3M Transcript for the following interview: Ep 97 Supplied Airline Systems

Mark Reggers **(R)** Terry Gorman **(G)**

Introduction: The 3M Science of Safety podcast is a free publication. The information presented in this podcast is general only, and you should always seek the advice of a licensed or certified professional in relation to your specific work or task.

(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 Supplied Airline Systems with Terry Gorman. Welcome back, Terry.

(G) Hello, Mark. How are you?

(R) Great to have you back again. I hope you've been well in the crazy world that we've seen in the last year or so. But for those that may not have listened to previous episodes we have done together, which has been quite a few now, which has been great, can you please introduce yourself? Who are you? Where are you from and what do you do?

(G) Yes, Mark. I am an Occupational Hygienist working for 3M in the world of Personal Protective Equipment and focusing mostly on respiratory protection. I've been doing that for about 20 years at this point.

(R) Just a little while, which is why you've been one of the main people we've had in quite a few times to talk about essentially anything to do with respirators. But as a starting point when we talk about supplied airline systems, where does that sit in the world of respiratory protective equipment?

(G) Well, at a high level, we can divide respiratory protection into two lines where you've got an air purifying line of products and then you've got an air supplied line of products. So air purifying Is masks, etcetera that use a filter to clean the air and trap the contaminants. Air supplied is where you are getting a clean air source and supplying that to the wearer of the respirator and giving them obviously clean air to breathe while they're doing their job in a contaminated environment.

(R) Most of the stuff we've spoken about before probably sat on that air purifying side of things, when you think about filters, which may be a PAPR or disposable N95 P2. So, we're really going to delve into this air supplied airline side of things. So, when would or should a workplace consider a supplied air system versus some of those other types you just mentioned?

(G) Well, there's a few reasons. Air supplied systems use a clean air source and supply that to the wearer, as I said in the contaminated area. This means that the air is clean, given you've done the right things and is going to that person working. An air purifying system has to purify the air in the contaminated area. We don't have filters that can capture all contaminants known to man. There are millions of chemicals out there in theory, and filters do not exist to capture every one of those. By using a supplied air system, we don't need a filter in the in that contaminated area. We're supplying the clean air from a remote source if you like, and therefore we don't have the problem with filters, and they're non-existence in some case, for certain contaminants. The other reason is that these systems provide no breathing resistance, so there's no issue in terms of the added resistance, that a filtration system can cause to the wearer. So, it's normal breathing in the sense that it just does not require use of your lungs to pull air through the system. It arrives automatically if you like. We can use it for people with facial hair and beards, to some extent by selecting the right type of head top, people do not have to be clean shaven.

(R) So that's one of those loose-fitting head tops were spoken about in the past.

(G) Correct. And the other reason that it can be a big advantage is that you can perform air conditioning on the supplied air. So we can use systems, some are called vortexes, where we can cool or heat the ambient air that's arriving to that respirator by something in the order of 25 degrees Celsius. So, if you're working in the back blocks of Karratha in WA, where it can get up to 50 degrees in the summertime, then obviously the airconditioned air - 25 or up to 25 degrees cooler - would obviously be

of great benefit and comfort. Same in reverse for heating. If you're working in a cold environment, you can get that heated air supply.

(R) So a workplace, as a starting point, once again, like we've spoken about, look at the contaminants or the hazards. Is it adequate? And that may point you down the supplied air path. But then there may be the other considerations that you highlighted - some of those temperature things, breathing resistance. So it's really going to depend on the workplace and the specifics to what their requirements are from what you've just said there.

(G) Of course, everything is always specific. So, you've got to look at all those all the issues. There's clearly an issue with airline systems in that you are wearing a supply hose, so you are tethered to a source if you like. Now, if your job is only in a certain defined area that the fact that you're tethered to a system is not an issue. But if you've got a traveling type job where you've got to go up and down stairs and across platforms and down holes and across factory floors, you clearly can't have an endless hose dragging behind you, becoming a snag and safety hazard and simply running out of distance. So, there are certain requirements where airline is probably the best answer in theory for respiratory protection because it has all those pluses, but the downside is you've got that that geographic spatial restriction that means you can't wander around with it, and therefore that rules out a lot of job applications because it's just not practical.

