

FIVE INNOVATIONS IN FIXED GAS DETECTION THAT IMPROVE PLANT SAFETY

Process and plant engineers all know the dangers of undetected hazardous gases, especially in the oil/gas and chemical industries where these hydrocarbon-based fluids are both the product and a daily safety challenge. In these plants, Safety is Job #1 because the consequences of an accident can be devastating in terms of the potential loss of human life as well as the damage to equipment or facilities that can be catastrophic.

While the safety industry has come up with a number of highly effective sensor technologies for combustible and toxic gas monitoring, they all have limitations based on the application environment and none of them are truly easy to install and maintenance free. For that reason alone, the safety industry continuously focuses on developing new innovative technologies, materials and construction techniques with the intent of making safety easier.

The Problems

Three of the major complaints about fixed gas detection equipment that cause the most problems for plant teams in hazardous industries are:

- Frequent sensor replacements
- Installation and maintenance challenges
- Integration with plant control systems

Under the best of circumstances, fixed combustible and toxic gas detection is difficult. Petrochemical processing plants are typically large and often have a high density layout of equipment, piping and tanks. Processing areas requiring gas detection are often

partially or fully exposed to the outdoors, subjecting gas monitors to heat, humidity, fog, rain and wind.

For these reasons, no single fixed gas detection sensor technology is appropriate for all applications. Depending on the location, the surrounding environment and the nature of the leak source, what works well in one location can be a failure in another. The differing chemistry of gases further complicates the detection method. For example, differences in density affect where a gas will pool inside a building or how a large cloud will move in the wind.

All that being said, the safety industry is now making great strides in adopting the latest digital technologies and advances in materials and construction techniques. For example with newer digital bus communications such as HART, fixed gas detection systems are now simpler to integrate with other plant equipment and systems, as well as easier to update and troubleshoot.

There are five important trends in fixed gas detection systems that are worth paying attention to at this time. This is especially true if your plant hasn't upgraded recently to newer gas detectors or is planning an upgrade or expansion project in the near future.

Innovation 1: Sensing Technology and Configuration

Until now, most fixed gas detection systems have been constructed with discrete electrochemical, catalytic bead, metal oxide semiconductor (MOS) or point infrared (IR) detectors. That was fine if you were concerned only about one gas, but what if you needed to monitor two different gases? You had to buy two individual transmitters, wire them up and commission them. You also had to maintain both of them—test, clean or replace sensors, recalibrate and bring them both back online. The electrical wiring and maintenance expenses ended up being more expensive than the monitor itself.

That's all starting to change now thanks to MSA's latest dual sensor transmitter design for fixed gas detectors. The new ULTIMA X5000 Gas Monitor (Fig 1) with its dual sensor design doubles its capabilities while requiring 50 percent less wiring and conduit than a single gas transmitter for equivalent sensing coverage

Using MSA's XCell® electrochemical sensors, catalytic bead sensors or point IR sensors, the ULTIMA X5000 detects any two combinations of combustible gas (0 to 100% LEL), H₂S or CO in multiple ppm ranges, as well as 0-25% O₂. Accuracy is ±2 to 5% of full scale depending on the gas and sensor type.

Another trend to watch is a new open-path gas detection technology from MSA. Open path detection technology is an excellent solution for monitoring large areas or perimeters where point detection would be too costly or impractical. The company's Senscient ELDS™ Open Path Gas Monitor (Fig 2) with its enhanced laser diode spectroscopy (ELDS) sensor detects toxic and flammable gases with remarkable specificity. In the event of a gas leak, the sensor's laser technology detects the Harmonic Fingerprint™ produced by the target gas's absorption of the laser light. The harmonics produced through absorption of the laser light are as unique to the gas as a human fingerprint is to an individual, thereby providing a level of false alarm immunity unmatched by any other gas detection technology (Fig.3).

Critical to any open path detectors function is to maintain a clear path between the transmitter and receiver, which can prove very challenging in outdoor applications. Senscient ELDS Class 1 eye



