Quantifying Nitrogen Pollution: An Analytical Approach

ABSTRACT: Nitrogen pollution removal from wastewater, in the form of ammonia, nitrate, nitrite, and complex nitrogen, is a goal of utmost importance to wastewater treatment plants. If nitrogen pollution is not removed from wastewater before being discharged back into the receiving waters in the environment, there can be dire and even fatal consequences for flora, fauna, and humans. This can be by the production of harmful microbial species, such as problematic algae and cyanobacteria that can produce toxic microcystin compounds. Another possible issue is the reduction of dissolved oxygen in the receiving waters by eutrophication, causing either the selection and propagation of dangerous organisms, undesirable nuisances such as odor and color, or the suffocation of aquatic organisms in some extreme cases. The introduction of harmful chemical species such as nitrite and nitrate into the environment is also an issue, as high levels can have adverse effects on human health. Luckily, wastewater treatment plants can have the capability to analytically quantify nitrogen pollution so that appropriate measures can be taken within the wastewater treatment plant to reduce the presence of nitrogen pollution in the effluent generated by the wastewater treatment plant. With an understanding of the nitrogen chemical species pollution limits as set by the wastewater treatment plant's NPDES (National Pollutant Discharge Elimination System) permits, appropriate analytical methods can be developed to not only detect the concentration of nitrogen species being discharged into the receiving waters, but also the concentration of nitrogen species within the plant to understand and optimize plant processes to further encourage nitrogen pollution removal. These methods can be as simple as pre-packaged colorimetric methods, or as advanced as a myriad of EPA-recommended laboratory methodologies. However, knowing the concentrations of nitrogen pollution entering and leaving the wastewater treatment plant is only halfway to fixing the issue. A firm grasp of wastewater treatment methods available to combat nitrogen pollution is also very important. In being educated as to why we fight so hard to remove nitrogen pollution from our treated wastewater, we can ensure that we remember the reasons why we continue the battle against nitrogen pollution. The purpose of this presentation is to create a greater awareness of the sources, consequences, analytical methodologies, and treatment techniques regarding nitrogen pollution.

Bio 1: Zach Wilson received his bachelor's degree in chemistry with a minor in geology in 2015. Later, he earned a master's degree in chemistry in 2017. Zach has been working in the field of water and wastewater treatment for a combined 5 years of experience but has been working in various laboratories for a combined total of 13 years. Currently, he is employed as a chemist for the City of Springfield, Missouri at the Southwest Wastewater Treatment Plant.

Bio 2: Serena Austin earned her bachelor's degree in biology and a Minor in Chemistry from Missouri University of Science and Technology in 2014. Serena has been working in the field of water and wastewater treatment for nearly 6 years but has been working in various laboratories for a combined total of 9 years. Currently, she is employed as a senior analyst for the City of Springfield, Missouri at the Southwest Wastewater Treatment Plant.

PFAS Sampling

ABSTRACT: More and more communities are collecting PFAS data in order to understand the loading contribution to their Publicly Owned Treatment Works (POTW). With the finalization of EPA's Method 1633 earlier this year, it is important to ensure that sample collection is being conducted in a way that minimizes potential sample contamination. This presentation will review method-specific sampling procedures, compile best practices from different states, and share lessons learned from PFAS sample collection.

BIO: Katie Bruegge is an Environmental Program Manager at KimHEC. Katie graduated from Bradley University with a BS in Environmental Science in 2012. She has been working in the wastewater field since 2017 where she started as a laboratory analyst. Since then, she has been involved in laboratory supervision, MS4 program management, biosolids program tracking, and pretreatment and FOG program implementation. Katie has been with KimHEC since 2022, working to assist multiple Missouri communities in Industrial Pretreatment Program implementation and maintaining NPDES permit compliance. When not at work, Katie is either completing a home improvement project, spending time with family, or enjoying the outdoors.

A City-Wide Approach to Monitoring Hydrogen Sulfide

ABSTRACT: Odors within wastewater are self-evident to their origin. There is, however, an acceptable threshold for odors in terms of their strength and locale. Odors not only produce a public nuisance, but they can also create unsafe working conditions and even infrastructure degradation. Therefore, it is pertinent to locate, identify and mitigate odors throughout the collection system and wastewater treatment facilities. The scope of this presentation is to identify locations with odors through analytical analysis. Tools used to accomplish this include remote seasonal monitoring, utilizing movable data loggers, collecting water samples and analyzing in a lab setting and having continually logging monitored devices in lift stations which communicate to SCADA. The mitigation portion of this presentation is aimed at finding solutions to reduce odors, increase safe working conditions and protecting infrastructure. Along with mitigation, there lays its own set of continued monitoring and maintenance which will directly correlate the success and efficiency to accomplish the goal to reduce odors, increase safe working conditions and protecting infrastructure.

