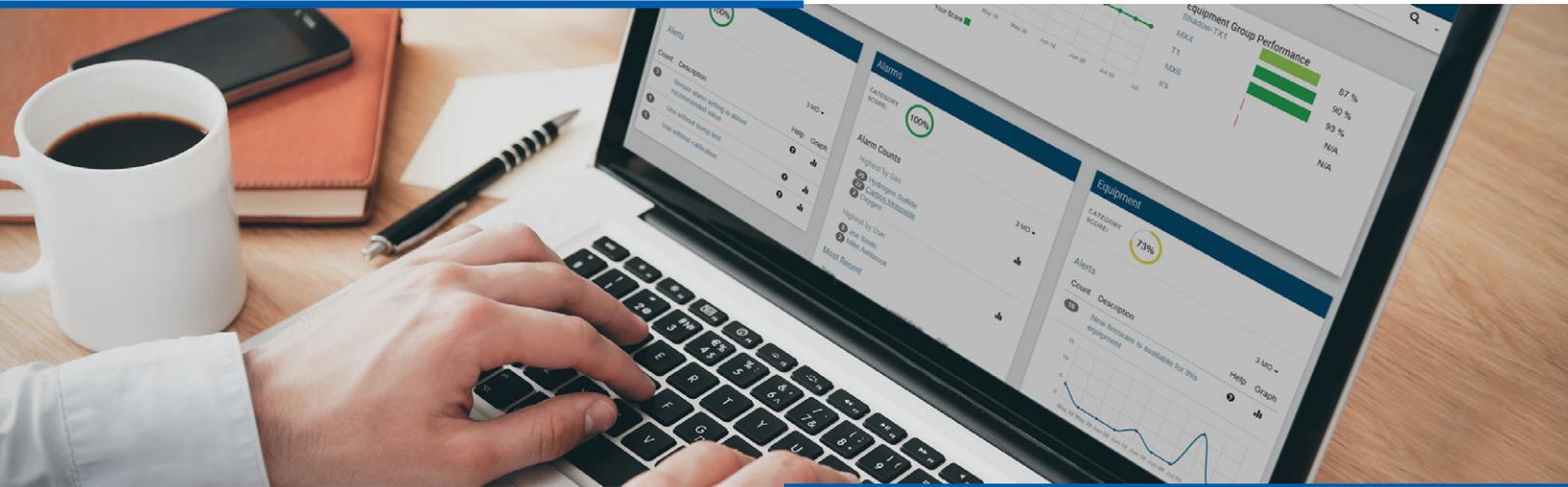


Does Your Gas Detection PROGRAM NEED A HEALTH CHECK?

Every safety professional should be able to answer three key questions about their gas detection program.



Every year, millions of workers suffer a serious job-related injury or illness,¹ most of which are caused by at-risk acts. When at-risk acts and at-risk conditions converge, the result can be devastating.

As a safety professional, the most important questions about your gas detection program are:

1. Do your gas detectors work properly?
2. Are your gas detectors being used correctly?
3. What gas hazards are your team members exposed to?

You should be able to answer these three questions easily using data from your gas detectors. If you can't, then your gas detection program needs a health check. Read on for details about where you should dig deeper in your gas detection program and how to use your gas detection data to inform critical decisions that will improve safety in your organization.

1. Do Your Gas Detectors Work Properly?

A portable gas detector is a critical piece of equipment meant to save lives. To use it with confidence, your workers must know that it works properly, and the only way to know this for sure is by regularly bump testing and calibrating. Some people think these simple yet critical maintenance tasks are too much of a hassle to perform regularly. However, there are systems available to fully automate and document these functions, reducing the time it takes your team to maintain devices.

BUMPTESTING

The only way to be certain that a portable gas detector will respond properly to a gas hazard is to bump test it. Bump tests expose a known concentration of the target gas to the monitor to test sensor and alarm function.

