overflow as waste activated sludge (WAS).

With many utilities facing addition of nutrient limits in the next one to two permit cycles, the approach provided in this presentation will help these utilities to save capital dollars on their improvement projects.

Making Sense of the Scatter: A Comparison of Traditional and Machine Learning Models for Predicting Primary Clarifier

9/10/2024, 02:00 PM - 02:30 PM

Speaker(s): Nick Guho

As the first treatment process at many water resource recovery facilities (WRRFs), primary clarifiers (PCs) have a significant impact on subsequent solids and liquid treatment processes. Conventional PC solids and organic removal can be substantial—typically 50–70% of the influent TSS and 25–40% of the BOD or COD are removed. It is also common for these removals to be highly variable. This variability poses a significant challenge for predicting the performance of both new and existing PCs.

Numerous models have been developed relating PC performance to influent and PC operating variables. These models range from simple steady-state empirical relationships to more complex systems of differential equations. Empirical relationships are more often used in practice. Once fitted to historical or bench testing data, these models can estimate PC performance over a range of operating conditions. PC performance variability, however, often results in fitted parameters with high uncertainty. The empirical models to date have also employed a diverse array of mathematical

relationships. While these models can be calibrated to yield similar predictions over subregions of the operating space, predictions will often diverge outside these regions.

Machine learning (ML) models provide a means of estimating PC performance that can address the uncertainty and structural concerns with empirical models. Artificial neural networks (ANNs), for example, have been used successfully by several researchers to estimate PC TSS and COD removal. ML models fit historical data better than empirical models in these works; however, each was limited to one facility and empirical model. A more general comparison between ML and empirical models for multiple data sets would shed light on the strengths and weakness of each in PC performance modeling.

In this work, traditional empirical models as well as more general ML models were applied to PC operating data from three full-scale facilities. The ML models generally provided better fits to test historical data when sufficient observations were available for training. With less available data, empirical models provided competitive and, in some cases, better representations of the data. Taken together, these results suggest that ML and empirical models are both valuable tools in modeling PC performance.

Peracetic Acid and Biological Oxygen Demand in Wastewater

9/10/2024, 02:00 PM - 02:30 PM

Speaker(s): Jacquelyn Wilson

The presentation will focus on the use of Peracetic Acid (PAA) as a disinfecting agent in water and wastewater. It will explain why PAA causes minimal biological oxygen demand (BOD) increases in wastewater effluent. Additionally, it will showcase its effectiveness as a green "next generation" treatment option because it does not produce harmful byproducts or require a neutralizing agent to make water safe for discharge. The presentation will also highlight the results of field trials conducted at a large treatment plant in Tennessee, which demonstrated negligible increases in BOD. Moreover, the presentation will discuss the possible challenges faced by facilities with consistently high BOD levels. And it will underscore the reasons why PAA is a suitable choice for wastewater treatment due to its effective disinfection, lack of byproduct formation, cost-effectiveness, and simple installation process.

Tucson Water’s Reclaimed Water Program: Serving Tucson for 40 years

9/10/2024, 03:00 PM - 03:30 PM

Speaker(s): John Kmiec

The City of Tucson is located in the northern semi-arid reaches of the Sonoran Desert in eastern Pima County, Arizona. Until the early 1990s, the Tucson community relied almost exclusively on pumped groundwater to meet water demand, but, due to rapid growth in population and associated water demand following World War II, the groundwater system transitioned from an approximate state of equilibrium to one of accelerating depletion. Reclaimed effluent is a renewable water supply that Tucson Water has come to rely upon to help meet the community's need for a sustainable water supply, and Tucson Water runs one of the oldest large, distributed reclaimed

water systems in the country. This presentation will chronicle the history and array of infrastructure of the Tucson Reclaimed Water System through the last forty years. A discussion of the future of recycled water in Tucson will also be presented as the utility prepares for the diversification in the economy of southern Arizona that will necessitate the flexible utilization of the current infrastructure with the opportunity for expansion and advancements in quality.

Combining Metabolic, Kinetic, and Physical Selection to Achieve Full-Scale Continuous Flow Densified Activated Sludge and Nutrient Removal at Robert W. Hite Treatment Facility

9/10/2024, 03:00 PM - 03:30 PM

Speaker(s): Anna Scopp;Rudy Maltos

Metro Water Recovery's (Metro) Robert W. Hite Treatment Facility (Hite) in Denver, CO is permitted for a maximum month flow of 220 mgd and has two parallel liquids treatment trains including the North Secondary (NSEC). The NSEC utilizes a modified Ludzack Ettinger (MLE) process with a sidestream anaerobic reactor (SAR) for nutrient removal. Recognizing the need for increased aSRT to meet future nutrient regulations, Metro commissioned a full-scale demonstration train (NAB2) with an isolated aeration basin and secondary clarifier to pilot densified activated sludge (DAS). This study presents findings from NAB2 piloting and discusses how Metro is translating DAS into a full-scale solution at Hite.

Throughout pilot operation, Metro tested various physical, metabolic, and kinetic selector approaches within NAB2 against a "control" train lacking such selection. The following methodologies were routinely employed for DAS evaluation:

Particle size distribution (PSD) of MLSS, hydrocyclone underflow (UF), and hydrocyclone overflow (OF).

Settling column testing of bulk ML and particle size fractions determined Vesilind equation settling coefficients (V0 and k).

Activity testing evaluated nutrient removal rates of bulk ML and particle fractions.

Hydrocyclone underflow nozzle size testing evaluated mass flow and particle retention.

Data from NAB2 testing were used to develop optimization strategies for full-scale operation and to develop process models in BioWinTM and computational fluid dynamics (CFD) models for capacity assessment.

PSD and SVI data suggest improved settleability when the mass fraction of granules (particles >212 um) in the sludge exceeds 15%, as also indicated by settling testing. Larger particle fractions had lower denitrification and nitrification rates while Bio-P was highest in particles greater than 200um. Results indicate that minimizing particles >600um may optimize nitrification/denitrification/Bio-P while achieving superior settling and compressibility. Nozzle testing suggests that reducing nozzle size decreases mass flow, offering a strategy to maintain target PSD. Lastly, stress testing data demonstrates the pilot clarifier's capability to pass high flows and loads while maintaining stable effluent quality. Data collected in this study informed process modeling, which indicates that DAS could allow Metro to successfully treat future flows without investing in additional aeration basins or secondary clarifiers, offering savings exceeding $50 million dollars.

Creating the Foundations of Digital Maturity Through a Data Management Master Plan

9/10/2024, 03:00 PM - 03:30 PM

Speaker(s): Adrienne Menniti;Ben Stanford

Clean Water Services (CWS) is a water resources management utility that serves more than 600,000 customers in Washington County, Oregon. As with many utilities, CWS generates a large amount of data from a range of sources but struggles to integrate those data sources. The current data systems create inefficiencies in accomplishing routine data-driven decisioning making tasks. To address these challenges, CWS initiated a data management master plan project with the goal to improve data access for evaluation, make more informed decisions and document those evaluations and decisions. This project will also lay foundations for the adoption of future analytical advancements such as digital twin or artificial intelligence systems.

The objectives of the project are to assess the current state of data management at CWS, to create a vision for what the future state of data access and management would look like, and to identify the data needs and priorities of different business units and stakeholders. The ultimate outcome is to develop an implementation plan that will outline software, hardware, integration and staffing requirements for expected digital investments and the expected timeline of those investments. It will also identify where coordination is required with enterprise data architecture, data governance and cyber security.

The project is taking a phased approach, with the first phase focused on defining the current and future needs of workgroups from treatment facility, pump station and conveyance operations and engineering. Phase 1 has a six-month schedule and kicked off in March 2024. Future phases will expand the needs analysis to other workgroups and create the detailed utility-wide implementation plan. This presentation will describe the approach taken for first phase, discuss the intermediate outcomes and lessons learned, and summarize the future directions and the next steps.

Forging Operational Resilience: Measuring O&M Success and Adaptation In The Climate Change Era

9/10/2024, 03:00 PM - 03:30 PM

Speaker(s): Ray Brown

Introduction

Drainage and wastewater operations & maintenance teams are wrestling with complex and growing pressures, including human resources, and staffing issues, dated processes and technologies, and increased public relations expectations. Simultaneously, our teams are being directly impacted by changing weather patterns from climate change and increasing demands on services from the communities we serve. Accomplishing work in the field is becoming increasingly more difficult and complex.

This presentation will briefly share survey data about Seattle Public Utilities frontline staff's experience with changing rainfall patterns and increasing demands on our services. It will also highlight how selected human resources and staffing, dated processes and technology, and public relations issues are making maintenance accomplishment increasingly challenging.

The bulk of the presentation will focus on how a service-oriented mindset and culture of continuous improvement contributed to several specific workforce efficiencies in 2023, despite this complex context. Those complexities include how Seattle Public Utilities DWW System Maintenance Division, has experienced increases of 20.5% in completed work order hours and an increase of 25% in urgent / emergency work orders between 2020 – 2023, compared to a similar time frame from 2016 - 2019. Between 2022 and 2023, the System Maintenance Division also documented significant improvements in average hours per completed work order, planned work order completion, and hours per mile of pipe cleaned and pipe CCTV'd.

The presentation will conclude with a discussion of if/how these results can be replicated or improved upon, and how metrics-focused approaches need to be contextualized with safety, human resources and staffing, and other pressures.

About The Presenter

Ray Brown is Seattle Public Utilities' Drainage & Wastewater System Maintenance Division Director. He directs the operation, maintenance, repair and rehabilitation of Seattle's stormwater and wastewater system. He is responsible to a team of 140+ employees who are represented by 4 different labor unions, and perform both scheduled, reactive, and emergency maintenance activities. Ray has extensive experience in the areas of asset management, planning & scheduling, and operations & maintenance activities in the water and drainage & wastewater utility industries.

Location of each Presenter (City, State/Province, Country)

Seattle, Washington, United States

Process Intensification opportunities via Partial denitrification Anammox (PdNA) process: Applications and impact on CAPEX and OPEX of nitrogen removal

9/10/2024, 03:00 PM - 03:30 PM

Speaker(s): Ahmed Al-Omari

Water resource recovery facilities (WRRFs) face increasingly stringent nutrient limits. Traditionally, WRRFs have employed energy-intensive biological methods for nitrogen removal and combined biological and chemical techniques for phosphorus removal, and often require costly external carbon sources and significant operational expenses. The partial-nitritation anammox (PNA) pathway has shown potential for mainstream deammonification to reduce carbon substrate, energy, and alkalinity consumption compared to conventional nutrient removal. However, over the past 10 years, several implementation challenges related to "out-selection" of nitrite-oxidizing organisms (NOB) were uncovered. As a more feasible and easier-to-control alternative, the development of the PdNA pathway was pursued. Likewise, PdNA has the potential to help WRRFs meet nutrient limits while also improving efficiency and reducing energy consumption, carbon emissions, sludge production, and overall costs. PdNA provides a number of process intensification opportunities, one it enables redirection away from the biological reactor because it requires a fraction of the carbon for nitrogen removal resulting in reduction in BNR footprint. 2nd intensification opportunity, it allows the operation near minimum SRT without introducing additional risk because of its ability to remove ammonia anoxically via anammox bacteria resulting again in further reduction in tank volume need and significantly less aeration. A third opportunity is the use of carriers for selective anammox retention which allows for more compact reactor design.

