3M Transcript for the following interview: Ep-2-Respiratory Selection Part 2

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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.

This is part two of a conversation we had with Terry Gorman about respiratory protection filters, air purifying respiratory protection filters. If you haven't listened to part one, I suggest you pause it now, go and download part one cause part two will make a lot more sense. So, enjoy the second part of my chat with Terry Gorman!

(R) – So, we've spoken about particulate filters, now onto the other side of the filters, we've got the gas and vapours side of things. Is it similar to the particulate side of things? Is there a G1, G2 and a G3 for the different levels?
(G) – Ha ha, no, no it's not quite as simple with gas and vapours. We still need capture mechanism. In gas and vapour filters, the most commonly used is activated carbon. That is produced by burning a material under controlled conditions to

create a carbon or a charcoal with appropriate attractive forces on the surfaces, which is then used to capture the gas and vapour molecules. So, they are made to capture different types of those gases and vapours, so we have to, in certain cases, treat that carbon so that it can then effectively capture different types of gases and vapours. So, we end up with a rating system for gas and vapour filters to give us an indication of what that filter is capable, or rated, to capture.

(R) – So, when you say capable, is it all gases can be captured by filters? Or how does that work? I've put my gas cartridge on and off I go.
(G)– Well no, no, it's a bit more complex as you would imagine. First up we should say we don't have filters that can capture every known gas or vapour. So straight away there's a chunk of gases and vapours that filters are not suitable for and cannot capture. So, they're out of that ballpark, and we shouldn't be using gas and vapour filters if they can't work. So that's one consideration. There are gas and vapour filters made for different types of contaminants. So, we have filters for organic vapours, we have filters for acid gases, we have filters for ammonia, we have filters for mercury and so on. They are given an appropriate test or tested against an appropriate challenge agent and then rated accordingly. So, if we need protection from a specific material, we need to get filters that are rated to deal with that specific gas or vapour.

(R) – So, if I were to pick up a particulate filter, and I pick up a gas and vapour filter, how do I tell…if I'm a worker and I'm going out to workplace and I pick a filter to put on my respirator…what am I looking for?
(G) – So, the particle filters, as we said, will be marked with their rating – P1, P2, P3. Similarly, gas and vapour filters are marked with a rating. So, there's a letter indication, and a number indication. An example would be A1. A means its rated for organic vapours and the 1 indicates the capacity of that filter. In other words, how much of that organic vapour can it hold. Class 1 is say, the most normal or common size in filter rating. So, an A1 would give us organic vapours with that rating. A B1 or

B2 would be rated to deal with acid gases with a different capacity. We have E filters for gas sulfure dioxide. Mercury filters are marked Hg and so on. So, there are a range of different filters available, that are able to deal with a different rang of gas and vapour contaminants.

(R) – You just mentioned Bananas in Pyjamas, B1 and B2…sorry for my terrible joke there. What's the difference between a B1 and a B2? So, you're saying they're both doing inorganic gases, but they must be different if they've got a different number.
(G)– Sure, that's talking about capacity. So, the size of the filter in terms of how much of the acid gases it can hold. So, a B1 if you like, is a small bucket and a B2 is a bigger bucket. It will hold more of those contaminants if it's full.
(R)– So with gas and vapour filters, we spoke about the particulate and when to change the filter. Is it similar type of rule of thumb as far as that breathing resistance for gas and vapour filters like we mentioned with the particulate filters?
(G) – No, it's' not. Gas and vapour filters are much more problematic. They do not increase breathing resistance and they load up, so there is no noticeable change, so you cannot tell that way. They load up over time as they're exposed to the contaminant, depending on the concentration and the time of use, that capacity will be used up. Once that capacity is used up, in other words the carbon has no more absorption capacity for those gases and vapours, it stops working. So, then those contaminants will go straight through the filter and into your lungs. So, they do not give you a resistance warning. They will stop working when they're full. Then you've got to rely on having knowledge about when you should change those filters.
(R) – So, with that gas and vapour filter, you're saying you've got to know about the environment. What do you need to know, or what would you tell a worker to know when to change that gas and vapour filter if you're not getting any warning or resistance like the particulate filters?
(G) – In most cases the worker should be being informed to a time, a service life for that filter. So, the filter will have a known performance. You can ask the

manufacturer as to what that might be. If you know you are dealing with gas or vapour X or Y, you know the concentrations and the manufacturer is able to give you an indication of how long that filter may last under those conditions. So, if it lasts 10 hours, you will then need to assess how long that is in use terms in your work place, and make sure that the workers are changing their filters before that gas filter is full, and breakthrough occurs.

(R) – If breakthrough does occur, what does happening to the worker?

(G) – The worker is then being exposed. So, the contaminant, the vapour, is no longer being captured and its going straight through the filter and into the lungs of the worker. So that exposure of concern, whatever it might be, is happening. And then you obviously have some exposure issues in terms of health effects or outcomes from that exposure.

(R) – I guess what you're saying is you don't want to rely on the worker hopefully smelling what it may be, to then come and tell you?

(G) – Sure. Odour has been used in the past and still used, to be fair, in the real world as an indicator that the filter is full. If there is an odour, we know many gases and vapours there are no associated odours, so there's no way of telling when that's happening. If it does have an odour, and if your nose is working well, you have a good sense of smell, you don't have a cold, you are able to notice it and that's helpful, but it's not going to be the case for every worker in every situation. So, it's a dangerous and not recommended method of assess when a filter is full.

(R) – Colours? I know when I've picked up filters in the past, and it looks like a nice little rainbow down the side. What is that communicating to the worker or people looking at these particular products?

