



Make Your List and Check it Twice ...

INDUSTRIAL GASES

can be Naughty or Nice!

By DAVE KUIAWA

No, it's not Christmas and I'm not Santa Claus; but one of the best gifts you can give your employees is safe passage in and out of a confined space or other potentially hazardous industrial environment. This starts by having a good gas detection plan, and every good plan starts with a checklist.

When considering what elements to place on the checklist, you must focus on the instrumentation and space itself while recognizing their impact on the industrial hygiene of your workers. The following elements are the keys to your success:

- ⇒ Know your gas hazards
- ⇒ Use gas detectors in top working condition
- ⇒ Listen to your gas detector

Know your hazards

The best place to begin is by understanding the hazards that exist inside your operating unit. This starts with a review of your company's process inputs and outputs as well as maintenance points along the way.

In addition, you must answer some important questions. What are the chemicals that feed this process? How are these chemicals transformed as they advance through the process? What residues are

left behind? What happens if a process breaks down?

For example, if your business is petroleum refining, you can map the process from crude oil input to finished product output. You understand how your raw materials are refined and where the "touch points" are along the way. Documenting these gas hazards is the first step toward creating your checklist.

Once you have identified your gas hazards, you need to choose the right gas detector to help you make a determination if they exist outside of a process or prior to entering a confined space. This begins with choosing an instrument that offers the appropriate sensors.

In the world of gas monitoring there are two types of gas monitors, portable and fixed. Fixed gas monitors are sensors that are mounted permanently and interface directly to a central monitoring and control system. Portable gas monitors are generally offered in single gas and multi-gas configurations.

Single gas monitors are exactly what their name suggests. They monitor only one gas. Industrial Hygienists use these instruments for personal protection and exposure trending. By clipping a single gas monitor onto an employee, you will protect them from acutely dangerous situations. If equipped with a datalogger, you can determine chronic dangers as well. Today, most single gas monitors are small

in size, can be worn in the breathing zone, and come equipped with a datalogger. Accumulated data can be downloaded to a PC where an Industrial Hygienist can review, archive, and trend the data by employee, area, and/or hazard.

Multi-gas monitors detect more than one gas. Generally, the initial two gases are oxygen (O₂) and combustible gas (LEL). OSHA states in 29 CFR 1910.146(c)(5)(ii)(C) that "Before an employee enters the (confined) space, the internal atmosphere shall be tested with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order." The "potential toxic air contaminants" is the wild card here. To determine which toxic gas sensor(s) you should install in your multi-gas monitor, you need to understand your processes ... and the checklist grows.

Of course, multi-gas monitors are useful for other functions outside of confined space entry. Because their size is continuously shrinking, Industrial Hygienists are choosing to use them much like personal single gas monitors and collecting data specific to a greater cross section of gases. Also, costs have come down significantly. Ten years ago, a single gas monitor would cost much more than most economical multi-gas monitors do today.

Use gas detectors in top working condition

Now that you have taken the time to map your process, you should have a list of attributes you would like to see in the gas monitoring instrumentation you will purchase. Once on site, you realize that the best instruments in the world will not perform at a precise level without being properly maintained. Guess what? More checklists.

At the center of any gas monitoring program is functional “bump” testing and calibration activities. The only sure way to know if a gas monitor is functioning properly is to challenge it with a target gas. Bump testing and calibration are different activities and “best practices” suggest they should be done at different intervals.

A bump test should be performed on each instrument prior to it being placed into service, on a daily basis. Bump testing is defined as exposing your gas monitor to a controlled amount of NIST (National Institute of Standards and Technology) certified traceable calibration gas for a fixed period and monitoring the response to a set percentage. This sounds complex, but it is really easy.

Let’s say, for example, you have a carbon monoxide (CO) sensor and you want to bump test it. Your calibration gas is 100 ppm and you want to make sure the sensor responds to 50 percent of the applied gas in 30 seconds. Understanding this, you would apply the 100 ppm gas and monitor the response of the sensor. At 30 seconds of exposure, if the display reads at least 50 ppm, the unit would pass the bump test. Most gas monitors available today have automated routines to manage bump tests making the “math” easier and taking the error factor out of the process.

Calibration should be performed at least every 30 days or whenever an instrument has failed a bump test. Where calibration differs from bump testing is in the fact that during calibration, the sensor’s gain is adjusted to “calibrate” its response to a known concentration of calibration gas. Calibrations can be

Every good plan begins with a checklist.

performed manually or in an automated fashion and procedures vary by instrument and manufacturer. You can use calibration results to determine when sensors would need to be replaced.

Obviously, if a sensor does not pass a calibration, it needs to be replaced immediately. However, span trending can also be used to help an Industrial Hygienist manage replacement parts inventory so that instruments are not rendered un-repairable until such time that parts can be procured. Managing the what, when, and results of these tests can be done through the use of, you guessed it, checklists.

Listen to your gas detector

The final piece of the puzzle is to understand what to do with the information you receive from your gas monitor. There are obvious action/reaction procedures. For example, if your instrument goes into alarm, get out of the area. Most gas monitors have dataloggers that can be downloaded to determine what gas an employee was exposed to, how long the exposure lasted, and what the significance of the exposure is. Even without a datalogger, there is usually a “peak hold”

function that shows the highest exposure the instrument saw since the last time the peaks were cleared.

OK, so we have gas present. Now what do we do to correct the situation? Let’s get back to our checklist. Can we use ventilation to remediate the situation? Can we block the source? Can we use personal protective equipment (PPE) to neutralize the threat? The best choice ties back to the first section of this article, understanding your gas hazards.

Another way to “listen” to your gas monitor is to review gas alarm and exposure data to find and address areas of high risk. This is the essence of Industrial Hygiene. By regularly downloading, analyzing, trending, and reacting to the data, today’s Industrial Hygienist can use the data to ensure the safety and overall health of the workers at their facility.

Conclusions

All of the items in this article take an organized approach to be successful. Knowing your gas hazards, using gas monitors that are in top working condition, and listening to what your gas monitors are telling you are all elements of a successful gas monitoring program. A great place to begin is taking a step back, making a list, and checking it twice. This approach is guaranteed to elevate the health and safety of your workers and who knows, it might just get you on Santa’s “nice” list.



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