Presentation Time 8:15

Title: Developing an Action Plan for MDNR's Phosphorus and Nitrogen Removal Policy

Abstract:

The Missouri Department of Natural Resources (MDNR) is getting very close to formulating a phosphorus and possibly nitrogen removal policy. This time it looks like it will really happen. Now is the time to start considering how to remove phosphorus and possibly nitrogen. We can use this time to study the issues and develop a path forward. The implementation schedule is up in the air and wouldn't it be nice to be able step back to do a facility plan and develop a budget to take to your council and plan for the future in a proactive manner.

Influent data, other than your regular biological oxygen demand (BOD) and total suspended solid (TSS) monitoring data, is needed to determine the challenges ahead. The total kjeldahl nitrogen (TKN) and alkalinity data are needed for nitrogen. If you are already nitrifying ammonia completely, then soluble effluent TKN data is also needed. There is a non-biodegradable species of TKN that needs to be defined for developing a total nitrogen control strategy. Influent total phosphorus (TP) and orthophosphate data are also needed along with either soluble BOD or soluble biodegradable chemical oxygen demand (COD). The soluble BOD to TP ratio is critical for assessing how well conventional biological phosphorus removal will work in your facility. A week's worth of data does not provide a reliable picture of your influent wastewater quality. Without this data any consultant will have to make assumptions, and assumptions add to project cost.

Take the time to compare chemical phosphorus removal with biological phosphorus removal. Look at ways to modify existing basins and determine if you need to add more basin volume. Examine how you would approach total nitrogen removal. Actually, removing nitrogen usually requires the larger basin volume over phosphorus removal.

Is nutrient removal hitting you at a time when you need to consider a plant expansion? Or have you just added basin volume in a recent expansion and need to figure out how to create anaerobic and anoxic zones in your new basins? If you start planning now, then you will have time to wrestle with these issues and develop a path forward that best uses your existing facilities and minimizes future expenses.

This presentation will walk you through what you should consider doing now to proactively approach the impending nutrient limits.

Bio: Edmund A. Kobylinski

Ed is a graduate of the University of Missouri – Rolla with a Bachelor of Science (1977) and Master of Science (1978) in Chemical Engineering. He has been working in the environmental field for the last 44 years. Ed worked for 34 years as a process engineer, retired, and has come out of retirement to work at Olsson and teach at Kansas University. For the last 20 years, Ed has worked on biological nutrient removal system designs and has worked closely with Dr. Barnard to develop sidestream fermentation.

Ed has performed many facility plans examining treatment alternatives and has supervised many field sampling efforts to gather data needed for assessment of nutrient removal alternatives and nutrient removal designs. Influent wastewater quality is the key to designing nutrient removal systems that work. Ed has designed many conventional biological phosphorus removal and denitrification systems. He has two sidestream fermenter designs in operation at Olathe, Kansas, (2012) and Lawrence, Kansas, (2018) and a temporary/interim system at the McAlpine Creek Wastewater Treatment Plant (2020) for Charlotte Water.

Title: Lagoons, still lots of life left for Nitrification and Disinfection, Case Study on Jonesburg MO Upgrades

Abstract: In communities throughout the USA, with lagoon-based systems never designed for nitrification or other advanced limits, operators and their consultants need to know what proven solutions work in beating ever more challenging limits. This presentation covers why lagoons fail, particularly on winter nitrification with a special emphasis on how Jonesburg MO evaluated their current system, designed, bid, and installed the recent lagoon-based plant upgrades. Additionally, taking a dive into the unique way disinfection is being achieved.

Bio: Isaiah LaRue

Isaiah started his career with a BSc in agricultural engineering from the University of Nebraska and has been working over a decade in wastewater treatment sales and applications with both municipal and industrial wastewater treatment projects across North America. He also participates as an active member of WEF's Plant Operation & Maintenance Committee along with providing review assistance on their various MOPs.

Presentation Time 9:15

Title: An Integrated Pretreatment Program

Abstract: Pretreatment Programs are typically ran independently from operations, collection systems, etc. This presentation will be an overview of how pretreatment programs fit into a community's wastewater organization and how to use a pretreatment program to protect your POTW and provide more insight into your WWTP operations.

