3M Transcript for the following interview: Episode 99 Self-Contained Breathing Apparatus (SCBA)

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(R) Welcome to the 3M Science of Safety Podcast presented by 3M Australia & New Zealand Personal Safety Division. This is the podcast that is curious about the science and systems of all things Work, Health and Safety that keep workers safe and protect their health. I'm Mark Reggers, an Occupational Hygienist who likes to ask the questions. "Why?" "How?" And "Please explain." Whether you're a safety professional, Occupational Hygienist, someone with any level off WHS responsibility in the workplace, maybe you're a user of safety equipment, or maybe you're a bit of a safety nerd who finds this stuff really interesting – then this is the podcast for you. Today. We're talking all about self-contained breathing apparatus with Kevin McComb. Welcome back, Kevin.

(M) Thanks, Mark. Appreciate you having me over again.

(R) Now we did speak way, way, way back in episode 28, talking about supplied air respiratory in confined spaces. But for those that may still be needing to catch up with that episode, can you please introduce yourself? Who are you? Where are you from and what do you do?

(M) My name is Kevin McComb. I worked for 3M. I'm a technical specialist. I look after our self-contained breathing apparatus, our thermal image cameras and our air supplied systems. I provide advice on this range and I also provide training on the self-contained breathing apparatus.

(R) I was going to say a large part of your role, obviously we do work together. You travel around Australia and New Zealand doing a whole bunch of training on self-contained breathing apparatus - which is why I thought you'd be the best person to speak to about this. But for those people that may

not have heard of that term self-contained breathing apparatus or SCBA, as they're commonly referred to, what is an SCBA, for those that may not be aware?

(M) We have a face piece, a back frame with a pneumatic system; hoses and pressure reducers, and we have a cylinder. This gives us an independent source of air to enter into dangerous areas.

(R) Much like many other episodes, we've done our respiratory protection, we talk about this air purifying sort of category of products and air supplied range of products which SCBA falls under. Is there anything else you'd like to add around air supplied type respiratory equipment?

(M) Well, air supply is basically we take our air with us, Mark. We're not reliant on the atmosphere around us. So, that's the beauty of SCBA. We're bringing clean air into the space. We're consuming that air, so we don't rely on the atmosphere around us and we have a limited time in the space. From 30 to 60 minutes, in most cases, unless we're bringing air from another source as well, but that gives us a clean air supply, so we can carry out whatever work we need to do there.

(R) So, when we compare that to an air purifying respirator which has filters, why would or when would a workplace consider using a self-contained breathing apparatus as the preferred choice?

(M) When we're talking about entering into an IDLH (that's Immediately Dangerous to Life and Health) situation, we can't rely on an air purifying respirator to do that work. When we don't know what the contaminants are, or what the contaminant levels are and, for example, we use this commonly in things like confined spaces.

(R) Knowing what the contaminant is and what the contaminant level is so critical when we start thinking about what respirators to select and what may be suitable. We have done a previous episode about respiratory protection factors. So if we don't know what it is, we can't confidently use a product in that environment. So, it's really critical, if we don't know where we're cracking open a vessel in a work site or a confined space, an SCBA is going to be a great option. Is it most commonly associated with confined spaces that you find in your travels, Kevin?

(M) In my travels it's most commonly associated with firefighting. We deal with a number of large fire brigades, you find that the majority of the sets are used by fire brigades and in underground mining.

(R) It makes sense that firefighters, when you think of that image in your head of them, responding to fires or emergencies, that they want to bring their air with them to make sure they're being protected. They don't know what the toxicity is, the level, so it makes a lot of sense there. So, Kevin, I've heard of escape breathing apparatus. Is that different to a self-contained breathing apparatus?

(M) Most definitely. Escape breathing apparatus are just that – they're designed to escape from an area which suddenly becomes immediately dangerous to life and health. sometimes we may enter into a confined space and conditions change. Most confined spaces obviously have a certain risk. For example, we may be doing some monitoring, and we have basically no indication of any issues. The confined space is entered into, then conditions change. The workers would be wearing a portable gas detector and the gas detector alarms. Then we need to escape from that area. So, the escape set is designed just for that. When conditions change, we would actually activate the escape set. An Emergency Escape Breathing Device (Apparatus) the 3M ELSA (Emergency Life Support Apparatus) is a small cylinder containing air. It delivers air to a hood and air flows freely into the hood. The user consumers the air and basically, after fitting, makes an exit. These escape apparatus have a maximum duration of 15 minutes.

(R) Is that just because it's a smaller cylinder versus typically an SCBA has a bigger cylinder?

(M) Yes, it's a small cylinder. It's easy to carry as well. ELSA-type units are commonly used for confined spaces, and we have found in recent history we've be putting them on to trucks carrying dangerous goods.

