

## **3M Transcript for the following interview: Ep 68 -Jen Hines, Diesel Particulate**

### **Matter Part 2**

Mark Reggers (R) Jen Hines (H)

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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're continuing our conversation about diesel particulate matter with Jen Hines. Welcome back, Jen.

(H) Thank you very much for having me back again, Mark.

(R) I couldn't not have you back. We only covered one half of diesel particulate matter, where we spoke about what is it, what are some of the hazards, what can workplaces do. But today, for part two, I really want to focus on the control aspect, which really is what make the difference in workplaces. The controlling is what protects the workers. But just for those that may not have listened to part

one, can you please introduce yourself? Who are you, where are you from, and a little bit about what you do?

(H) So yes, as you said, I'm Jen Hines and I am an occupational hygienist. I've got roughly 20 years' experience in occupational hygiene. I have my own consulting company as well as working at the University of Wollongong and helping out there with their occupational hygiene program. I am also doing my PHD at UOW, and that's all-around diesel exhaust and how to maintain engines to improve the exhaust that's actually leaving those engines. So, overall, we're protecting our workers. So, that's one of the controls that I'm hoping that we'll get to talk about today, Mark.

(R) We certainly will. But just to take it back a little bit, what are some of the things that a workplace can look at in their environment to assess whether they may have a DPM issue, or whether they should be considering controls for their workers?

(H) That's a great question and we did cover off a little bit on this previously. What we need to do is have a look at have you got diesel machinery in your workplace?

(R) Pretty good starting point.

(H) Yeah, good starting point. If you don't, you're home and hosed for this particular risk anyway. But if you do, we're wanting to have a look; have we got visible signs of it? Have we got a visible haze in the workplace? Are vehicles or plant left idling? Are they left running when they should be being turned off? Do you have soot deposits? Do you have health complaints from your workers? Are they complaining about what they're being exposed to? Have they got some of the acute health effects, so have they got sore eyes or coughing or feeling nauseous after being around the machinery? What state are the engines in? Have you got a really good maintenance program in place, or are you doing just the bare minimum to keep them operational because you're potentially too busy to do anything else? What happens to the exhaust in the workplace? Can it be moved somewhere else? Is it directed outside, or don't you consider that at all? So, there's lots of different

things that people can look at to determine if they've got a potential health risk in their workplace from this exposure.

(R) One of the things you mentioned in the last episode is where is the diesel engine being used? We spoke about underground versus above ground and in a mining environment, but that ventilation aspect would have huge implications on the amount of DPM that may be collecting and impacting workers' exposures as well.

(H) Absolutely. So, where the engine is, if it's running outside and that exhaust can just dissipate into the environment, then that's going to be far less of a risk to if you're in an underground mine or if you're in a fairly enclosed warehouse or somewhere like that where that exhaust isn't actually able just to be diluted and dissipated rapidly.

(R) So, now, we get to the hierarchy of controls; elimination, substitution, isolation, engineering, administration and PPE. So, before we go through the hierarchy, starting right at the top there, elimination, but specifically for DPM. So, the first question that should be getting asked is do you need a diesel engine at all? I'd imagine that'd be the first question a lot of workplaces should be asking themselves.

(H) Absolutely. Can we get rid of it? Do we need to have it?

(R) Maybe, maybe not.

(H) Yeah, I know, so that'd put me out of my PhD, but that's okay. I'm okay with that.

(R) That's going to be better for the workers, so that's okay.

(H) So, I'm okay with that. Yeah, so can we eliminate it? Do we need to have that running? Can we potentially substitute something else in there if we can't eliminate it? So, diesel engines are becoming obsolete in some workplaces, but they are going to be around for a very long time. But we might be able to put something in

like battery powered, or an electric engine, natural gas or maybe even petrol. Just if we're going to be doing that, we need to be really careful that we don't introduce another hazard, but they're things that we can look at. Can we eliminate it completely or can we substitute another power-generating option in?

(R) Are you seeing more electrical motors in the industrial space that can get the output and the grunt of a diesel engine because I know that's obviously an evolving area?

(H) Yes, it is evolving and yes, there are becoming more. You're right around the power and the grunt. That's what our diesel engines are really good for. That's what we have them for. They've got a long life generally as well. But it is becoming more common for battery or electric options to be available that are getting close to as being as good as some of the diesels.

(R) So, something to consider when you are looking to replace any diesel equipment to check out those options, depending on what you need, and your requirements are. But asking the question may eliminate it completely if it is a suitable alternative. So, what's the next one on our hierarchy that we can be looking at for DPM?

