Gas Detection **Misconceptions**

The Safety Company

The five most common misconceptions about gas detection.

In recent years, portable gas detectors have shrunk in size and cost while many new features have been added: automatic time-weighted average (TWA) and short-term exposure limit (STEL) calculations, data logging, man-down alarm, and wireless capabilities to name a few. With increased usage due to reduced cost, enhanced safety awareness and tighter regulations, misconceptions regarding correct portable instrument usage have increased accordingly.

Misconceptions become problematic when those ideas are gradually accepted as truth. Those safety industry misconceptions can not only be costly, but also potentially hazardous, injurious and even deadly. Five common safety industry misconceptions will be discussed here.

MISCONCEPTION ONE

Gas detection is self-explanatory; no training is necessary.
Most manufacturers design portable gas detectors to be as intuitive and as simple to use as possible, offering quick-start guides and electronic simulators; however, training related to the specific application is still necessary. While most employers provide adequate training programs, there are still many safety managers who provide little or no specific application training, assuming instead that workers will interpret the manufacturers' limitations accordingly.

A gas detector will do what it is designed to do: provide alarms that sound, light or vibrate when a gas hazard that the unit is equipped to detect is present. Of critical importance is the need to understand environmental influences and technological limitations in order to prevent informational misinterpretations, worker panic or major incidents concerning potentially hazardous gas exposures.

Examples of accidents due to inadequate training range from fatalities occurring within confined spaces to tank explosions. An example of the latter: a documented incident concerning combustible gas readings taken prior to welding. The latest reading indicated levels well below the lower explosive limit (LEL). Improper instrument use plus the operator's inadequate understanding of its limitations were cause of a fatality. Low oxygen level (<10%) resulted in an incorrect LEL reading interpretation. Other documented informational misinterpretation incidents relate to cross-sensitivity or sensor poisoning. Every instrument has its own set of sensors, operating procedures and instructions that must be understood by all users.

Gas detection education and application-specific training improves user comfort level, reduces misunderstanding and reduces costs long-term. Most gas detection instrument manufacturers offer training classes to improve your knowledge base. However, the addition of comprehensive application-based training can be the difference between life and death.

MISCONCEPTION TWO

Daily instrument bump tests are not required as long as you calibrate periodically.
This statement is commonly used in the field to win sales orders; however user manuals may contradict assertions concerning frequency of bump tests and full calibrations. There is no way to ensure that gas detectors work properly unless gas is applied and alarms and readings are verified. It doesn't matter whether your fleet includes disposable alarming devices or direct reading instruments. Recent cases of O2 sensors 'frozen' on 20.9% Vol reading, or unresponsive CO sensors displaying stable zero readings are clear evidence. Poisoned combustible sensors can also display stable zero readings and not respond to applied combustible gas. After such industry-wide occurrences and resulting safety notices, the assertion above is thankfully less likely to be used.

To make life easier for users, manufacturers have developed bump and automatic calibration stations to simplify complex and time-consuming processes, minimizing necessary training for performing required instrument tests before each day's use.

While several manufacturers offer innovative ways to verify sensor life and health, there is no current automatic solution to determine that sensor outer membranes are clogged with invisible polymers or dirt, an issue that can prevent gas from reaching sensors.

MISCONCEPTION THREE

All gas detectors are the same and provide the same safety level.
Not all detectors are created the same! Most manufacturers use off-the-shelf sensors from known sensor suppliers, but only a few have the know-how and capability to manufacture their own sensors. While all gas detectors are approved to meet certain standards, only some meet stringent performance standards and will hold up to the harshest conditions.

Where costs are concerned, the devil is in the details; sensor life, response time, warranty, rugged design, total cost of ownership, etc. differ significantly when comparing competitive gas detector. Faster-responding sensors not only alert you more quickly to potentially hazardous situations, but also save you gas and labor time with every calibration and bump test.

Unreliable sensors and poorly constructed detectors can cause unnecessary downtime and shutdowns, costing more than you ever imagined.