Why do you need to do this? Gas monitors are complex systems that include a sensor surrounded by sensitive electronics, alarms, a battery, and a display. When you turn on the instrument, you can easily see that the battery and display are working properly. But what about the rest of the instrument? Do the sensors and alarms work at all? What if the instrument was dropped and a sensor broke? Are the sensor and alarm openings clogged with mud? Bump testing with a brief exposure to a gas concentration greater than the instrument alarm set points confirms whether the sensors and alarms work. Most important, bump testing assures your workers that the monitor will respond and alert them to gas hazards.

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CALIBRATION

While bump testing verifies that a monitor and its sensors are functional, it does not guarantee accurate readings. This is why you need to calibrate the gas monitor. Calibration aligns sensors with a known concentration of gas to assure you that your device will accurately detect hazardous gas.

Calibration also tells you the condition of the sensors in the instrument. Gas sensors are consumable components with a finite lifespan. Some sensors naturally last longer than others and the consumption rate correlates directly to the amount of gas they are exposed to. Nevertheless, all gas sensors will lose sensitivity over time. The typical life span of various sensor types is shown below.

Oxygen Sensors	1.5 – 2 years
Catalytic Bead Combustible Gas Sensors	3 – 5 years
Electrochemical Toxic Gas Sensors	1 – 4 years (depending on type)
Infrared Gas Sensors	5 – 10 years
Photoionization Gas Sensors	2 – 4 years

Environmental conditions such as temperature, humidity, dust, dirt, and rough handling all contribute to premature sensor degradation. Calibration adjusts the readings to account for these changes. It also allows you to monitor changes to sensors and replace the sensors before they fail and leave workers without the gas detectors they need. A history of the sensor serial numbers will show you whether sensors are being replaced in a timely manner.

Although bump testing and calibration are distinctly different functions, executing both correctly ensures that your gas detection equipment is working properly. Any time an instrument fails to respond properly during a bump test, you should complete a full calibration successfully before using the instrument again.

You can see if your gas detectors are being maintained properly by reviewing bump test and calibration records. Your documentation should show that workers are adhering to recommended intervals. Records should also show that bump test and calibration times correlate with instrument use times, and thus show that instruments are being tested before use.

2. Are Your Gas Detectors Being Used Properly?

Despite all the advancements in gas detection technology, industrial workers still die from exposure to toxic and explosive gases. Even with the most reliable instruments, the likelihood of workers being injured or killed on the job remains high if instruments are not used properly.

In an organization with a weak safety culture or poor processes, team members might not use gas detectors correctly. Or worse yet, they might not use them at all. All teams—even those with the highest skills, most experience, and the best intentions—need to be supported by safety-conscious management.

You can use data from your gas detection program to spot habits that endanger your team members. Look for the following at-risk behaviors to know whether your gas detectors are being used properly.

USING GAS DETECTORS WITHOUT A BUMP TEST

You should know if your team tested their gas detectors before the start of each shift. Why? Because three in every 1,000 instruments used daily are likely to fail a bump test and thus fail to respond to hazardous gases. As clear as this evidence is, workers still use instruments without bump testing them first.

THREE IN EVERY 1,000 INSTRUMENTS USED DAILY ARE LIKELY TO FAIL A BUMP TEST AND THUS FAIL TO RESPOND TO HAZARDOUS GASES.

You probably wouldn't feel safe flying in an airplane if you knew the aircraft hadn't been inspected. And the captain wouldn't fly the plane himself if he knew the plane hadn't been thoroughly tested. The only way to be certain that the instrument you send out to the field will respond to life-threatening gases is to bump test before each use.

USING GAS DETECTORS THAT ARE OVERDUE FOR CALIBRATION

A gas detector that is overdue for calibration is less likely to give accurate readings and thus may not alarm at the appropriate time. Keeping the instrument calibration up to date means your team members are more likely to believe the readings and react appropriately to the warnings rather than simply discount them as "false alarms."

IGNORING ALARM EVENTS

You might wonder why someone would ignore an alarm from their gas monitor. This unsafe behavior usually stems from a poor safety culture. Team members are driven to succeed and simply want to get the job done. Unfortunately, that drive, along with a false sense of security, can eventually bring together at-risk acts and at-risk conditions.