(R) With an escape breathing apparatus - and it kind of is in the name there - but what if I just need to jump into the confined space very quickly. Can I use an escape apparatus? You know I've got that 15 minutes to duck in and duck out quickly?

(M) Mark, that's a common question, and it's a definite "no". The apparatus is designed to escape only. It is not an SCBA. We need to use it as it's designed to escape from an area not to enter into a dangerous area.

(R) So, for workplaces that may be considering self-contained breathing apparatus, or from what you describe, it may be something they could be considering, what are some of the things that workplaces should be aware of when going down this path?

(M) The main thing we need to think about when using SCBA or any of these products is we need to get training. Training is very important. The equipment is designed to go into hazardous areas and therefore, the people who are using it need to be trained to wear the equipment correctly and obviously they need to know how to operate it in case something goes wrong.

(R) It doesn't matter what the equipment is, whether it's a respirator or other type of PPE or machinery, if people don't know how to use it and use it correctly, it's not going to perform as it's expected to perform. And when it's expected to potentially save someone's life or to get them out of a life-threatening situation, that makes perfect sense there. Now, you mentioned there's full facemask pieces that come with self-contained breathing apparatus. Are they required to be fit tested like we've quite often spoken about Negative Pressure Respirators?

(M) The face pieces do need to be fit-tested as well. The face piece runs in what we call positive pressure. Therefore, there is a higher pressure inside the face piece than outside. However, in the event that the unit does go into negative pressure, we want to make sure that the seal remains intact. Therefore, no contaminants could go into the face piece and be breathed in by the operator. So fit testing is very important.

(R) And if people recall back to the previous fit testing episodes that I've done, when you are fit testing a positive pressure mask or used in positive pressure on the job, it gets fit tested under negative pressure because we really want to focus in on the fit being, the critical component. Now a common question I get, Kevin, around positive pressure, tight-fitting respirators is the requirement to be clean-shaven. If it's positive pressure, wouldn't that be okay to not be clean-shaven because that air is pushing out.

(M) Another common question, if air is pushing out and we don't have a good fit, therefore, we're going to lose a lot of air. We're going to be in a situation where we have constant leaking through the face piece out to atmosphere therefore our duration is going to be considerably less. Clean shaven is important even on these positive pressure face pieces. We need them to fit correctly and it is a requirement of the Australian Standard.

(R) I mean, if you've got a cylinder that has a limited amount of air - 30 to 60 minutes, depending, minutes will absolutely count if you're losing a higher volume of air out of that leaking face piece, if you're not clean shaven or getting an adequate seal. So, it does make sense, but we're going to be using these potentially in life-threatening situations, so we want to make sure everything is going to be operating correctly to give us the best chance of doing what it's there to do.

(M) Most definitely.

(R) You mentioned a couple of components that make up a self-contained breathing apparatus. Can you just go over those again, but I know there's a few other things that people may not be familiar with, when we start talking about rescue second man attachments, split demand valves, fast-fill assembly. Can you explain what those are and where they may be used in the workplace?

(M) Working from the basics, we have a back plate or a harness system. We have a pneumatic system, hoses and a pressure reducer, which reduces pressure from the cylinder. The cylinder is filled to 4500 PSI. So, we're carrying a lot of pressure on our back and that pressure needs to be reduced because we can't use that pressure. We have a pressure gauge, so we know what the contents are. The pressure gauge has a warning whistle built into it. That warning whistle will activate at 55 Bar plus-or-minus 5 Bar, so that gives us another warning if our pressure is low. We have a demand valve and these systems work on a positive pressure, but it's by demand. When we take a breath, the demand valve opens and supplies air to the face pieces. It's not constantly flowing into the face piece. That saves us on air. You mentioned the airline attachments and rescue second mans. The airline attachment is for attaching the breathing apparatus to a mobile trolley system, which could be outside the confined space. This will increase our duration or air, so the trolley would also be fitted with cylinders and it would supply air through a hose to the SCBA and if we needed to separate ourselves

from the trolley we can disconnect and go onto the cylinder air which is on the SCBA. Fast fill attachments used in mining. The reason we have a fast fill attachment is that we at times need to refill the cylinder while it is on the operator's back. The idea of that is once we have depleted the cylinder contents, if we are making an escape from a mine, or we are actually running out of air, we go into a fast fill station and then we can connect our breathing apparatus to the fast fill station and refill the cylinder. Once the cylinder has reached 80% full. We can disconnect, and then continue making the escape.

(R) Can you get self-contained breathing apparatus that have two cylinders on the back if one cylinder has got X amount, but having two of them, would that help for duration?