BIO: Jacob Schwoerer (Sh-where) is currently employed by the City of Jefferson as a Laboratory and Pretreatment Supervisor. He received his Bachelor of Science degree from the University of Wisconsin-Stevens Point in Water Resources with minors in both Soil Science and Wetland Science. In addition, he received his Master of Science degree from the University of Missouri in Natural Resource Management. He holds a Class "A" Wastewater Operators license and is the Chair of the MWEA Laboratory Practices Committee. In his free time, Jacob enjoys spending time with his wife and two daughters, going bowhunting, and working in his ever-expanding garden.

Internal Seed vs. PolySeed in BOD Testing

ABSTRACT: The Biochemical Oxygen Demand analysis, aka BOD analysis, is a measurement of dissolved oxygen used in wastewater samples during the incubation period which is 5 days. It is an index of the biodegradable organics and oxygen used to oxidize inorganic materials in water. A key aspect of this analysis is the use of a seed in effluent samples. This presentation will cover the pros and cons of using an internal versus commercially available seed.

BIO: My name is Eden Viles and I graduated from Lindenwood University in May of 2023 with a bachelor's degree in Biochemistry and I'm currently obtaining a master's in business administration with an emphasis in project management. Shortly graduating, I took a job with the Kansas City Water Department as a chemist and have been there for just over a year now. Outside of work I enjoy working out and hanging out with my dog, a now 5-year-old mini–Australian Shepherd. This is my first presentation at a conference so please ignore my nervousness. Thank you for listening, I hope you learn something new and interesting.

Fats, Oils, and Grease determination using EPA method 1664

ABSTRACT: The determination of oil and grease in wastewater is vitally important to the environment due to the environmental impact it can cause. Oil and grease buildups can cause clogging in wastewater pipes and cause overflows that can cause air pollution, soil degradation, and water contamination leading to the death of aquatic life. Oil and grease analysis is an important step in protecting the environment from the harmful effects of oil and grease contamination. In the determination of oil and grease, the certified method used is EPA Method 1664 A: N-Hexane Extractable Material and Silica Gel Treated N-Hexane Extractable Material by Gravimetry. This method corresponds with the Standard Methods SM 5520 B/F. The method does allow alternative extraction methods provided they adhere to the method definition. Solid phase extraction (SPE) is the most widely known and used of these alternatives. Both extraction methods will be discussed in this presentation. The calculation of results will be discussed along with formulas used and any possible interferences. Lastly troubleshooting issues and errors in methodology and calculations will be covered.

BIO: Derek Gillis, an Inorganic chemist in charge of metals analysis on the ICP-MS, and Fats, Oils, and Grease determination using EPA method 1664. Derek received a Bachelor's Degree in Chemistry in 2010 and a Master's Degree in Analytical Chemistry in 2012. Has 13 years in Wastewater Chemistry at the Southwest Wastewater Treatment Plant for the City of Springfield with the last 8 years spent working as an Inorganic Chemist.

Laboratory Mathematics 101

ABSTRACT: Mathematics is a huge part of running an efficient laboratory. A simple mistake can have huge consequences. We will review the calculations used routinely around your lab. We will even take a step back in time and review a few key math rules to follow while calculating your results.

BIO: Emily Lute currently serves as the Chief Wastewater Operator for the City of Moberly where she's been since September of 2020. Previously to that, Emily worked for 5 years for the City of Jefferson City as the Laboratory and Pretreatment Coordinator. She holds a Class A wastewater license. Emily graduated from Missouri State University with a degree in Wildlife and Conservation Management along with an Agronomy minor. In her free time, Emily enjoys spending time in the outdoors. This can include hunting and fishing or working on the family farm.

Biosolid Sample Collection & Fecal Coliform Analysis by Membrane Filtration

ABSTRACT: Biosolids are nutrient-rich organic materials derived from domestic wastewater treatment. They are processed to reduce pathogens and odors, resulting in a safe and beneficial product for agriculture. This material is closely monitored and must comply with regulatory standards to ensure safe use. This presentation focuses on elements of best practices for sample collection and handling of biosolids, and utilizing the membrane filtration technique through serial dilutions for detection and enumeration of fecal coliforms.

BIO 1: Lien Nguyen is an Environmental Officer at KC Water, with a broad background in environmental science. She is a graduate of Northwest Missouri State University with a B.S. in Environmental Geology. In her current role, Lien assists with maintaining environmental compliance, sample management, and field services at KC Water. Lien's experience extends to roles in environmental mining regulation, economic geology, and scientific education. Beyond her career, Lien enjoys outdoor activities like biking, backpacking, and walks with her dog.

BIO 2: Kayti Monahan received her master's degree in natural & applied science with an emphasis in biology in 2022 from Missouri State University. While finishing her degree Kayti worked at City Utilities' Blackman Water Treatment Plant for 2 years as their Laboratory Assistant Co-op. Currently, she is employed as a Chemist for KC Water with 6 years of cumulative experience working in various laboratories.