Confined Space Entry & Compliance

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Confined space entry always presents a potential hazard and unnecessary accidents can be avoided by having a robust procedure in place. It is imperative to ensure that workers are fully trained and properly equipped to work in these types of environments and an essential component of the safety equipment is a portable gas detector.

Recognise the hazards

A confined space is defined by three factors. The space must be large enough for a worker to enter. Secondly, the space cannot be designed for continuous worker occupancy. Thirdly, a confined space has limited openings for entry and exit.

Some confined spaces may require a permit to enter, owing to the likelihood of hazards that the operator may face. For example, environments with inwardly sloping walls or sloping floors will allow gases to build up more quickly. Areas containing materials that present the potential for engulfment are also very dangerous. Regardless of whether the area is permit required or not, all confined spaces should be treated with caution.

Confined spaces may contain various gas hazards that can only be detected through testing. Oxygen (O) deficiency, Hydrogen Sulphide (H_2S), Carbon Monoxide (CO) or Methane (CH_4) are common hazards that can be monitored with a portable gas detector.

An Oxygen deficient atmosphere can be the result of Oxygen displacement by a toxic or inert gas. Microbial action, oxidation caused by rusting metal, combustion and absorption can also create an Oxygen deficient environment (when the Oxygen in the atmosphere has fallen below 19.5%). At this concentration, an operator will feel drowsy, whilst less than 17% Oxygen will result in severely compromise cognitive processes and coordination and then lead to death.

The possibility of the presence of H_2S gas is another confined space hazard. H_2S is produced as a by-product of rotting vegetation or matter. Although H_2S smells of rotten eggs, you cannot rely on your sense of smell to alert you to this hazard; at concentrations higher than 30ppm, H_2S paralyses the sense of smell. At concentrations of 500 to 700 ppm, death will occur within 30 mins to 1 hour.

It is important to be aware of the vapour density of the gas hazards that are likely to be encountered; for example, H_2S is slightly heavier than air and can collect in confined spaces where there is little air movement. Varying vapour densities means that it is essential to test at various levels in a confined space.

A confined space gas detector kit makes stratified testing easy and generally includes a multi-gas monitor with pump, 10 foot sampling hose for pre-testing (longer lengths available), spare batteries (rechargeable or alkaline), quad-gas cylinder for bump testing and calibration with gas regulator, all conveniently contained in a rugged carrying case.

Besides H_2S, the decomposition of organic waste materials can also produce Methane (CH_4). Leaks in gas pipelines can be another source of CH_4 in confined spaces. Although CH_4 is the most commonly encountered combustible gas hazard, it is important to monitor for additional combustible gases. A combustible sensor that reads in the %LEL range is suitable for measurement of CH_4, Propane, and other common combustible gases. It is important to remember that a gas like Propane, which is heavier than air, can displace Oxygen in sumps and basements. Catalytic bead sensors require Oxygen to work, so in some instances IR sensors may be preferable.

The internal combustion engine exhaust from vehicles, pumps and compressors running in the vicinity of a confined space can also create a build-up of Carbon Monoxide (CO). A concentration of only 1,600 ppm of CO can be fatal within hours.

When working in confined spaces it is important to consider all hazards that could potentially be encountered. Taking into consideration the impact that process equipment and machinery can have is also essential. For example, an Oxygen enriched environment can be created when an Oxy-acetylene torch's supply perishes, producing Oxygen. Oxygen enrichment is very dangerous as materials may spontaneously combust. So when working in confined space always ensure that all factors have been taken into account.

PPE (Personal Protective Equipment)

A portable multi-gas detector with H_2S, CO, Oxygen and combustible (%LEL) sensors is the ideal solution for the majority of confined space entry applications. Although these are the most likely confined space gas hazards, sensors selected should reflect the known and potential atmospheric hazards associated with the environment to be monitored and work to be done (i.e. induced potential hazards from the tools used).

After initial testing is complete, continuous monitoring is required to ensure the area remains safe. If a hazardous atmosphere is detected during entry, employees should exit immediately, re-evaluate the space and take corrective measures. This continuous monitoring can be carried out in two ways; by the operator taking the gas detector into the area with him, allowing the device to monitor via diffusion or alternatively, by having a second operator using a pumped portable device to monitor the area from above, if applicable. There should be a proper communication procedure established between the different people involved in the work to be carried out.

A device such as GasAlertQuattro, from BW Technologies by Honeywell, is ideal for monitoring confined space entry. It provides simultaneous monitoring of up to four gas hazards and its user optimised design permits easy, single button operation. It is also ideal for use in challenging environments thanks to both audible and visual alarms.

Bump testing and calibration

Workplace environments can be harsh and gas detectors can be subjected to all kinds of conditions that can affect their operation.

The only way to guarantee an instrument will detect gas accurately and reliably is to test it with a known concentration of gas. Exposing the instrument to a known concentration of test gas will show whether the sensors respond accurately and the instrument alarms properly.

There are two methods of verifying instrument accuracy:

1. A functional bump test
2. A full calibration

Each is appropriate under certain conditions. A bump test verifies that the sensors are working by exposing the instrument to a known concentration of test gas; it checks that the sensors are responding in the right time frame. The instrument reading is compared to the actual quantity of gas present, as indicated on the cylinder. If the instrument's response is within an acceptable tolerance range of the actual concentration, then its calibration is verified. Users are recommended to check with the gas detection equipment manufacturer for the acceptable tolerance ranges.

Instruments should be "zeroed" before the bump test to give a more accurate picture of the bump test results. Also, the test should be conducted in a clean, fresh air environment. When performing a bump test, the test gas concentration should be high enough to trigger the instrument alarm and if the device fails a bump test, it must be adjusted through a full calibration before it is used. When calibrating an instrument, always follow the manufacturer's recommended calibration frequency and procedure.

It's important to note that a calibration does not verify the response time of the sensors like a bump test does. Therefore both are useful. A bump test can be performed frequently such as daily, for example; it is fast and cheap.

A calibration is performed less frequently; for example twice a year or when there is an incident. A calibration should also be performed after a sensor has been changed.

This makes the combination of MicroDockII and Fleet Manager from BW Technologies by Honeywell an ideal solution, as it provides the capabilities to do both.

Bump testing and calibration made easy

Imagine a busy industrial facility where all engineers on site use portable gas detectors and strict safety protocols must be adhered to. How can you tell if all the

engineers are using instruments that are properly maintained? How can you tell all the engineers have even turned their instruments on?

Thanks to recent innovations in gas detection, suppliers like BW Technologies by Honeywell can help sites not only simplify the process of calibrating portable devices but help to dramatically lower costs and improve a site's safety.

When used with Fleet Manager software, MicroDock II is nothing short of a site supervisor's best friend; this software adds an additional dimension to MicroDock II and is capable of tracking calibration data of devices and alerting both the user and the supervisor to the fact that a device needs calibrating. Calibration certificates can also be auto-generated and sent out to users and supervisors. This is part of insuring compliance to safety rules and regulation.

Devices like MicroDock II, when used with Fleet Manager, help to not only simplify calibration and reduce the costs associated with it, but allow enhanced control of portable devices and increased on-site safety. MicroDock II is compatible with all of BW Technologies by Honeywell's range of portable gas detectors, including GasAlertQuattro.

Safety first

It is important to remember that most confined space deaths that have resulted from exposure to lethal atmospheric conditions could have been prevented.

By implementing an effective confined space entry programme and ensuring all personnel entering such areas are properly equipped with portable gas detection, you can prevent such an unnecessary tragedy happening at your site.