(M) Yes, certainly we can add additional cylinders to the unit in some models. Obviously, there is a bit of a balance here. We need to weigh off extra time against extra weight for the user. But yes, twin cylinder models are available, and once again, that gives us our extended duration, as you mentioned.

(R) The air that is in the cylinder. Does that need to be checked and need to be a certain quality to be suitable for human consumption?

(M) We need to ensure that the air is clean. This is not just factory air we're using, and we need to ensure that we don't have carbon monoxide, carbon dioxide, oils or moisture in the air content. As we compress air and we put it into a cylinder, we need to be assured that the air that we're breathing is clean and not contaminated. The filtration of the air is important and the breathing apparatus compressors are very similar to the scuba diving compressors. They are regularly maintained, and they have a number of filters designed to take out these contaminants.

(R) Does any Australian standard provide guidance on the parameters of breathable quality air?

(M) You will find that in the Australian Standards. However, we also state in the front of our user manuals with regard to air quality required to run these sets.

(R) Australian Standard 1715 also provides some guidance and some of the dependencies there. So, the information is out there if you're unsure of where to go, so please go look it up when you need to

get that information. Now, I'm pretty sure this is the case Kevin, but I'm hoping you can confirm for me that these different back plates have different adjustability for different wearers or heights and sizes and have different comfort features of people, say firefighters, as you mentioned earlier, have to wear this for extended periods of time, we want to make that a bit more bearable for those type of workers. Is that the case?

(M) Yes, Mark, that is the case. At the bottom end of the scale where we talk about entry-level set, we have a very basic back plate. As we make our way up through the models, the top model has an adjustable lumbar region and extra padding. You'll find that there's no compromise in face pieces or pneumatic systems. The back plates become more comfortable, as the models go from, say, an economy level to a premium level.

(R) Like any bit of equipment, maintenance and inspection is a critical part for ongoing confidence. What are the types of pre-use checks/inspections workplaces should be undertaking for some SCBA they may have purchased?

(M) First is a visual inspection, making sure the face piece is intact. Make sure it's connected to the demand valve. Make sure that the cylinder is connected to the back plate correctly. Then we'd put the apparatus on. That's called 'donning the apparatus'. We'd do up the waistband, adjust shoulder straps. Then we'd fit the face piece and turn the cylinder valve on slowly. We need to check that the contents indicator reads at least 80% prior to any use. Once we've donned the actual facemask itself, we can conduct a positive pressure test. We can check that the face piece remains in positive pressure by breaking the seal and allowing air to flow. Then we can conduct a face mask seal test. That means that we put the face piece on. We turn the cylinder valve off slowly until basically the face piece seals to our face, just like we'd test a negative pressure respirator. Once that's done, we can reactivate the set and turn the air back on. Now, the warning whistle test is also incorporated into this so we can basically reset our demand valve, which would be activated when we've been breathing it. And we'd actually then turn the cylinder valve off, release the pressure down, and we'll ensure that the warning whistle goes off at 55 Bar plus-or-minus 5 Bar. Final checks, basically are making sure that the unit is obviously clean. We've got to clean the face piece after our final checks to make sure we haven't contaminated the face piece. And we'd log all this work in a BA logbook.

(R) What are the service requirements when it comes to self-contained breathing apparatus? Do they have to be sent off to an approved service agent from time to time?

(M) We recommend a 12-monthly service on breathing apparatus. Now breathing apparatus service is under the OEM guidelines (Original Equipment Manufacturer guidelines). And it's also mentioned in the Australian Standard AS/NZ 1715. Servicing can only be provided by a manufacturer or a manufacturer's Accredited Service Agent. The unit needs to be checked correctly and if parts are needed, the correct parts need to be fitted, which are coming from the manufacturer. We test sets normally under a dynamic mode, meaning we use a dynamic test bench. The test bench we prefer to use is a product called 'PosiChek'. This basically gives the set a workout and tests all the functions of the set and will actually breathe the set as it would be used by a user and provides a detailed record of the testing carried out. The report shows a breathing graph showing the actual operation of the set ensuring that it stays in positive pressure.

(R) If these are being sent off every year, is it the same things being checked every year? Is it a bit like a car service where there's milestones where you're going to give a bigger overhaul of the products or you're checking more things than usual? How does that work?

(M) Mark, at year 6, the set is due for a major overhaul. However, this is at the discretion of the service agent, providing the unit is dynamically tested from year 1, meaning that we put this across the test bench. During this service, we tend to replace soft parts, for example, seals and O-rings. We also look at parts that are due to actually wear out from our own experience and these are also replaced. Year 6 service is comprehensive. It may not require a full-service kit to be fitted at year 6 in some instances. Now on the opposite end of the scale, if we have a user who's using the equipment in a very harsh environment - and this can be firefighting, or it could be working in a chemical process - then parts will need to be replaced more regularly. So, this is the whole idea of doing dynamic testing on the set. We ensure that the set is ready to go once it has been through a dynamic test. If anything needs to be replaced during the dynamic testing phase, we will put that part into the set.

