

3M Transcript for the following interview: Ep 89 Conducting a Respiratory Fit

Test Part 1

Mark Reggers (R) Mike Clayton (C)

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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 science 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 equipment 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're talking all about conducting a respiratory fit test. Now, this is another one of our respiratory focused episodes we've been doing over the last year and a half, so I would suggest if you have a listen to some of those, they may help make a bit more sense about what we're going to talk about today. But let's power on. We're talking again with Mike Clayton. Welcome, Mike.

(C) Good morning, Mark. Greetings from the UK.

(R) Good evening's greetings from Australia. Now, we had you in last time and spoke about respiratory protection factors, so I thought it'd be great to get you

back to talk about conducting a respiratory fit test. But for those that may not have listened to that episode, can you please introduce yourself? Who are you, where are you from and what do you do?

(C) Okay. I'm a PPE RPE subject matter expert at 3M based in the UK but supporting customers with selection and implementation of personal safety solutions right across the EMEA region. I have the pleasure of going out and visiting customers to understand challenges they are facing and helping them to make recommendations and help them implement effective solutions to protect their workforce. I'm also a member of the British Safety Industry Federation and I actually chair the Respiratory Protection Group. This is a trade body within the UK, and we support manufacturers, big end users and distributors with respiratory protection equipment. I'm also a member of the UK's British Standards Institute where I provide guidance and expertise to develop the British, European and International Standards. And a particular focus on today's podcast is respiratory fit testing and I hold the position of the assessor and technical advisor to the UK's respiratory fit testing competency scheme, which is referred to as Fit2Fit. I've been at 3M now for about two years. My previous career was at HSE, and that's the UK health and safety regulator, where I was the technical team lead covering PPE. In that role, I've managed projects, provided technical support to the development of HSE's regulation, HSE's policy, HSE's guidance and with quite a lot of emphasis on respiratory fit testing throughout the 2000s where we started to introduce fit testing to the UK. It was very confusing at the very start, and so, I wrote a lot of guidance to help industry understand what it's all about and implement it. One of the roles I also had at HSE was conducting incident investigations and this was the sad part of my role there where we saw what happens to users when PPE goes wrong and so, from that experience, I'm really passionate about doing my best to help workplaces implement an effective program so we don't see that thing in the future, and also, try to making in-roads to

the number of ill-health stats that we see. We don't see a massive drop in those ill-health statistics, and I'd love to actually see that over the coming years.

(R) So, today, we're talking about conducting a respiratory fit test. But for those that may not be as familiar with what that is, what is a respiratory fit test and why is it such a crucial part of a respiratory protection program.

(C) Right. Respiratory fit testing applies to what we refer to as tight fitting face pieces. These are either full face masks that cover the mouth, nose and eyes, and half masks which covers the mouth and nose. And a crucial function of these designs of masks is that they should seal well to the wearer's face, so that when the wearer inhales, the air comes through the mask via the filters or from the compressed air source and doesn't enter the mask from gaps around the face seal. So, if there are gaps in the face seal, then of course, the air will not struggle to go through the filter. It will take the path of least resistance, leak through the face seal and in that situation, you will get contaminated air entering the face piece to be inhaled. So, just looking at you, Mark, which I can see you on my screen here ...

(R) Yes.

(C) I guess a mask that fits you will probably not fit me. I mean, you've got very chiselled, strong features there and I'm more of a rounder face. So, one size ...

(R) You must have the Photoshopped version of my face there by the sounds of it, Mike.

(C) So, one size or shape of a respirator face piece wouldn't fit everyone. If the seal's not good between the mask and the wearer, then of course, the wearer could become exposed and so fit testing is an essential part of correct selection within a respiratory program. Now, over the years, regulators, industry, standards bodies

have realised the importance of fit testing and it's now mandated in some countries and now is accepted as good practice. But it's growing all the time, and it's now become an integral part of that effective RPE program. There are standards and guidance published on fit testing, there's growing awareness of its importance, development of new fit test methods and protocols and respirators are now available in a number of sizes. If you go back a few years, you'd just get one size of that model, or one size of this model. Now, we have so much choice and I believe that respiratory fit testing has really encouraged manufacturers to produce more than one size. And from the work that's been conducted over the years as well, and some work that I was personally involved in while at HSE, we've done studies on fit testing and studies on fit checking and that evidence really demonstrates the value of fit testing and that does help to achieve better protection when someone's wearing a respirator in the workplace.