(R) So, I was going to ask about the limitations of a supplied airline system, and I think you've touched on one of that mobility aspect. Are there other limitations for certain environments where supplied airline might not be suitable?

(G) Yes, there can be. Again, it's a case of sometimes it's simply the ability to move as we just talked about. There's a restriction there. The other issue can be the potential for the hose, the supply hose to be damaged or contaminated. If you're working in an area where the floor or the services are filthy, covered in grease or some solvents or chemicals, you've got an issue in terms of the hose maybe getting contaminated. It may be soaking in a solvent or something, and you eventually may get breakthrough into the hose supply and therefore you are now going to be breathing that chemical. So, you've got a look at the issue of the hose condition. Can it be safely used in the area of interest? People have used things like gantries where they can run the hose along the roof if you like, and then

drop down to the worker where they can move up and down with the roof on flexible mountings or the mountings can move with the worker. That's one way to solve that sort of problem. But it's something to consider. The other problem with supplied air is we've been talking about getting a clean air supply through that system. That's clearly an issue. You must be sure that your air supply is clean and reliable. It's no good giving people a respirator with a supplied air system that shuts off or is supplying them with dirty slash contaminated air. So, there is an issue in terms of guaranteeing or making sure that air supply is what it should be.

(R) Are supplied air systems suitable at times for, say, oxygen-deficient environments, confined spaces or IDLH (Immediately Dangerous to Life or Health) environments? As we've spoken about, we're bringing in air from an outside source to where the worker maybe.

(G) They can be, but it's getting a bit more specific in terms of the extra requirements. The principle is fine. Again, you're getting nice, clean air into the worker working inside, let's say a tank, doing some welding or, painting or whatever inside the tank. Definitely a confined space and definitely requiring respiratory protection. That's fine. You might even have a potential for an IDLH environment in there, but the supplied air can supply you with that clean air. But what happens if that supply is cut off? The person is then potentially in immediate danger because they're clean air supply is off and they're inside that contaminated environment. So, when we're working inside confined spaces, you can have a supplied air system, such as we've been talking about, but you also need a back-up escape auxiliary device where you have a small breathing air bottle on your belt. When things are working properly, the air is coming through the supply hose and you can breathe. If, for some reason that supply is interrupted; somebody cuts the hose, somebody parks the truck on the hose, the compressor fails for some reason, then the system cuts off the supplied air line and cuts on, turns on the small bottle that you're carrying with you - maybe 10 minutes supply something like that - that gives you time to then realize it's time to stop work and get out of the confined space and go and find out what the problem is. It guarantees you supply of clean air all the time through that process. So you've got a back-up supply to get you out when the main supply fails.

(R) So that's given us a good overview of where it may or may not be suitable, depending on people's workplaces. But what components make up a supplied airline system? You've mentioned a few

different things about the hose and head top and a vortex that can cool or heat. So, what are the different parts of a supplied air system that would need to be there?

(G) So, the first thing is the air source the clean air source, if you like. The most commonly used way to do that is a compressor - air compressor. We see those in smash repair shops and in large factory complexes will have a large compressor supplying air through the system that can be a source for a respirator for breathing air. Of course, we can supply that air to a location in the workplace. At that point, we need to have a breathing air filter panel. So what we want to do is, if you like a final filtration on that air coming through from the compressor that makes sure that we are going to be supplying the wearer of the respirator, a clean, filtered air supply, these filter panels will contain a HEPA (High Efficiency Particulate Air) Filter. They will typically also have a small carbon filter to capture any organic type vapours that may have got down the line from the compressor, from oils or lubricants in that system. And that air filtration panel will do that cleaning and then supply the air through a flexible hose, usually of appropriate length, with appropriate safety fittings on either end to make sure it's connected securely and safely with a double action connection removal process.

