

## Common Mistakes in Confined Space Monitoring - 06/01/2005

A confined space is no place to "learn as you go." Learn how to avoid these potentially deadly errors in the work world's most dangerous spaces.

*by Thomas Suski*

Learning from practical, real-world experience often requires learning from your own mistakes. In many cases, this can be an effective way of developing greater levels of competence and understanding in a given subject. Unfortunately, when mistakes are made in confined space monitoring, the cost of this education is often measured in the number of lives lost.

The deadly nature of confined spaces leaves little room for error and even less opportunity to "learn as you go." Learning about some common mistakes before entering a confined space will go a long way toward establishing a workplace air monitoring program based on industry best practices.

### **Mistake #1 – Not knowing OSHA standards and recommendations**

It all starts here. Understanding what kind of hazards may be present at your job site involves familiarity with OSHA standards and a working knowledge of its terms and definitions. For example, a confined space as defined in OSHA's confined space standard, 29 CFR 1910.146, is any space that is large enough and configured so that an employee can bodily enter and perform assigned work, has limited or restricted means for entry or exit and is not designed for continuous employee occupancy.

When a space meets these criteria, further consideration must be given to determine whether it meets OSHA's definition of a "permit-required" confined space. If a confined space also contains or has a potential to contain a hazardous atmosphere, contains a material that has the potential for engulfing an entrant, has an internal configuration such that an entrant could be trapped or asphyxiated or contains any other recognized serious safety or health hazard, then additional measures must be taken to safely enter and perform any work within the space.

More than just a glossary of safety terms, OSHA standards also provide a blueprint for procedures and practices that are at the heart of any safety program. In fact many, if not all, mistakes in confined space monitoring could be decreased or eliminated altogether if safety managers and workers simply followed OSHA's standards and recommendations.

### **Mistake #2 – Using your own senses**

While it is common knowledge that a number of hazardous gases are both colorless and odorless, many people think they can easily recognize the presence of hydrogen sulfide – one of the more common confined space toxic gases. The problem with this deadly gas is that its distinctive "rotten egg" odor is only perceptible at very low concentrations. At higher levels, hydrogen sulfide has a paralyzing effect on your sense of smell. Even at low concentrations, prolonged exposure can dull the olfactory nerves and make it impossible to accurately detect, even if concentrations suddenly increase.

The only way to safely detect a hazardous atmosphere is with a "calibrated direct reading instrument" as described in OSHA's confined space standard 29 CFR 1910.146.

### **Mistake #3 – Disregarding the importance of training**

A gas monitor is not the only component of an effective gas detection program. When workers are trained on the operation of the instrument and the procedures for confined space monitoring, the risks involved with this type of work can be greatly diminished. One of the more important benefits of training involves an increased awareness of the potential dangers. Familiarity, complacency and a false sense of security can all lead to abandoning best practices, especially when the time spent working in the space is expected to be minimal. But trained workers know that accidents can happen to anybody and that no matter how much time is spent working in the space, the potential danger remains the same.

A variety of training options from gas monitor manufacturers are available, from video, online and computer-based training to classroom sessions and hands-on learning through confined space simulators. With so many options, including sessions that can be held at your facility, there's no reason that proper training in confined space monitoring should be overlooked.

#### **Mistake #4 – Not implementing a gas monitor maintenance program**

A sound maintenance program will ensure that your gas monitors will accurately measure the presence of atmospheric hazards and immediately alert the user to a dangerous condition. One common mistake is zeroing the instrument in an environment that contains any significant concentration of a hazardous substance. Using a less-than-ideal atmosphere to establish the monitor's clean-air reference point can lead to inaccurate or even negative readings and an increased risk of safety.

Many equipment end-users also are confused about how – and how often – to bump-test and calibrate their gas monitors. The confusion typically results in ignoring best practices or avoiding the responsibility altogether. A training program can ensure that, at a minimum, a bump test is performed with a known concentration of gas to verify sensor accuracy before each day's use and that the instruments are adjusted with a full calibration should they fail the bump test. These minimum recommendations were established by the International Safety Equipment Association (ISEA), a trade association for manufacturers of protective equipment, and echoed by OSHA in a Safety and Health Information Bulletin released in 2004.