The following topics will be covered:

- Understanding WWTP Loading (how to identify domestic and industrial loading)
- How to optimize a Pretreatment Sample Plan to evaluate the effectiveness of your program and to help plan for the future (think nutrients, capacity/growth, etc)
- Decisions related to "local limits" vs. "surcharges"
- Examples of how to respond to industries that impact your WWTP operations

By implementing a more hands-on approach to the data associated with your Pretreatment Program and your wastewater treatment plant, your community will be prepared for local limit technical evaluations, and you will have the tools needed to communicate with city personnel such as city administrators, design engineers, or economic development directors on potential new industries looking to locate to your wastewater service area. Pretreatment Programs can be used as a tool to plan for the future and to help provide a better understanding of your WWTP operations.

Presenter Bio: Kim Cole and Katie Brugge

Kim Cole has been the Principal of KimHEC Environmental Consulting for 6 years and has been working in the wastewater industry for 20 years. KimHEC specializes in the update and implementation of pretreatment programs. Kim graduated from Purdue University in Civil Engineering and got her M.S. in Environmental Engineering and Science from Clemson University and is a registered Professional Engineer in Missouri. Her daily roles include facilitating communication between industries, wastewater personnel, and laboratories to analyze and interpret data as it impacts pretreatment programs and wastewater treatment plant performance and compliance. She performs close to fifty industry inspections every year. In her free time she enjoys traveling, reading, being in the kitchen, and trying to make a better butterfly garden in her backyard.

Katie graduated from Bradley University in Peoria, IL with a BS in Environmental Science - Biology in 2012. After graduation, she worked in natural resource conservation and monitoring until she moved to Missouri. Katie joined the wastewater workforce in 2017 when she started working for the City of St. Joseph Water Protection Division. In her various roles with Water Protection, Katie was responsible for the Industrial Pretreatment Program, Water Protection Facility laboratory, MS4 compliance team, FOG program, and the City's developing biosolids fertilizer program. Currently, Katie is the Environmental Program Manager at KimHEC in St. Louis where she has the privilege of helping clients meet their pretreatment and other compliance requirements. She holds an A level Wastewater Operator

Certification, D level Laboratory Analyst Certification, is a Core Emerging Leader Training (formerly Core Growth) alum, and is a proud recipient of the Crystal Crucible Award.

Title: Lagoon Management & Maintenance

Abstract: A town can save thousands of dollars by implementing just a single concept from this presentation. Lagoon systems are designed and built for decades of use but they tend to become progressively less efficient over time. We will be discussing the impact of routine and cyclical maintenance as well as retro-commissioning/recommissioning as a framework to help get systems back to operating as designed. Help your lagoon do it better by attending!

Presenter Bio: Ben Shakman

Ben has been in the water and facilities business for the last nine years and holds an MBA from the University of Illinois. His background includes high purity, utility, and wastewater experience at both Nalco and Evoqua. Before entering the water business, he spent over 26 years in the US Army. Ben has been certified as an instructor by both then US Army Armor School at Ft. Knox and the Officer Candidate School at Ft. Benning. Additionally, he has taught as an adjunct professor at the graduate level.

Presentation Time 10:30

Title: Trolly Trail Basin – Expect the Unexpected

Abstract: The Kansas City, Missouri Trolley Trail Basin Project is a successful example of consultants working together with City departments to benefit the community. George Butler Associates, Inc's team developed a unique project that improves water quality and also provides community enhancements to a neighborhood park for the City of Kansas City, Missouri. To relieve overflow and capacity issues in the Blue River Interceptor Sewer (BRIS), GBA designed a 3-million-gallon clay-lined earthen storage basin with accompanying gravity sewers, automated control and gate system, and radio signalization for the City's remote system. The project is located in Kansas City's South Oak Park. As part of the sewer project, the GBA team and the City Water Department and Parks Department worked together to develop a new trail system connecting the park to the Trolley Track Trail System, as well as improvements to the existing loop trail. The project also benefited the community by removing and properly disposing of over 51,000 tons of unregulated landfill material at the site.

