Are there gaps in your fire and hazmat gas detection program?

When lives are on the line, hazmat teams need to focus on the incident, not the reliability of their equipment

June 10, 2021

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AN INTRODUCTION TO BLACKLINE SAFETY

Blackline Safety is a global safety technology leader. We provide comprehensive live monitoring and wireless gas detection to help teams working in hazardous environments respond to emergencies in real-time and manage efficient evacuations. Our talented team of designers and engineers create and manufacture everything in-house, from wearable technology and personal gas detectors to cloud-hosted infrastructure and web-based interfaces for global industry.

We have created the world's first turnkey, work-anywhere safety monitoring solution that offers 4G wireless, remote gas detection, a two-way speakerphone and live monitoring to meet the demanding safety challenges of organizations in over 200 countries. Our vision is to become the leading supplier of wireless gas detection products in the world, and to that end, we offer the broadest and most complete portfolio in the industry.

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Is your gas detection equipment for fire or hazmat responses simple, rapidly deployable, flexible and comprehensive enough to ensure the safety of first responders and the people they are risking their lives to protect?

This white paper reviews the components of an end-to-end safety ecosystem to evaluate whether your current hazmat response gas monitoring equipment is as complete and as effective as it can be.

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Are there gaps in your fire and hazmat gas detection program?

WHEN LIVES ARE ON THE LINE, HAZMAT TEAMS NEED TO FOCUS ON THE INCIDENT, NOT ON THE RELIABILITY OF THEIR EQUIPMENT

Ensuring the safety of first responders, hazmat teams and the communities they are there to protect requires a comprehensive strategy with straightforward steps to build a safety ecosystem. This system will include connected safety devices, real-time access to data to visualize the situation, and an effective way to communicate information for a coordinated response. A complete safety solution also requires the ability to retroactively analyze the data from the response, in addition to the hotwash debrief, to identify opportunities for improvement on future missions.

First, safety and gas monitoring equipment are only useful if actually used. Portable gas detectors and area monitors need to be simple to use and rapidly deployable to receive the critical data needed to plan the response. They also need to be automatically connected so that monitoring personnel in the command center have real-time data and insight into the situation should conditions change. Gas monitoring devices should never become a source of frustration to the point where it becomes a deterrence to use them wherever they are needed. Lives are too important to compromise.

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A holistic response

An effective hazmat response requires a holistic approach. This includes not only the appropriate gas detection hardware but also the right software, data collection, and communication capabilities to provide real-time visibility into the incident and make it easy to seamlessly share information across agencies and jurisdictions, as needed.

On the hardware side, a comprehensive safety solution includes both site-wide area monitors and portable gas detectors for each responder at risk. For structure fires and medical or industrial responses, multi-gas detectors should be used to detect the levels of LEL, CO, O2, H2S, and HCN from burning synthetic materials. Both portable gas detectors and area monitors should also allow users to swap sensors on the fly, depending on the incident specifics as details are received. For example, G7 personal gas detectors and area monitors feature a rapidly swappable sensor cartridge that makes it fast and easy to change out with specialized, pre-calibrated gas sensor configurations to detect the presence of hazardous gases like VOC's (PID) such as diesel fuel vapors, NH3 and Cl2. In addition to portable gas detectors, area monitors should be used to create a hot zone perimeter around the incident to protect neighboring communities. This will allow the command center to make informed decisions about whether shelter-in-place or evacuation notices need to be issued.

However, the hardware itself is not enough to protect the safety of the responders and surrounding communities. Gas detection equipment on its own protects the individual and others nearby, but the ability to make data-driven decisions based on real-time information and insights can better protect the many responders on-site.

Gas detection hardware creates extremely valuable data — but it's only useful if it can be accessed and used in real-time to drive critical decisions. The devices must be able to maintain connectivity with the command center wherever they need to be deployed without worrying about line-of-sight. And they need to provide real-time visibility into the entire event now — not 10 minutes ago.

To achieve this, the ability to rapidly deploy and instantly connect both area monitors and personal gas detectors is critical. From there, the software solution must quickly make the data available in a way that is easily understood and usable. For example, the Blackline Live software interface clearly displays the exact location and status for each device in the connected safety network — instantly — on an intuitive dashboard. This sharable dashboard makes it easy to give full visibility to other response teams, government agencies, media or consulting specialists, regardless of location, to ensure clear communication and a coordinated response is executed, without the need to manually send updates.

