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Process Emissions Webinar Series

Webinar 3: Nitrous Oxide Emissions from Wastewater Treatment

October 31, 2024

Speakers: Shannon Cavanaugh (Brown and Caldwell), **Emma Shen** (Jacobs) and **Eron Jacobson** (King County, Washington), moderated by **David Ponder** (U.S. Water Alliance) and **Harry Zhang** (The Water Research Foundation).

Key takeaways:

- According to the U.S. EPA, wastewater treatment is the **third-highest source of nitrous oxide emissions** after agricultural soil management and stationary combustion. Nitrous oxide in the wastewater sector is highly variable depending on space, season and type of treatment process.
- **Sources of nitrous oxide emissions** are numerous and include nitrate accumulation, biological nutrient removal (BNR), post-aerobic digestion, sludge incineration and solids storage, among many others.
- Nitrous oxide can be measured using emission factors, nitrogen loading assumption and direct measurement. Of these, directly measuring nitrous oxide using instrumentation is the **most accurate and complex** way to measure nitrous oxide in wastewater treatment plants.
- The science of nitrous oxide emissions from the wastewater sector is developing, and there are still **unanswered questions about nitrous oxide** when it comes to modelling, prediction, dominant pathways, mechanisms and technologies.
- Nitrous oxide measurements can be **plant-wide or site-specific** and **continuous or intermittent**, and many of these measurement methods can also be used to measure methane emissions. Plant-wide and site-level measurement methods can carry out both continuous and intermittent measurement methods of nitrous oxide measurements. Of all the methods mentioned, **only the aqueous phase method of nitrous oxide measurement cannot measure methane as well**, but this method is sensitive to variations in temperature.
- **Accurate air flow** is critical to accurately measuring nitrous oxide emissions from treatment plants.
- The findings from the case studies presented by Jacobson concluded that nitrous oxide emissions were lower than IPCC estimates, but **aqueous probes are easier to use and provide good estimates of nitrous oxide emissions** from treatment plants.

A critical message from the panel is that although there is a lot we don't know, **we do know enough to start measuring and mitigating nitrous oxide emissions from the wastewater sector now** while ongoing research continues to provide more answers.

This series was organized by the U.S. Water Alliance and Canadian Water Network, hosted by The Water Research Foundation, and presented in collaboration with the Danish Water Technology Alliance, Water Environment Federation and International Water Association.

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