(R) Yes, we don't want to attach the air tool hose and use that as the breathing hose. We want to have them separate. We're not going to be contaminating the line there. That makes sense.

(G) Absolutely. Those breathing tube hoses are different to machine hoses. They're much bigger in diameter, and they have to carry more airflow. So, they are much at that bigger volume. And they are typically also can be lined to provide, a guaranteed clean inside, if you like. At least when it's new and not dunked in anything. Those hoses have to be tested to the Australian standard. They are tested for pressure. They're tested for, kinkability - I'm not sure if that's the right word, but the ability of the hose to not collapse if it has to go around a corner under pressure, so that we guarantee that the airflow is going to continue if the hose is bent around a corner at an angle. So the hose itself has to be designed to be a breathing supply hose. So you should be using hoses that are so rated and any system you buy should obviously have that type of hose included in it of appropriate length.

(R) That air panel is that is that near the person? Or is that closer to the compressor? Because obviously, there's different hose lengths and positions, and I'm thinking workshops and bigger facilities. Where would the air panel usually be positioned?

(G) It has to be closer to the worker. So, in theory you could have a large industrial site with a giant compressor down one end, and the respirator is needed one kilometre down the other end of the site. So, you may have a good reticulation system. In other words, a piped compressed air system that covers the site. You can tap into that down at the appropriate location, close to where the work's going to happen. You can then run your filter panel at that point, which does that final clean-up, remove any water or rust or scale that might have got in, in the system over the years, through the pipe work. Cleans the air up, and then you then connect your flexible hose we just talked about from that panel to the worker. So you are normally within, say, less than 30 metres is what is typical of that filtration panel to give you that, make sure you're getting that clean air

(R) On the worker, what's on the worker? Does that hose connect straight up to the respirator they're wearing?

(G) It normally connects to a belt-mounted regulator or, you know, air regulating valve. This controls the air pressure and will adjust the pressure in the flow up to the head top to be within appropriate parameters, to give you a good selected flow of air that will keep you appropriately supplied with an excess of air to keep positive pressure in that head top and thereby provide you the respiratory protection that you expect. So, it will be a device on the belt, which that flexible hose will connect to - again with a safety connection, a double action connection that is then connected to a larger bore, flexible breathing tube, which goes up to the head top. That head top can be something tight, like a full-face mask. It can also be a loose-fitting type head top, like a hood or a welding shield or a lightweight, rigid style head top. Again, depending on the application and what's required.

(R) So, we've got the compressor, the air panel, the hoses connecting everything. We've got the regulator in the respirator. So, there are a few components to the system - all required and makes sense from what you described. But with that compressor, can any compressor be used? Can a workplace go down to the local hardware store or Bunning's and pick one off the shelf and plug it in and off you go?

(G) Yes, it depends on the specifics of what's required. So, a compressor has a certain capacity, a certain free air capacity. In other words, a volume of air that it is rated to supply. Now, depending on

what demands there are on your compressor, you might have machinery, as we talked about earlier, air powered machinery. You may have all sorts of other demands, and then you may have respiratory demands - one or more workers. Now, all of those things will be demanding air of that compressor. So, you need a compressor that is big enough to supply all of those things. They may all be running together. So, the obvious thing you would do is buy compressor big enough to be able to deal with all those sources of demand. In fact, you have to buy one that's bigger than the demand. Compressors do not like running full time. They don't want to run 100% of the time, and they're not designed to do so. You would normally want at least a 20% excess capacity on that compressor to the added demands on the other end. So, a big enough compressor is what you want. A typical respirator, depending on the on the type, you could be using a little as say, 100-110 litres a minute. Whereas a high demand type product like a vortex cooling unit, you would be using something like 400 litres a minute. So, again it all depends on the specific products you've got and what their demands are. You need to know what you're getting, what you need.

