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Gas monitoring for safer environments

A Toxic Odour Problem Is Reduced to Almost Nothing

Industry: Municipal Wastewater
Problem: Lift station odour and hydrogen sulphide control

Business Overview

The Water District provides fresh water and sewer service to more than 40,000 residents and more than two million visitors a year in this coastal community. The district delivers 25 million litres of water each day to homes and businesses and removes 15 million litres of wastewater for treatment.

The District's facilities are extensive. The sewer system contains 200kms of pipelines, 3,800 manholes, 14 lift stations and 5kms of force mains.

The district's commitment to quality service is evident: to meet or exceed state and federal standards through disciplined maintenance and repair, as well as the addition of capital improvements to its facilities.

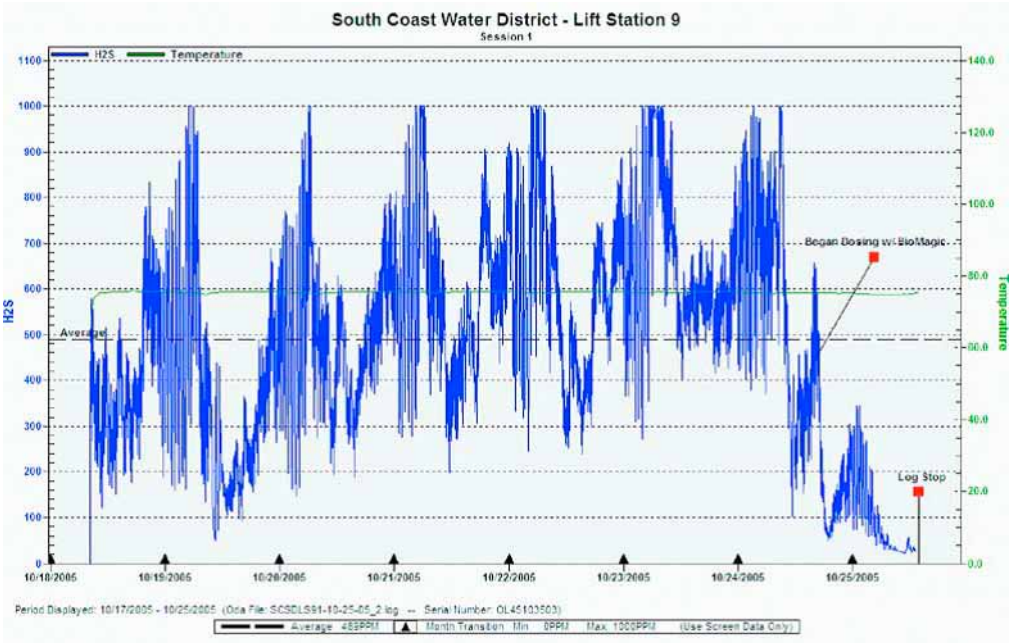
Challenge

Lift Station 9 is located in the environmentally sensitive marina area of the harbor, with the force main discharge manhole very near a highly used jogging and biking path.

Restaurants and businesses provide the lift station's primary influent.

Unfortunately, most of the restaurants in the marina area are older, meaning that they do not have the grease interceptors required of new food service establishments. The influent to the lift station, therefore, contains an inordinate amount of grease and food wastes. Rapidly decaying wastes, plus normal sewage, along with long periods of very low flow, contribute to an environment for heavy production of liquid sulphides. Add the turbulence created as the effluent of the force main drops almost 10 feet to the floor of the force main discharge manhole and now we have the ideal situation for the release of extremely high levels of hydrogen sulphide gas (H2S). The result is both corrosive damage to the manhole cover, ring, and lining and significant odour complaints.

To determine the extent of the problem, baseline measurements were taken in the force main discharge manhole for one week using an OdaLog L2 H2S datalogger provided by Thermo Fisher Scientific. The average H2S concentration for the baseline test was 527 parts ppm and at least once each day, H2S levels exceeded the instrument's 1000 ppm upper limit.



