



Best Practices in Gas Detection - Five Keys to a Safer Workplace

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IT WAS MID MORNING and the day had started off like any other for the nine men returning from their morning tea break. The air was thick with humidity blowing in from the nearby tropical sea. It was the wet season and the clouds that had been building since early morning looked ready to prove they meant business while thunder could be heard in the distance. The men hurriedly climbed the dockside gangway that would take them back to their work area within the protection of the hull of the ship and out of the oncoming rain.

They crossed the still dry main deck of the ship to hold number 3, and one by one entered through the open manhole, climbing down a few meters to the first level and briefly pausing to allow their eyes to adjust to the dim light emanating from below. They had done this hundreds of times in the past. Clambering through dark, dirty, sometimes cramped confined spaces was all part of the day's work for these men; and they got paid well to do it.

The men were all employees of a local onsite contractor specializing in repairing fuel systems on bulk carriers and today's task to replace a section of fuel system along a bulkhead near the bottom of one of the holds was going well. The vessel was a bulk crude oil carrier and this hold had contained heavy crude just a few days before coming to the shipyard for maintenance.

Descending down the labyrinth of scaffolding to the bottom of the hold took the men another 10 minutes further. Upon reaching the bottom they noticed an unusually strong smell in the air and one of the junior men questioned if it was 'normal'. The foreman noted that the hold had been steam cleaned and certified just the day before and that only hours back a 'permit to work' had been issued after gas testing by a shipyard safety officer. After checking for any leaks or changes, the men agreed that it was not out of the ordinary for there to be some 'smell' present and continued on with their work.

What the men did not realize is that a small amount of oil sludge remained trapped behind a heavy steel plate they had been welding on prior to their break. While not catching fire immediately, it is assumed that as it was heated, the sludge released flammable vapors which built up over a period of time to become a hazard.

Shortly after the men resumed work there was a blinding flash and 'whoosh' as the vapor caught fire and the floor of the tanker erupted in flames. The fire did not last long. It is estimated that it was out within seconds, leaving only a small area of fire up against the bulkhead. Blackness ensued and the men, in shock and suffering from burns, panicked. They searched for and found the stairs on the scaffolding that would take them up and out of the hot smoky blackness. Little did they realize that as they worked their way up the scaffolding to the ships deck that they were being exposed to a combination of ever increasing levels of lethal carbon monoxide and a low oxygen environment.

Sadly, all nine men perished due to the lethal atmosphere created by the flash fire. Their remains were recovered by the rescue team only meters below the top of the tank and within sight of the entry hatch.

The above tragedy is a dramatized recount of an actual event that took place several years back in a South East Asia shipyard. Many lessons were gleaned from the subsequent investigation and changes were implemented to reduce the chances of a similar accident occurring in the future.

One fact that clearly emerged is that this accident most likely could have been prevented if properly operating gas detection equipment had been used by a qualified person to test the confined space prior to the men reentering and was also used to continuously monitor the environment while the men worked.

Detailed below are five common mistakes companies and people make related to gas detection in confined spaces that could lead to disaster.

1. Not continuously monitoring the atmosphere in a confined space while workers are inside.



Conditions can change rapidly for many reasons and it is imperative that at least one worker carry and understand the usage of an instrument to monitor for changes in the atmosphere at all times. Even when ventilation equipment is used to purge the air, hazardous atmospheres can exist in ‘voids’ and low lying areas where the air exchange may not be sufficient.

Some companies only test a confined space ‘prior to entry’ and then at set intervals after the initial entry permit is issued. The ‘authorized gas tester’ may have many confined spaces that are his responsibility to test in a shift and will rotate between them. However, it is law in certain jurisdictions that at least one worker in a ‘group’ working in close proximity to each other carry a direct reading gas detection instrument and that monitoring be done continuously while the men are inside the confined space. For bigger groups or large confined spaces, additional instruments should be carried.

As the accident above demonstrates, continuous monitoring when hot work activities are being undertaken is especially important.

2. Not using the correct sensors for the job at hand.

Although most companies measure for oxygen and combustible gas (the minimum required by regulation)



they frequently neglect to test for common toxic gases such as carbon monoxide (CO) and hydrogen sulphide (H₂S) or others that may be present – depending on the pre-entry hazard analysis. Accidents can occur when toxic gases are present but not detected due to the incorrect sensors being used. Although not present initially, toxic gases may be released during work being carried out in confined spaces. For example if sludge or ‘black water’ containing hydrogen sulphide is disturbed, it can release H₂S gas that can quickly build to hazardous levels.

3. Failure to test equipment before use.

One of the most widespread and potentially deadly mistakes is also one of the easiest to rectify. Instruments that have been stored for long periods, are improperly serviced, mistreated, or used in harsh conditions may not be working properly. The only way to be certain that your instrument detects gas is to challenge it with gas before use. Performing a functional test on a gas monitor is a simple task that takes only a few seconds.

Would you trust your life to a piece of equipment that you are not 100% certain is functioning properly? Would you be comfortable stepping aboard an airplane if you knew that the pilot did not perform the required preflight inspection? Do not skip the preflight check on your gas monitor.

4. Failure to properly test ALL areas of the confined space that workers could enter.

There are documented cases of workers perishing due to hazardous atmospheres in ‘remote’ areas of confined spaces that were not tested properly prior to entry. These areas are typically low lying sumps or behind baffle plates where heavier than air vapor or gas has collected but not been detected. As a start, always be certain that the sample tubing and motorized sample draw pump used are adequate to draw a sample from the very bottom of the confined space.

Some confined spaces have complicated internal structures such as baffles, risers, and sumps that in many cases are not able to be adequately tested by dropping in sampling tubing or using a probe alone. Internal structures or temporary staging such as scaffolding and ladders can prevent sample tubing from reaching the most critical area to sample – the bottom of the tank.

5. Lacking sufficient and/or ‘correct’ instruments to work safely during ‘peak periods’.

Workers may be doing all the right things but during certain periods lack sufficient numbers of instruments to perform work in the safest possible manner. Under pressure to complete projects or tasks on time workers may be inclined to take ‘short cuts’ instead of waiting for instruments to become available.

During shutdown, turnarounds, emergencies, or increases in workload it is important to pre-plan to be sure that sufficient instruments are made available to contractors and workers.

Is your business growing? Do you have enough instruments on hand now to accommodate present and expected future workloads? Are there any shutdowns or turnarounds planned in the near future? How will you be sure there are enough additional instruments to go around? Do you have contingency plans in place in the event of an emergency or unplanned maintenance event requiring additional instruments?

The good news is that instruments are now more affordable than ever and features that were once optional are now considered standard. Still, there are options if you prefer not to purchase additional instruments. Now there are many companies providing short or long term instrument rental. Renting allows companies to manage their budgets and safety programs for maximum benefit and is becoming common practice for contractors and large companies alike.

Gas detection and monitoring is a critical component of any confined space safety program and should be given the highest priority and attention to detail that it deserves in order to avoid accidents such as the one described and subsequent loss of life.



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