(R) I know when I've conducted fit testing in the past, and you're talking to the worker or the wearer and you're explaining that you have those filters and they're great, but if that seal isn't there, they're still going to be breathing stuff in which defeats the whole purpose of wearing a respirator. So, it's very important stuff there. A quick question though; is this just for negative pressure respirators? I know people can wear these tight-fitting masks connected to a PAPR or self-contained breathing apparatus. Is it still critical to have that fit test on those types of masks?

(C) It is, yes. Fit testing applies across the board to all tight-fitting respirators, so from a filtering face piece, half mask, full face mask, and then full-face pieces or half masks that attach to supplied air or full-face masks attached to positive pressure breathing apparatus. Now, it used to be the case that people used to think that turbo units on power respirators used to create that positive pressure within the respirator all the time so that if there's any leakage, it will be outwards. But evidence over the years have shown that not to be the case. And similarly, for

self-contained apparatus, which you can imagine, these are used by people, take a firefighter for example, going into a burning building. They don't know what particular hazard they're going to be facing, and so they need to really have that confidence in that protection and if they don't achieve that good seal with the face, first of all, there is likelihood that they could inhale contaminants that could get inside the face piece. But secondly, if there is a leak, a gross leak on the face seal, of course they would lose some of their duration from their cylinder and so, their ability to be able to conduct their job might be affected. So, it's crucial that all tight-fitting face pieces, we undertake a fit test.

(R) I know when I'm talking to different workplaces ... we spoke about those assigned protection factors in that previous episode ... that those types of RPE that have positive pressure, they actually have a much higher assigned protection factor, and that higher assigned protection factor is that combination of the fit and the positive pressure as well. So, really crucial stuff if you're wearing that type of equipment, that you are getting that expected level of high protection. So, what are some of these tests? Are there different tests to determine whether a wearer is getting an adequate fit or an adequate seal?

(C) There are a number of available fit test methods out in the market. The first one is referred to as a qualitative fit test. Now, these are ones that are based on smell, on taste and one that is not very common these days, was based on irritant smoke. Now, all these methods rely on the wearer's subjective response to the test substance that's used to determine the quality of fit. Because these methods don't measure quantities, and so no numbers are produced, they're referred to as qualitative fit test methods. And the sensitivity of these qualitative fit test methods and you'll often see the acronym QLFT, that limits the range of face pieces that can be fit tested to filtering face pieces and half masks. Now, moving onto the second family of fit test methods; these are referred to as quantitative methods. As the name implies, these measure the quantity of the test substance that's used during

the fit testing and these generate numbers. And there are two main methods of quantitative fit test methods in common use. The first one employs ambient particles. So now, that's the particles that are floating around in the air. Now, if we just look across our room or our workplace, we may not see anything there. But there will be a number of microscopic particles in the air and this method uses those as a test challenge. So, it measures the concentration of these particles outside your respirator, the concentration of these particles inside your respirator and this determines the quality of that face fit and it reports the result. And that report is a number. So, ambient particle counting methods, also known as APCs, can be used to fit test filtering face pieces, half and full-face masks. The second method, instead of using particles, uses air pressure to determine the quality of fit. So, basically this method creates a negative pressure inside the respirator while it is worn, and then it measures the quantity of any air leaking into the face piece and uses this to measure the quality of fit and reports a fit factor. This method is known as the controlled negative pressure method and this method can be used to fit test half and full-face masks.

(R) You've mentioned a couple of different types there. Do the different standards or guidance material say one fit test method is better than the other?

(C) No. The standards or guidance would give information on the various different methods, but it's not a case that one method is better. They're all accepted or approved fit test methods. The difference is on the methodology that each of them use, and the limitations. I've mentioned that you won't be able to fit test a full-face mask with the qualitative method. The ambient particle counting device, you can fit test the whole range and the controlled negative pressure, the CNP methods are limited to elastomeric half masks and full-face masks. So, they're all acceptable methods. The key thing is that you follow the correct procedure and the correct protocol for each method that you are wishing to use.