A fourth opportunity is the integration of PdNA and bio-P, which will offer the simultaneous removal of Phosphorus and nitrogen in the same reactor and minimize the reliance on external carbon. In this presentation, we will discuss the development of PdNA and its potential to significantly reduce operational and capital costs for nitrogen removal upgrades. The presenter will cover the concepts, lessons learned from two major and leading utilities in this field, applicability in the general sense, and specific applications for utilities in the Pacific Northwest region specially under the anticipated TN discharge requirement for the Puget Sound.

Short on Time and Budget: Expedited Alternative Delivery of a Greenfield Treatment Plant

9/10/2024, 03:00 PM - 03:30 PM

Speaker(s): Allison Lukens, PE;Shawn Spargo, PE

The City of Estacada, Oregon provides sewer service to approximately 5,750 residents and has over 1,000 new residential units in planning stages. The City operates a traditional secondary wastewater treatment facility that the community has outgrown, and the facility has had challenges meeting effluent quality requirements. Rather than retrofit the aging plant, the City has opted to replace it with a greenfield treatment plant at an adjacent site.

The plant discharges to the Clackamas River which is subject to Department of Environmental Quality (DEQ)'s Three Basin Rule. This regulation stipulates that facilities with existing National Pollutant Discharge Elimination System (NPDES) permits cannot increase mass load limits into the River, so the treatment system must produce higher quality effluent to allow for population growth. Therefore, the City proposes to construct a 6.6 million gallons per day (MGD) flat-plate membrane treatment facility with fine screening, closed-vessel UV disinfection, and aerobic digestion.

With an expedited, regulatory-driven schedule, the team had to bring forward innovative ideas to fast-track the project to construction. Recognizing the need to hit the ground running, the project transitioned from a traditional Design-Bid-Build (DBB) to a Construction Management/General Contractor (CM/GC) project delivery method. In less than one year, the project progressed from the alternatives analysis and site selection phase to bidding for a CM/GC contractor and implementing Early Work Packages.

This presentation will explore the nexus of community outreach, alternative project delivery, and maximizing value to efficiently deliver a greenfield wastewater treatment facility while short on time and budget. Attendees will learn how to prioritize operational efficiency while designing a plant that can produce high-quality effluent. We will also describe how our team effectively accommodated future expansion within a tight footprint.

Exhibit Hall Showcase Demonstrations Pt. 2

9/10/2024, 03:00 PM - 03:30 PM

Speaker(s): Scott Wendling

Demonstration of materials for protection against corrosion. Sauereisen is a world leading manufacturer of corrosion-resistant materials of construction. We manufacture sealants, corrosion

barriers and substrate repair materials for the protection and restoration of wastewater infrastructure. From collection systems to treatment facilities, Sauereisen offers materials to resist acidic environments and prevent water inflow & infiltration.

Keeping The Recycled Water Flowing in Mountain Home

9/10/2024, 03:30 PM - 04:00 PM

Speaker(s): Eric Roundy; Julia Reese; Chris Curtis

Mountain Home, Idaho, operates a vast land application irrigation system on a nearly 600-acre farm owned by the city. The city is several miles from the nearest stream; therefore, using the treatment plant effluent for irrigation is ideal in many ways. In addition to growing and selling the crops, the area has benefited from not pumping water from the aquifer. The regional aquifer beneath the city has been declining one to two feet annually, and groundwater pumping is suspected as the root cause of the decline. In their recent facility planning study update, the city investigated ways to continue to keep the recycled water flowing to benefit the aquifer. The City of Mountain Home has also seen a significant increase in population. The influx of residents from other states and commuters to the city has impacted the need for additional wastewater infrastructure. The Mountain Home Air Force Base is also located nearby, and personnel who cannot stay on the base typically reside in the city. The Air Force Base is also interested in protecting the aquifer. As a result, the city was able to receive funding to investigate different solutions together. The city also investigated increasing the treatment level at its plant, including directly augmenting groundwater levels. This presentation will discuss the solutions investigated to benefit the aquifer and the planning performed to meet the city's future recycled water needs.

Enabling Integrated Urban Wastewater Management by Connecting Digital Twins

9/10/2024, 03:30 PM - 04:00 PM

Speaker(s): Venu Kandiah

The use of digital twins for improved real-time control of urban wastewater systems is still in its early stages, but steadily growing. Two separate lines of digital twins have emerged in wastewater systems, focused on the operation of collection systems and wastewater treatment plants (WWTPs), respectively. Collection system digital twins can help minimize the impacts of flow variations and attenuate flows to WWTPs during storm events; and reduce and control sewer overflows to minimize environmental impact. WWTP digital twins can help improve energy, process and cost efficiency; optimize capacity utilization; reduce CO2 emissions; and assist in operator training.

Combining the two digital twins can support operation of collection systems and WWTPs in an integrated manner to achieve these objectives globally, enable more effective coordination of operations while providing a holistic view of the wastewater cycle. This presentation describes DHI’s roadmap for integration of its collection system digital twin, Future City Flow (FCF), with its WWTP digital twin, TwinPlant, for improved management of the wastewater cycle.

The first application examples of the digital twin integration will be presented, with tested use cases including (i) the use of inflow forecast from FCF during rain events to proactively and timely identify, through TwinPlant, change to wet weather operations (e.g., phosphorus precipitation in primary settlers) and prepare operators for intervention; (ii) evaluation of different inflow control strategies and selection of the optimal one based on the resulting process performance in the WWTP. This second case can be extended to a fully automated feedback control, whereby the automated identification of optimal inflow conditions to the WWTP is used to control and optimize tunnel and in-line storage utilization. These examples show the potential for management of the overall wastewater system towards global objectives.

The presentation will describe the approach being taken by DHI to combine the two digital twins, with focus on the solutions adopted for stable and reliable communication. Evaluation of results from the above-described use cases will be presented along with potential applications being considered. Challenges along the way and next steps will be described.

From Data to Insights: A Guide to Hydraulic Modeling Evaluations for Non-Hydraulic Modelers

9/10/2024, 03:30 PM - 04:00 PM

Speaker(s): Nandita Ahuja

Hydraulic modeling is a widely utilized technique for simulating water distribution and wastewater conveyance systems, allowing engineers and planners to evaluate system deficiencies, optimize operation, and conduct what if analysis. It is a staple tool for utilities developing master plans. Use of these models is often limited to experts with an understanding of modeling softwares which can hinder the engagement of internal or external stakeholders and limit the level of insights and analysis that powerful hydraulic modeling tools can offer.

In this presentation, we will explore two case studies in which enhanced data analysis was leveraged at every step of the modeling process to improve efficiency and engage stakeholders and staff both internally and externally. By integrating data visualization into the modeling process, the power of hydraulic models can be made more approachable to non-modelers, leading to more meaningful insights. The presentation will attempt to cover the: why? how? and pitfalls to avoid using the two case studies.

How Low Can We Go? A Full-Scale Case Study of Low DO Operations for Suboxic Biological Nitrogen Removal

9/10/2024, 03:30 PM - 04:00 PM

Speaker(s): Michelle Young;Natalie Beach, PhD;Sam Reifsnyder;Anne Conklin

Several strategies exist to optimize aeration to reduce energy demands, including “low dissolved oxygen (DO)” operation of aeration basins targeting 0.7-1.5 mg/L. However, suboxic BNR (SBNR) (DO <0.7 mg/L) shows potential to provide enhanced nutrient removal performance and energy savings regardless of diurnal flow and load changes, which is relevant to facilities in the Pacific Northwest that have budget and sustainability goals while also facing more stringent nutrient limits.

As part of this ongoing U.S. Department of Energy (DOE) funded project, full-scale demonstration testing and process design of a low DO system is conducted at the Los Angeles County Sanitation District's Pomona Water Reclamation Plant (PWRP). PWRP was retrofitted with high-speed turbo centrifugal blowers, new aeration control valves and actuators, nutrient probes, and the software package DO/Nmaster™ (Ekster and Associates, CA, US) which utilizes real-time ammonia, DO, pressure, and airflow within its machine learning (ML) based aeration control algorithms.

In one year, the specific energy usage at PWRP has decreased by nearly 50%, from an average of 1,400 kWh/MG to approximately 750 kWh/MG. This energy savings was achieved through the equipment upgrades, transition from traditional PID based control to ML based aeration control, and initial DO setpoint reduction in two aeration grids (from approximately 5 mg/L and 2 mg/L down to 2 mg/L and 0.65 mg/L, respectively).

Over the next 6 months, DO will be slowly reduced to SBNR conditions. Energy usage is expected to decrease to the project target of 650 kWh/MG or less. Nitrification performance, biomass acclimation and other performance parameters will be monitored as DO is lowered. Updated energy use, DO, and nitrification performance data will be available for presentation at the conference. Successes and challenges faced by operations and mitigation strategies used during the transition to SBNR will also be discussed.

Pump Station Phasing to Accommodate Variability of Industrial Flows

9/10/2024, 03:30 PM - 04:00 PM

Speaker(s): Jeff Hart;Eddie Kreipe

Designing a sewage pump station to initially serve low flows while also being capable of handling the potential for desirable new "wet industries" with higher water use. The audience will learn how careful consideration of future phases of a project can pave the way for straightforward upgrades as flows increase, while not creating a lot of near-term capital expenditure that might result in stranded assets. We will also present some of the complex design and construction aspects of the project that include a 45-foot deep wet well, gravity sewers over 30 feet deep, construction in high groundwater, trenchless construction of three pipelines under a creek and sensitive area, and a force main alignment to fit with future planned City bridge and roadways, all within a tight deadline to meet industry discharge needs.

Size Doesn't Matter - Successful Alternative Delivery for Small Utilities

9/10/2024, 03:30 PM - 04:00 PM

Speaker(s): Ben Miller

Introduction

Alternative delivery methods in the water and wastewater market are proven to provide owners with value added and risk reducing approaches for executing capital projects. These delivery approaches are often associated with large utilities completing projects with hefty budgets.

However, the same approaches can have equal, if not greater, advantages to small utilities providing resources for limited staff, minimizing design changes, and saving time and money.

Objectives

The primary objective of this case study is to investigate the benefits and challenges of alternative delivery implementation at two small wastewater utilities. The City of Fruita, Colorado (Fruita) conducted two construction manager at risk (CMAR) projects on their wastewater system in 2023 for a total construction budget of approximately $3.0M. The City of Laramie, Wyoming (Laramie) is currently conducting their first CMAR project for their wastewater utility. Both utilities struggle with similar issues complimentary of the CMAR approach:

1) Technically understaffed for wastewater capital project execution

2) Budgetary victims of ever climbing cost of work,

3) Location and project size limit contractor interest in open bid opportunities

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Emerging Solids Technology

9/10/2024, 03:30 PM - 04:00 PM

Speaker(s): Chris McCalib

The presentation highlights emerging solids technology that are developed and implemented in the United States from across the globe. Ranging from thickening technologies, dewatering, polymer reduction capabilities, drying, digestion alternatives, digestion enhancement, and beyond Class A solids minimization. These systems supply viable solutions at cost savings options that can be retrofitted into existing WWTP facilities to meet current and future needs. This presentation will touch on current alternatives to address Emerging compounds of concern (PFAS/PFOA/endocrine disrupters/microplastics/pharmaceuticals).