Figure 1: ULTIMA X5000 dual sensor gas transmitter



Figure 2: Senscient ELDS laser-based open path gas detector

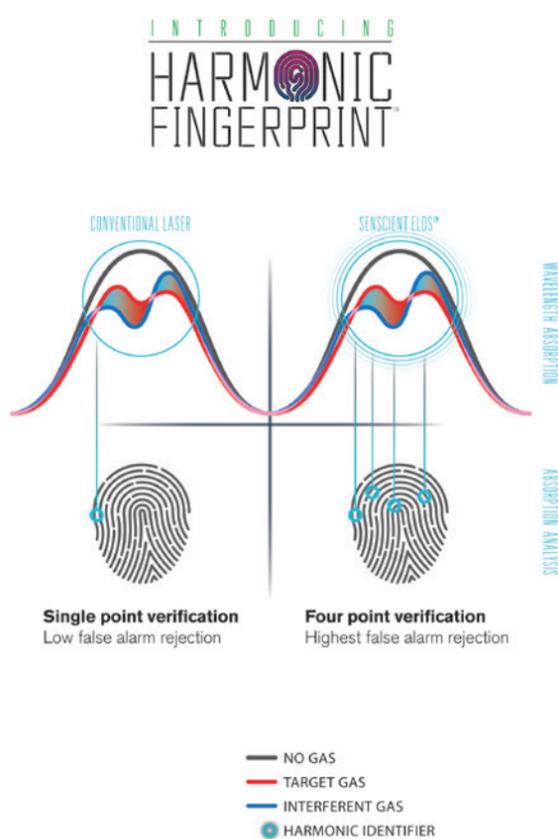


Figure 3: Harmonic Fingerprint technology helps eliminate costly false alarms

safe lasers are used to penetrate thick fog, heavy rain and snow beyond the capability of traditional open path infrared (OPIR) detectors. With the automated SimuGas™ safety integrity self-check, there is no need for the typical OPIR sensor gas checks and recalibrations requiring field technician time to address. Unlike electrochemical cells, Senscient ELDS sensors are also immune to sensor poisoning and interferent gases, thanks to their gas specific harmonic fingerprint detection.

Innovation 2: Touch Screen Displays

The point of fixed gas detectors is that they can be located where people might rarely come into contact with a combustible or toxic gas until it is too late. On the other hand, there are many locations where the transmitter can be placed where it is more convenient and less labor intensive for factory technicians to review and confirm alarms, diagnostics data or make updates.

With an industry-first touch screen button interface and a bright OLED display, the ULTIMA X5000 Gas Monitor makes it easier than ever to view plant safety data. The field of view of this new generation of OLED displays improves visual ergonomics for technicians who are often working under challenging plant conditions. The X5000's colorful text and icons show a gas reading gauge, progress bar, operational status, maintenance alerts and alarms.

Innovation 3: Wireless Bluetooth

Employee falls are one of the most common causes of accidents in process and manufacturing plants. Fixed gas detection monitoring systems often must be located and directed in high or other hard to access locations near piping or valves and other critical equipment that must be monitored continuously for combustible or toxic gas leaks.

With the improved security of wireless technology, the addition of optional Bluetooth® communications to the ULTIMA X5000 gives plant technicians with mobile devices an HMI screen and fully capable controller at their fingertips. All functions can be reviewed and performed up to 75 feet (23 meters) away for added safety and convenience in difficult to reach locations.

Innovation 4: Digital Bus Communications

The evolution of standardised digital communications, such as the HART protocol, offers many advantages to plant and corporate teams in terms of bringing the right data to the right systems both at individual plants and to large corporate networks. HART protocol, for example, provides process information to DCS, PLC and other plant control systems that can issue safety alerts in the event of a combustible or toxic gas leak and initiate gradual plant shut-downs based on those alerts, compile historical event data and more.

The ULTIMA X5000 Gas Monitor is available with HART 7 protocol. That means carbon monoxide and hydrogen sulfide XCell® Sensors with TruCal® technology from MSA are capable of sending sensor status via HART into a plant's preventative maintenance system, further automating the sensor maintenance process.

Innovation 5: Onboard Diagnostics

Depending on the sensor technology chosen, nearly all gas detection monitoring systems require periodic maintenance. The routine maintenance required can range from periodic cleaning, sensor calibration, sensor replacement or monitoring for signs of sensor poisoning that degrades performance and reliability.

To improve the ease of use of toxic gas detectors, MSA's advanced XCell® Sensors are designed with TruCal technology that actively monitors sensor life, compensates for environmental factors such as high temperatures or humidity and adjusts for drift. For worry-free operation, XCell sensors with TruCal self-check four times per day with an electrical pulse, which mimics the real application of gas eliminating the need for manual intervention. They are designed with a typical five- to ten-year sensor life, depending on the gas and sensor type.

Conclusions

Safety will always be Job #1 in hazardous industries such as oil/gas, chemical processing and many others where combustible and toxic gases are potentially present. The safety industry has a long history of innovation and recognises the need to improve performance, increase reliability and simplify use and maintenance. If you're planning to upgrade, retrofit or expand your facility, make fixed gas detection one of the first priorities.

Talking early with safety professionals will ensure that you're able to optimise the gas monitoring safety of your plant. Don't wait until late in the process or you could find yourself with unnecessary safety challenges—think ahead. If you have a problem, be sure to reach out quickly to safety industry professionals who see the same or similar problems every day and can assist you in resolving them with fewer headaches at the lowest possible cost.

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