Problem And Solution:

As part of Kansas City, Missouri's Consent Decree with the EPA, improvements were required at Diversion Structure 068/ Outfall 058 to reduce overflow volumes from Outfall 058 to no more than 0.32 million gallons annually, and no more than seven overflow events in a typical year. The project was initially envisioned as a 9,400-linear foot relief sewer project which consisted of a new sanitary sewer system from the combined sewer system at South Oak Park downstream to the BRIS system. The originally proposed alignment alternatives paralleled the existing BRIS system but was fraught with potential constructability issues. Challenges encountered through the original alignments included a deteriorating parallel storm system, work adjacent to a stream including crossings and exposed manholes, traversing a major electrical transmission system, an abandoned mine, private property crossings, railroad right-of-way, and navigating a popular trail. Furthermore, hydraulic evaluations of the proposed relief sewer alternatives indicated continued surcharging of the system with improvements in place.

The design team evaluated a parallel relief sewer, a replacement sewer, relocation of the diversion structure with sewer separation, as well as aboveground and underground storage upstream of the BRIS. Storage options considered included prestressed concrete tank, concrete basin, and earthen clay-lined basin. After evaluation of costs and challenges associated with the relief sewer alignment, it was determined that storage upstream of the BRIS would provide hydraulic benefits while being a more cost-effective and less disruptive solution.

During the design phase of the project, an unregulated landfill was discovered at the site of the proposed earthen storage basin within the City park. The design team went back to the drawing board to further evaluate additional storage site locations, costs associated with each, and analysis of the landfill materials. The team worked together with City officials from multiple departments, evaluating landfill costs and concerns, floodplain issues, park considerations, and trail considerations. The City was then able to make an informed decision to maintain the project in the originally proposed site and remove the landfill material simultaneously with the sewer project.

Design of the storage basin and associated sewer system included several public meetings and coordination with stakeholders including the City's Office of Environmental Quality, Parks Department, Industrial Discharge Department, and the Missouri Department of Natural Resources. The design team worked closely with KC Water's Facilities Department to take into account maintenance issues such as mowing and trash in the basin, as well as control of the gate system and signalization to the City's treatment plants.

Design of the project began in 2014, and the project bid in 2019. Construction was completed in 2021 and the basin has been operational since then. Construction of the basin and sewers presented additional challenges due to the site constraints requiring that the majority of the park remain open throughout construction and that a vegetated buffer remain adjacent to the stream and park. The design and construction team worked together to overcome challenges during construction including difficulty in finding appropriate soils, landfill disposal, rock in excavations, and concrete issues, to name a few.

Construction of the storage basin upstream of the overloaded BRIS enables the storm peak to pass in the BRIS while holding the peak flow from the combined sewer basin upstream. The updated system, including the earthen storage basin, sensors, gates, and controls allow the City the flexibility to store combined sewer flows for up to 24 hours to reduce impacts on the downstream BRIS. Additionally, the citizens of the neighborhood have been able to enjoy the parks improvements and new trail connecting to the Trolley Trail Basin.

This project exemplifies many City and private entities working together to solve a problem. The Trolley Trail Basin Project meets the City's consent decree requirements and has the added benefits of removing unregulated landfill waste, and providing additional community benefits in South Oak Park.

GBA will discuss the ups and downs, ins and outs of the design and construction process bringing this unique project to fruition for the City of Kansas City, Missouri.

Presenter Bio: Colleen Connor

Colleen Connor is a graduate of Iowa State University and has 18 years of water/wastewater industry experience. She has worked on a variety of wastewater and water projects, including master plans, new sewer design, sewer separation, pump stations, treatment plant upgrades, and studies. Colleen has undertaken many roles at GBA ranging from staff engineer to project manager and has helped lead the team on GBA's innovative mapping efforts. Recently she has served as Project Manager for two of KCMO's CSO projects.