Reuse Regulator Session and Q&A

9/10/2024, 04:00 PM - 05:00 PM

Speaker(s): State Regulators

Regulations for recycled water have historically been driven from a state level which leaves a regulatory framework that is unique for each state. From a regulatory standpoint water reuse will be discussed from the regulating in the Pacific Northwest: Oregon, Washington, and Idaho. Additionally, other states will be participating to discuss their considerations and differences from the Pacific Northwest. The rules and considerations for protection of public health and the environment from each state's perspective will be discussed along with questions from the moderator and the audience.

Approaches for Evaluation of Phosphorus Dynamics in the Fernhill Natural Treatment System

9/10/2024, 04:00 PM - 04:30 PM

Speaker(s): Leila Barker;Colin Wilson Root

During dry season operations, the Forest Grove Water Resource Recovery Facility (WRRF) sends secondary effluent through a natural treatment system for further polishing prior to discharge. The 90-acre Fernhill Natural Treatment System (NTS) was designed for temperature reduction and dissolved oxygen compliance. As of 2022 the NTS effluent also serves as the dry-season point of compliance for additional water quality parameters, including total phosphorus (TP).

Since the NTS began operation in 2017, phosphorus (P) concentrations in NTS effluent have been consistently lower than concentrations in WRRF effluent discharged to the system. Because the system was not constructed with P removal as a treatment goal, Clean Water Services (CWS) is invested in understanding and characterizing the mechanisms of P removal in the wetlands to ensure compliance with current and future phosphorus limits. Short-term concerns include understanding the impacts of operational interruptions and phosphorus loading on NTS effluent P. In the long term, CWS hopes to evaluate whether and when soils might reach a saturation point after which P removal efficiency could be diminished or exhausted. Analysis of P fluxes is complicated by annual winter flooding that inundates most of the system. Multiple approaches were employed to analyze seasonal and annual P trends.

This presentation will detail the approach to sampling and testing that CWS has undertaken to characterize P dynamics in the NTS, and describe initial soil and water column findings. Regular dry-season longitudinal profiles indicate aqueous P concentrations decrease exponentially with flow travel distance in the NTS. Composite soil and sediment samples are collected seasonally at multiple internal sites to measure baseline soil phosphorus concentrations against which to chart future changes. Soil elevation data are recorded annually via <1-inch-resolution RTK with the aim of assessing long-term soil accretion or erosion trends that may impact phosphorus storage potential. To investigate the potential for compliance challenges resulting from extended flow interruptions, benchtop microcosms containing surface soils were subjected to controlled drying and rewetting. Increases of 0.1 – 0.5 ppm TP were observed as a result of soil-associated P re-dissolving into the water column.

Digital Technologies Help Build a Sustainable Future - The Milano Nosedo WWTP

9/10/2024, 04:00 PM - 04:30 PM

Speaker(s): Mark Drake

The Milano Nosedo WWTP is the main wastewater treatment plant in Milan, Italy. The facility treats an average daily flow of well over 100 MGD with peak flows of nearly 350 MGD, and has the ability to reuse all of its effluent for agricultural purposes. In 2019 the plant was looking for an advanced solution to help improve their ecological footprint and build a more sustainable treatment operation. The solution would need to achieve many key objectives: reduce specific energy consumption, maintain high and stable effluent quality at all times, increase biological phosphorus removal, avoid sludge escape during wet weather events, improve the operational management of the settling phase, better handle of the biological load variations and reduce chemical consumption. After thorough review of existing optimization efforts and potential solutions, Milano Nosedo WWTP implemented a Digital Twin based optimization platform.

The digital twin solution includes automated real-time performance optimization and capacity enhancement of the wastewater treatment plant. The solution autonomously simulates scenario options before actioning the one providing the best possible outcome in the real world, leveraging advanced algorithms, providing stable operation and compliance with regulatory requirements.

The Digital Twin solution achieved completion in 2020, leading to significant benefits which have continued to be realized in subsequent years. The Milano Nosedo WWTP has been able to reduce its carbon footprint by approximately 1,200 tons of CO2, and has achieved such specific objectives as:

* 27% reduction of emissions from energy consumption in biology and from chemicals for P-precipitation

* 25% reduction of energy consumption for the biological treatment

* 65% reduction of chemical consumption related to P-precipitation with corresponding reduction in chemical sludge disposal

* Overall improvement in compliance

This innovative project is a typical example of how facilities can “do more with less” by capitalizing on the latest digital and smart solutions to improve ecological footprint and sustainability.

Don’t Get Caught With Your Pumps Down…Using Analytics To Improve Pump Reliability and Performance

9/10/2024, 04:00 PM - 04:30 PM

Speaker(s): Ryan Hougham

Much has been written about the potential for plugging solids handling pumps in both wastewater and raw water pumping applications. The use of VFDs offers both improved process control and the potential to reduce energy expenditures. Unfortunately, operating these pumps at reduced speeds may also be leading to increased incidents of partial plugging and therefore increased potential for sanitary sewer overflow (SSOs). Most commercially available remedial systems focus on alarming, or even potentially reversing the rotational direction of the pump if pre-determined current setpoints are exceeded. Unfortunately, these systems do not provide much insight into the overall performance potential of the system.

Data analytics of individual pump performance provides a more holistic approach to the life cycle asset management and operation of these critical assets. This presentation will demonstrate how analytics can be used in real time by operators, managers, and engineers collaboratively to ensure that systems are operated, maintained and even designed properly for the given service. The presentation will show data from two different wastewater and potable water pumping stations. The first is Mustang Special Utility District’s Temple Dane pump station. It will be reviewed how this potable water station uses a digital twin to analyze and determine the correct combination and speeds of the five site pumps.

The City of Chattanooga also implemented this analytics platform on their largest wastewater pumping station, the Citico Pump Station. The analytics platform indicated that there was a significant amount of deterioration of the impellers of two of the four pumps. It also indicated significantly more headloss in the forcemain system. These two factors essentially reduced the real

firm capacity of the station from its design of 120 MGD to an actual 102MGD. Additionally, the analytics platform indicated that plugging occurs in the pumps at reduced speeds, and that periodic pump scouring can reduce the overall energy expenditure by anywhere from 15-50% depending upon the severity of the plugging.

This presentation will demonstrate how a powerful analytics platform can provide operational insights, reduce energy expenditures, extend the useful life of equipment, and protect the environment by reducing unplanned outages.

Leveraging the CM/GC Model to Overcome obstacles at Sandy WWTP

9/10/2024, 04:00 PM - 04:30 PM

Speaker(s): Jennifer Coker, PE;Andrew Pharis, DBIA;Shannon Johnson

In the realm of infrastructure development, challenges such as tight schedules, budget constraints, and the necessity to maintain ongoing operations present formidable obstacles. This abstract presents a case study on leveraging the Construction Manager/General Contractor (CMGC) model to address these challenges effectively.

The CMGC model integrates the expertise of both the construction manager and the general contractor from the early stages of a project, facilitating collaboration and innovation. Key findings indicate that the early involvement of the team allowed for comprehensive planning, risk mitigation, and evolving scope on a tight deadline. This proactive approach enabled the project to adhere to stringent schedules. Moreover, by involving stakeholders from various stages of the project lifecycle, the CMGC model supported minimal disruption to ongoing operations, thereby enhancing overall project efficiency.

The case study sheds light on practical strategies employed by the project team to navigate complexities inherent in water infrastructure projects, offering valuable insights for industry professionals seeking to optimize project outcomes.

Nitrogen Removal Performance and Lessons Learned from Mobile Organic Biofilm Demonstration

9/10/2024, 04:00 PM - 04:30 PM

Speaker(s): Bryce Figdore

In anticipation of future nitrogen removal requirements, the City of Mount Vernon, WA proactively pursued full-scale demonstration testing of Nuvoda MOBTM technology. Nuvoda MOB is a process intensification technology that utilizes a mobile organic biofilm (MOB) for increasing the effective solids retention time (SRT) of an activated sludge system.

The City's activated sludge process has flexibility to operate in a variety of modes and includes capability to operate in a MLE nitrogen removal mode. The original design is based on operating in MLE nitrogen removal mode only seasonally when nitrification can be achieved at lower SRTs. Therefore, the potential to achieve year-round nitrogen removal within existing tankage with minimal modifications via the MOB intensification process is very attractive.

The full-scale demonstration began in February 2023 and remains ongoing. Nitrogen removal has been sustained over winter conditions with apparent aerobic SRT (i.e., neglecting media and associated biofilm) as low as 6 days. Testing lower aerobic SRTs has been challenging due to the need to maintain a minimum MLSS concentration for good secondary clarification. The process displayed robustness during a month-long digester upset where a boiler failure resulted in loss of digester temperature control, sour digester conditions, and return of high sidestream organic acid loads. Ongoing efforts involve optimizing the process to balance nitrification-denitrification and limit caustic addition.

Key challenges and lessons learned included the following: 1) Establishing nitrification in the non-nitrifying background activated sludge took longer than anticipated. Ultimately, a combination of bioaugmentation and natural occurrence of nitrification with warmer temperatures was required. 2) The design and operation of the media retention screen is important. The City received a media retention screen much larger than needed for a plant of its size. This appeared to result in elevated media loss at the start of the demonstration and much lower media inventory than design. Operational modifications were made to improve screen performance and stabilize media loss. 3) Media inventory tracking can be challenging due to settlement and migration of the small volume of media relative to overall tank volume. 4) Increased mechanical mixing intensity may be needed to keep media in suspension.

Revolutionizing H2S Management: The Hach GS2440 Probe for Enhanced Water Treatment and Infrastructure Protection

9/10/2024, 04:00 PM - 04:30 PM

Speaker(s): Jedd Powell

"Revolutionizing H2S Management: The Hach GS2440 Probe,"

The presentation will be structured to highlight the key points clearly and succinctly, using the following sections:

Introduction: Briefly introduce the Hach GS2440 H2S probe and its significance in aqueous H2S detection.

Key Features: Outline the probe's capability to measure dissolved H2S and provide real-time data.

Potential Cost Savings: Explain how the GS2440 potentially reduces chemical dosing costs through accurate, optimized usage.

Infrastructure Protection: Discuss the probe's role in preventing corrosion and extending the lifespan of critical infrastructure.

Conclusion: Summarize the transformative benefits of the GS2440 for water quality professionals.

Visual aids such as diagrams, charts, and infographics as well as an actual demo unit will be used to emphasize the probe's innovative design and practical applications, ensuring a clear and impactful presentation.

Does AI Make a Difference? Case Studies of AI's Impact on Multi-Year Collection Systems Management

9/10/2024, 04:30 PM - 05:00 PM

Speaker(s): Daniel Buonadonna

Artificial intelligence (AI) solutions for sewer CCTV defect coding and analysis have now been in the US marketplace for over a year. In that time, municipalities have had opportunities to pilot different offerings and evaluate the efficacy of this technology for the asset management of their collection systems. This presentation will present a case study of Jacobs' AI solution performance and impact on lifecycle ownership costs for sewer utilities.

The comparison will include a side-by-side of both human-coded, and machine-coded sewer CCTV data; but also an analysis of the practical impacts the different data sources had on predicting remaining useful life, prioritizing cleaning and inspection schedules, and forecasting maintenance costs. In addition, a comparison of the impacts from AI-enhancement on the predictive accuracy of conventional decision logic/matrices will also be presented. This latter comparison will also include the associated impacts on overall asset ownership costs.