(R) Because I guess if you've got 5 users versus 10 users with all tools and no tools that really can vary quite widely, depending on as you say, what the requirements are. So, coming back to that compressor, having that understanding what you need will drive the pathway with a Bunning's compressor may or may not be suitable, given the ones I've seen they usually quite small. So, if you got a couple of workers, they're probably not going to be suitable with that free air capacity you mentioned, but still a critical component that it's not just grab a compressor off the shelf, and that's just going to be fine. So, workplaces do need to have a little bit of knowledge and research as to what is going to be required there.

(G) Yeah, many people have no idea what their compressor capacity is. They literally… you ask, and they don't know. You have to go and find out from the supplier or the manufacturer to determine exactly what it can do. A rule of thumb is that 1 one horsepower is worth about four cubic feet per minute, or 110 litres a minute. So, if you can see looking at the compressor serial number plate that they have on most compressors, it usually indicates the horsepower, As a rule of thumb, 1 horsepower compressor will supply about 4 Cubic Feet per Minute (CFM), which is about 110 litres per minute.

(R) Good, a rough and ready indicator there that at least start having that conversation or start asking those questions. When it comes to the number of people – we've spoken about, you know, variants of

people that could be on the system. Does it just come down to the compressor size so you could have 10 people, theoretically, if your compressor was big enough to supply that amount of air or is there a maximum limit that systems can handle?

(G) No, in theory, the compressor is as big as it is. So, yes, a giant compressor will be able to handle more people. But remember, you also need that filter panel working close to where the respirator is being used, and those panels will have a maximum throughput as well. So those final filtration panels will be rated to take, you know, 15 cfm or 30 or 50 depending on their size and again that means that they may only be able to supply one or two workers at the same time. If you've got, you need four workers, you might need two separate filter panels, to supply 2 and 2, or 2 and 2 and 2 or however many you need to cover what your worker demands are.

(R) If all four in the one location, you've got a big enough air panel for four people, that may be okay, but if you got four people and two are at either end of a shed or something, there's certainly going to be multiple panels there. So, yes, something else to think about when looking at these types of systems.

(G) Yeah, it's not complicated. It's just logic. Get your numbers. Get clarity on what's needed, and then you can work backwards and say “Yes, I need one panel or two panels or three panels, and then I need a compressor that overall needs to supply X”, and then you can see where you're at.

(R) If a system doesn't have enough air or that CFM that you mentioned, does any part of the system, whistle or alarm to let people know “Hey, you probably shouldn't be working in the current set up if there isn’t enough air pressure there”?

(G) Some of the belt units will have a warning whistle. So, if the airflow coming through your hose to your system, if it drops, it will set off a warning alarm, but it's that's not a given. Some units do that. Some do not. So, it's usually fairly clear when the air stops to the wearer. They're no longer getting air into the head top. They will feel no airflow. They will hear no air movement, and then they can react to that. But again, it depends on the specifics of what you've got and what it will tell you.

(R) So, the air quality, as we've highlighted a few times, is critical to supply to the wearer. So how are those air checks done? You mentioned the start there that needs to be of appropriate standard. How does the workplace check or who would a workplace engage to check if the air is suitable or not?

(G) There are people who will come and do it. Mostly compressor type companies will come and check the quality of air so they can check the moisture content, if there's any carbon monoxide issues. One of the issues with the compressor is its intake, where it's sucking clean air into the compressor and blowing that down the system. If that intake is in a car park, you may be pulling in already contaminated air, if you like, with some amount of carbon monoxide from vehicle exhaust, potentially, will go through the system, and there's no filter in the system for that. So you need to check the air from the compressor is appropriate. The air filter panel will also have pressure gauges and performance indicators of the filters on them, potentially, so you can get an idea from those where you're at. But you can certainly get contractors to come in and check your air quality. As I said, usually the compressor suppliers or manufacturers have that type of capability.

(R) Is there a standard that provides guidelines about what those parameters should be about breathable quality air?

(G) Air quality is dealt with in Australian Standard 1715 in appendix A. Requirements for air quality is dealt with in Australian standard 1715 appendix A.

