

# The evolution of gas detection

You may not always be able to smell it, taste it or discern its presence, but toxic and flammable gases can present significant industrial hazards. New technologies are improving gasdetection capabilities, helping safety managers ensure employee health and well-being. Here, Duncan Gooch, Director of Offering Management, Honeywell Gas Analysis and Safety, explores the evolution of gas detection technologies and the role of connectivity in the future of safety.

Although it is typically viewed as a cultural relic from the days of the first Industrial Revolution, the practice of carrying canaries into mines to detect carbon monoxide continued in the UK until 1996. First conceived in the 19th century by scientist John Haldane following a series of studies into the cause of miner deaths, Haldane determined that the portability and anatomy of canaries made them an ideal early indicator of airborne poisons.

The canaries were the miners' only gas detector until 1986, when an "electronic nose" – a detector with a digital reading

largely replaced the birds, ultimately
leading to their redundancy in 1996. This
was the first of several considerable,
much-needed improvements made
to gas detection technologies –
improvements that continue to this day,
as gas detection becomes integrated into
wider environmental monitoring.

Technology for communicating gas hazards has improved significantly, with real-time monitoring that ensures speed and accuracy. In addition, the sensor networks that measure environmental factors are becoming connected to one another, which helps safety professionals identify problems sooner and act faster.

This enhanced responsiveness is invaluable, as industrial processes increasingly involve the use and manufacture of highly dangerous substances, particularly toxic and combustible gases. Some industries generate gas hazards or rely on chemistry that itself poses a danger, such as the processes involved in electric power management, water treatment and paper production. Identifying dangers early and accurately is of paramount importance because gas hazards can be invisible and hard to identify. Some gas leaks can go unrecognised until the victims experience symptoms of distress – which may be too late.

To help safety managers understand the options, here's an overview of gas detection options with a few tips on how to approach assessing the right choice for business needs.

# The three dangers of gas

Gas hazards generally are separated into three categories: flammable (fire or explosion risks, such as methane or propane), toxic (poisoning risks, such as carbon monoxide or chlorine) and asphyxiant (suffocation risks, primarily oxygen deficiency, including situations where oxygen is consumed or displaced by another gas).

The distinctions are important even though the categories have some overlap. Many gases are both combustible and toxic, for instance. However, the hazards and regulations involved are different, as are the sensor types required to identify them.

While all hazardous gases are dangerous, some are more inconspicuous than others. Even low concentrations of some gasses can affect workers who are exposed. It's not always about inhalation, either; poisonous gases are sometimes absorbed through the skin. Because of the adverse effects from long-term exposure to gas additives, it is important to measure both the concentration of gas and the total exposure time.

Toxic gases are present in nearly every industry, but some gases present unique challenges to specific industries. In the semiconductor industry, for example, gases including phosphine and arsine are especially flammable and toxic. Etching and cleaning industries face similar issues with ammonia.

In the UK, acceptable ranges for each airborne substance are outlined by the Health and Safety Executive's EH40/2005 list of workplace exposure limits. Data from this and other organisations inform the development of gas-detection equipment across industries, as do additional equipment standards, which covers the whole range of gas detection equipment. Obviously, gas hazards are serious, pervasive and insidious. While technology has always stepped in to improve detection, the industrial reliance on often-dangerous substances means we have to look for even more safetymeasure improvements.

### Today's gas detection tools

An optimal instrument system monitors both short- and long-term exposure levels, as well as instantaneous gas levels.

In every system, the detection process raises an alert. This spurs staff to respond appropriately to comply with relevant industrial regulations and safety requirements. With so many harmful gases to identify and measure, it's no wonder that there are several applications for fixed and portable gas detection. When they all work together as a layered approach, they help provide the best outcomes for detecting gas leaks.

Today, there are catalytic detectors that use a tiny sensing element or, an infrared gas detector, which measures combustible gases where the absorption bands are in the infrared region of the light spectrum. Some instruments use that same infrared technology in the form of a powerful beam that can cover a distance of several hundred meters. Alternatively, there are electrochemical sensors, which are compact, require very little power and generally have a long-life span.

In testing, location and context matter. Sensors that detect gas concentrations may collect data in a geographical area, such as "in the factory" or "in the northwest corner of the third floor", or at personal locations, wherein the worker wears instruments that sample their breathing zone. Deciding which methods are right for a company's staff depends on the specific situation.

The choices, however, are not only about functional technology.

#### Improved visibility

High-speed wireless networks allow gas-detection systems to monitor worker safety in real time. One way it does this is location tracking.

Managers can see where each worker is. In an emergency situation, the manager

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knows how to find every employee, and in the worst of situations can dispatch an emergency crew to the worker's exact location.

From a business viewpoint, this feature translates into clear benefits. If something goes awry, no one has to wonder, "Where's Harry? Last I knew, he was headed to the storage room – right where we just got that alert." Undoubtedly, location tracking becomes a significant safety feature that can quickly and easily save Harry's life when used properly.

# Integrating gas detection in an always-on safety-first environment

Many of the baseline technologies for identifying gas hazards have a long, proven history. However, new technologies allow for improved detection capabilities, helping managers ensure that every worker goes home at night, safe and sound. In particular, connected technologies and real-time data communication are enhancing gas detection – as well as wider safety systems.

For example, there are manufacturers working to integrate sensors, personal protective equipment, software applications, and databases to create an accurate real-time picture of plantwide safety. Connected safety solutions and real-time intelligence can let experts respond to safety threats, manage business risks and improve productivity.

As part of this, some gas detectors provide real-time data visibility. Some equipment can collect sensor data, which helps identify and resolve problem areas. The real-time availability of data is invaluable for workers.

The recorded data also makes it easier to gather and manage critical compliance data. Software can automatically collect critical safety data from across a business and store it. This saves time in compliance reporting, highlights missteps and lets safety engineers focus on the most important matter — taking care of workers.

There are many business benefits when disparate data is joined for analysis, collaboration and reporting. Gas readings are among the information gathered, which helps safety managers make better-informed decisions and sometimes connect otherwise unconnected dots.

It is important to test and monitor in any environment where humans may encounter harmful gases. As with so many other things, when it comes to gas detection solutions, it's important to choose the appropriate tools for the job. That includes identifying which gases to detect, recognising possible sources where they may be found and asking the right questions, among other applicationspecific concerns.

Even in traditional scenarios, the product decision process includes contemplating ease of use for operators and routine servicing. In the old days, this simply may have meant buying and caring for canaries, but we've evolved since then.

About the author



**Duncan Gooch** is a Director of Offering Management for Honeywell with more than 20 years' experience in gas detection, currently focused on Honeywell's fixed gas and flame line of business. Honeywell offers a comprehensive range of gas and flame detection solutions to help protect workers and facilities, including portable, fixed, commercial, high-tech & semiconductor detection and gas cloud imaging solutions for a wide variety of industries around the globe.