Enhancing Collaboration and Innovation in the Design of a $250M Wastewater Pipeline

9/10/2024, 04:30 PM - 05:00 PM

Speaker(s): Ryan Nordvik;Kim Hackett;Michael Jaeger

This presentation takes the audience through the design and construction of an award-winning $250 million wastewater pipeline. Silicon Valley Clean Water (SVCW) faced the same challenges shared by many wastewater districts nationwide, including aging infrastructure and underperforming assets. To address these issues, including frequent leaks of a 54-inch sewer force main, SVCW initiated the Regional Environmental Sewer Conveyance Upgrade (RESCU) program, comprising three primary projects. Notably, one of these projects, the Gravity Pipeline Project, involved the construction of a 10- and 11-ft internal-diameter fiberglass reinforced polymer mortar wastewater pipeline installed within a 3.3-mile-long, 13.5-foot internal-diameter tunnel.

The Gravity Pipeline project serves as the physical link connecting the three RESCU projects. Consequently, the Gravity Pipeline's programmatic and technical interfacing assumes paramount importance. The engineering challenges for this progressive design-build project included complicated hydraulics and seismic engineering to meet the pipeline's 100-year design life. The success of the project was driven by SVCW's close collaboration with their design-build partners, where quality teamwork was emphasized throughout the project lifecycle.

Key highlights of the Gravity Pipeline system include:

Innovative Engineering: The passive system design incorporates features such as hydraulic drop structures, efficient solids/grit transport, airflow and odor control, and in-pipe equalization.

Holistic Approach: SVCW actively engaged internal stakeholders, particularly their Operations and Maintenance (O&M) staff, during planning and design process. This holistic approach allowed them to address the project's unique hydraulic challenges effectively in partnership with the design-build team.

Performance Life: The outcome of this collaborative effort is a system designed and constructed to perform for 100 years.

Join us as we dive into the details of this challenging and successful project, exploring the tools, methods, and collaborative spirit that drove its success.

Innovative Multi-barrier Approach using Ozone-two stage Biofiltration to manage Organics, Nutrients and Emerging Contaminants

9/10/2024, 04:30 PM - 05:00 PM

Speaker(s): Gayathri Ram Mohan

The City of Franklin, TN has seen significant population growth in the last few years and is estimated to grow by another 20 to 80% by 2040 with most of the growth occurring outside the service area of the existing water reclamation facility (WRF). In parallel, the state has listed the section of Harpeth River in the vicinity of Franklin as impaired for nutrients (TP, TN), DO, and sedimentation. Such rapid growth and a critical need to improve the health of the Harpeth river have urged the City's leadership to carefully consider alternatives to address the anticipated water and wastewater demands.

Due to the impaired nature of sections of the river, the engineering team identified ability to meet anticipated stringent nutrient (low TN) limits as a core goal of the AWT process.

Subsequently, this inland utility embarked on a journey to explore the potential benefits of carbon-based advanced treatment, a non-RO based process, to produce advanced treated water. While the primary focus is the ability of the AWT train to consistently produce high quality water, lack of a need for concentrate handling and disposal, that can pose severe challenges for inland utilities, favored the City's decision to further explore CBAT process capabilities.

The focus of this presentation is an innovative treatment that was incorporated as part of the multi-barrier scheme: ozone/two-stage biofiltration (aerobic followed by anoxic), to specifically design the AWT process to be able to remove organics (TOC), CECs and nutrients (TN). While researchers have previously experimented operating biofilters in anoxic mode downstream of ozonation, high DO concentrations that prevail in the ozonated effluent often impede ability to establish conditions conducive for denitrifiers to acclimate and thrive. In this study, the research team operated the filters in several phases by modifying specific design metrics and operating until effluent quality targets were met and steady-state performance was demonstrated. Overall, the research team was able to demonstrate ability to meet low TN targets (< 2 mg/L), TOC and CEC removal using ozone/two-stage biofiltration. This presentation will review lessons learned from 9-month long pilot operations and water quality data collected across process train.

Wastewater Pump Station 45: System Optimization Through Data Analysis

9/10/2024, 04:30 PM - 05:00 PM

Speaker(s): Karen Iwasaki, P.E.;Arevik Sargsyan, P.E.

Upgrading system capacity can be a costly and time-consuming endeavor. Seattle Public Utilities (SPU) opted for a multidisciplinary approach to delve into the recent surge in sanitary sewer overflows at Pump Station 45. Various potential issues, including pump and conveyance capacity limitations, as well as upstream inflow and infiltration sources, were earmarked for thorough investigation and analysis.

The area upstream of Pump Station 45 spans 134 acres, comprising three residential subbasins and two industrial subbasins. The basin consists of sanitary sewer mainlines with some private side sewers with downspout connections.

SPU utilized data from a nearby City rain gauge, pump station operations logs, and several temporary flow monitors to inform their analysis. Upon scrutinizing the flow monitoring data against rainfall records, SPU pinpointed areas where the sanitary sewer mainline reacted notably to wet weather occurrences. They discovered a significant influx of flow stemming from industrial private sanitary sewer system connections during such events, with flow rates exhibiting stark contrasts between dry and wet weather conditions.

Further analysis of trends and pumping patterns, coupled with a review of recent infrastructure as-builts, unveiled a potential culprit: a private sanitary sewer system potentially discharging stormwater into Pump Station 45 during wet weather events.

Collaborative efforts with property owners, tenants, regulators, and SPU Source Control culminated in operational adjustments aimed at curbing stormwater inflow to SPU's sanitary sewer system.

The investigation is ongoing, with SPU now turning their attention to other locations within the 134-acre basin flagged for significant inflow and infiltration into the SPU sanitary sewer mainline, with the aim of bolstering available capacity.

Water Reuse Feasibility ... the City of Klamath Falls Story

9/10/2024, 04:30 PM - 05:00 PM

Speaker(s): Wayne Gresh

The City of Klamath Falls (City) operates a municipal wastewater treatment plant that discharges treated effluent to the Lake Ewauna at the headwaters of the Klamath River. The city waited nearly 20 years for a National Pollutant Discharge Elimination System NPDES permit renewal while the Total Maximum Daily Loads for the Klamath River were worked out. The permit conditions are part of an enormous undertaking by federal, state, and local agencies, tribes, and water users to restore the Klamath River.

For the city two permit conditions present significant challenges to meet with mechanical treatment processes without significant economic burden to ratepayers: daily total ammonia as N limit of 5.5 mg/l and temperature increase limit of 0.03 degrees Celsius in the October through May cold periods.

Beginning in 2020 the City started searching for beneficial water reuse and other alternatives to meet the permit conditions more sustainably and economically. The City studied supplying the drought-stricken area with a resilient supply of reuse water for agricultural crop irrigation, indirect

groundwater recharge to an aquifer in decline, and partnering with a neighboring utility with similar permit conditions. At every turn regulatory or process obstacles have been encountered.

This presentation provides the findings of a beneficial water reuse study performed by the city under an Oregon Water Resources grant. The nutrient and temperature challenges facing the City will be characterized to provide an understanding of the issues. Details about the obstacles of using irrigation canals to convey recycled water, water quality limits on aquifer recharge, and process challenges in partnering for treatment will be presented, and how they provide a roadblock for implementation. The costs for each program studied by the city will be presented, compared to the cost of mechanical treatment. And, information will be presented on the City's quest to partner for temperature treatment using wetlands through work being funded through the US Fish and Wildlife Service.

Jetting Techniques and Proper Nozzle Selection

9/10/2024, 04:30 PM - 05:00 PM

Speaker(s): Phil Davidson

SWS Equipment would like to teach about proper pipe cleaning techniques and nozzle selection on the different kinds of nozzles on the market. Including tips and tricks of ways to maintain safety habits for each nozzle type.

Cleaning up Biogas for "Free" at Lander Street WRF

9/11/2024, 08:00 AM - 08:30 AM

Speaker(s): Jeff Hodson;Kylle Walkoski;William Leaf;Adrian Romero

High sulfide (H2S) is commonly seen in biogas produced from anaerobic digestion in municipal water renewal facilities. These H2S concentrations cause corrosion, increase biogas conditioning costs, compromise reliable cogeneration operation, and produce sulfur dioxide emissions. Traditional methods of removing H2S have relied on chemical dosing into the digesters or biogas scrubbing, both of which are expensive and maintenance intensive. Boise has investigated full-scale implementation of microaeration (MA), which employs a very small amount of air introduced into the anaerobic digester to oxidize H2S to elemental sulfur and remove it from the digester in the digested sludge.

Previous MA pilots presented at PNCWA focused on supplementing downstream biogas H2S treatment systems. This presentation will review the design, implementation, and successful results of the first known microaeration pilot study in Idaho completed at Lander Street WRF (LSWRF), a 15 mgd facility, to eliminate the need for ongoing upstream iron dosing for H2S control in the biogas. The main driver for controlling H2S levels at LSWRF is air emissions regulations. While MA process usually requires a biological acclimation before seeing reduction in H2S in the biogas, the levels of H2S dropped from the target 600 ppmv to zero ppmv on day one of air being injected to the LSWRF digesters at 1 cfm. This was due to regeneration of iron leading to additional sulfide precipitation. Iron dosing was turned off and allowed to come to a naturally occurring iron baseline in the wastewater, at which point H2S levels started to increase to near 500 ppmv. Once

determining that the target H2S levels were achievable with MA at 1 cfm of air dosing, and without the need of additional iron, different air doses were tested to determine the level of H2S treatment that can be achieved while observing impacts on methane concentrations due to nitrogen gas dilution. The facility is now able to use MA for H2S control, eliminating chemical addition with minimum capital investment. Moreover, the City of Boise is now planning to implement this process for the West Boise WRF, a 24 mgd facility.

Construction and Startup of the Big Sky WRRF: Resiliency Through Covid, Supply Chain Disruptions and General Churn

9/11/2024, 08:00 AM - 08:30 AM

Speaker(s): Scott Buecker;Trent Dyksterhouse;Ron Edwards

The Big Sky County Water and Sewer District is located at 4700 ft in the Northern Rockies in Big Sky, Montana. The District has never been permitted to discharge wastewater and so for 30 years has operated as a zero-liquid discharge, 100% reuse facility. Creating a marketable effluent for reuse by the Community is a high priority, so in 2017 the District began planning for a major upgrade and expansion to its 2004 vintage Sequencing Batch Reactor and Media Filtration Facility. The District chose a five-stage biological nutrient removal (BNR) process with an online/offline Fermenter design and membrane bioreactor (MBR) technology for the project.

Design took place in 2019 and 2020 with project bidding in 2021. Constructing a highly technical, remote project during Covid and subsequent supply chain disruptions was a bumpy ride, but the District and its Boise-based general contractor, RSCI, persevered and liquids startup was commenced in March of 2024.

This project will describe the challenges and successes of building a complex project across three years, from the Owner, Engineer and Contractor's perspective, as well as provide attendees an overview of a relatively unique process flow designed for maximum BNR flexibility.

Improving Power Quality at King County’s West Point Treatment Plant Under Executive Order

9/11/2024, 08:00 AM - 08:30 AM

Speaker(s): Kevin Stively, Moderator;Samantha Brittain;Tammy Lupenski;Mark Slepski

Poor power quality at the West Point Treatment Plant (WPTP) presents itself in the form of voltage sags that arrive through Seattle City Light’s distribution system. Between 2019 and 2020, 124 voltage sags were recorded at WPTP. A few deeper and longer duration voltage sags led to unpermitted discharges of wastewater due to essential electrically-driven equipment entering self-protective modes. These shutdowns and loss of hydraulic control can force plant operators to bypass untreated flow around part of or the entire plant to protect it from flooding.

