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SIX FIXED GAS DETECTION INNOVATIONS

SAFETY MONITORING IN THE OIL & GAS INDUSTRY

FOCUS ON ENCLOSURES

MITIGATING CONDENSATION WITHIN ENCLOSURES

KEEP PROCESS INSTRUMENTS PERFORMING

LIMITS OF MECHANICAL SWITCHES

PM # 40065710

THE NEW HA-VIS RFID READER RF-400 FROM HARTING CANADA
Page 10

HN4FM DOUBLE DOOR CABINET FROM HAMMOND MANUFACTURING
Page 23

THE SUMMIT 2196 ANSI CENTRIFUGAL PUMP FROM JOHN BROOKS COMPANY
Page 19

NEW WATERFLUX 3070 FLOWMETER FROM KROHNE
Page 29

Six Fixed Gas Detection Innovations to Consider for Safer Plants

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The dangers of undetected combustible and toxic gases in hazardous industries are well-known to process and plant engineers. Safety is Job #1 in these industries because the consequences of an accident can be devastating in terms of the potential loss of human life as well as catastrophic damage to equipment or facilities.

To prevent gas related accidents, the safety industry continuously focuses on developing effective sensor technologies for combustible and toxic gas monitoring. Unfortunately, they all have some limitations based on the application environment and human error. In addition, most of them are not truly easy to install, operate or maintain.

That's starting to change significantly at this time. The safety industry is today focused on adopting and developing a whole new generation of innovative gas monitoring technologies. These advances in fixed gas detection offer new sensors, more advanced intelligence, the latest in communications and efficient packaging, all with the objective of making safety systems smarter, more intuitive and easier to implement and maintain.

The problems

The three major complaints about fixed gas detection equipment that cause the most problems for plant teams in hazardous industries can be summarized as:

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

Fixed combustible and toxic gas detection is difficult under the best of circumstances. Process plants, such as those found in the petrochemical, mining/metals, pulp/paper, electric power and other industries, 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.

With all that being said, there are six emerging trends in fixed gas detection systems that are worth paying attention to at this time from both a safety and lifecycle cost perspective. 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.

Figure 2. Senscient ELDS open path gas detector

1. Electrochemical Cell Sensor Advances

The new generation of XCell® sensors with TruCal®technology (Figure 1) saves time and money by offering higher performance (faster response times) and a longer life that is double the industry average. They also automate much of the hard work previously performed by technicians during installation with plug-and-play capability and less maintenance.

Figure 1. XCell sensors with TruCal Technology

These next-gen electrochemical cells have been designed with pulse check technology and Adaptive Environmental Compensation (AEC) algorithms. With built-in TruCal technology, they provide peace of mind like never before when it comes to assuring continuous proper calibration to avoid missed or false alarms that can result in accidents or reduced productivity.

Automated pulse checks are the muscle behind TruCal technology. Every six hours, an electrical pulse stimulates the sensor, similar to having actual calibration gas applied, providing a snapshot of the sensor's sensitivity at the time of the pulse. Using this sensitivity snapshot, the sensor can:

- Validate that the sensor is operating normally.
- Compensate for sensitivity drift due to changing environmental conditions.
- Recommend when a calibration should be performed.
- Warn when the sensor will need to be replaced in the near future (2-3 months).
- Report the life and health status of the sensor as "Good" or "Fair".
- Initiate a "Fault" alert indicating the sensor is no longer monitoring effectively.

2. Laser-Based Gas Open Path Detectors

Another trend to watch is a relatively new open path detection sensor technology that is an excellent solution for monitoring large areas or perimeters where point detection would be too costly or impractical. ELDS™ Open Path Gas Monitors (Figure 2) with enhanced laser diode spectroscopy (ELDS) sensing can detect both flammable and toxic 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 other gas detection technologies (Figure 3).

Critical to any open path detector's functionality is to maintain a clear path between the transmitter and receiver, which can prove very challenging in outdoor applications. These ELDS Class 1 eye safe lasers are used to penetrate thick fog, heavy rain and snow beyond the capability of traditional open path infrared (OPIR) detectors. They are an excellent alternative to non dispersive infrared (NDIR) gas detectors where harsh weather is a maintenance issue.

3. Onboard Diagnostics-Ease of Maintenance

Simplifying and reducing the cost of maintaining fixed gas detectors is a major focus in the industry. The routine calibration checks required by toxic and combustible gas detectors are today largely a manual task performed by technicians who must carry special tools, test gas cylinders and more with them. Spare gas sensors and other parts also must be stocked, stored and inventoried to be ready for use.

That's no longer the case since the arrival of onboard diagnostic capabilities in the latest generation of electrochemical cells (as mentioned previously) and laser-based gas detectors. New intelligent technologies are performing routine calibration self-checks and calibration adjustments first and then alerting technicians should a sensor need eventual replacement.

