USING AN EARLY OIL SPILL INFLUENT WARNING SYSTEM CAN PREVENT WWTP FOULING

By **Der-Liang Yung**

In May 2020, the Co-op Refinery Complex in Regina, Saskatchewan, experienced an oil spill from their storage pond, which led into the municipal sewerage network. As a result, the Water Security Agency, which oversees Regina's wastewater treatment plant, was forced to divert some 60,000 litres of incoming wastewater into a segregated lagoon for special treatment.

What is poignant about this story is that the operators at Regina wastewater treatment plant relied on visual inspection to identify the oil spill slick on the surface of the incoming wastewater. There was no automated system, nor specialized sensors, let alone any provisions for how visual inspections would occur at night. Human observation alone is fallible and reaction times can be delayed by the bureaucracy of decision making at each level of management. The questions arise:

- What would happen if the oil slick entered the wastewater treatment plant?
- Would the plant have to shut down for cleanup and repairs?
- What impact would it have on the water management for the city of Regina?
- What would the overall cost be, both financial and reputational for industry and residential?
- And, importantly, what if the scenario was contamination of a drinking water source?

Although treatment plants are meant to handle all sorts of wastewater, whether it be from residential or industrial sources, incoming oil contamination still poses a considerable threat to a facility's operations. These oil spill incidents can occur any time and without warning. If not handled properly, they can lead to contaminated wastewater flowing into natural environments. Depending on the technology behind the facility, oily wastewater can foul membrane filters, destroy the biodigesters, or clog sand filters, leading to a potentially long plant shutdown.

Hydrocarbon sheens will tend to surface once entering laminar flow areas in rivers and streams. Here is where early detection is most critical for an appropriate oil spill response.

The number of industries which use water as a medium and therefore discharge water is greater than one would imagine. Cement, chemical, metal, petroleum, food, microchip and pulp & paper manufacturers can all discharge process water in some form into municipal wastewater systems.

A wastewater treatment plant's location is an important factor in assessing the risk level from oil pollution. When it is downstream from industry, there is always a chance for accidental oil contamination reaching it. Wastewater treatment plant shutdowns are particularly critical when oil contamination exceeds the ability of the plant to handle it. To ensure protection, the critical requirement is safeguarding and actively monitoring influent inlets.

The Remote Optical Watcher (ROW) by Laser Diagnostic Instruments (LDI) is an oil spill detector, which monitors water in real time and sends early-warning alerts when it detects oil sheens. The main principle of the technology uses UV fluorescence to distinguish hydrocarbon's unique fluorescence signature and potentially other materials on the water.

The centre piece of the technology is the optical, non-contact feature with a physical range of up to 10 m from the water's surface. This allows the sensor to be installed safely over a river or pump station channel while monitoring the water upstream of a treatment plant.

Non-contact sensors eliminate biofouling or contamination of the instrument. Whether it be algae growth, or dissolved organic matter, not having a sensor physically in the water column means a cleaning mechanism is not necessary.

The second advantage stems from the inherent nature of oil spills. Common

oils such as diesels, gasoline, lubricant oils or machine oils naturally float on the surface. A common oil spill incident would constitute fresh, raw oil being spilt from a source, and inadvertently discharged into the waterway carrying the slick downstream.

Even taking turbulence into account, these hydrocarbon sheens will tend to surface once entering laminar flow areas, which are normally found in rivers and streams. Here is where early sheen detection is most critical for an appropriate oil spill response.

Installing a network of autonomous oil spill detectors in the area leading to the water inlets of a wastewater treatment plant allows for early detection of potential threats. The continuous 24/7 monitoring, configured with controllers for alarms, datalogging and triggers, can automate the initial decision making process, saving critical time in the early stages.

It also provides more options for appropriate containment. Whether diverting the oily water away from a plant, or quickly deploying oil absorbance booms or materials, the importance of early warning may signal the contrast between managed response and unmitigated disaster.

Each sensor can be connected on-grid or completely off-grid, with all data converging to a single control centre. Trend data can correlate when and where oil spills have been previously detected, and, depending on the different upstream inlets, allows authorities to narrow the polluting source.

While sensor technology cannot prevent an oil spill, it can help to limit the damages caused by the initial incident by providing early warning and faster response in subsequent stages. ■

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