Due to the occurrence of the unpermitted discharges caused by voltage sags, the Washington Department of Ecology (DOE) issued Administrative Order 19477, requiring the County to take immediate corrective measures to stop the unpermitted discharges initiated by poor power quality.

In response, under an Executive Declaration of Emergency, the County initiated the WPTP Power Quality Improvement Project to quickly implement effective mitigation measures for voltage sags.

This project constructed a new 24,000-square-foot two-story electrical building to house 14 transformers, switchgear, and seven 2400 kVA UPS units to supply up to 2.5 minutes of run time for seven pumps running full load. The building foundation spanned a 40-foot-wide emergency bypass channel and influent tunnel on this culturally significant and geotechnically complex site. The foundation was composed of a 4-foot mat slab supported by 53 70-foot-deep drilled shafts. Building cooling load was more than 1 MBTU/HR and 60kW of photovoltaic were installed to support the County renewable energy commitments.

This panel discussion will tell a story about this emergency project from the perspectives of the owner, design consultant, and construction contractor by covering the technology selection, design constraints, permitting, equipment delivery and construction challenges for this 3-year project. Mini presentations followed by attendee question and answer session will provide a sense of how others can perform critical infrastructure projects quickly by learning how the County executed this successful project.

PFAS in Wastewater – From Research to Reality

9/11/2024, 08:00 AM - 08:30 AM

Speaker(s): Kenneth C Hui;Samir Mathur

This presentation will provide an overview of the cutting-edge research on the treatment technologies and regulatory aspects related to PFAS in wastewater, as well as as guidance on how utility managers and operators can apply this research to address real-life PFAS issues at their specific WRRF.

Poly- and perfluoroalkyl substances (PFAS) are a class of compounds that have gained significant attention from the public and the scientific community due to their prevalence, persistence, and toxicity.

The presence of PFAS in WRRFs has been widely reported. However, comprehensive quantitative data on specific PFAS compounds, their fate and phase partitioning through WRRF treatment processes, and the factors that control PFAS distribution in finished biosolids remain poorly understood. The absence of this fundamental information is a critical barrier for utilities to effectively manage and respond to a rapidly evolving public perception and regulatory climate related to PFAS. A significant body of research on PFAS fate and transport in the environment has accumulated in recent years, and tools and insights from this research can be leveraged to investigate much-needed information that is specific to WRRFs.

This paper will discuss the findings of the following WRF projects related to PFAS and provide key conclusions that can be drawn from each project, and how utility managers and operators can apply this research to potentially address real-life PFAS issues at their specific WRRF in a cost-effective manner.

1. WRF Project 5031 - Occurrence of PFAS Compounds in U.S. Wastewater Treatment Plants
2. WRF Project 5042 - Assessing PFAS Release from Finished Biosolids

3. WRF Project 5082 – Investigation of Alternative Management Strategies to Prevent PFAS from Entering Drinking Water Supplies and Wastewater

4. WRF Project 5214 – Direct In Situ Measurement of PFAS Transformation and Leaching from Land-Applied Biosolids.

5. WRF Project 5212 – Enhanced Aeration and Scum Recovery for Physical Removal of PFAS from Wastewater

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Advances in PFAS Water Treatment: Membrane Filtration with Concentration and Destruction of Reject

9/11/2024, 08:30 AM - 09:00 AM

Speaker(s): Tamzen Macbeth

Per- and polyfluoroalkyl substances (PFAS) are widespread in the environment due to their extensive use in thousands of industrial, commercial, and household products. However, PFAS are extremely persistent and difficult to break down due to the carbon-to-fluorine (C-F) bond, the strongest known single bond to carbon in chemistry. Currently, water treatment systems rely on processes that only separate PFAS from impacted water streams, such as granular activated carbon or membrane filtration (i.e., nanofiltration or reverse osmosis). These separation technologies leave behind PFAS concentrates or spent media, which require careful management as PFAS can be re-released into the environment. From a risk and life-cycle perspective, destructive technologies are desired to remove these harmful chemicals entirely from our environment. Therefore, there is high demand for cost-effective destructive PFAS treatment technologies for water. Several technologies such as electrochemical oxidation (ECO), non-thermal plasma, hydrothermal alkaline (HALT™), sonochemical, and supercritical water oxidation have advanced beyond the bench-scale to the pilot scale, and they have demonstrated the ability to completely break down PFAS for water treatment applications.

In this presentation, we will compare these technologies based on the treatment scale, rate, performance, and efficiency during the complete breakdown of PFAS. To integrate these promising technologies for future water treatment, treatment trains that first separate and concentrate PFAS to reduce volumes are necessary to make destructive treatments viable. We will highlight advances in developing a complete PFAS destruction treatment train at the pilot scale. The treatment train consists of three stages: 1) nanofiltration or RO to remove PFAS, 2) surface active foam fractionation (SAFF™) to concentrate PFAS from the membrane reject stream, and 3) destructive treatment using plasma, ECO, UV-sulfite or HALT. A direct comparison between the destructive technologies will be provided based on 1) a complete breakdown of PFAS and complete fluorine mass balance and 2) treatment efficiency using the electrical energy per use order (EE0). A full evaluation of target PFAS destruction, including life cycle costs and water quality parameters that affect the performance of this treatment train approach, will also be presented.

Keeping the Fire Going – A Continuation of Lessons Learned During the Startup of Three 16 Million BTU Firetube Steam Boilers on Digester Biogas.

9/11/2024, 08:30 AM - 09:00 AM

Speaker(s): Emmett Minner

Abstract Summary:

This presentation is a continuation of issues, corrective actions, and lessons learned during the startup and commissioning of steam boilers that feed three Thermal Hydrolysis Process (THP), designed to process 375,750 dry lbs/day, specifically using Digester Biogas.

Background:

With the constant demand and desire of the modern world to move towards renewable energy, and the recycling and reclamation of existing resources, the use of Digester Biogas has started to come to the forefront of possible solutions. Coupled with the need for ancillary steam supply for Thermal Hydrolysis Process (THP), the use of Digester Biogas to power boilers leads to a whole new set of unique challenges. These challenges can impact Startup and Commissioning of the system and in turn possibly delay the project schedule.

As THP systems grow in popularity across the country, the need for industrial sized steam boilers at Wastewater Treatment facilities has also increased. These new boilers can pose many interesting and sometimes frustrating challenges that are not typically seen in municipal facilities. These challenges double when adding on the desire to utilize the Digester Biogas produced by the THP fed Digesters as a main gas source for the boilers. As an extension on last year's presentation Trying to Start the Fire, this presentation will delve into more challenges that arose during startup and commissioning of three 16 million BTU Firetube Steam Boilers.

Specifically, with the need to supply pre-heated and deoxidized water to the boilers at any moment, the necessity of a properly heated Deaerator is crucial to the success of the system. Undersupplied steam feed will underheat the boiler feed water and wreak havoc in the system. This presentation will also look at how the constantly moving target of digester health can lead to drastic changes in Methane content, which impacts the boiler's flame stability.

This presentation will outline the issues that were found, the troubleshooting steps taken, corrective actions utilized to get the systems up and running to support the THP systems, and lessons learned during the entire process.

Prioritizing Resiliency and Sustainability in Combined Sewage Storage Tank Design While Helping to Protect the Duwamish River

9/11/2024, 08:30 AM - 09:00 AM

Speaker(s): Carrie Murillo-Oaks

King County Wastewater Treatment Division (WTD) is the largest wastewater utility in the state of Washington. Older parts of the County's sewer system are combined, conveying both wastewater and stormwater to a treatment plant. The West Duwamish Wet Weather Storage project will prevent sewer backups and reduce combined sewer overflows (CSOs) released into the Duwamish River. Although wastewater in CSOs is diluted by stormwater, CSOs may be harmful to public health and aquatic life because they can still carry chemicals and disease-causing pathogens found in urban rainwater runoff. As part of WTD's CSO Control Plan, WTD is building a 1.25-million-gallon storage tank to store combined sewage during storms and reduce CSOs into the Duwamish River. Not only

will the project improve water quality in the Duwamish River by reducing CSOs, but the project also prioritizes resil.iency and sustainability.

This presentation will present a summary of how the project design incorporated resiliency elements and sustainable features. Key resiliency elements include designing the facility for seismic forces and to minimize damage during an earthquake by including ground improvements under the facility. The resiliency design also accounted for future projected impacts of climate change and storm characteristics as well as sea level rise since the tank is tidally influenced by the adjacent Duwamish River. The presentation will also discuss the design of the facility's sustainable features such as solar panels, electric vehicle charging, reuse of existing facilities, and lowering embodied carbon of cast-in-place concrete, and how these elements were balanced while maintaining the functionality of the facility. Lowering embodied carbon of cast-in-place concrete was a particular focus of the design since it was the largest opportunity to reduce the project's carbon footprint.

Assessing the Impacts of Industrially-derived Reverse Osmosis Concentrate on BNR – Macro and Molecular-level Investigations

9/11/2024, 09:00 AM - 09:30 AM

Speaker(s): Erik R. Coats;Royce Davis

The City of Boise is implementing a water recycling program that is focused on recovering and treating industrial wastewater for either reuse by the subject industries or groundwater recharge. Effluent water quality from a new water recycling plant is aimed at meeting safe drinking water act standards. Reverse osmosis (RO) of the industrial wastewater is a central technology to the future water recycling plant. However, implementing RO yields a concentrated waste stream that must be properly managed. The city prefers to discharge this RO waste stream into the city's sanitary sewer system, with ultimate discharge into the Lander Street water resource recovery facility (WRRF). The Lander Street WRRF operates a biological nutrient removal (BNR) process that achieves removal of ammonia, nitrate/nitrite, and phosphorus through microbiological processes. While wastewater from the subject industry is currently discharged into the city's sanitary sewer system and ultimately to the Lander Street WRRF, it is highly diluted through mixing with other municipal wastewater by the time it reaches the WRRF; the effects of a concentrated RO waste stream on the BNR process are unknown. Before implementing this water recycling project at full-scale, the city undertook a research project in collaboration with the University of Idaho (UI) to better understand and characterize the potential impacts of RO concentrate on the microbiological processes central to the Lander Street WRRF operation. Specific interests included:

i) Does the RO concentrate adversely affect the biological nutrient removal processes? If performance is impaired, what is the magnitude and scope? Can the impacts be avoided/mitigated?

ii) At what RO concentrate loading might the BNR processes fail?

iii) How might RO concentration addition affect effluent toxicity (i.e., as measured via whole effluent toxicity (WET) testing)?

Investigations conducted by the UI team included ROC dosing to bench-scale batch reactors and SBRs followed by an evaluation using UI's continuous flow pilot scale WRRF. Process analyses

focused on nutrient cycling/removal and intracellular carbon cycling coupled with molecular-level investigations using metabolomic and transcriptomic methods. Results and findings from this research will be presented and discussed.

How Can Switching from Distributed Generation to Centralized Generation Make Sense?