Ultimately, this can save the incident commander valuable time while letting them stay focused on the task at hand.

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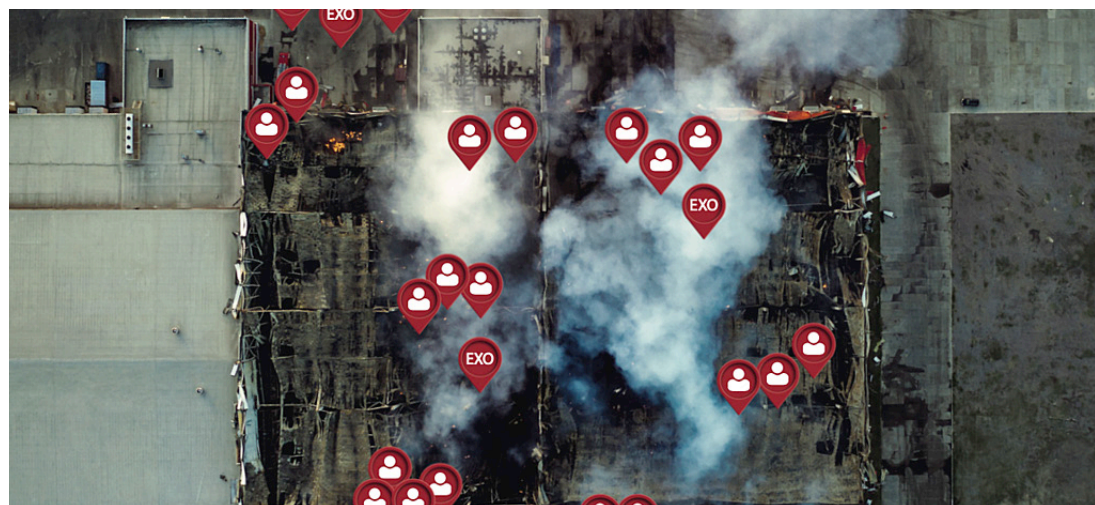
Considerations when establishing your gas detection and safety ecosystem

1. SIMPLICITY OF OPERATION

One of the most critical aspects of a connected safety solution for hazmat response is simplicity of operation. Many hazmat response teams don't use gas detection equipment every day and they often don't have time to continuously train and refresh on the device's operation and set-up requirements. Furthermore, once the response team arrives at an incident, they must be able to get gas detection equipment up and running as quickly as possible, because when lives are on the line, every second matters.

G7 EXO area monitors, personal monitoring devices, and software from Blackline Safety are simple and easy to use with little or no experience required. Simply turn them on and place the devices wherever they are needed. With a push of a button, the devices quickly connect to the network using 4G cellular or satellite connectivity — no need to set up relays, repeaters or additional costly devices to get around obstructions, such as buildings, or out of large venues such as stadiums. Plus, firmware automatically updates wirelessly, reducing the traditional maintenance time needed to update equipment, and ensure the devices are always current with the most recent firmware.

2. FAST, EFFECTIVE DEPLOYMENT FROM ANYWHERE

Gas detection equipment should be easy to set up and configure en route to the scene so the response team is ready to react to the incident as soon as they arrive. As more information about the incident becomes available, response teams should be able to choose the appropriate sensors to match the actual gas hazards present — whether the situation is a carbon monoxide leak, a chemical fire, or a potentially explosive situation.

To ensure a fast, effective deployment, choose gas detection equipment with a wide variety of pre-calibrated sensor cartridges that can be swapped out in seconds to prepare for the specific gas risks of the scenario. In addition to the benefit of being able to be responsive to changing conditions, swappable cartridges also negate the need to purchase and carry multiple devices with various gas detection configurations. Instead of acquiring, storing, maintaining, and transporting a fleet of gas detectors to cover all scenarios, use a single gas detector with various cartridges for simplicity and cost savings.

Imagine if you are en route to a train derailment and the team first on scene reports that one of the rail cars contained ammonia... Or chlorine... Or diesel... Or all of them. Swappable cartridges allow you to quickly replace the sensor configuration in a device for whatever hazard each team may face, without needing back-up devices to cover the gamut of possible gases the responders may encounter.