With the automated SimuGas™ safety integrity self-check designed into ELDS open path detectors, there is no need for the typical OPIR sensor gas checks and recalibrations requiring field technician time to address. Unlike electrochemical cells, ELDS sensors are also immune to sensor poisoning and interferent gases, thanks to their gas specific harmonic fingerprint detection method.

TruCal and SimuGas technologies not only automate much of the maintenance requirements, but they help improve gas detection reliability while also reducing the possibility of false alarms. They also free up plant technicians to attend to other tasks throughout the plant, increasing their productivity.

4. Wireless Bluetooth

New communication protocols such as Bluetooth® and industrial plant apps now make it possible for plant technicians to communicate with gas detectors from safe areas. Employee falls are one of the most common causes of accidents in process and manufacturing plants, and performing gas detector maintenance can

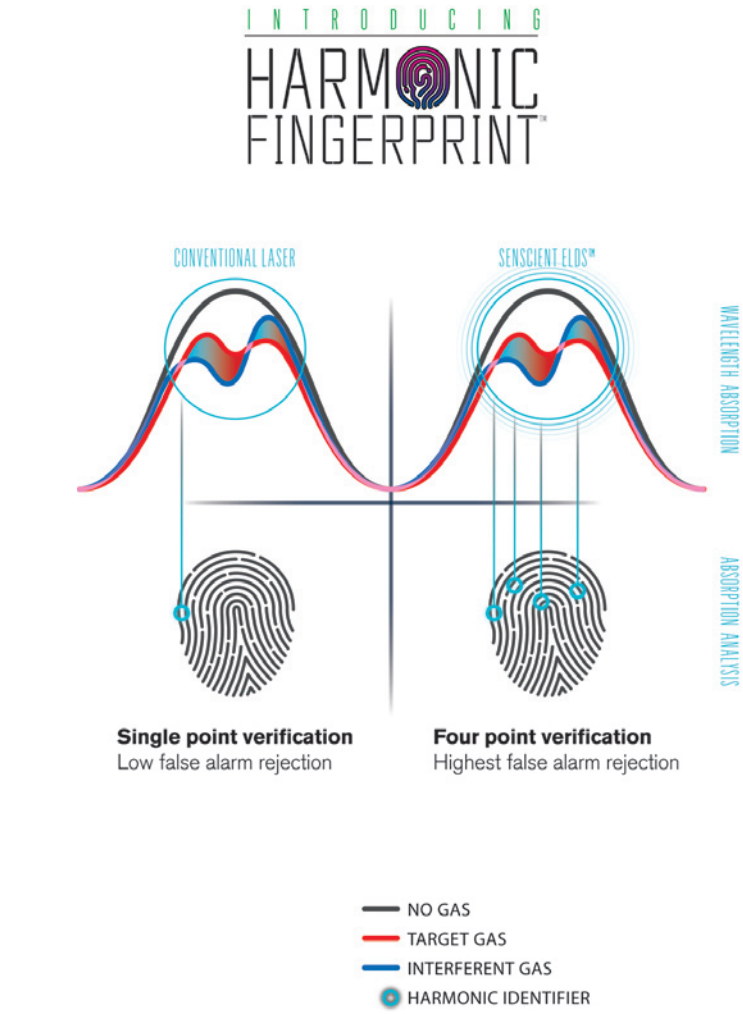

Figure 3. Senscient ELDS harmonic fingerprint reduces false alarms

be a hazard in itself.

Fixed gas detection monitoring systems are often 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. Until now, that meant using open stair ways or scaffolding and required safety harnesses.

With the improved security of wireless technology, the addition of optional Bluetooth® communications to the newest generation of Ultima X5000 gas transmitters and laser-based detectors gives plant technicians with mobile devices an HMI screen and a fully capable controller at their fingertips. All functions can be reviewed and performed remotely for added safety and convenience in difficult to reach locations.

5. Data and Communications

The evolution of standardized 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 HART 7 protocol is now available on newer gas detectors. That means carbon monoxide and hydrogen sulfide XCell®Sensors with TruCal® technology

Figure 4. ULTIMA X5000 Dual Sensor transmitter

from MSA are capable of sending sensor status via HART into a plant's preventative maintenance system, further automating the sensor maintenance process.

6. Dual Gas Sensor Transmitters

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?

Plant operators had to buy two individual transmitters, wire them up and commission them. They 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 changing with dual sensor transmitter designs for fixed gas detectors. For example, a gas monitor (Figure 4) with a dual sensor design doubles its capabilities while requiring 50 percent less wiring and conduit than a single gas transmitter for equivalent sensing coverage. Making it less expensive to monitor gases encourages operators to install more comprehensive plant gas detection systems.

Conclusions

Safety will always be Job #1 in hazardous industries where combustible and toxic gases are potentially present. The safety industry has a long history of innovation and recognizes 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.

By speaking early with safety professionals, you're able to optimize the gas monitoring safety of your plant.

Waiting until late in the process can lead to unnecessary safety challenges - think ahead.

When you encounter problems, reach out quickly to safety industry professionals who see the same or similar problems every day. They can assist you in resolving them with fewer headaches at the lowest possible cost.

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