3M Transcript for the following interview: Ep-27-Gas Detection in Confined Spaces

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Welcome to the 3M Science of Safety podcast presented by 3M Australia and New Zealand Personal Safety Division. This is a podcast that is curious about the signs and systems of all things work, health and safety, that keep workers safe and protect their health. I am Mark Reggers, an occupational hygienist, who likes to ask the questions Why, How, and Please Explain. Whether you are a safety professional, occupational hygienist, or someone with any level of WHS responsibility in the workplace, maybe you are a user of safety products or maybe you are a bit of a safety nerd who finds this stuff really interesting, then this is a podcast for you.

(R) Today we are talking gas detection in confined spaces continuing on from our three other episodes we have done about confined spaces with Ash Mayor, we are chatting with Kevin McComb, welcome Kevin.

(M) Thanks Mark.

(R) Right if you can give us a brief little intro of who are you, where are you from and what do you do?

(M) Well my job with 3M is I am actually the technical services manager for SCBA (Self Contained Briefing Apparatus) gas detection and thermal imaging.

(R) Fantastic. Now we did a couple of other episodes with Ash Mayor and we spoke about confined space identification, we spoke about working in confined spaces as well as confined space emergency or rescue procedures and we spoke about a little bit about toxic atmospheres and so we are going to delve into the gas detection just as a bit of a summary, what are those toxic atmospheres that are most commonly associated with confined spaces?

(M) Well just to name a few we would talk about lack of oxygen actually in a confined space and that is actually major for us. The presence of hydrogen sulphide and other gases, for example carbon monoxide.

(R) So, we have got lack of oxygen, we need oxygen, we have toxic gases that are not going to be good and we also spoke about fire and explosions as flammability type hazards associated with it as well.

(M) That is always a concern Mark if the flammability is there then there is a chance of an explosion within the confined space.

(R) You mentioned obviously oxygen deficiency, we got toxic gases and we got flammability but how would a workplace or a worker who is having to work in these confined spaces monitor these conditions, can they just use their nose, I can smell rotten egg gas, shouldn't that be enough?

(M) Unfortunately, no Mark. The best way to do it is with a portable gas detector which will have the correct sensor in to monitor those gases within a confined space. My recommendation is the most common one is one that has an LEL sensor in it, a carbon monoxide sensor in it, an H2S sensor detecting hydrogen sulphide and a carbon monoxide sensor.

(R) And that is knowing about the hazards of that confined space. You may be expecting other types of gases, so you would select the appropriate sensor to the appropriate gas, but I guess the four that you have mentioned are the standard ones, would that be accurate?

(M) They would be our most common ones Mark, but really speaking if you suspect something else is in the confined space then you would actually select a sensor that would actually monitor that type of risk.

(R) So, using gas detectors when do I use them, do I just go into the confined space and then turn them on, is there a certain process to actually use these for confined spaces?

(M) Selecting a gas detector which can actually monitor from outside of the confined space is best. That would be using a gas detector with a probe or pump. We would normally say for example drop a hose into the confined space and monitor it from inside but stay safe working from the outside so that we can actually detect what is actually in that space.

(R) So where do I monitor it. So, I dropped the probe in, am I just monitoring the top, the bottom, different corners within there, maybe I cannot get to a far corner?

(M) Top, middle and bottom. So, they may be a case of the agents which are heavier than air or the toxic gasses which are heavier than air are actually at the bottom of the confined space. Some gases are lighter than air will actually rise. So, for example Mark some gases such as hydrogen sulphide are heavier than air and in unventilated areas will settle to the bottom of the space while other gases such as methane are lighter than air and will collect at the top of the space. Testing should be carried out on a sufficient number of points to accurately reflect the areas of the space that is likely to be accessed.

(R) How often should the atmosphere be monitored, is it only at the start as you said you are dropping the probe down into there, is it the start of the job, the middle of the job or end of the job? Or will we be monitoring all of the time?

(M) Really continuous monitoring is needed. So, we want to know what is actually happening throughout the whole job, so things change, we may stir up sludge at the bottom of the confined space then gases may be released so we need to know what is happening throughout the whole time of the job.