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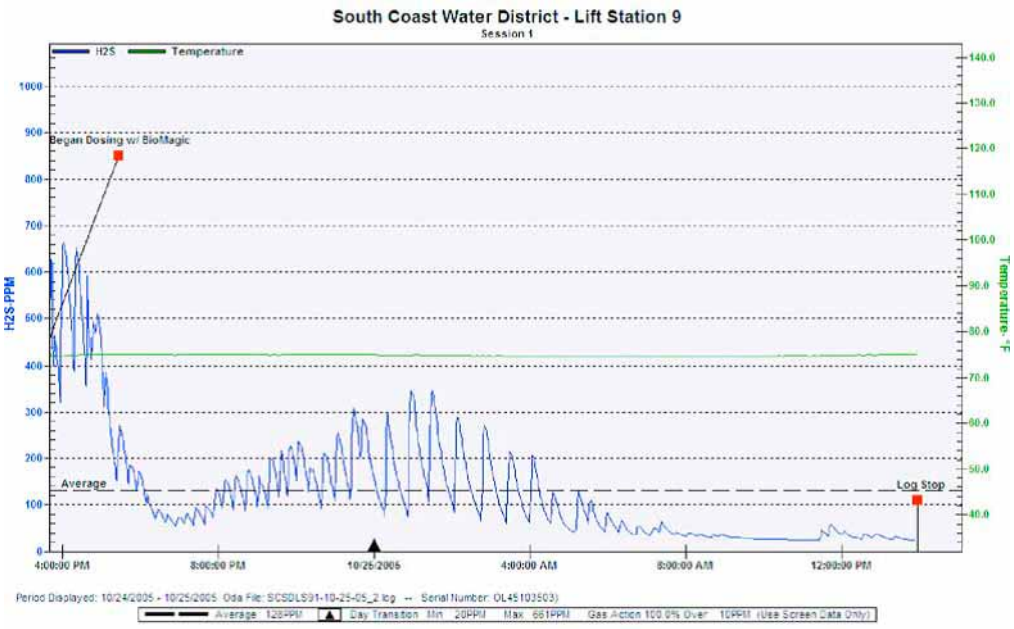
Solution

A chemical injection system was set up to deliver product directly into the wet well. Because of the extremely high sulphide levels, an aggressive dosing scheme was implemented. This dosing was semi-continuous, delivering every three minutes.

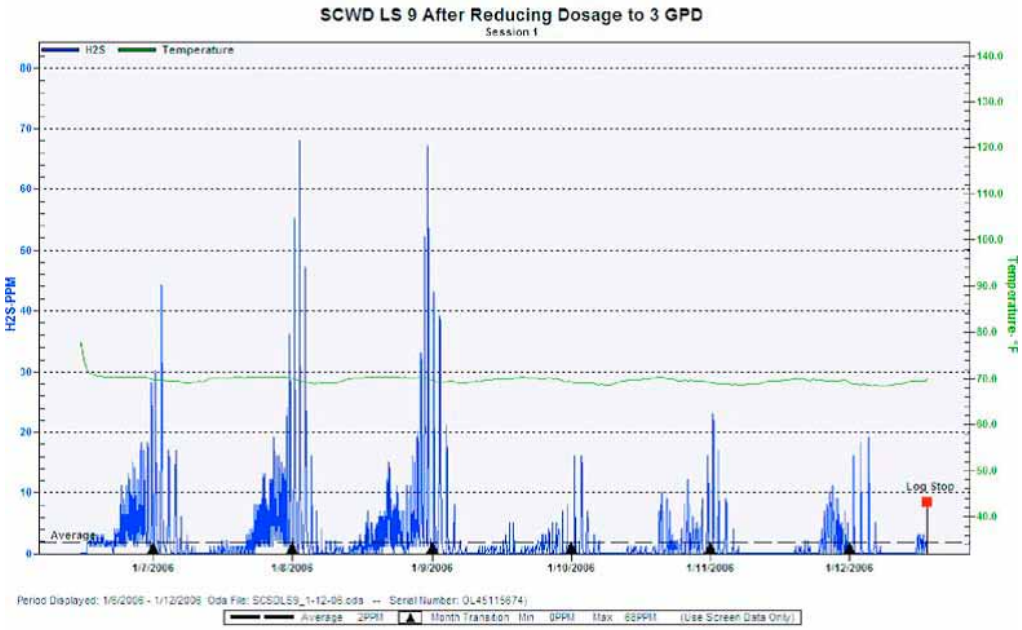
Results

H2S levels recorded by the Odalog L2 dropped dramatically to fewer than 25 ppm during the 15 hours after treatment began—a 20 times reduction.