Title: How Proper Mixing of Anaerobic Digesters creates optimal volatile solids reduction and maximum methane generation

Abstract:

Proper mixing of an anaerobic digester creates optimal volatile solids reduction and maximum methane generation. We will discuss concepts such as viscosity, shear, Non-Newtonian fluids, solids suspension,

and mixing energy which are important to setting up a uniform velocity profile in the digester tank. Digestion occurs in two phases: the acid phase and the methane generating phase, which must operate in a delicate balance. Proper mixing creates an environment for bacteria to thrive. In the acid phase, this allows the bacteria to convert sugars, starches, and carbohydrates into volatile acids. In the 2nd phase, proper mixing eliminates steep temperature gradients which can kill off the fragile methane generating bacteria. We will discuss what contributes to foaming in the digester and what imbalance causes the carbon dioxide and methane to get trapped beneath the surface of the digester fluid. We will provide an overview of what nozzle mixing is, its operational objectives, components of nozzle mixing systems, and why it is used in anaerobic digesters. Will show installation photos, discuss design considerations, and show clips of transient Computational Fluid Dynamic (CFD) simulation runs.

Bio: David P Miller

David P. Miller, Regional Sales Manager, Hayward Gordon.

Hayward Gordon is a MFR of hard metal, specialty, Centrifugal Pumps and top entry, shaft mounted, impeller style mixers, and nozzle mixing systems. David received a Bachelor of Science, Mechanical Engineering - University of Cincinnati and lives in Dayton, OH. He has 31 years in the process industry and has worked for five different equipment MFRs.

Presentation Time 12:30

Title: Safety for the Laboratory and Beyond

Abstract: Safety should always be number 1 no matter what the job may be. In this presentation we will point out some of the hazards that come with working in the lab as well as outside the lab. We would touch base on different kinds of chemicals & other hazards associated with working at a WWTP because in the end we want everyone to go home safe!

Bio: Rodney Spires

Rodney started in 2001 for the City of New London before going to Alliance Water Resources in 2003. Then in 2006 he went to the Hannibal Board of Public Works as a Wastewater operator. He took over the lab in 2017 & takes care of all the testing for the WWTP.

Rodney & his wife Lisa live in Mexico & between them they have 3 girls (Rebecca, Madison, & Brooke) & 3 dogs (Piper, Miley, & Stella).

Outside of work he enjoys coyote hunting, crawling on the rocks with his RC Crawler & of course spending time with his family.

Rodney is currently the MWEA Lab Practices Committee Chair & in 2018 he was the recipient of the WEF Laboratory Analyst Excellence Award.

Rodney currently holds an A level Wastewater certification & a D level Voluntary Wastewater Analyst Certification.

Title: A Look at Sewer Evaluation Techniques and Nomenclature

Abstract:

A discussion of the use of PACP coded CCTV inspections to facilitate sewer rehabilitation planning. Topics covered will be strategic planning, prioritizing and planning defect remediation, budgeting, development of bid forms and pay items, and use of related data to create planning and GIS resources

Bio: Barry L. Howell

Barry L. Howell is a Business Development and Sales Professional with thirty years' experience in the public works, construction and public utilities industry.

Visu-Sewer, Inc. (2009 to present) Business Development: New territory development for corporate office and Visu-Sewer of Missouri LLC sewer rehabilitation and evaluation contractor. Duties include sales, specification writing, engineering analysis, marketing research, and business acquisitions.

Presentation Time 1:30

Title: Wastewater Microbiology: The Basics

Abstract: The presentation is centered on wastewater microbiology as it relates to the activated sludge process. Information on key organisms and their significance will be discussed. The goal of the presentation is to give the audience a basic understanding of how these organisms play a role in the effective operation of a wastewater plant (WRRF). Vital information with color picture examples will be the format of the PowerPoint presentation.

Presenter Bio: Terry Joubert

Terry has over 40 years of water and wastewater treatment experience, including additional areas such as aquaculture and agriculture waste treatment. He has taught training classes to wastewater personnel in the stats of Louisiana, Texas, Mississippi., Arkansas, Alabama as well as Missouri. He has been involved in troubleshooting wastewater systems worldwide.

Title: Prevent the Backup: Understanding the Impacts of Sediment on Collection System Conveyance and Hydraulic Modeling Efforts

Abstract: The buildup of sedimentation can cause significant issues in any collection system. Other than restricted conveyance of the physical assets in the system, sedimentation buildup can lead to backups in the system, inefficient operations, and a general headache for maintenance staff. Identification of this build-up can be time consuming and costly, further adding to the problem.