(R) And things can happen very, very, quickly so you want to be able to respond when something does change and get the workers out of there.

(M) Most definitely and make an escape plan.

(R) I've got my gas detector and we are planning to do our entry, our risk assessment, we got our permit there, how do I know that that gas detector is actually going to work when I go to put it into the confined space and put that probe there because it is a potentially lifesaving device.

(M) Well first thing we need to be concerned about is whether our gas detector is calibrated. That means that we test it against certain known levels of a test gas to ensure that the instrument is working correctly. Secondly, we should actually carry a test gas with us. It is what we call bump test with a gas detector to ensure that it will respond when it is exposed to different sources of gas.

(R) So how long does the bump test take, is that a long test to do? You are saying you are carrying a bottle of gas with you is a short process to do, a long process, is it hard?

(M) It is very easy Mark. It's relatively quick. We just subject the sensors to the gas which we release from the test gas container which is usually a multi-gas. We can then actually detect whether the detector will respond and sound an alarm.

(R) I know myself personally I would want to know if this particular device is going to work for me before I go into a potentially very hazardous environment, so it feels like a fairly obvious check to do that could probably get easily overlooked I imagine with everything else that is happening with a task or job like that.

(M) Well it is very easy test to do and one of the mistakes I think that can happen is that people believe that the gas detector will work because it worked last time and that might have been weeks, if not months before.

(R) So, you mentioned a before a 4-gas sensor detector, that is oxygen, LEL, CO and H2S, what are some other different types of gas detectors I am sure there is more than just the four gas.

(M) Almost definitely. There are a number of different detectors out there on the market including single gas detectors as well. Multi-gas seem to be the most common however we could plug in different sensors depending on the instrument. Some of the common ones might be SO2 or carbon dioxide. Even sometimes we have what we call exotic gases for example we need to detect phosphine which is used in fumigation, so we have sensors for that also.

(R) PID's I have heard that term thrown around at times, what is a PID sensor?

(M) Yeah, PID's are basically a sensor that we would detect forms of flammables in a lot of cases, but we can actually tune them to different gases also. Not so common these days, but as I say a very useful instrument. What we really need to identify what we are looking for with a PID before we use that sort of sensor. There is also

other gas detectors that we would use for example an area monitor which would monitor the whole area. Apart from the personal gas detectors that the crew would wear, the area monitor will actually give us an idea of what is actually happening, for example if gases are escaping from the confined space.

(R) It is fair to say you need to know what gases your potentially expecting because obviously if you just think I am going to grab that four-gas detector that you mentioned before, and you have got a different type of gas, obvious it is not going to respond and let the workers know something is going on.

(M) It is not going to respond at all and that would actually subject the workers to more risk. So, carrying out a risk assessment prior to actually doing the job is very important. So once again the risk assessment would include what toxic gasses we expect to be encountering.

(R) So, I got my gas detector, it starts to alarm, starts to vibrate, nice flashing lights on there. When will a gas detector go into alarm. What are those levels, do the users need to know what they are?

(M) Definitely the users need to know what they are but having the gas detector go into alarm straight away is a concern. You would take the alarm seriously because you would know then that the levels of gas are increasing, and you would be making a plan to exit the area.

(R) So, say on a gas detector we have got a TWA alarm, we got STELs and peaks, can you explain what those three different alarm types are.

(M) The TWA alarm is giving our time weighted average which is the average over the whole shift. The stel is the short-term exposure limit. Basically, that is the exposure in a shorter period of time.

(R)15 minutes I believe?

(M) Yes. And obviously when we reach the peak of the alarms, so the peak is the absolute maximum that we wish to ever reach with regard to the sensor. Therefore, this is an emergency situation.

(R) So earlier Kevin you mentioned about LEL alarm, what is LEL and you mentioned about flammability? How does that work?