Dosing continued at this level for an additional 17 days while the OdaLog gas logger continued to monitor the levels. Average H2S levels were reduced even further during this time frame to 9 ppm.

Dosing was then reduced by 40%, which was the originally agreed upon maintenance dosing level. Treatment continued at this level for about one additional month. Testing showed that average H2S levels had dropped to 2 ppm. Odour complaints had been eliminated.



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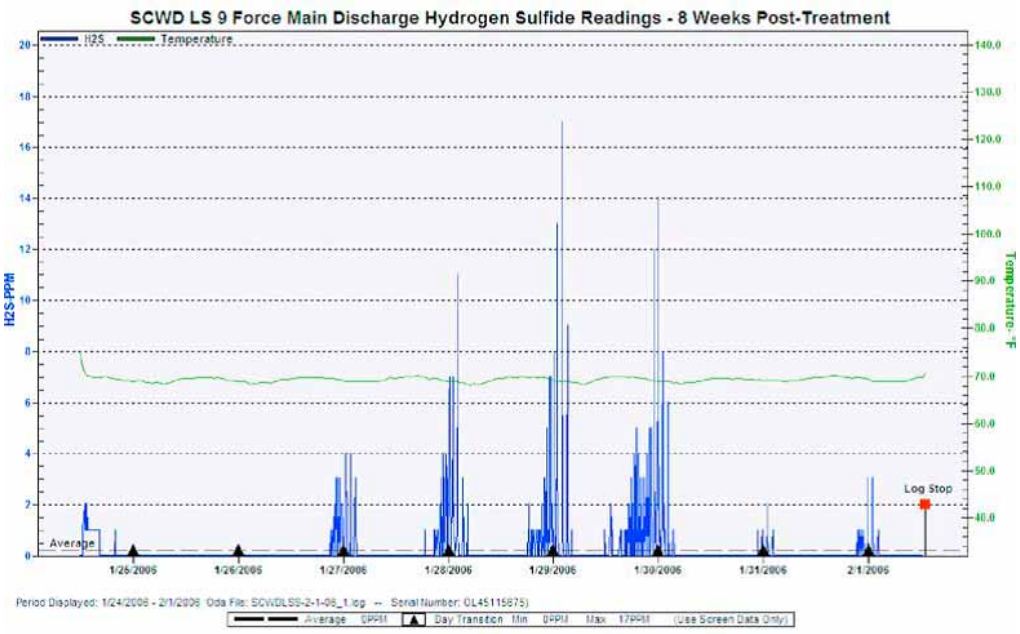
Eight weeks after initial treatment, average H2S readings were even better, having been reduced even further to 0 ppm, with minor spikes of 2-15 ppm.



Odour complaints have been eliminated, corrosion damage has been stopped and the district and its customers are all breathing easier.

The OdaLog L2 detectors remain in place, regularly recording the H2S readings, to ensure levels are being maintained.

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Responsible Management of Landfill sites

Many areas of towns and cities have been reclaimed by landfilling since the 1950s , where waste, primarily of household rubbish, is deposited at the site. Following their closure, the sites are capped and rehabilitated. Part of the requirement of a landfill closure is to ensure ongoing monitoring for legacy gases that may rise from the old landfill. Many of these areas have subsequently been developed for parklands or industrial purposes.

Landfilling produces landfill gas for many decades, which, in some cases, can migrate through the subsurface, may accumulate in confined spaces within buildings and structures and may be detected above ground. The odour generated by this rubbish and occasionally experienced by facility neighbours consists mainly of trace levels of ammonia and sulphides. These are also the heaviest elements of landfill odour and have a tendency to linger and travel low in cool, still weather conditions. Contrary to popular belief, methane and carbon dioxide are odourless. Methane is the major component of gas generated by decomposing organic wastes in landfills. Methane is also the principal component of our natural gas reticulated to our homes for heating and cooking.