Once on the scene, devices should be deployed in minutes and stay connected even if the incident expands in scope or area, or the command center needs to be moved. Via a satellite connection, devices can maintain connectivity even in remote areas or where cellular service is limited or non-existent. Furthermore, when the team can place area monitors without limitation or concern for loss of connectivity, the command center can also be set-up wherever it is safest and most convenient for the response — with NO distance limitations.

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Considerations when establishing your gas detection and safety ecosystem

3. IMPROVED RESPONDER SAFETY

Saving lives is always the first priority, so it is critical to choose the technology that will keep people safe and enable a quick response. A complete safety solution should provide real-time visibility of the safety of all crew members to ensure risks are minimized. For example, personal monitoring devices should provide visibility of a responder's location to anyone with access to the monitoring dashboard. This makes it easy to quickly locate a crew member in distress due to everything from gas exposures to falls or lack of motion, allowing for a rescue to instantly be initiated — so no responder is left behind.

4. RAPID DECISION-MAKING BASED ON REAL-TIME DATA

Rapid deployment of area monitors is critical in mitigating potential gas migration outside the hot zone and into surrounding communities. With real-time monitoring, requirements for shelter-in-place or evacuation mandates can be made within minutes rather than hours where it may leave communities vulnerable for longer periods than necessary.

In addition, the ability to visualize the entire hazmat response as it happens gives the incident commander the ability to continuously make informed decisions to respond to changing conditions. Being able to communicate a more complete picture of the situation among agencies and jurisdictions helps to resolve the incident efficiently. Quite often, municipal fire departments are the first to arrive on the scene. If they can easily provide details of the incident — including real-time gas readings and the location of responders at the scene — state, federal or other hazmat teams that are en route can more easily coordinate their response upon arrival. A connected safety platform also allows users to share information with any third party as necessary. Users can easily communicate to local government officials and media by sharing a dashboard of the situation. This visual dashboard eliminates the need to actively email or text updates throughout the incident and keeps their focus on the response.

After the incident, the recorded data can be reviewed via a visual dashboard and map, in addition to the hotwash, to provide quantitative information as a learning tool from which improvements can be made for future responses.

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Considerations when establishing your gas detection and safety ecosystem

5. RUGGEDNESS AND LONGEVITY IN ANY ENVIRONMENTAL CONDITION

For equipment to be effective, it should be rugged enough to withstand the demands of the incident even in the harshest conditions like extreme heat or cold. There shouldn't be a need to purchase extra devices or batteries to swap out during the response, consuming valuable time when the team should be focusing on the response.

Since incidents may last up to 24-48 hours to resolve completely, and many gas detectors provide only 16-20 hours of battery life (less in cold conditions), area monitors need to be able to last the entire time so team members don't need to be diverted from handling the situation to change out fresh devices or batteries. Having an area monitor with longevity greater than the response also negates the need to purchase and transport back-up units, saving both funds and valuable space within the hazmat vehicle.

6. ACCURATE AND RELIABLE DETECTION OF COMBUSTIBLE GASES IS PARAMOUNT

Equipment must also be reliable and provide accurate readings for a broad range of hydrocarbons to ensure an appropriate response and avoid false alarms that may lead to unnecessary evacuations, consuming valuable time when lives are on the line.

The detection of combustible gases has not significantly changed in the past forty years. Catalytic bead (pellistor) and infrared sensing technologies (Non-dispersive infrared sensor — NDIR) have remained the dominant technologies for personal and area gas monitoring of combustible gases. These technologies have seen minor improvements over the past several decades, but the basic functionality has not substantially changed. While they are still widely used, new technology is overcoming many of their shortcomings.

ENHANCING SAFETY IN FIRE AND HAZMAT APPLICATIONS

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Correction factor scenario

Imagine this scenario — hazmat responders are called to a scene after a passerby called 911 after seeing someone unconscious in an industrial park. While approaching the victim, the first responders notice a large tank of isobutylene nearby. They know it can be an asphyxiant but are wearing SCBAs so their main concern is fire or explosion. They actively monitor the LEL reading for combustible gases on their personal gas detectors.

