How to minimize the impact of problematic wastewater from upstream distilleries and industry

By **Patrick Kiely**

In almost all regions of North America, municipal wastewater treatment plants (WTTPs) are surrounded by industry affecting their daily influent and resulting effluent. "Industry" has become synonymous with "unpredictability", from the upstream distillery randomly dumping wastewater filled with high organic matter, to local manufacturing plants discharging toxic effluent.

For the WWTP operator, that means unexpected treatment challenges and headaches. For the manager, it means excessive costs and energy use for the plant. Pre-treatment programs are put in place to mitigate this impact, but they lack reliable wastewater tools and data to know what is actually being sent to the downstream WWTP.

A WWTP SUCCESS STORY FROM THE DISTILLERY HEARTLAND

The City of Frankfort, Kentucky's wastewater treatment facility serves a population of 30,000, two upstream distilleries, and 14 industrial clients. The area is also prone to heavy wet weather events.

The Frankfort WWTP includes grit removal, an activated sludge oxidation ditch, a sludge thickener, and a two-stage aerobic sludge holding with a belt press. It has a capacity of 38 million litres per day from two collection streams – municipal and industrial. Because of this and the local weather, the plant continuously faced variable organic loading and major biochemical oxygen demand (BOD) swings.

In fact, during one year, operators had to run the belt presses 24/7 for over a month to keep up with solids production due to BOD loading. They also often came into the plant in the mornings to find the oxidation ditches had turned almost black due to toxicity issues from local industry.

After experiencing continuous influent "surprises" and resulting plant upsets, mainly related to distillery discharges, the Frankfort operations team knew they needed to better anticipate and handle sudden high organic loading and toxicity from these dischargers, and better understand the extent of the impact from rain dilution events.

They turned to Prince Edward Island based SENTRY: Water Monitoring and Control (SENTRY), which offers a real-time biological activity and water quality monitoring platform. By placing SENTRY's zero-calibration, biofilm-based sensors in facility locations never possible before, operations staff gain the real-time influent monitoring and data points they have been needing, allowing for processes to be adjusted on the fly, avoiding kill-off events, environmental disasters and associated fines.

The Frankfort Wastewater Treatment Plant where they used new biofilm-based sensors to identify excessive biological loading and toxic shock events in real time, allowing them to adjust treatment processes accordingly.

EARLY VISIBILITY MEANS EARLY RESULTS

A pre-inoculated SENTRY sensor was initially placed at a location post bar screen, prior to grit removal in the Frankfort plant's influent channel to identify high organic loading or toxic shock. Sensor data almost immediately profiled high organic loading and toxicity from upstream distillery discharges, as well as the true impact from rain dilution. One surprising recurring and weekly upset event flagged by the sensor every Wednesday was triggered by a landfill leachate delivery at a receiving lift station.

Influent visibility like this then led Frankfort to install an additional SENTRY system into their two influent stream splitter boxes as a point of earlier detection and action. This information allowed the operations team to further quantify events coming in, as well as do the following:

- Monitor the biomass health at the influent channel in real time, helping operators divert high-strength influent to a large equalization tank and meter it back in during periods of more stable influent.
- Use targeted manual sampling to capture data during upset conditions.
- Use the real-time sensor data to identify loading trends and patterns to prepare and act early with reoccurring events.
- Fine-tune process decisions during upset events to identify what works best to maintain stable effluent quality despite

changing influent conditions.

With both SENTRY systems, Frankfort's WWTP now saves an estimated $80,000 to $120,000 USD a year and has improved its oxidation ditch loading management. The plant continues to use the two layers of defense to protect and optimize their treatment process during highly variable influent fluctuations and toxic events. They are now exploring a third SENTRY system further into the treatment process to contribute to a feed-forward aeration control process.

PROBLEMATIC INFLUENT DOESN'T HAVE TO BE A PROBLEM

The most challenging part for any treatment facility operation is a lack of real-time visibility into the characteristics of the wastewater being treated. Most tools for monitoring wastewater are either lab-based or come after treatment processes. As such, operations teams typically wait five days for sampling results. When there's an average of over 25 problem events detected daily, that's a lot of process upset leading to operational challenges, additional costs, and environmental impacts.

The zero-calibration, biofilm-based SENTRY sensor.

However, problematic influent (from whatever source) doesn't need to remain a problem if the data is available to help stay one step ahead. Depending on a sensor's location, this means these teams can build better pre-treatment solutions that allow then to better identify and understand organic loading, industrial discharge toxicity, toxic/imbalance events, impact of I&I (rain events), seasonal impact on plant performance, optimal aeration efficiency, optimal carbon dosing, carbon requirements and effluent wastewater quality.

Having the right data at the right time gives WWTP operators the confidence they need to turn variable influent into more predictable outcomes, with a lot less hassle and cost along the way. With the right sensor data they can now get the continuous microbial metabolic activity snapshots that directly correspond to how treatment processes will be affected by the industry around them. ■

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