Trends in Monitoring H2S Hazards

Instrumentation [1]

As the price of oil pushes toward all-time highs, domestic land-based exploration and production are at near-record levels, particularly in the various shale formations throughout the United States. The largest shale drilling sites are located in remote areas of Texas, the Dakotas and Pennsylvania, among other states. One of the dominant hazards associated with drilling in shale formations is the prevalence of high concentrations of hydrogen sulfide (H\textsubscript{2}S), which occurs naturally in crude oil and gas.

In high concentrations, H\textsubscript{2}S is extremely toxic. It has an Immediately Dangerous to Life and Health (IDLH) threshold of 100 ppm. Several of the shale formations contain high concentrations of H\textsubscript{2}S, which poses a threat to human life in and around the drilling sites. To mitigate this threat, exploration and production (E&P) companies routinely deploy area gas monitoring systems at their sites. Drilling typically takes place in remote, uninhabited forested areas. Historically, one of the most common challenges in utilizing permanently mounted monitoring systems was a lack of power at the site where the system would be mounted. Recently developed products specifically address some of the unique challenges of detecting H\textsubscript{2}S and combustible gases in remote drilling locations with limited power availability.

Products released in 2011 are capable of being powered by batteries or solar power stations, utilizing state-of-the-art technologies for the detection of toxic gases. Highly customizable for individual applications, these products have entity approval through CSA and are suitable for Class I Division 1 or Class I Division 2 areas.

Three trends to watch

1. Versatile products with wireless transmission: E&P companies demand systems that can be quickly deployed, can monitor up to 16 remote areas around a drilling site and report back to a central controller. Wireless solutions are growing for the oil and gas industry for good reasons:
   - Limitations and costs of wired systems can be eliminated, enabling more flexibility for users to monitor and control devices remotely.
   - Wells, lift stations, storage tanks and other points within a site can be accessed by end users without the expense of running wire or fiber.

A common complaint heard throughout the oil and gas industry is the issue of frequency interference at drilling rig sites that have employed different gas detection systems. A transmitter with a toxic sensor solves this issue and, when fitted with a lithium ion battery and an H\textsubscript{2}S sensor, can monitor for H\textsubscript{2}S and report near-real-time readings back to a central controller. Each transmitter has its own unique programmable address matching that of the controller to ensure proper communication. Ultimate flexibility allows sites to employ multiple systems in close proximity without cross interference.

Controllers always should have wireless master and slave operation, which allows detectors to be either hardwired or tethered at distances of up to 350 feet. A 16-channel controller powered by a 12-VDC battery and a solar panel can transmit all of the information wirelessly with one radio, thus eliminating the need to manage and maintain multiple radios.

2. Agility and expertise: Like those in most industries, oil and gas companies are continually being asked to do more work with fewer people. Oil companies now expect suppliers to be very consultative in their relationship. Most E&P companies are looking for more than just a supplier of equipment—they are looking for a partner that can design, commission and maintain the gas detection system. It's a serious business in which a lack of agility can lead to high costs and a lack of expertise can lead to a deadly result. It's not just about how good the equipment is—it's about the knowledge and core values of your gas detection partner.
For example, gas detection engineers are frequently asked where they should place sensors. In the past, most gas
detector manufacturers were hesitant to make this kind of recommendation. Now, with the availability of plume
modeling software that takes into account potential leak sources and wind direction, gas detection experts can help
to provide real guidance in sensor placement at any operating facility. But the key is to consult experts.

3. **Redundancy, SIL 2, and PFD:** A trend that continues to gain steam is the demand for systems that provide
redundancy and have a safety integrity level (SIL) of at least 2. This has had a profound influence on how gas
detection manufacturers design products in terms of product concept, design and manufacturing. The net effect has
been an increase in the overall quality of a system that is more reliable and robust, and which requires much less
maintenance. The industry also has become very adept at understanding probability of failure on demand (PFD)
calculations.

Customers are beginning to ask for PFD calculations and have expressed keen interest in the maintenance
requirements necessary to maintain a SIL-rated system. Customers are starting to learn that not all SIL-rated
systems are alike; one must read the fine print. One device may be SIL 2 compliant but may require maintenance
four times per year, while another device requires maintenance only one time per year. Multiply the number of points
at a given site and the total cost of ownership begins to add up.

**Deck:**

Gas detection systems becoming more reliable and robust

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