Protocol dictates they evacuate if gas levels reach 10% LEL but their gas monitors, which have a methane-calibrated pellistor sensor, are only reading 8%. The level later spikes and goes into high alarm with a reading of 20% LEL so they immediately evacuate the area. However, in the post-incident investigation, the Command Chief notes that because the team's gas detectors were calibrated with methane and the readings were due to exposure of isobutylene, they needed to apply a correction factor of 1.6. When the gas detector went into alarm, they were actually in an atmosphere with 32% isobutylene (20% X 1.6 = 32%). Also when the readings were at 8%, the true levels were 13% and the devices should have gone into alarm much earlier with an evacuation initiated at that time.
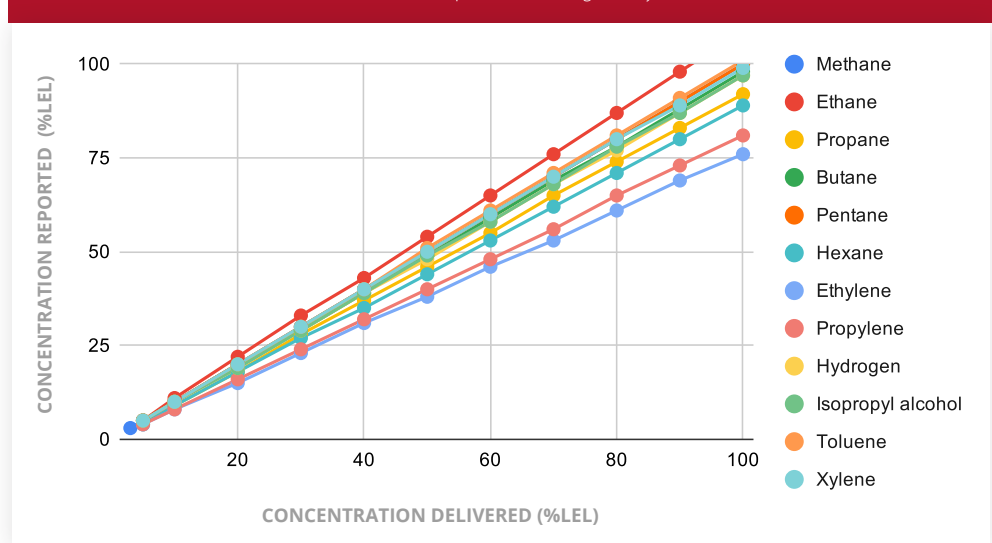
In an emergency, responders are reacting in seconds and don't have time to a) determine the correction factor required based on the gas risk present — assuming they know which combustible gas it is, or b) use the correction factor to calculate the actual percentage of LEL when checking readings.

However, times have changed, and technology has advanced. The newest emerging technology in combustible gas detection is the Molecular Property Spectrometer™ (MPS) sensor.

This advanced sensor analyzes the properties of various combustible gases in order to categorize them, while compensating for environmental conditions (air pressure, temperature and humidity) to give accurate readings. The MPS sensor is also poison-immune to contaminants such as silicone vapors (e.g. from WD-40) and accurately detects a wide array of combustibles regardless of the calibration gas used, including H2 and acetylene which an NDIR cannot.

This means that hazmat crews won't get interrupted by unnecessary false alarms or be exposed to unnecessary risks due to inaccurate readings. The MPS sensor's long lifespan also ensures responders can confidently use it without a replacement for approximately five years. For more details, please review our detailed white paper on combustible gas.

Accurate detection of multiple flammable gases by an MPS sensor

CONCENTRATION REPORTED (%LEL)

CONCENTRATION DELIVERED (%LEL)

- Methane
- Ethane
- Propane
- Butane
- Pentane
- Hexane
- Ethylene
- Propylene
- Hydrogen
- Isopropyl alcohol
- Toluene
- Xylene

ISOBUTYLENE

CAS No. 115-11-7 Colorless gas. Simple asphyxiant which can displace available oxygen; initial symptoms: rapid respiration, air hunger, diminished mental alertness, impaired muscular coordination. Can form explosive mixtures in air. Flammable.

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Having the right gas detection technology is critical for fire and hazmat responses — from the hardware, to the software, to the data analysis, and communication capabilities. It gives teams the insight and visibility they need to quickly make the right decisions in emergency scenarios.

Contact us today to speak with a consultant about connected safety solutions for fire and hazmat responses.

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