While analysis tools such as flow monitoring and hydraulic modeling are effective means to determine flows in a collection system, if sedimentation is a notable problem, these tools may become less effective without a good understanding of the impacts of sediment in the system. Traditional evaluation tools such as dye testing, smoke testing, and even CCTV do little to identify the extent and severity of sedimentation in the system. Alternative investigation methods may be required to understand the system conveyance under the influence of significant sedimentation.

Once identified, sedimentation can present unique challenges when performing flow analysis of collected data and evaluating hydraulic models. Issues may arise as early as a flow monitoring program where sedimentation build up can interfere with proper data collection, leading to an elevated need for proper site selection and sediment documentation. Sedimentation may also cause volume imbalances in downstream meters when flow is restricted. Shifting sediment can also cause hydraulic model calibration to become difficult due to changing conditions in the system. Traditional cleaning may temporarily relieve sedimentation build-up but does not always provide a long-term solution.

To provide a usable evaluation of data, certain considerations need to be taken into account for hydraulic modeling and collection system analysis. When these analyses are part of a capital improvement program or integrated master plan, understanding the impacts of sedimentation on a system can be the difference between establishing a regular cleaning program and a multi-million dollar sewer rehabilitation project.

This presentation will explain how sedimentation affects collection system conveyance and operations, present ways to evaluate buildup utilizing hydraulic models and other sanitary sewer evaluations, and provide examples of analysis and implementation based on past experiences. Case studies include analysis of flow monitoring data with both known and unknown sedimentation issues, impact of including sedimentation in hydraulic models near lift stations, and the determination of capital improvement projects based on inclusion of sedimentation.

Presenter Bio: David Ecklund and Jacob Eck

David Ecklund is a licensed professional engineer in Burns & McDonnell's Water Group. David graduated from Kansas State University and has 7 years of experience on projects including collection system modeling, stormwater collection and design, and water distribution system modeling.

Jacob Eck has been with Burns and McDonnell for 3 years, 2 of which have been spent in the Water Group working primarily on collection system modeling. Jacob graduated from the University of Missouri with a degree in chemical engineering, with an emphasis in environmental engineering.

Presentation Time 2:45

Title: Using Hydroxyl Radicals to Treat FOG & Odors and Prevent Microbial Induced corrosion and Prevent Corrosion

Abstract: Odors are a natural byproduct of wastewater and, consequently, odor control is frequently required at pump stations and collection systems to mi! gate the nuisance it causes, especially to residents. In addition to odor, fats, oils and grease (FOG) and corrosion are destructive elements in lift stations that can be very difficult to control or eradicate. Historically, adsorption, biological oxidation, and chemical scrubbing have aided in the removal of odors, and chemical addition has become a solidified approach to suppress odors. Newer technologies introduced to control odors are ionization and photocatalytic oxidation. A method that has been in use for over 15 years is oxidation of

odorous compounds in the vapor phase using hydroxyl radicals. This method also virtually eliminates FOG above the water line and prevents corrosion typically associated with H2S. The hydroxyl radical is one of the most reactive species in the reactive oxygen species (ROS) family.

This presentation provides an explanation of using hydroxyl radicals to treat odors and FOG including the prevention of Microbial Induced Corrosion.

Presenter Bio: Jason Gregg

Jason Gregg has been in the wastewater industry for over 14 years. Starting as an operator in 2008, moving over into maintenance, and eventually working his way into a maintenance specialist role at a Jacobs contracted wastewater facility. Jason moved into a municipal sales role with Jack Tyler Engineering of Arkansas in early 2019 and joined Vapex Environmental earlier this year. He has focused on using his experience from wastewater operations and maintenance to better understand his customer's needs.

Title: Water and Sewer Service for Sustainable Residential Development: A Missouri Case Study

Abstract: High density residential development is making a comeback in the U.S. and Missouri. The revival of such development is reviewed with its advantages and challenges. One such development was started in Saint Charles, Missouri almost 20 years ago and thrives today. This development has unique residences, amenities and much common ground.