(G) – Again, that helps you identify. We talked about A filters for example that are rated for organic vapours. The associated colour with that is brown. So, a filter will not only have the A1 on it, but it will have a brown marking on the label. So, indicating by text and also by colour. The same occurs in acid gases, inorganic gas, ammonia, they've all got their own colour, letter and number indicators.

(R) – So, if I'm a health and safety officer in a workplace, I should be able pick up any brand of respirator or filter and see the colours and know what it's there to capture.
(G) – Yes, it should be clear once you understand the colours and what they mean, and the letters and what they mean, you can tell if that filter, or what that filter is rated for and whether then that is appropriate for the work being undertaken.
(R) – We spoke about N95 and the US standards before, same colours around the world? Or is that a whole other difference for people to be aware of as well?
(G) – Yes, unfortunately there is no standardized global colours. So, the US has different colours. They do not use the same number and letter indication system, so their filters have slightly different markings and the colours do not align. So yes, people need to be aware of the specifics of the filter in use – whether it's a US filter or an ASNZS filter, they still need to be sure that it is appropriate for their application.
(R) – So moral of the story, whatever brand you're using, know what those colours mean in your workplace, so you can easily identify would be a good, I guess, Terry's tip of the day!
(G) – Yes, if it's the wrong filter, it's not protecting the worker so absolutely it should be clear to all involved what the specific filters they should be using for that task.

(R) – Limitations of gas and vapour filters – we spoke briefly on the particulate filters – same? Different? Other things to consider?
(G) – Well, there are always the same issues. There's got to be rating on that filter for the contaminants, all of the contaminants of interest. It's no good if it only captures half of those gases and vapours. It needs to deal with all the ones that are of concern. The service life is important. Make sure those filters are changed before they are full, and thus the protection will be provided. The filters do not provide oxygen. So, if there's any concern about the level of oxygen in the workplace, for some reason, then you need to deal with that specifically. The filter

will continue to work on the gases and vapours and filter those, but if there's not enough oxygen for the worker to breathe, then that's clearly a very significant hazard and needs to be addressed separately.

(R) – So, if I'm a workplace and I've got one area that's got a little bit of dust, I'm talking quite broadly here. And another area I've got a lot of dust, you know for what you can see. Would I be using the same respirator in the same areas? You know, based on the levels of contaminant that are in there, what do I need to know in that case when selecting filters and masks and products?

(G) – So, the Australian and New Zealand Standard, 1715, gives us a ranking of the performance of respirators in terms of how much protection they provide. Now for example, the half mask – the Australian Standard says 4 particulates and gases and vapours. That half mask that's compliant with the standard is rated to give minimum 10 times reduction to a trained, clean shave, fit wearer. So, the workplace will have its own exposure levels in different places as you said, you need to wear a respirator that is rated and given a protection level that is suitable for those different areas with potentially different exposures. They might be close enough that you can wear the same gear, but it's also possible, the high exposure area might need a totally different higher protecting product than the lower exposure area.

(R) – So, I guess that sort of falls in line with what we spoke about earlier, with the P2 P3 looking at the mask as a whole. Is that the concept that you're sort of saying there? Because obviously that's the same filter in higher efficiency areas and, but you're talking about different levels. Does that sort of tie back into what we mentioned earlier?

(G) – That's correct, yes. So, you will get a performance on a half mask that is 10 times reduction, as I said. The weak spot in any tight-fitting mask is the face seal. So, the filers will do what they do, but if your face seal is substandard, or not what it should be, you'll get exposed. You'll get leakage. You'll not get the protection that you should. So, the difference between a P2 and a P3 in that case becomes

irrelevant because the mask is not fitting. We want higher protection, we go to a higher protecting mask like a full-face mask, and we put on higher rating filters like P3, again with those provisos that it fits, we can then get higher protection levels for the wearer.

(R) – So, when we're talking about respiratory filter selection, the filter is kind of one part of the story? The other part, reiterating what you're saying, is the fit, the size. How does it work? Check those things, because obviously it's easy to get an Australian Standards approved filter, but how do I know, how do I check, how do I validate that I'm getting that fit that you talk about that is so important.
(G) – Yeah, the Standard deals with this. Any tight-fitting mask should be tested on the individual worker. And you should have a fit test. This is a standardized protocol which challenges the fit of that mask and filter on the individual wearer and assess the seal that they're getting on their face is effective enough to be able to use that product and get the protection they need.

(R) – Anything else about respiratory filters that people should know about? I guess we've covered quite a bit so far! Obviously, we can go quite a bit deeper if need be, but we're really trying to give that broad information to people that have got all the tools of their, at their hand, or information to know what to be looking for. Anything else that we haven't covered so far, which has been a bit?
(G) – Sure! I think we're covered the main things, but the overarching approach should be use of a full respiratory protection program, you need to look at a whole lot of different areas besides just the filters or just the mask component. There are other issues like training, like fit testing, like auditing of the program to make sure that overall the workers are getting the information they need and the equipment they need, and the training they need to use the equipment to get the protection they need.

(R) – Well thanks for your time, Terry, today. We've covered a lot! Thanks for listening. If you have any questions, comments, suggestions for any future topics or guests you think would be great to get in the studio, please shoot us an email at scienceofsafetyanz@mmm.com For further information about the podcast, you can check out the show notes or you can visit our blog. And please make sure you do subscribe, we'd had for you to miss out on any future podcasts that we will be releasing. We've got quite a lot in the pipeline. If you enjoyed listening to the podcast, or found it informative, we'd really appreciate it if you could take a few minutes to give us a review at it really helps other people find the podcast as well. And as Winston Churchill said, "Success consists of going from failure to failure, without loss of enthusiasm". Thanks for listening and have a safe day.