9/11/2024, 09:00 AM - 09:30 AM

Speaker(s): Lauren Stanford;John Barrutia

Standby power is essential for wastewater treatment facilities to ensure utilities can both move water through their facilities, reliably meet permitted discharge requirements, and protect public health. For most facilities, stand-by power is provided by engine-driven generators. Options for configuration of such generators can be in centralized or decentralized systems. Often, wastewater facilities may end up with decentralized power generation systems as the facilities expand due to perceived simpleness of the system and lower capital cost associated with a centralized system backbone not being installed. Such decisions may be made without considering long-term impacts such as ease of operations and maintenance, operations and maintenance costs, and overall reliability. This presentation will discuss what parts of a plant, at minimum, should be on stand-by power, what are advantages and disadvantages of centralized and decentralized generation systems, and what factors should be considered to determine if switching from decentralized generation to centralized generation makes sense.

Lessons Learned from Low Pressure Biogas Pipe Replacement Project at West Point Treatment Plant

9/11/2024, 09:00 AM - 09:30 AM

Speaker(s): Majid Neyestani;Jesse Collins

The King County West Point Treatment Plant (West Point), located on Puget Sound in the Magnolia neighborhood of Seattle, is rated to treat up to 440 million gallons per day (mgd) of wastewater. At West Point, wastewater solids are processed through thickening, anaerobic digestion, and dewatering to produce Class B biosolids. An important byproduct of digestion is biogas, which is further processed for energy production and other beneficial uses. The biogas piping network at the plant, consisting of several thousand feet of both exposed and buried pipes of varied sizes, has been operational for over 30 years. Due to significant corrosion, a major project was initiated to rehabilitate the biogas piping network to ensure its safe and reliable operation.

Between 2018 and 2019, a comprehensive condition assessment was carried out. The findings were instrumental in developing alternative solutions for specific areas within West Point. The analysis of alternatives was grounded in a range of criteria including:

- Cost Effectiveness: focused on capital, operation, and maintenance (O&M) costs, and life cycle costs.
- Technical Aspects: Consideration of constructability and construction sequencing.

- Community Impact: Evaluation of the project's sustainability and potential impacts on the surrounding community.
- O&M Concerns: Including potential outages, system reliability, and safety enhancements.

The selection of preferred alternatives for each process area marked the beginning of a multi-year design and construction phase. The project entailed pipe rehabilitation and replacement in congested areas, requiring complex construction sequencing and the design of temporary bypasses to minimize disruptions to operation of utilities, digesters, and local amenities such as Discovery Park. In close collaboration with King County, various strategies were explored to accelerate the design and construction phases, aligning them with the O&M digester cleaning schedule.

This paper aims to share the valuable lessons learned throughout the pre-design, design, and construction stages of the project. It covers the evaluation metrics for alternative analysis, insights into O&M concerns and requirements, design strategies, safety protocols, risk management, and the effective coordination among King County, the design team, and contractors. The project highlights the importance of comprehensive planning and collaboration in tackling complex infrastructure challenges.

WW Assessment to Justify Cost of Service Rates

9/11/2024, 09:00 AM - 09:30 AM

Speaker(s): Maria Brady

Water rates are an extremely touchy Water industry topic. The combination of matching customer use to cost of service is a real challenge. How do we fairly proportion the costs to the various sanitary sewer users? For the average residential and commercial customer: We don't measure flow. We don't measure strength. So how do we know we are charging individual customers a fair and proportional cost of service? Most utilities use some very old water process textbook data and assumptions about return flows from water meter usage. But there are almost no studies that have collected current flow and load data to try to verify the actual conditions.

Until now.

Working for the City of Tempe, Stantec has conducted a comprehensive flow and load study for residential and commercial customers. The study was broken into three parts, 1) Industry Literature Review, 2) Data Collection, and 3) Data Analysis.

For the Industry Literature Review, we researched who has conducted flow and load studies. We found a few, but most were old, too specific, comprehensive enough, or the study is not published because it led to customer outcry during rate modifications. We also collected data on the various customer categories that cities use and how they are implemented.

Then we sat down with Tempe and identified residential areas that would represent single family and multi-family home neighborhoods to collect flow and load data. This data has been used to verify return flow rate assumptions from water meter usage data and may be used to establish a strength "baseline". Tempe's smart water meters provides detailed and comprehensive data for the neighborhoods and for individual homes.

Next up, a detailed evaluation of Tempe commercial customers was used to categorize the types of customers. In some cases, these match up with the current commercial rate categories, but other categories were added. Using the City GIS and record drawing data, specific commercial entities were selected to represent commercial categories. Western Environmental Services Inc then placed samplers in each location. Data collection commenced in September 2021, October 2021, and January 2022.

This presentation summarizes the data collected.

An Exploding Star – How A Local Sewer District Has Kept Up With Rapid Growth

9/11/2024, 09:30 AM - 10:00 AM

Speaker(s): Michael Schulz, P.E.;Eric Roundy, P.E., BCEE

Star, Idaho is one of the fastest growing cities in the country. Located close to Boise, the city has expanded from a population of 648 in 1990 to 18,000 last year. The Star Sewer and Water District (SSWD), which provides water and sewer services for the city, has worked diligently to keep costs down to continue encouraging growth in the area. However, in addition to the challenges associated with growth, the SSWD was forced to meet new stringent phosphorus (0.07 mg/L) and ammonia effluent requirements.

The SSWD has not shied away from novel treatment processes. Their wastewater treatment plant installed Idaho's first membrane bioreactor (MBR) system. Additionally, they were one of the first to utilize magnetic bearing turbo blowers for MBR aeration and a new specially designed drum screen for their headworks. The innovative treatment technologies have allowed the SSWD to phase improvements and keep operating costs low.

SSWD recently completed a significant upgrade to address the phosphorus and ammonia limits. The improvements included a new headworks with a unique odor control technology. Also, the MBR system was upgraded to newer technology, and the chemical phosphorus removal incorporated an unusual flocculant. This presentation will discuss how SSWD has phased improvements to keep up with growth, the novel treatment processes installed, and the construction lessons learned, including performance testing.

Full Scale Two Stage PN-Anammox: Conquering Sulfate-Enriched Wastewater Challenges

9/11/2024, 09:30 AM - 10:00 AM

Speaker(s): Amit Kaldate

The highly sensitive nature of anammox requires that all plausible inhibiting factors (such as heavy metals, sulfate, etc.) are controlled within practical thresholds. However, the unexpected fluctuations in treating industrial wastewaters with the anammox process required a non-usual resilience of the two stage AMX process. The study on the full-scale anammox process explored the impact of high-strength sulfate levels 90% above thresholds on nitrogen removal efficiency. To address this challenge, innovative strategies were employed, including direct ferric addition, microbial activity monitoring, and anammox reseeding. These interventions prevented complete

activity loss and maintained stable nitrogen removal efficiency. Notably, the resilient two stage AMX technology achieved impressive results: a designed nitrogen loading rate (NLR) of 0.87 kgN·m-3·d-1 and exceeded the 82% nitrogen removal performance target. By reducing nitrogen loads in the side-stream by 88%, sewage treatment plants operated smoothly even during winter. The cost savings over KRW 1.5 billion ($1.15M) annually underscores the potential of anammox for future side-stream treatment. Benefits of the two stage anammox utilizing this resilient anammox strain showed over conventional treatment processes included operating costs reduction of 83%, capital expenditures of 64- 93%, and process footprint by 70-90%. This full-scale experience can benefit all plants that seek to side treat digestate in a cost effective and energy positive way. The full paper will present key principles and supporting data of this unique strategy for application to other challenging Anammox projects.

Purging Flammable Gas Systems and Equipment Into and Out of Service – Incorporating Federal Standards

9/11/2024, 09:30 AM - 10:00 AM

Speaker(s): Spencer Goodro

2024 PNCWA Conference Abstract

“Purging Flammable Gas Systems and Equipment Into and Out of Service – Incorporating Federal Standards”

Instructor – Spencer Goodro, Lead RNG Operator Eugene/MWMC Metropolitan Water Pollution Control Facility, Eugene Oregon

Incorporating Renewable Natural Gas process into wastewater plant anaerobic digester O&M revealed safety gaps in existing practices and procedures. Outreach to gas industry entities for information was not productive due to differences in public and private business practices. Research by this Operator found Federal Standards applicable to flammable gas systems and processes commonly utilized by POTWs. Federal standards found in publications “NFPA 56” and “AGA - Purging Principles and Practice” were found to be directly applicable to biogas production and treatment equipment. These standards have been incorporated into Eugene/MWMC WWTP O&M and creation of JHAs, work plans and procedures.

Building Lasting Community Relationships

9/11/2024, 10:30 AM - 11:00 AM

Speaker(s): Kerri Franklin;Ryan Orth

Building lasting community relationships is essential to delivering resilient projects. But with many communities to serve, the demands of daily life, and limited resources, where do you start? Two senior practitioners at EnviroIssues, Kerri Franklin and Ryan Orth, bring decades of experience in engagement across Pacific Northwest communities to address these challenges and share solutions grounded in equitable engagement, as well as the complex nature of project delivery.

Expanding The Stormwater Park Design Toolkit: Addressing Baseflow Challenges and Maximizing Benefits by leveraging Wetland Technologies Typically used for Wastewater Treatment

9/11/2024, 10:30 AM - 11:00 AM

Speaker(s): Dustin Atchison;Amy Carlson

In recent years, a greater recognition of the impacts of climate change, nutrients and emerging contaminants on our already degraded water bodies will require scaling up stormwater retrofits throughout the Pacific Northwest. Stormwater parks and regional approaches are receiving greater attention as a strategy to achieve improved water quality while enhancing community spaces. However, recent projects have revealed potential challenges of treating continuous inflow from baseflow, as tributary areas increase and larger volumes of runoff using current popular treatment approaches, such as bioretention and proprietary media filters.

Wetlands, by their nature, offer a unique combination of physical, chemical, and biological processes that can be harnessed for stormwater treatment. For decades these designed natural systems have been used to treat wastewater effluent to remove nutrients and other pollutants. However, often application for stormwater has been limited in urban locations due to the need for consistent inflows and large footprints away from waters of the state. The move toward stormwater parks presents an opportunity to revive treatment wetlands for stormwater treatment. Transferring these insights gained from wastewater treatment to stormwater management involves adapting wetland designs to accommodate higher flow rates and variable pollutant loads typical of stormwater, while ensuring resilience to weather extremes and climate change impacts.

This presentation will include a number of case studies ranging in scale, location and water sources to demonstrate the applicability of treatment wetlands for stormwater treatment:

•Stormwater Treatment Wetlands for wastewater and stormwater (Nampa, Idaho)

•Long's Pond treatment wetlands for algae control and stormwater treatment (Lancaster, Pennsylvania)

•Arboretum Headwaters Stormwater Park to treat stormwater, flows from the Japanese Garden koi ponds, and to restore summer baseflow in Arboretum Creek (Seattle, Washington)

•Ocala Wetland Recharge Park for treatment and wetland recharge (Ocala, Florida)

•Parkway Estates Pond retrofit to provide stormwater treatment and increased storage (Lake Stevens, Washington)

Applying lessons learned from these cases is essential to optimize these systems and fully realize their potential in diverse urban settings. The presentation will share insights, innovations and advancements in stormwater treatment wetlands, providing attendees with the insights to implement stormwater parks in locations with continuous baseflow.