(R) So, it really comes down to understanding the pros and cons of the different methodologies and what approach you may be taking in the workplace. But a question that does come up quite often I know in my travels, when we speak about the fit test requirement for positive pressure masks, as we said before, using a self-contained breathing apparatus. Do you conduct these fit tests under positive pressure, or do you conduct them under negative pressure?

(C) Well, if we go back to what is a fit test. Now, the fit test is the test to determine the quality of that particular face piece seal on the wearer. So, we're looking at the face piece only. If you were to conduct a fit test with the SCBA fully connected and operated, then you won't be measuring the goodness of that fit. You'll be more measuring the performance of the whole set, which is not what we're going to do. So, for powered respirators and for supplied air or compressed air, breathing apparatus, you would just measure the fit of the face piece only. Now, that might mean that you would have to convert a positive pressure full face mask into a negative pressure mode, which can be done, or you may be able to use a surrogate face mask which has exactly the same sealing characteristics as a full face mask connected to a SCBA set.

(R) Now, last time we spoke, we spoke about fit factor versus protection factor. So, how does fit factor come into these different fit test methodologies?

(C) Again, a good question, and one that does crop up frequently. So, a protection factor is a measure of the protected performance of the whole respirator or breathing apparatus, and there are various types of protection factors, depending on its purpose and how it's determined and of course, we covered a lot of that in our last session. The fit factor is a number that refers to the output of the fit test, so it only relates to the fit test and not to the RPE as a whole. Now, if you were to pass a fit test and say, "Oh, I've got a fit factor of 20, 30, 40,000," all that means is that you've passed the fit test, depending on your criteria. So, when the fit test was

first introduced in the UK, I know we had workers who were fit tested and go, "Oh, I've got a great protection. This face mask fits me brilliantly." And then, that can build up a false sense of security because what we want wearers to do is just to be told, "Yes, that mask is capable of fitting you, but do take care and make sure you done it correctly. Make sure you carry out a fit check every time to make sure you've got the fit on that occasion as good as possible." Now, quantitative methods like aerosol particle counting or the controlled negative pressure method gives that fit factor result. So, they look at a number which is the fit factor. Although, the qualitative taste methods don't generate numbers because of the difference in taste strength between the sensitivity and the fit test solution being a factor of 100. So, if the wearer passes a fit test using a qualitative taste method, then it can be assumed that they achieve a fit factor of at least 100.

(R) I know you mentioned last time that if someone gets a high fit factor, that doesn't correspond into a high protection factor, and it makes sense as you explained the fit test is purely checking the fit, not the overall protection of the combination of the respiratory type that may be getting used there. So, important stuff that people understand the difference between a fit factor and protection factor and what they need to actually achieve that on-the-job or when the mask is being worn. So, what's the go when it comes to facial hair in fit testing? If someone could pass an ambient particle counter fit test with facial hair, what does that actually mean?

(C) Again, if I had a pound ... that's a UK pound ... for every question that was asked on this particular subject, I'd be a millionaire. It is one of those most common questions. So, if I'm at a conference or it's a safety dialogue, and asking people questions, you can guarantee that someone will ask about facial hair. And I'm sure many wearers in Australia and New Zealand, like many around the world, would wear facial hair. And it's a personal choice. It's in fashion. I myself have got some facial hair. Or for reasons of belief, and we need to do our best to cater for these

preferences. Yeah, fit testing facial hair is a problem. Let's take it back one step. As I said earlier, tight fitting face pieces, half masks, full face masks, filtering face pieces, rely on that good seal to the face and of course, facial hair, even a couple of days' stubble interferes with that seal and prevents it from sealing closely to the wearer's skin. And studies have shown that for some individuals, just a day's stubble can have the effect on the fitting the mask. And whilst I was at HSE, my team conducted a study on this very topic and listeners can actually read that study. It's published. Just search for 'HSE' and 'stubble' and you'll see that report. What we are not saying is that a wearer can't have facial hair, but what we are saying is that they must be cleanshaven in the area of their face where the mask seals. So, a neatly trimmed moustache or a sole patch or something like that, which is totally within the seal of the face piece, may be acceptable. However, one word of caution here; so, if a workplace does allow this degree of facial hair, then they should implement a means of supervising or checking on this to prevent unacceptable facial adornments, put it that way, getting out of hand.