(M) Well the LEL is actually the point below which the concentration of gas to atmosphere is too lean to burn and we are actually measuring the lower explosive limit LEL to ensure that basically we operate within a safe level. The UEL is a point above which the concentration of gas mixture to atmosphere is too lean to burn, sometimes is expressed in upper flammable limit. The lower explosive limit or LEL is a point which the concentration of gas mixture to atmosphere is too lean to burn. This is sometimes expressed as the lower flammable limit. Any concentration between these limits may ignite or explode with little or no warning. Gas concentrations above the UEL are also extremely dangerous as they displace oxygen and must travel back through the explosive zone during ventilation efforts to reach safe limits.

(R) So, I like to explain it like cordial, is one way to think about it. So we got too much in there we have got a lot of flavour of cordial and it is not going to ignite and is a basic analogy, then we have this middle part that is the perfect flavour range that we just want to keep drinking it down on a hot day and then we have this lower amount where it is really I guess watered down so we are trying to monitor this watered down environment before it gets to this ideal range but in the flammability side of things that is the explosive range. So, it very simple basic analogy but I like to

visualise it with cordial because I can think about those concentration and colours, so these gas detector alarms, what percentage of LEL are they set at to go into alarm.

(M) The lower limit would be only about 5%

(R) Wow 5% out of that LEL limit.

(M) Yes, so we are playing very safe at this range and the idea of that is basically we would never get anywhere near the explosive limit.

(R) That is the ideal situation, that is why it is being monitored. These gas detectors sound pretty vital and critical. What are the limitations of gas detectors, it has got pros and cons? What do we need to be aware of if I am using a gas detector?

(M) I think we need to think about firstly we talked about calibration above testing, but we also need to make sure that the gas detector is looked after. There is no use having a gas detector that has been dropped into a drain and the other things that we get concerned about is sensor poisoning, for example sensors can be poisoned by high concentration levels of toxic acids. So that is also a concern, plus cross sensitivities, we may find that the sensor does pick up other things within a confined space and cause issues. One of the major concerns we have is the use of things like WD40 around gas detectors and any sorts of lubricants like that will end up poisoning sensors.

(R) Like any bit of critical equipment, be it lifesaving equipment, you need to know the limitation and what it is going to affect it so there is that confidence and you can rely on the results when that gas detector goes into alarm to exit the space. So, if I am in a confined space and the alarm does go off, what typically would a worker do or what should a worker do at that point in time.

(M) I think the worker needs to then start looking at how they are going to actually exit the confined space. We purchase these instruments and we need to rely on their effectiveness, so we do not want to second guess the instrument. We may find that there is more than one instrument within the confined space and other workers will be confirming with their instrument that there is a problem, so we would be making an exit out of the confined space if the gas detector activates.

(R) We want the gas detector to activate if something is happening in that particular environment. I mean it is only a very short time and we have really skimmed the surface but to help me summarise, to wrap it in a nice little bow, what are those key points that workplaces who are using gas detectors, thinking about purchasing one because they are going to be doing confined space entry, what is some of the key points you really want to reinforce to those people?

(M) I think the key points is ensuring that the gas detector is calibrated and also ensuring that the workers do bump test the gas detector before entering the confined space. Maintaining the gas detector and ensuring as we said the sensors aren't poisoned, that the unit is operated correctly and of course really basic things like ensuring that the battery is fully charged before actually using the instrument. So, verify the gas in the ports are free and dirt and debris prior to use and finally be safe and in the event of any alarm on the instrument screen follow work procedure and leave the area immediately.

(R) Some fantastic points Kevin. Really appreciate you coming into today. Like I said we had to skim the surface but thanks once again.

(M) Thank you, Mark,

(R) Well thanks for listening everyone. If you have any questions, comments, suggestions for future topics or guests you think we should get into the studio, please

shoot us an email to Science of Safety ANZ@mmm.com. You can also contact via email if you need any help or assistance or guidance around gas detection, confined space work or anything in that particular area. We are here to help. Be sure to subscribe to the pod cast or iTunes wherever you get your podcast from so you don't miss any future podcasts. We have got plenty in the pipeline to come out. If you enjoyed the podcast or found it informative we would really appreciate if you could take a few moments and leave us a review as it really does help other people find the podcast as well. And as the Joyce brothers said, "a strong positiveself-image is the best possible preparation for success". Thanks for listening and have a safe day.