Providing water, sewer and storm water service to sustainable developments is often challenging. Design and construction is often difficult because the easement area must be minimized. Maintenance of the infrastructure is likewise trying in the cramped quarters. The sewer infrastructure is presently undergoing rehabilitation; our experience in that work is presented. Working in tight quarters is among the obstacles our contractor has to overcome. Techniques used in the construction such as full-depth granular backfill of utilities present challenges when the infrastructure must undergo maintenance. We also have an in-depth look at routine operation and maintenance costs. We compare the cost of

maintaining sustainable development to that of traditional subdivision development. We offer advice from the lessons learned to guide other communities in permitting and operating utility infrastructure in sustainable developments.

Biography: David Cavender is a Utility Engineer with the City of Saint Charles. His 40 years of experience in the water and water reclamation fields was gained in both government and consulting positons. Mr. Cavender is a Board Certified Environmental Engineer, earned a B.S. in Civil Engineering at the University of Missouri and an M.S. in Environmental Engineering at the Georgia Institute of Technology.

Presentation Time 3:45

Title: Technological advancement of biogas upgrading to renewable natural gas - an update on practice and research

Abstract:

Authors: Yue Rao, Zhen (Jason) He

Affiliation: Department of Energy, Environmental, & Chemical Engineering, Washington University in St. Louis, St. Louis, MO

Biogas generated from organic wastes by anaerobic digesters is acknowledged as one of the foremost renewable energies and can help address the current energy challenges. However, many places that operate anaerobic digesters do not actually use biogas. Converting biogas to renewable natural gas (RNG) will enhance the utilization of this bioenergy. This presentation will thoroughly summarize state-of-the-art biogas upgrading approaches including CO2 removal and CO2 conversion to methane. Practical examples of biogas upgrading will be introduced. Research progress on new technologies for biogas upgrading will be discussed. It aims to provide audience the with knowledge about biogas upgrading and identify the associated challenges that must be addressed for a broader implementation of the biogas upgrading technologies.

Presenter Bio: Yue (April) Rao

Yue (April) Rao. Yue is a second-year Ph.D. student in Energy, Environmental, and Chemical Engineering Department at Washington University in St. Louis. She is studying environmental engineering. She published one paper as the first author in Water Research.

Currently, she is working with Dr. Zhen (Jason) in Environmental Biotechnology and Bioenergy Laboratory and is working on an in-situ biogas upgrading project. During her spare time, she loves dancing and going to the gym.

Title: Innovative Trenchless Culvert Lining Solutions

Abstract: As municipal officials and engineers know, aging sewers and culverts made of CMP, brick, clay, and other materials are failing at extraordinary rates. New sewer and storm sewer rehabilitation technologies have emerged and matured, presenting contractors and sewer network managers with multiple rehabilitation options. This presentation explores commonly-deployed techniques for large-diameter sewers including a trenchless solution known as centrifugally cast concrete pipe (CCCP). Several criteria are suggested for evaluating large-diameter sewer/culvert rehabilitation projects and choosing appropriate solutions.

Bio: Colin Melton / Eric Luschen

Colin Melton has spent 7.5 years in the water/wastewater industry with 6 years as the Technical Services Manager for APM Permaform/CentriPipe. While in that role he refined and patented lining equipment and techniques, assisted engineers on designs and trained and guided installers in the field in many different countries in large diameter pipe rehabilitation, utility hole rehabilitation and concrete structure rehabilitation. For the last year and a half, he has been with MMG working in the rehabilitation division specializing in trenchless methods focusing on educating and providing the latest technologies for long term, cost effective structural solutions.

Eric Luschen has spent 8 years in the water/wastewater industry working for McIntire Management Group. Starting from the bottom up, he would travel the Midwest/Midsouth assisting our outside territory reps with inground product demos such as chimney seals for manholes and culverts to FRP point repairs on gravity sewer lines. After about 3 to 4 years of doing that, he took over as the Missouri and Southern Illinois outside territory representative for MMG and have been in that position since. His ultimate goal is to help clients find solutions to help improve their water and wastewater system.