Floating Mobile Eyes: Cost-effective Camera System for RDII Assessment

9/11/2024, 10:30 AM - 11:00 AM

Speaker(s): Jadene Stensland;Amin Mahdipour;Chase Nelson, EIT

Rainfall-derived infiltration and inflow (RDII) is a major contributor to sanitary overflows and wastewater treatment plant capacity impacts. Clean Water Services (CWS) traditionally uses CCTV pipe inspection every 8 years to locate potential structural issues that correlate to RDII; however, that is an expensive and infrequent process. We investigated an innovative new RDII detection method, using lightweight 3D-printed camera balls, floating within pipes to cost-effectively gather qualitative visual RDII data. The goal is identifying and eliminating RDII to reduce pipe failures and capacity issues.

The floating camera system uses 3D-printed watertight spheres equipped with 360-degree GoPro cameras, floatation, batteries, and illumination. These are released into sanitary sewer system and retrieved downstream, providing video documentation of pipe conditions related to RDII, such as leaks associated with cracks and holes in the pipes and maintenance holes. The frequent qualitative data supplements CWS historic CCTV footage and flow monitoring analysis to pinpoint sanitary sewer lines exhibiting significant RDII requiring repair and replacement.

This innovation tested the floating cameras against intensive conventional CCTV imaging, demonstrating a scalable, customizable, rapid deployment solution for real-time identification of RDII and pipe defects. The goal is to develop an enhanced, low-cost RDII detection protocol to inspect known areas of high RDII during storm events to identify specific RDII locations that will help to identity the level of effort for repair and replacement projects. Additionally, engineers collaborated with Operations staff to demonstrate the floating camera cost-effectiveness, field durability, and data quality applications.

When Your Project Cost Increases By 50%

9/11/2024, 10:30 AM - 11:00 AM

Speaker(s): Holly Johnson, P.E.;Tyson Carpenter, P.E.

The City of Jerome's wastewater treatment plant is unique because it receives a large proportion of its flows from several dairy processors. The dairy wastewater significantly impacts the plant loading and increases the amount of hydrogen sulfide (and other sulfur compounds) released in the headworks. The metal headworks building and equipment had experienced significant corrosion, and the building was a considerable health risk to city operators. Also, due to increasing influent wastewater flows, the headworks facility was slated for a substantial improvement project to increase capacity.

However, the Covid-19 pandemic upended the project cost estimate. Rather than $4M for the new improvements, the city needed 50% more than that amount. During the design phase, the City and Keller evaluated several alternatives and worked together to focus on the priorities that would allow the project to still be completed. The evaluation included a closer study of the future design capacity, equipment phasing, building size, operator maintenance activities, and remaining equipment life. Collaboration between the City and Keller resulted in significant savings while still doubling the hydraulic capacity of the headworks facility. Construction of the new headworks was recently completed. The new headworks addresses the corrosion issues and provides a facility to

meet the city's needs well into the future. This presentation will highlight the collaboration process that allowed the city to meet its urgent needs and fit within its budget.

Building and Maintaining Effective Workplace Relationships

9/11/2024, 11:00 AM - 11:30 AM

Speaker(s): Hannah Thomascall;Mark Poling

Anyone who's worked on a team can tell you how important the people you work with are. When you spend every workday together, building effective workplace relationships is critical to creating a great place to work. Without them, it's easy for small issues to get blown out of proportion, old grudges to continue to cause friction and make a team much less productive. Not only does this make you dread going to work, but it affects your life outside of work. When work is a continuous source of frustration and anxiety, your life and relationships outside of work also suffer.

Great workplaces and teams start with a core of personal connection. It can be surprising how little a team knows about each other, even after years of working together. For example, do you know how many siblings everyone on your team has? What their hobbies are, and what things are important to them? Learning basic, non-invasive information about your coworker's life outside of work (and sharing about your own life) is an important part of building trust on your team. As the saying goes, people won't care about what you know until they know how much you care.

Pulling from sources including The Five Dysfunctions of a Team, Radical Candor, and The Fearless Organization, this talk will outline some simple, implementable ways to strengthen your team and make work a more positive experience for everyone. While supervisors will find many of these ideas and concepts useful in building their team, anyone can employ them to strengthen your individual workplace relationships and create a better, more cohesive work life.

Feeling the Heat: Integrated Planning to Reduce Stream Temperatures

9/11/2024, 11:00 AM - 11:30 AM

Speaker(s): John Phillips

The Northwest has embraced watershed planning for over twenty years as a useful way to prepare for and implement strategies to improve the health of waterways while effectively managing limited budgets and staff resources.

The National Pollution Discharge Elimination System requires that discharges do not degrade the receiving water body. Much attention has been given over the past half century to biological oxygen demand and nutrient loading; however, over the past two decades, research has shown growing negative impacts of increased water temperatures on native species in several US regions [e.g. Coho Salmon].

Now, there are new challenges facing watersheds that Parametrix has begun to integrate into watershed planning and will discuss in this presentation.

While a reactive approach has worked thus far, with climate change and urban population growth set to make the thermal loads on water bodies more impactful, there is a need to better understand and predict the thermal load of municipal resource recovery facility effluent streams.

Parametrix has worked with multiple jurisdictions to develop integrated watershed plans and long-term growth management studies. Parametrix has worked communities on integrated watershed planning from large to small.

This presentation will discuss innovative approaches to integrated watershed planning, including:

- Developing a water resource management vision and mission, identifying measurable outcomes for each plan element, and discussing risks early on

- Straight-forward ways to address the impacts of climate change

- Updating development standards, including infill, redevelopment, new site development, and water quality retrofits based on a more integrated understanding of potential impacts

- Use of key habitat-quality metrics to help prioritize protection and development efforts

- more proactive approach to thermal management and opportunity for low effort optimizations to reduce thermal loads

As part of our planning process, we will discuss how to address long-term management of existing municipal systems while also plotting courses for future land use development and responsible growth. Parametrix will discuss how to set goals; determine strategies; and define actions and funding strategies for risk management, environmental stewardship, climate change, and compliance with stormwater regulations as the population of a watershed grows.

Forging Resilient Inspection Technologies – Guided Wave and Automated Ultrasonic Testing

9/11/2024, 11:00 AM - 11:30 AM

Speaker(s): Sarah Burch;Douglas Keene

The City of Portland Bureau of Environmental Services (BES) Columbia Blvd Wastewater Treatment Plant (CBWTP) was first constructed in 1952 and continues to expand. Many process pipes and plumbing systems are original to the plant's construction. Prior to this project, most pipes had not been inspected internally during their lifetime or assessed for their condition and remaining useful life (RUL). The CBWTP has experienced an increase in pipe breaks in the recent years causing process areas to be shutdown, creating a detrimental impact on plants operations and a sharp increase in financial expenditures. Frequent breaks and leaks have also taken significant a toll on the operations and maintenance staff who are continuously patching piping systems to ensure reliable operations of the treatment plant.

BES condition assessment program has engaged with Kennedy Jenks consultants to prioritize, inspect, and assess plant process piping to move BES towards proactive management of its pipe assets. The primary goal of this project is to identify BES's risk exposure due to these aging pipe assets to enable tailored and sustainable long-term replacement/ rehabilitation strategies.

This presentation will begin with a brief overview of Advanced Non-Destructive (NDE) technologies such as Guided Wave Testing (GWT), Automated Ultrasonic Testing (AUT) and external Laser Profilometry testing. Attendees will learn about the advantages of utilizing GWT that can rapidly screen long sections of piping components to identify specific locations to deploy additional direct examination methods. The GWT inspection process is complemented by utilizing AUT and external Laser Profilometry to obtain quantitative data from areas identified with GWT. Finally, the presentation will focus on a specific project where the GWT and AUT techniques were utilized to assess approximately 1,200 feet of various piping components and locations. The presentation slides will include GWT data, AUT data and the benefits of utilizing these processes over the typical NDE methods that were previously used.

Spiral-Wound Pipe Rehabilitation Of Structurally Deficient Sewers

9/11/2024, 11:00 AM - 11:30 AM

Speaker(s): Eric Dienst, P.E.;Bob Jacobsen, P.E.

1Tetra Tech Inc., United States of America; 2Brown and Caldwell, United States of America; Eric.dienst@tetratech.com, Bjacobsen@brwncald.com

King County, Washington, identified severe corrosion in its 50-year-old Lake Hills interceptor sanitary sewer. This 7,200-foot reach of 48-inch and 54-inch reinforced concrete pipe with 19 maintenance holes runs through the Bel-Red industrial and Spring District area in the City of Bellevue. The eastern part of the interceptor runs westward down a five-lane major arterial road before jogging through smaller streets, alleys, private property, and a bus terminal. The County needed to minimize construction impacts while maximizing hydraulic capacity.

An alternatives evaluation identified Sekisui SPR's tight-fit spiral-wound system (SPRTMTF) as the preferred alternative to provide a full structural repair. Spiral-wound lining is the process of winding strips of PVC into a maintenance hole and "zipping" the strips together, to create a new pipe inside an existing pipe. The tight-fit lining system used for the Lake Hills project utilized steel-reinforced PVC strips tightly pressed up against the host pipe.

The rehabilitation project required full bypass pumping of up to 17 million gallons per day. Along the alignment, the City of Bellevue was completing major roadway reconstruction and building developments around the new East Link light rail system. The interceptor rehabilitation and bypass pumping alignment had to coordinate with those design teams and City of Bellevue permitting authorities, get temporary construction easements on private properties, coordinate with two bus terminals, and coordinate driveway closures with over two dozen private properties.

Construction started in the spring of 2023 and was substantially completed by that fall. Many lessons were learned from this groundbreaking project about optimal diameter and length for the spiral wound rehabilitation process, the benefits and limitations of the process, implementation of the bypass pumping system, and community outreach. This project was a great success in minimizing community impacts while forging a resilient, rehabilitated sanitary sewer system that will maintain needed hydraulic capacity for years to come. Significant knowledge was gained, and King County has determined if they would use this product again.

6PPD-quinone - When the Rubber Meets the Road

9/11/2024, 11:30 AM - 12:00 PM

Speaker(s): Ross W. Dunning, P.E.

Regulations and Funding, Research and Innovation, Treatment

Keywords: Coho, salmon, 6PPD, stormwater, treatment

6PPD-quinone - When the Rubber Meets the Road

Ross Dunning

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6PPD, also known as N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine, is an organic chemical commonly used as a stabilizing additive in rubber compounds to prevent degradation and cracking. 6PPD is found in footwear, synthetic turf and playground equipment and it has been used for decades as an antiozonant additive extending the life of automotive tires. Within the rubber, 6PPD is mobile and gradually migrates to the tire surface forming a protective film that reacts with ozone in the air more rapidly than ozone can react with the rubber itself. This film acts as a scavenger, sacrificing itself to protect the tire material from ozone-induced damage, reacting with ozone to create the breakdown chemical 6PPD-quinone (6PPD-q).

Ever wonder where the rubber goes when your tires wear out? Our tires leave a film of dust on the road every mile we drive and that microscopic dust washes away with each rainfall into our nation's waterways. After extensive research spanning decades, scientists in the Pacific Northwest have definitively established a connection between 6PPD-q present in urban stormwater runoff and a phenomenon known as Urban Runoff Mortality Syndrome (URMS). This syndrome leads to the untimely demise of Coho salmon in inner-city streams during rainfall events, preventing them from successfully spawning. 6PPD-q was proven to be toxic to Coho at very low concentrations (less than 1 part per billion) while some salmon and other fish species appear to be unaffected.

