Case Study

Highland Creek Wastewater Treatment

GENERAL MONITORS
Protection for life.

Problem

- Wastewater methane gas build-up
- Low sensitivity and excessive drifting
- Maintenance intensive resulting in excessive man-hours
- Short sensor life cycle
- Need rapid troubleshooting

Solution

- Combustible gas detectors, controllers, accessories
- Low drift increasing both reliability and intervals between calibration cycles
- Non-intrusive one-man calibration
- Poison resistant sensors for longevity
- Superior diagnostic capabilities

Application

The Highland Creek Wastewater Treatment Plant serves a population of 310,000 people on roughly 35,000 acres in the Municipality of Scarborough, Ontario, adjacent to Toronto, Canada. The 145.8 acre facility is managed by the City of Toronto Works Department and has been in operation since 1956. The plant has a treatment capacity of 48 million gallons of wastewater per day.

The wastewater treatment process begins at the Head House where grit and inorganic materials are screened out. The next step is Primary Sedimentation where the flow enters large tanks, the velocity is slowed, and solids settle to the tank bottom. These solids are then pumped out to a sludge blending tank. Next aeration occurs when effluent from a Primary Sedimentation tank is mixed with return activated sludge from final sedimentation tanks into aeration tanks. The 16 aeration tanks have a total volume of 53,000 cubic meters. The mixed liquor from the aeration tanks then flows into one of 16 final sedimentation tanks where sludge settles. Chlorine then disinfects the final effluent to destroy organisms before discharge into Lake Ontario. Finally, the sludge is allowed to settle and thicken before it is dewatered and incinerated.

The process involves an extensive methane gas generation distribution network. Therefore, reliable and accurate gas detection is of paramount concern for the protection of the plant's people and equipment, as well as maintaining sewage services for local residents.

The Dangers of Methane Gas Build-Up

Decomposing organic carbons can quickly cause methane gas build-up. Methane gas is colorless, odorless, lighter than air, and extremely flammable. In the confined spaces of wastewater treatment facilities, methane gas build-up can cause oxygen deficiency asphyxiation, ignition, and/or explosion.

Selecting the Right Gas Detector

After previously employing a series of 40 gas sensors from another supplier, the Toronto Works Department, Water and Wastewater, discovered sensitivity was low while excessive drifting resulted in unreliable gas detection and excessive maintenance costs.

With mounting expenses for both manpower and equipment, the City of Toronto carefully examined its options. It selected General Monitors to develop two complete gas detection systems, including sensors, controllers and operator interface panels. With its requirements for a high-performance, robust system, the City of Toronto looked for specific feature sets. Among the requisite features were non-intrusive one-man calibration, low maintenance with increased reliability, long-life poison resistant sensors and longer calibration cycle intervals. Additionally, the city looked for on-board diagnostic capabilities for troubleshooting ease and a strong technical support staff.

The solution developed by General Monitors consisted of two complete methane gas detection systems. System One included an S106A Smart Sensor and an IR2100 infrared point gas detector, both to detect methane, and an S700 CO smart sensor, which was combined with a DC120 dual channel readout relay controller (for the IR2100), two trip amplifiers (TA102A and TA502A) and a system panel enclosure. System Two included one IR5000 open path monitoring system and one IR2100 infrared point gas detector along with

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two trip amplifiers (TA502A and TA102A) and a system panel enclosure. With the implementation of the two new systems from General Monitors, the maintenance cycle was reduced to once every three months. The result was a 90% annual manpower savings, reducing overall maintenance hours to just 32 hours per year. Additionally, the sensor's longevity (coupled with ease of calibration), and gas detection sensitivity, earned the long-term trust of operating personnel.

Detector Sensing Technology

Model S106A

The S106A is designed around a rugged, highly reliable catalytic bead sensor. It operates on the simple principle that combustible gas can be oxidized to produce heat, resulting in a temperature change that is converted via a standard Wheatstone Bridge-type transducer to a sensor signal.

Model IR2100

Using infrared point technology, the IR2100 is a highly reliable gas detector. The detector measures the intensity of the specific wavelength and compares it with another outside the absorption wavelength.

Model IR5000

Housed in a tough aluminum housing, the IR5000 open path gas detector is highly effective in measuring hydrocarbon gases. Using an infrared detection method based on the absorption of IR radiation, the gas concentration is measured as an average over the path length.

Model DC120

Contained in an explosion-proof case with a large viewing window, the reliable Model DC120 controller displays read-outs based on two remotely located General Monitors combustible smart sensors. A redundant design ensures continued operation in the unlikely event a channel is unavailable.

Model S700

(superceded by the Model TS400)

Using electrochemical cell technology, the S700/TS400 continuously monitors for carbon monoxide. The 4-20mA analog output signal provides linear output that easily connects to control hardware, PLC's or computer-based systems.

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