(R) How do you check cylinders? I've heard of this hydro test. How does that work?

(M) That's a test on the cylinder, and there's a requirement under WorkCover that we need to hydrostatically test a breathing apparatus cylinder and other gas cylinders come under the same scheme. We would actually fill the cylinder with an incompressible liquid, usually water, pressurize the cylinder and examine for leaks and permanent changes in shape. This will include a visual inspection of the cylinder exterior and interior. Cylinder testing intervals are usually five years now. We use a lot of composite cylinders for breathing apparatus. That keeps the weight of the cylinder down. These cylinders range in a life span from 15 to 30 years.

(R) I was going to ask about shelf life or end-of-service life. So, you mentioned that for the cylinders. What about for the rest of the SCBA; the backpack, the pneumatic and the gauges? Do they have a date like you mentioned the 6 years major overhaul? Or they can continue to be used providing they're performing?

(M) I think the good news on that one, Mark is providing we can still get the components for the set, therefore, we can maintain it. We have sets in service at the moment that have been regularly maintained, which are older than 30 years.

(R) That's good to know if people are proactive and look after the equipment, they should get a long life out of it and that's value for what you're investing, get that type of equipment for what they're doing there. When it comes to SCBA cleaning, is there any recommended cleaning solutions or approaches when it comes to that side of things?

(M) With regard to breathing apparatus cleaning, this needs to be taken care of using a light detergent. Most cases on the back plate, wiping down the pneumatic components and with regard to the face pieces we will usually use of virucidal wash to ensure that the face piece is clean and free from any contaminants. When we talk about any detergents or washers and things like that, we recommend a thorough rinse of the set as well, with water. We don't recommend any particular brands.

(R) I previously did an episode with Terry Gorman about care and maintenance of respirators, and it really depends on where that particular product is being used to the level of, and that's whether it needs to be decontaminated or sterilized in different environments. So, it really comes down to the user understanding what they need to clean it to. So, it really is going to become application specific.

(M) Most definitely.

(R) Now we've spoken quite a bit around SCBA from what it is, where it may be used, but to wrap up our conversation, what would be some key points you'd like to leave with our listeners.

(M) Well, SCBA is very good in the hands of a trained individual. That the equipment is designed to go into a hazardous area, and if you don't know how to use it, you'll be putting yourself in danger. So, training is very important. The second thing is regular service of that equipment as well and ensuring that it is operational at all times. No one is going to be hanging an empty fire extinguisher on their walls. We need to have things ready to go, and we need to have the equipment there that's suitable for the environment we're going to use it in. SCBA does need to be maintained. Cylinders need to be filled, and the actual user of these sets needs to be not only trained but familiar with the use of the equipment. And internal training by organizations needs to also take place on a regular basis.

(R) Self-contained breathing apparatus are life-saving devices and equipment, so it makes sense they've got to be ready to go and used correctly by the people that need to use them. We have touched on a lot of things. We've only given a bit of a high-level overview here. But where could listeners go to get further information about self-contained breathing apparatus?

(M) There's a number of manufacturers of this equipment. They have their own websites. The Australian Standards will cover maintenance and selection. The web is a big place and there is a lot of papers on breathing apparatus and applications for that product.

(R) Kevin, how can people get in touch with yourself if they wanted a bit more information around some of the 3M products?

(M) Just feel free to contact me on my LinkedIn account That's probably the best vehicle we found.

(R) And people are welcome to email the podcast show, so we can connect you with Kevin, should you have any questions? So, Kevin, thank you so much for coming in. Once again. Hope you've enjoyed yourself.

(M) Thank you, Mark.

(R) Well, thanks for listening, Everyone. You can get in contact with a show by sending an email to ScienceofSafetyANZ@mmm.com if you have any questions, topic suggestions or would like some assistance in your workplace when it comes to self-contained breathing apparatus or any other type of PPE, 3M are certainly here to help. You can also visit our website https://3m.com.au/sospodcast for further resources on self-contained breathing apparatus, as well as a transcript of the chat Kevin and I have just had. We also have information on all the other previous episodes we have recorded. Be sure to subscribe, rate, review and share through Apple Podcast, Spotify, Google Podcast or wherever you get this podcast from. And as John Wooden said, "Things work out best for the people who make the best of how things work out." Thanks for listening and have a safe day.