(R) So, I've got these different methodologies; qualitative and quantitative, and those different types in there. So, I know there's different protocols that are used around the world. Can you explain what some of those are and the differences between them?

(C) Okay, so a protocol, a fit test protocol details the fit test exercises and durations which need to be conducted during the fit test. So, while being fit tested, the wearer is asked to perform a number of exercises to some way simulate work activities such as head movements, talking etcetera. And dependent on the regulations or standards or guidance you are working under, there are a number of protocols which slightly differ as to their exercises and durations. Okay, so which protocol should you end up using? Well, it depends in which region you are conducting the fit test and which standards, or regulations apply, because there are a number out there. So, OSHA sets out a protocol. ANSI sets out a protocol. HSE

document, which is INDG479, again sets out a test protocol. And there's also the ISO Standard on fit testing which is 16975-3 and that sets out the test protocol suitable for the aerosol particle counter device, the APC, the controlled negative pressure device, the CNP, and also for the qualitative fit test methods. Now, the duration of these protocols can differ from about 12 minutes down to about two and a half minutes, and so there's a number of options out there, so the best thing to do is to refer to your local standards and guidance to find the most appropriate fit test protocol.

(R) I know in Australia and New Zealand, we have Australian and New Zealand Standards 1715 and it covers fit testing, but it probably doesn't go to the amount of detail as some of those other protocols you've just mentioned. I know most people in Australia that I interact with most follow the OSHA protocol or maybe some of your HSE INDG479 protocol as well. So, we do see a few different protocols here in Australia, but whatever protocol is being selected and used, that process must be followed to have confidence and reliability of the protocol that you are actually using. Mike, I've probably got a few more questions I'd like to ask. What we might do is we might finish it up here for this particular episode and continue our chat, because I actually do have quite a few more questions. So, is there anything you'd like to leave with our listeners today about what we've spoken about so far about these different methodologies, or maybe some of these protocols?

(C) The main takeaway point at this stage is really to understand which is the most appropriate method for your particular application. Now, we've briefly touched upon the three main methods; qualitative, taste, ambient particle counting, controlled negative pressure. And we'll explore those in more detail at our next session. But for now, it's a case of understanding the scope and range and the limitations of these methods to find the most appropriate method for your particular application. So, if you are just using filtering face pieces, then perhaps the qualitative method is the best ones to go for. But then if you're using filtering

face piece half masks and full-face masks, then perhaps the aerosol particle counting or controlled negative pressure may be your best option. So, have a look at these different methods and decide which is the most appropriate for your application.

(R) There is so much information here, hence why we're trying to do a couple of episodes of them. But for those that may want to do a little bit more investigation on some of these types of protocols and the fit test methods, where would be a couple of good locations they could head to find out more?

(C) Well, we have of course the ISO Standards, so look at the ISO Standard, the number I've mentioned. That's 16975-3. There's the OSHA information, the ANSI Standards Z88.10 provides a lot of useful information and of course there's the HSE INDG479. So, those are good places to go to, and of course, the 3M resources on our website will give lots of information about respiratory fit testing. So, head down there.

(R) And I'll make sure to include a lot of those links on our blog post, that we do provide more resources with. And for those that may want to get in contact directly with yourself, what would be the best way to do that?

(C) I'm on LinkedIn, send me an invite on LinkedIn. It'd be great to chat with you there. So, just search for Mike Clayton 3M, and I'll pop up.

(R) Well, thank you so much for your time today, Mike.

(C) You're very welcome.

(R) Well, thanks for listening, everyone. You can get into contact with the show by sending an email to scienceofsafetyanz@mmm.com if you have any questions or

topic suggestions or you'd like some assistance in your workplace when it comes to respiratory fit testing, or the appropriate use of any RPE. 3M, we were certainly here to help. You can also visit our website 3m.com.au/sospodcasts for further resources on the topic we've spoken about today, being fit testing, as well as a transcript of the chat that Mike and I have just had, as well as all our other previous episodes. Be sure to subscribe, rate and review and share through Apple Podcasts, Spotify, Google Podcasts or wherever you get this podcast from. And as Albert Canna said, "Life is not a destination. Life is a journey. As long as you continue the journey, you will always be a success." Thanks for listening and have a safe day.