A Queensland local council requires ongoing regular testing of methane levels to be undertaken at major locations over a period of 6 to 12 weeks. The requirement is for a system robust enough to overcome adverse weather conditions. Ideally this system will be flexible in terms of the number and types of sensors communicating to the controller. The main hazards to monitor were methane, H2S and CO2. The monitoring will enable council to assess any potential ongoing risk and alert businesses in the area of any action that may be required.

Thermo Fisher Scientific, a leader in the design and delivery of integrated solutions for the detection of toxic and combustible gases, has provided a solution to detect a variety of gases and provide around-the-clock detection with multiple audible, visible, local, and remote threat alarms.

The RAE MeshGuard Gas Detection system offers the flexibility required for this application as it is a wireless system that gathers sensor and alarm data from up to 24 monitors simultaneously. The Meshguard will remotely monitor toxic gases using the most advanced gas detection technology and connected data systems. It is rugged, reliable and designed for rapid deployment. The heart of the system is the FMC 2000, the command and control centre of the MeshGuard intelligent, self-healing network.

The council enjoyed the ease of use of this system as all they are required to do is turn the system on, as the wireless detectors come online automatically. Further assisting with the ease of deployment is the fact that each remote wireless sensor can be magnetically mounted or fastened to a stainless steel bracket to increase the security of the system and it runs for up to six months on a single battery, providing continuous detection and measurement of potential threats, or a solarpak for 24/7 uptime. The MeshGuard intelligently finds the best available path to establish a self-forming, self-healing wireless network and delivers all sensor and alarm data.

Safety personnel will get up-to-date information from a network that immediately relays data regarding dangerous gases to an easy-to-understand central system.

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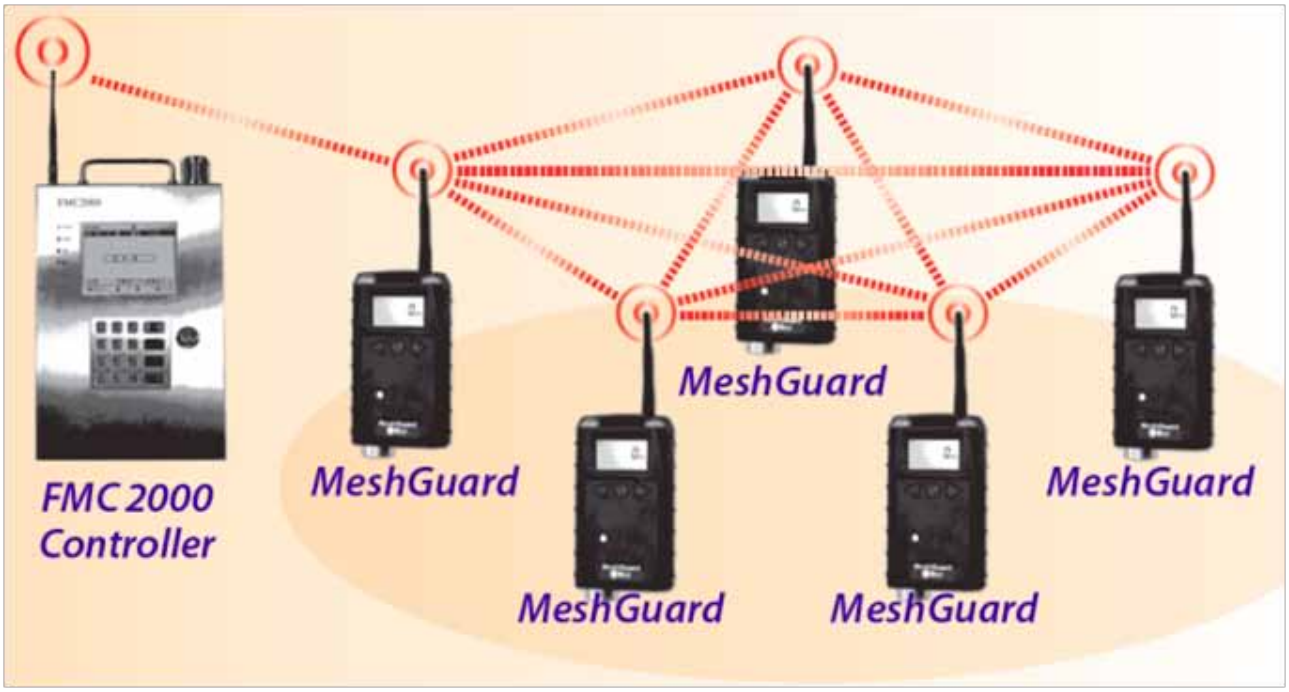

The initial deployment consists of 4 Methane sensors with the ability to add more sensors in future depending on their requirements.