Features such as color-change display screens can be critical in conveying information regarding potentially hazardous situations at a glance and taking proper, immediate action. In isolated environments where co-workers are out of sight, features such as man-down alarms enhance worker safety. Instruments with significant battery run time allow for use of the same detector for two or more shifts, reducing downtime and related costs.

MISCONCEPTION FOUR

Gas detectors don't require routine maintenance.

Maintenance is part of life…get used to it! You need to maintain your car and your home; even your body needs a periodic checkup to ensure that all parts work properly. Why would you not expect to maintain a device that is designed to save your life?

Periodic maintenance is needed to keep your company operating and profitable by minimizing unexpected failures and possible accidents; gas detectors are no different in that respect. The European Technology Platform Industrial Safety (ETPIS) estimates that 10-15% of fatal work-related accidents and 15-20% of all accidents are related to lack of proper equipment maintenance.

While maintenance is viewed as a necessary evil, a critical look at maintenance frequency and actual total cost can really pay dividends. Some manufacturers offer ways to reduce or eliminate portable instrument maintenance by offering total care programs built around leasing and renting instrument fleets to customers. Manufacturers provide instrument maintenance; consequential costs are simply included as part of leasing fees.

Actual long-term cost savings are hidden in the warranty, durability, sensor life, and response times. When optimized, those features can save you significant maintenance cost overall by reducing instrument and sensor replacement frequency, component replacement and calibration gas usage. Cost of ownership over several years typically far exceeds actual purchasing cost of detectors. Calculating total maintenance cost over a longer period can be a true eye-opener.

MISCONCEPTION FIVE

Gas detectors CAN accurately detect 1.0 ppm H_2S

The American Conference of Governmental Industrial Hygienists (ACGIH) has amended its H_2S exposure recommendation by reducing H_2S TWA level to 1.0 ppm; some European countries have changed their requirement to 1.6 ppm.

Let's consider a gas detector with a reading of 1.0 ppm H_2S, calibrated with typical NIST-traceable calibration gas of 20 ppm H_2S concentration. Cylinder accuracy is stated as ± 10%, meaning 2.0 ppm. Due to environmental factors (temperature, humidity, pressure, etc. and H_2S reactivity, the best electrochemical H_2S sensor currently available offers 5% of full-scale accuracy and 0-30 ppm detection range or 1.5 ppm.

Tolerances of instrument and calibration gas values are additive, resulting in 2 ppm + 1.5 ppm = 3.5 ppm. As a result, a typical 1.0 ppm reading is correctly stated as 1.0 ± 3.5 ppm; in other words, the concentration may be anywhere between -2.5 ppm and 4.5 ppm. The tolerances listed above, in addition to inherent electrical noise of sensors and associated circuits may cause instrument manufacturers to employ noise dampening techniques that mask low-level readings. Consequently, some gas detectors may not provide such precise readings at 1.0 ppm and may not even display values until they reach 3.0 ppm.

Due to the factors described above and depending upon environmental conditions, specific sensor type and manufacturer chosen, users with instrument H_2S alarms set at 1.0 ppm may not be alerted to concentrations between 1.0 and 4.5 ppm and/or may encounter frequent false alarms. This is important for users required to follow this ACGIH limit, as opposed to OSHA, NIOSH or other recognized H_2S exposure limits. Choose an instrument that provides appropriate detection capability.

CONCLUSION

Assumptions are not necessarily evil. Research is built upon assumptions, but should subsequently be followed with proper empirical analysis to prove theories as correct or incorrect. Avoid misconceptions, as acting upon them can result in negative impact upon the well-being of your personnel and affect the bottom line. Verify, rather than assume. Reliable and trustworthy manufacturers will help you to work through your questions and guide you to safer product solutions.

SOURCES

- European Technology Platform Industrial Safety
- Occupational Safety and Health Administration (OSHA)
- Safety and Health Information Bulletins (SHIB)
- American Conference of Governmental Industrial Hygienists (ACGIH), www.ACGIH.org/TLV/

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