(R) And the system, like a lot of things when it's set up, sounds like it's fairly straightforward. What kind of training should workers be given, who may be using a supplied air system to make sure they are going to be being protected and don't affect the system in any way?

(G) Yeah, sure, as with any respirator, there should be training appropriate to the product. So, you would expect the supplier of the gear or the manufacturer of the gear to give you training that is appropriate; how to look after the gear, how to clean it, how to replace parts, issues to consider, you know, all that sort of thing should be part of the deal. When you get the equipment initially, you would want to be getting your workers trained so that they are aware of the things to do or not to do... and use it properly and safely.

(R) Now there's lots of components here, hence the need for training. But from a service and maintenance point of view. What's the requirement for a supplied air system?

(G) Well, the compressor is one thing that would be the compressor manufacturer and to look at the condition and the appropriate servicing of that. But in terms of the respirator, inspection is important. The system, over time will suffer from wear and tear as any system does. And again, as part of the training that the worker, the wearer should know what to look for and check those things. In a very well run system, there's very few working parts or moving parts in these system, so there's not a lot of wear and tear given that the air that's coming through the system and is filtered appropriately and cleaned appropriately, the system should last and work well for many, many hours. Because of that, let's call it lack of complexity. But nevertheless, it's got to be looked at and inspected appropriately to make sure it continues to protect the wearer.

(R) You've given us a really good overview today, which has been fantastic. But to wrap this all up, what would be some of those key points you want to leave with our listeners when it comes to supplied airline systems.

(G) As I said, be very clear on what your situation is. Find out what your compressor can or can't do because that that is vitally important. Make sure it's big enough. Make sure it's providing quality air. Make sure your workers are involved in the selection process. Make sure they're getting a product that is suitable for the application, and you're taking into account all of those variabilities that can occur in different workplaces. Make sure they get appropriate training and understand their systems. Understand what things they need to do to make sure it remains in good condition and properly functioning. And when in doubt, go back to the manufacturer or the supplier. Make sure you're getting the information you need and make sure your air systems are working properly by routine maintenance of compressors and lines as appropriate. There are situations depending on the location and the weather conditions where water can become an issue in supplied air system lines in the main system, if you like, the ring mains or the supply mains. There might be a need for drain points and/or even a dryer to be put into the system. That is all part of that local assessment situation that you need to talk to with your compressor people to make sure you are getting appropriate air quality all the way down the system at all times.

(R) For those that do you want a bit more information, which I'm sure there's going to be a couple out there giving there is a lot, when you think of a lot of different components of the system, that may need to be considered, where can people go to get more information?

(G) The Australian Standard gives basic component information, if you like, and how to set up a system in a broad sense. But I would be talking certainly to manufacturers and suppliers of air line systems. They obviously do this regularly. They know what the problems may be. They can ask the right questions. They can help you determine where you stand. You know, "I've got no compressor. I need to start from zero" or "I've got a compressor. Is it big enough?" All those things, they can certainly help you with to determine what you need, what you're gaps are, what your options are. So, it's not rocket science. But there are a number of basic things that you need to get right. It certainly can be done. It is done routinely. So, ask the people who understand the products. They can help you get there with a minimum of fuss and bother.

(R) Well, thank you so much for your time again today, Terry. I really, really appreciate it.

(G) Most welcome, Mark. Thank you.

(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 you'd like some assistance in your workplace, maybe it's to do with supplied airline systems or maybe other types of PPE in your workplace. 3M are certainly here to help. You can also visit our website https://3m.com.au/sospodcast for further resource is on supplied airline systems as well as a transcript of the chat that Terry and I have just had, as well as all the other episodes we have released up to this point in time. Be sure to subscribe, rate, review and share through Apple Podcast, Spotify, Google Podcast or wherever you get this podcast from. And as Adedayo Olabamiji said, "Roads to success are always under construction. You are a work in progress. Keep growing and keep living." Thanks for listening and have a safe day.