According to Thermo Fisher Scientific the MeshGuard is intrinsically safe, IP-65 rated weather resistant, and IECEx certified for hazardous environments.

Laboratory low oxygen monitor

Across the world, many laboratories in academia, medical facilities and industrial businesses, to name a few, use nitrogen in their daily routines. Nitrogen can be used as a carrier gas, for flushing lines, as a refrigerant or just in daily use around a laboratory.

Nitrogen is essential for flora and fauna, including humans, to survive and grow.

The air we breathe is composed of 79% nitrogen and 20.9% oxygen. In a laboratory environment, an increase in nitrogen from a leak or a spill can displace the oxygen in the breathable air; eventually bringing the oxygen content down to a level that can prove fatal. Generally, when the oxygen level reduces to 19.5%, the air is considered oxygen-deficient and evacuation of a laboratory is required. It's very important to understand that this is not a hazard associated only with large laboratories or applications. Even small amounts of inert gases can create lethal conditions in small areas and rooms. Adding to the hazard is that at sufficiently low concentrations of oxygen, the first indication of a problem is sudden unconsciousness, followed rapidly by coma and death.

Oxygen deficiency hazards can be safely mitigated. The key is to first be aware of the problem and then to determine the extent of the hazard. Once this is done, appropriate mitigations may be taken to reduce the hazard. Typical mitigations include the use of fixed or personal oxygen monitors that alarm if the oxygen concentration becomes unsafe.

To ensure lab staff have breathable air where there is the possibility of an increase in nitrogen, fixed oxygen detectors should be installed. Thermo Fisher Scientific, an industry leader in the design and delivery of solutions for gas detection, can provide an inexpensive detection and alarm system using world-renowned Honeywell Analytics instruments.

The solution comprises of a single point oxygen detector, a single channel control panel and two combination light /sounder alarms. The Signalpoint oxygen detector is mounted in the laboratory and wired to a local alarm inside the lab to warn staff of a decrease in oxygen. It includes a LED indication of their status; green, amber or red. When used with the Honeywell industrial controller Touchpooint 1, all user adjustments are made at the controller as required. The Touchpoint 1 control panel accepts an AC or DC power input and is positioned outside the lab, or at a designated safe area, with a second combination alarm that warns people not to enter the area. The

Touchpoint 1 control panel can be used to acknowledge the alarm and monitor conditions inside the lab.

As well as providing local alarms, the Touchpoint 1 can send a signal to a BMS or SCADA system to warn building monitoring or maintenance. This signal can then be used to control ventilation, close or open valves and other actions as needed.

For applications requiring more than one detection point, Thermo Fisher Scientific offers the new Honeywell Touchpoint Plus with the Signalpoint oxygen detectors, providing a single panel solution monitoring up to sixteen detection points. The Touchpoint Plus' intuitive user interface and expandable approach enables the user to take control and configure what they need for a wide range of applications.

For personal protection, Thermo Fisher Scientific offers a range of portable, wearable gas detectors, the BW GasAlert Extreme portable gas detectors can monitor for and alert the user to potentially harmful situations or explosive gases that can't be seen — alerting for danger so they can take the right action. These are maintenance-free single-gas portable detectors, providing an easy, cost-effective and reliable way to ensure safety and compliance for people at risk.

It is often forgotten that Oxygen enrichment can also cause a risk. At increased Oxygen levels the flammability of materials and gases increases. At levels of 24%, items such as clothing can spontaneously combust. The Touchpoint gas detection systems offered by Thermo Fisher Scientific can allow for a second gas level to be monitored. If an upper level of oxygen is prescribed, a safe operating range can be determined.

These systems offer low cost, easy installation and simple maintenance making them a good choice when managing risk to property and people.

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