These findings have prompted urgent review by the U.S. Environmental Protection Agency and many states are rushing to understand how to best address this emerging ubiquitous pollutant. The tire industry has recognized the issue and industry organizations are seeking alternative materials to solve the problem.

Ross Dunning, Kennedy/Jenks Consultants Stormwater Practice Leader will present a summary of what is known about 6PPD-q toxicity and the status of emerging regulations and research. He'll provide details regarding our current understanding of the effectiveness of traditional stormwater best management and treatment practices in reducing the toxic effects of 6PPD-q. He will also describe regional sustainable stormwater treatment designs that may offer solutions to this widespread problem.

Location of each Presenter (City, State/Province, Country)

Federal Way, WA, USA

Does the Adaptation Action of Managing Water Rights Improve the Resilience of Umatilla River Basin to Climate-change Induced Droughts?

9/11/2024, 11:30 AM - 12:00 PM

Speaker(s): Sudip Gautam, Ph.D.

The stress from the impacts of climate change and droughts in the Umatilla River Basin (URB) has been a growing concern to the water users in eastern Oregon. This study explores the impacts of the drought adaptation actions, which are based on utilizing Columbia River water for the replacement of the certificated groundwater rights, on the state of and on the regime shifts in drought resilience indicators in a subregion of URB. To achieve this, the adaptation action is applied to eleven deep aquifer groundwater rights, and the impact of this adaptation is modeled using a SWAT model which simulates the hydrologic conditions and agricultural yields during the historical (1981-2010) and projected (2030-2059) climate scenarios. The findings suggest that drought adaptation action has the potential to improve the state of the resilience indicators during the historical period, both at the zonal level and at the water rights level. At the water rights level, three of the water rights used 20% more water for irrigation from the Columbia River than the deep aquifer, suggesting that, at present, groundwater supply is a constraining factor for the hydrologic response units (HRUs) with these water rights. The increased supply from surface water resulted in increased crop productivity in the HRUs that use these water rights. However, other water rights were not sensitive to the change in the water source. For projections of future conditions, results from the indicator and regime shift analysis indicate no observed change after adaptation, suggesting that additional adaptation measures might be needed under future conditions. Moreover, further analysis of the adaptation scenarios revealed the need to identify the water rights that produce more benefit per unit cost incurred in its adoption and adopt a range of adaptation strategies such as changing crop cycle, implementing managed aquifer recharge, or creating water rights market.

Mastering Modernization: The Journey of Portland's Wastewater Automation Upgrades

9/11/2024, 11:30 AM - 12:00 PM

Speaker(s): Leo Rodgers;Heather McKenna;Dinh Nguyen

Mastering Modernization: The Journey of Portland's Wastewater Automation Upgrades

The City of Portland's Bureau of Environmental Services (BES) has a wide array of different technology platforms and applications that have been developed over time to control and monitor the City's approximately 100 pump stations and 2 treatment plants. While meeting existing needs, the system had grown piecemeal without a unified vision and had fallen behind in upgrades. To address this, the City took a purposeful pause to develop a SCADA Roadmap to assess the current SCADA systems and chart the future course.

The overall goal of the roadmap was to summarize the current state of the system and prioritize needs to reach a developed future vision. This presentation will highlight the general outcomes of the roadmap which defined a series of projects to programmatically address deficiencies in the SCADA system and reach the future goals.

Further, this presentation will take a deeper dive into a high priority project identified in the roadmap - the Pump Station Automation Evaluation. Through the years, BES developed and matured two independent automation systems at pump station sites, mostly independent of each other. The intent of the evaluation was to assess both automation systems holistically and

determine the best value approach to establishing long term topologies and technology selection to meet the service goals of the Bureau.

A few challenges addressed in this planning effort were: establishing user requirements across different work groups, defining Level of Service Goals to meet or exceed regulatory requirements and establishing common decision criteria that was applicable and relevant to all stakeholders. This presentation will focus on the approach to overcome these challenges, centered around the unique planning process and approach taken; existing conditions survey, state of the industry presentation and benchmarking vs other utilities, definition of user and technology requirements, gaps analysis and alternatives analysis.

Tertiary Treatment Prepares Oregon Utility for New Permit Limits and Future Nutrient Removal

9/11/2024, 11:30 AM - 12:00 PM

Speaker(s): Mark Strahota;Brad Albert

This presentation will demonstrate how successful collaboration between a public agency and engineering teams can be critical in implementing the right project at the right time. Oak Lodge Water Services (OLWS) has faced challenges with permitting compliance at its wastewater treatment plant (WWTP) following changes to effluent limits for total suspended solids during the last permit cycle. To meet the new regulations, OLWS mobilized over a decade of effective planning for tertiary treatment to quickly prioritize the design of a new tertiary treatment facility (TTF) through an ongoing master planning effort.

The presenters will discuss the planning and alternatives evaluation of treatment technologies, in addition to the decision-making process during detailed design of the proposed TTF. The OLWS management team will discuss how they used engineering cost estimates from planning and design to choose a funding source based on recent financial planning and other factors.

The TTF project entails the removal of an abandoned in-place structure, geotechnical evaluation, support of an operating ultraviolet (UV) disinfection facility, and balancing operational flexibility with limited hydraulic capacity between plant processes. Through these efforts, the project will improve performance of UV disinfection and prepare for future phosphorus limits, while supporting compliance with the new permit limits.

Making Magic: Solutions for Increasing Capital Program Accomplishment Rate

9/11/2024, 12:00 PM - 12:30 PM

Speaker(s): Jennifer Belknap

Many utilities face challenges in delivering their capital improvement program (CIP) at the planned rate of accomplishment. Limited staff, unexpected schedule and scoping issues, competing priorities, and cumbersome change management processes can all contribute to reduced CIP accomplishment. Utilities may also struggle to ramp up their CIP. If they have barely been able to deliver $25 or 50 Million of projects per year, how can they get to $100 Million per year or more?

The financial and workflow impacts of not meeting CIP accomplishment can have a snowballing effect, creating a backlog of needed projects that just keeps growing. Over time, not delivering infrastructure projects at the needed pace can reduce the financial resiliency of the utility. It can also create intergenerational equity issues where future generations must pay more to replace or repair needed infrastructure while levels of service decline.

As a result, many utilities face pressure from their executives and governing bodies to "fix" their CIP process to deliver more projects. The impacts on staff of this pressure can be significant, resulting in frustration, lowered morale and burnout. Even with approval to add more staff, structural challenges may prevent work from moving ahead at the pace needed.

While there is no magic wand to wave to make this all go away, there are practical examples of what has worked elsewhere that can help you make some magic in your utility. This presentation provides examples of successful CIP ramp ups and improved accomplishment rates from mid-size to large utilities across the United States, from Maui Department of Water Supply to DC Water. Combining organizational assessment, realistic staff forecasting and workflow mapping with creative approaches to procurement and contracting helps create gains in CIP accomplishment. And if the organizational work is successfully implemented, team morale and workflow can increase at the same time.

The magic of our work happens when our team members feel understood, supported, and empowered to do their best work. Increasing your CIP accomplishment rate or ramping up your CIP while engaging and supporting your teams is a win-win.

Water Quality Trading and 401 Water Quality Certifications

9/11/2024, 12:00 PM - 12:30 PM

Speaker(s): Rob Annear

Many rivers and streams in the State of Oregon are 303(d) listed for water temperature being too high and endangering ESA listed fish species. Water temperature total maximum daily loads (TMDLs) have been developed for many of these watersheds and thermal loading limitations have been put on dischargers. In 2016 the Oregon Department of Environmental Quality started their water quality trading program, to provide more options for how to mitigate thermal impacts. Initially this program was used to allow wastewater treatment plants, through their NPDES Permit renewal process, to develop thermal trading plans to mitigate thermal loading impacts. More recently though, the state has been using the water quality trading program to require construction projects that have a nexus with rivers and streams with ESA listed species, seeking a Clean Water Act Section 404 Permit, to get a Section 401 Water Quality Certification for their project, including a thermal trading plan. This talk will cover the history and use of the current water quality trading program, the current application of it to water withdrawals through the 401 WQ Certification process, and implications for future use of the trading program for both dischargers and withdrawal. Several projects will be highlighted and new strategies for thermal offsets will be discussed as well.

The Dollars and Sense for Adopting Optimized Smart Technology O&M Processes

9/11/2024, 12:00 PM - 12:30 PM

Speaker(s): Jay Boyd

The three-decade-old EPA CMOM is designed to avoid SSOs, including collection system cleaning process guidance. It instructs that both total system and high frequency sites be cleaned guarding against SSO producing build-up. Historically effective, it's also known that O&M teams are wastefully cleaning already clean pipes.

Cleaning is a scheduled process. Arriving at the sites, O&M teams do not know the actual pipe conditions. To remedy this, utilities are now employing smart technology to acquire continuous remote-site condition visibility. These insights shift cleaning from a schedule-driven to site-condition based process. The smart technology also adds a valuable layer of full-time SSO monitoring.

The case studies that are cited below statistically show how the shift from schedule-driven to site-condition cleaning processes increase productivity. Smart level monitors with wireless communications and predictive analytics provide valuable insights for identifying developing build-up well in advance and drives the site-condition cleaning process.

Case 1

Set-up:

- 10 monthly-sites, 6-months.
- Scheduled cleaning: 60-sites
- Cost/segment-cleaned: $400

Results:

- Site-condition process: 12-sites cleaned, 80% reduction.
- Productivity savings: $19,200 (6-months), $38,400 annualized.
- Implementation cost: $33,650, 11-months recovered.
- Years 2 & 3: Operating costs ~$500/site annually, $5,000/year total. Annual savings: $33,400/year.

Case 2

Set-up:

- 20-sites, 4-months
- Frequency: 8-weekly and 12-monthly.
- Scheduled cleaning: 194-sites total.
- Cost/segment-cleaned: $400

Results:

- Site-condition process: 9-sites cleaned, 95.4% reduction.
- Productivity savings: $74,000 (4-months), $222,000 annualized.
- Implementation cost: $67,300, 4-month recovered

- The total first-year Net benefit: $154,700.

Case 3:

Set-up:

- 25 monthly-sites, 1-year
- Scheduled cleaning: 300-sites
- Cost/segment-cleaned: $595

Results:

- Site-condition process: 38-sites cleaned, 87% reduction.
- Productivity savings: $155,890 annualized.
- Implementation cost: 10-months recovered
- SSOs prevented: 3
- Yrea-1 net benefit: $154,700.

Case 4

Set-up:

- 112 with mixture of quarterly, bi-annual and annual-sites, 1-year
- Scheduled cleaning: 730X

Results:

- Site-condition process: 454, 37.8% reduction
- Labor saved: 828-hours
- Labor Savings: $110,000/year
- SSOs prevented: 10

Take-Aways and Conclusions

The studies demonstrate that smart technology can increase O&M productivity. Additionally, monitoring provides ongoing protection against SSOs. The implementation costs are recovered in less than one with significantly larger savings in ensuing years.

Summary

This presentation describes current but labor-intensive practices for cleaning maintenance. It offers a now proven alternative that illustrates measurable results through utility case studies.

Attendees will learn about how:

- Remote site visibility can be gained with technology
- Cleaning g frequency at hot spots can be safely lowered and with reduced SSO threats
- Machine learning can enable predictively when to clean
- Implementation costs are proven to provide payback in less than one year.

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