#### **Mistake #5 – Not knowing which toxic gases may be present**

Understanding the work area is essential not only for the purpose of identifying areas that should be labeled permit-required confined spaces, but in choosing the type of gas monitor to use. The most common configuration for a multiple-sensor gas monitor is one that can read levels of oxygen, combustible gases, hydrogen sulfide and carbon monoxide. While monitoring oxygen and combustible gas levels is required, toxic gas hazards vary with different types of confined spaces. So, to assume that the toxic gases present in any confined space are limited to only hydrogen sulfide and/or carbon monoxide ignores the possibility that different or additional toxic sensors must be used. Many multi-gas monitors now are available with several toxic sensor options and the flexibility of measuring up to five and even six gases simultaneously.

#### **Mistake #6 – Not performing a pre-entry test**

An extremely dangerous mistake regarding confined space atmospheric testing is not performing or incorrectly performing a pre-entry test. Wearing a gas monitor into a confined space is not enough to protect from many hazardous conditions that are immediately harmful to the entrant. OSHA's confined space standard 1910.146 states that before an employee enters a permit-required confined space, "the internal atmosphere shall be tested, with a calibrated direct reading instrument, for the following conditions in the order given: (1) oxygen content, (2) flammable gases and vapors and (3) potential toxic air contaminants."

Why test for oxygen first? Not only is it essential for the entrant to survive, your monitor may need it as well. Many gas monitors utilize a catalytic diffusion type of sensor that detects combustible gas by burning small amounts of it. Doing so requires an oxygen concentration of at least 10 percent. Anything less and the monitor will not respond to any amount of combustible gas, let alone dangerous concentrations.

Pre-entry testing also involves testing the atmosphere at the top, middle and bottom of the confined space. Because different gases stratify based on their weight, there is an inconsistency in the level of danger if the entrant has to descend or ascend several feet to get to the work area. Methane, for example, is lighter than air and would be found at the top of a confined space, while hydrogen sulfide (heavier than air) would be found at the bottom. Carbon monoxide is slightly lighter than air, so it will generally stay wherever it is released. To completely assess such dangers, OSHA's standards require that testing of the space be performed at 4-foot intervals. The best way to test is with a sampling pump and tubing or a probe attachment.

### **Mistake #7 – Considering the confined space safe after pre-entry testing**

Air monitoring does not end with the pre-entry test. Atmospheric conditions within a confined space are capable of changing rapidly, which makes it very important to continuously monitor for gas hazards. Improvements in technology have made it possible to manufacture gas monitors small and light enough to be comfortably worn without interfering with your work.

Considering this potential of a confined space atmosphere to change rapidly, OSHA requires conducting a "re-entry" test if the confined space has been temporarily unoccupied (for more than 20 minutes). For all practical purposes, re-entry testing and pre-entry testing are performed in exactly the same manner and should be considered as equally important.

### **Mistake #8 – Not assigning an "attendant"**

A large part of safely conducting confined space work is to have a designated "attendant" – someone to maintain contact with the entrant while they are in the confined space. The attendant must not be involved with any tasks or distractions unrelated to the safety of the confined space worker, and must not, under any circumstances, enter the confined space. If the work is to be performed over an extended period of time, the attendant may be responsible for recording additional atmospheric readings to monitor the safety of the confined space. The attendant should also know the gas hazards and the physical symptoms of exposure in case of an emergency.

### **Mistake #9 – Not having an emergency plan**

Not knowing what to do in an emergency puts both the worker and the attendant at greater risk. OSHA statistics of confined space-related deaths show us what to expect when emergency procedures are improvised. With would-be rescuers making up 60 percent of confined space fatalities, it's clear that many emergencies are followed with actions based on impulse rather than a rational and thoughtful plan.

The job of the attendant, in an emergency, is not to personally rescue the victims, but to implement the rescue plan. This may involve calling for assistance, ventilating the confined space and/or operating a non-entry, mechanical retrieval system. In all cases, the attendant must try to maintain contact with the entrant(s) to assure that help is on the way and to gather information about the incident that may be helpful to the rescue.

Reviewing some common mistakes in confined space monitoring, hopefully, is an impetus to acquiring further information and training. A wealth of information is available from OSHA, MSHA or the training department of your gas monitor manufacturer. Equip yourself with the right gas

monitors and proper training to eliminate these common mistakes ... and the hard lessons that can come with them.

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