Confined Spaces and Gas Detection

OSHA’s 1910.134 is the impetus for using a multi-gas monitor to perform atmospheric testing prior to entering a confined space.

by Bill Smith

When monitoring the atmosphere in a confined space, there are several important issues that need to be considered, reviewed, and managed. One of the major issues centers on air quality and what you are breathing, both prior to entry and during occupation of a confined space. You need to know what the oxygen content of the atmosphere is and whether there are explosive or toxic gases that could threaten the safety of the environment or, perhaps more importantly,
your life. When properly used and maintained, gas detection monitors will protect both.

Not only do you need to monitor the atmosphere of your confined space to protect your life, but also OSHA requires you to do so.

To understand exactly what a confined space is, let’s look at OSHA’s definition:

**Confined space:**
1. Has adequate size and configuration for employee entry,
2. Has limited means for access or egress, and
3. Is not designed for continuous employee occupancy.

A few examples of confined spaces could be underground vaults in the telecommunications industry, aeronautical fuel tanks, sewers, silos, or coal mines.

**Permit-Required Confined Spaces**
The term “permit-required confined space” as defined by OSHA is a confined space that meets the definition of a confined space and has one or more of these characteristics:

1. Contains or has the potential to contain a hazardous atmosphere,
2. Contains a material that has the potential for engulfing the entrant,
3. Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section, and/or
4. Contains any other recognized serious safety or health hazards.

Once you have identified your work area as a confined space, you should then refer to OSHA’s recommendations for monitoring the air quality of your space.

**Atmospheric Testing of Confined Spaces**
OSHA standard 29 CFR 1910.146 (c) subsection (C) states: Before an employee enters the 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.

Additionally, subsection (D) states: There may be no hazardous atmosphere within the space whenever any employee is inside the space.

This standard is the impetus for using a multi-gas monitor to perform atmospheric testing prior to entering a confined space. It also clearly dictates that continuous monitoring of the space must take place for as long as the confined space is inhabited.

If hazards are found in the space through utilization of a multi-gas monitor, OSHA standard 29 CFR 1910.146 (c) subsection (E) must be followed. This standard reads: Continuous forced air ventilation shall be used, as follows: (1) An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere; (2) The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee will be present within the space and shall continue until all employees have left the space; (3) The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards of the space.

**Choosing Your Confined Space Monitor**
When choosing a monitor to test and continuously monitor a confined space, you should take into consideration several attributes of the monitor and be sure to accessorize accordingly.

First and foremost, you will need a multi-gas monitor that is capable of monitoring for all of the OSHA-required hazards: oxygen, flammable gases, and potential toxic air contaminants that may be present as a result of the processes that take place in or around the confined space. Next, you should consider a monitor that has either an internal or external pump that is capable of properly drawing the air sample back to your fresh air monitoring point during initial testing of the space. The monitor also should have the capability of continuously monitoring the occupied space to ensure the workers’ continued safety. Other equipment such as sampling probes, durable carrying cases, and rechargeable batteries can be complementary accessories, as well.

Most of today’s monitors are equipped with bright visual and loud audible alarms to warn of potential hazards. An internal datalogger will help you to comply with the documentation of your spaces’ hazards. A datalogger is a device containing a microprocessor that stores information electronically taken from an instrument. The levels of all hazards being monitored can be downloaded from the datalogger to a computer or printed for reference and recordkeeping activities.

**Automated Instrument Docking Systems**
An instrument docking system can also be a plus when working in confined space applications. These systems provide the user with a myriad of beneficial capabilities, including the following functions:

- **Automated calibration/bump testing.** OSHA mandates in 29 CFR 1910.146 that the only way to safely detect a hazardous atmosphere is with a “calibrated direct reading instrument.” Automated calibration and full docking systems often provide single-button calibration options to help meet the OSHA requirements. Workers no longer have to calibrate their monitors manually.
- **Recordkeeping.** Docking systems automatically record and store valuable information such as bump and calibration records, as well as recordkeeping of all hygiene information stored. Datalogging information is logged and stored through the event-logging mode, which records information when an incident or event occurs.
- **Recharging.** Docking systems also can be used to charge monitors when not in use. This will ensure the monitor is fully charged the next time it is used.
- **Instrument diagnostics.** Automated maintenance systems may include technology that provides a means for diagnosing potential problems with your monitor, such as low or marginal sensor life and date of the last calibration, along with the number of days until the next calibration is due.

**Training Considerations**
Some manufacturers of gas monitors also provide hands-on training to ensure that you use and maintain your instruments properly. These courses are designed to educate participants about the basics of proper gas monitor use and management. When looking for hands-on training, some of the more valuable topics you will want to learn about include:

- **Hazardous gases.** Learning the common gases encountered in confined spaces, including information about deficient (asphyxiation hazard) or enriched (explosive hazard) oxygen levels, will prove
valuable in your overall understanding of a confined space.

- **Permit-required confined spaces.** Reviewing the regulations enacted under 29 CFR 1910.146 and learning how to utilize gas detection to meet the requirements will ensure compliance with OSHA's mandates.

- **Sensor technology.** Learning about and understanding the various types of sensors used in confined spaces, such as catalytic diffusion, electrochemical, and infrared sensors, will help you make an educated decision on instrument/sensor selection for your particular application.

- **Instrument review.** Learning about the functions and applications of complete lines of portable instruments, including calibration stations and docking systems, will further help with purchasing decisions.

- **Calibration and maintenance.** Learning to properly calibrate and care for your instruments and how to troubleshoot instrument problems and replace sensors and battery packs will give you the knowledge to be self-sufficient in maintaining your instrument inventory.

- **Hands-on operation.** Learning to use a variety of portable instruments will give you the confidence to operate your instruments at peak efficiency to make certain you are protected at all times.

**Proper Management of Ongoing Maintenance**

Another very important aspect of managing your confined space gas monitor program is the proper management of ongoing maintenance. The best way to be certain your monitor is in peak shape is by utilizing the services of a manufacturer's Factory Service Center. Using factory-trained service technicians ensures the servicing of your monitor is performed by individuals qualified to work on it. Some of the key services to look for are:

- **In-house calibration and service.** This service will ensure your confined space monitor is calibrated and serviced by professionals.

- **Maintenance and warranty repair.** Performing routine maintenance and utilizing warranty repair services are critical to keeping your monitor fleet up and running.

- **On-site mobile service and repair.** Where available, this service will bring an authorized technician to your site to perform maintenance and repair service on the spot, eliminating downtime.

- **Instrument rentals and leasing.** Having the option to lease or rent an instrument proves very beneficial, especially in cases of shutdowns or planned maintenance where you may need more instruments than you own in-house to perform the work in a timely manner.

The combination of the right instrument, the proper training, and the services that complement your monitors will help make managing your confined space program easier. For a full understanding of the OSHA confined space monitoring requirements, log on to www.osha.gov and search for the standard by number (29 CFR 1910.146).

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