WEAK SAFETY CULTURE	STRONG SAFETY CULTURE
Instruments used without bump testing	Instruments bump tested daily
Instrument used very infrequently	High utilization of instrument fleet
Long-lasting alarm events	Fast response to alarm events
Instruments turned off during alarm events	Alarm conditions quickly verified to be cleared
High alarm events occur frequently	High alarm events rarely occur
Alarm events not reported	All alarm events investigated to determine root cause

A gas detector study by Dr. Arunachalam, senior vice president of platform technologies at Industrial Scientific, uncovered how often this occurs. On average, gas detectors go into high alarm once every 10 days. In 0.26 percent of high alarm incidents, the users turn the gas detector off while it is still in the alarming condition. This means that in a fleet of 50 instruments, users turn the unit off during a high alarm event 4.7 times over the course of a year. In other instances, users simply continue to work through the dangerous condition while the unit is alarming. The graph in Figure 1 shows how a worker continued to work through an alarming condition while the gas concentration exceeded the alarm point of 5 PPM (parts per million). When the gas concentration increased beyond 5 PPM the second time, the worker simply turned the detector off. If you see this happening on your team, you need to strengthen your organization's safety culture.

Figure 1 - Gas Exposure Above Alarm



As you can see here, an alarm event followed by a period with no data shows that a detector was turned off during an alarm event. You will only find these patterns by reviewing your gas detection management data.

NOT USING GAS DETECTORS

Too often, team members do not use their gas detectors at all. Investigators of gas-related fatal accidents have often found no gas detectors at the accident scene, a gas detector attached to the victim in the off position, or the gas detector left behind in the victim's truck. These findings suggest that gas detectors are not used as frequently as they should be.

Correlating data periods with times that team members are known to be in the field reveals whether your gas detectors are actually being used when they are supposed to be. Of all the at-risk behaviors, the most dangerous is your team not using gas detectors when they should. If there is no correlating data, it's clear that your instruments aren't being used.

3. What Gas Hazards Are Your Team Members Exposed To?

The primary function of a gas detector is to detect hazardous gas concentrations and measure exposure levels. High alarm events on instruments indicate areas where at-risk conditions exist. Every safety professional should know how often these conditions occur, where they occur, and which team members are exposed to them. How many of these alarm events have been investigated to determine the root cause of the problem? How many of these events have been reported? Knowing the details about these conditions gives you the opportunity to take corrective action and mitigate the hazards before it's too late.

Other at-risk acts can be found by reviewing instrument alarm event and exposure data. If alarm events that last more than just a few minutes, your teams are likely ignoring warnings and working through at-risk conditions.

All gas reading data should be used to identify the at-risk conditions and hazards that your teams are exposed to. Alarm events and high exposure levels are clear evidence that your team may be in danger.

But, prolonged gas exposures just below the alarm thresholds point to at-risk conditions just as clearly as the alarm events, and recurring instances of elevated readings from the same areas show where your facility may need attention.

USING THE DATA

Now that you know the at-risk events you should be looking for and where to find the data, you need to use it. The best way to improve your safety culture is by using the data you have. Too often, gas detection data is collected, stored, and never reviewed. Or worse yet, it is not reviewed until a catastrophic event forces a postmortem investigation of the numbers.

If you don't use data to protect workers and make improvements to your operations, then why collect it in the first place? Doing something productive with all the numbers must be part of your plan to enhance the health of your gas detection program.

A good gas detection data management system should not make you do more work. It should work for you. Your gas detection management system should organize and present data so you can evaluate your gas detection program and worker safety at a glance. Beyond that, it should help you pinpoint areas for operational improvements. The system should alert you when there are problems and allow you to quickly identify the cause of any issue.

Gas detection management systems are evolving rapidly. As more data is collected, there are more innovative ways to use it. Today, there are systems using advanced predictive analytics to identify the source of problems. Future systems will be able to predict incidents before they occur so that you can take action to prevent them. But until then, there are many options for using your gas detection data management system to protect workers, assess your safety culture, and drive operational improvements.

¹News Release, (2018, November 8), Employer-Reported Workplace Injuries and Illnesses. Retrieved from: https://www.bls.gov/news.release/archives/osh_11082018.pdf