(H) So, we could isolate the hazard. So, we might separate the worker from the diesel exhaust. In this case, we might be able to put the worker into a sealed, air conditioned ... properly filtered mind you ... cabin, so that they're not being exposed to it and the air that they're breathing is actually filtered and cleaned. We might be able to provide some positive pressure ventilation as well or we might be able to modify the layout of the workplace by separating the area of the workshop in which diesel engines are operating from the rest of the workshop, if that's the type of workplace that you're in.

(R) A lot of it's going to be very workplace-specific, but once again, asking those questions and seeing if that is a practical thing to do, because it can have a much bigger impact on workers' exposures than the stuff we're going to get to lower

down the hierarchy of control. Engineering controls; what options may be suitable?

(H) Yeah, absolutely, there are engineering controls that could be suitable or that are suitable, and some of these things are just on the engine system themselves. So, after-treatment systems like catalytic converters; these are used to oxidise organic substances and gases and there are catalysed and non-catalysed particulate traps to remove particulate matter.

(R) So, that's something that's actually in the engine, so trying to filter it before it gets pushed out the back. Is that, in simplistic terms, what you just said that means?

(H) That's correct, yeah. So, we can filter out in different ways. There are filters that are regenerating and can be reused over and over again in the engine, and these are often ... you'll find these in hard rock mining. Or there's a filter that gets changed when the back pressure reaches a certain amount and the engine then becomes under a different pressure.

(R) So, like putting a prefilter on an engine, in simplistic terms.

(H) Yeah, but this is a post-filter, really, so this is unlike our respirator, where we'll put a prefilter on. This one we put right at the end of the exhaust. It's the last thing where the exhaust goes through. So, they're very popular engineering controls. There are also some excellent ventilation systems. So, again, depending on your workplace, you might be able to put a system in place where you can put a ventilation hood over the end of your exhaust, so therefore the exhaust is forced into that ventilation system and removed from the workplace. It doesn't even need to enter the workplace at all.

(R) So, I've seen some pictures of different workshops that have got those ventilation tubes hanging down and you stick it right on the back of that exhaust, as you say, preventing it getting into the ambient environment in the first place.

(H) That's right, yeah, and some places that use that are the firies. They use those. So, once they drive off, they actually fall off, for want of a better word.

(R) Disengage.

(H) Disengage from the exhaust as they drive off, because they have to leave them idling in a confined area for a fair amount of time. So, they can be a very popular thing to use as well.

(R) What about general ventilation? Is that an option for workplaces as well? Not just the LEV type stuff, but just opening roller doors? Can that be suitable?

(H) It can be suitable and should be done because obviously the more ventilation or the more airflow that you've got going through, the less amount of diesel exhaust is actually going to stay within that area. So, it certainly just blows it away. It dilutes it and that could be enough for your workplace. If you haven't got engines that are running all of the time, really dirty engines or lots of them, then that might be all you need to do in your workplace.

(R) If you were maybe in Tasmania or colder climates of Australia and New Zealand as well, I mean, having roller doors may not be an option for certain times of the year. It's not just to think about in the summer months, but obviously we've got to think all year around. "Well, we'll just open the roller doors." Many workers may not be too happy with that.

(H) No, and that's very true. You got to a lot of workplaces and definitely one of their controls is opening the roller doors and if you go and visit them in the winter months, those doors are down and you've got to ask the question, so, "What now?"

(R) And that tends to look at the other controls as well. Administrative controls; what could be considered in this space?

(H) Everything from just switching off your engine wherever possible. A lot of places will leave engines idling and Mark, sometimes that is because the engine

may not restart that well when you stop. So, it is hard to be in a workplace and say, "You must turn your engine off," because if a worker gets stuck in a different area because they've turned it off instead of idling it, then you're not very popular. But wherever they can be turned off, wherever they're not run in convoy ... so it's best not to be driving in convoy in diesel engines because the truck behind is just going to be breathing in the exhaust of the one in front, and so on. So, we want to avoid riding in convoys at all. We want to do things like adopt a regular engine maintenance program. We might be able to reduce the number of workers that are being directly exposed, or how long they're being exposed for. We might be able to change that. Office staff, people that are normally going to be exposed to those contaminants; we need to make sure that they're in separate areas completely, so that they don't have any exposure whatsoever. We might be able to have job rotations, so people are doing different jobs. We might be able to schedule other work that has to happen in an area where there's diesel exhaust being generated for a time when that's not actually running. So, there's lots that we can do around our administrative controls as well.

(R) Could you maybe limit the amount of vehicles or engines in a certain area because that would reduce the amount of DPM exposure, exhaust that's being pumped into an area as well?

(H) Yeah, that's a fantastic one. You do that using diesel tag boards, so you let a certain number of diesel engines into an area. So, this is one of the ... a big control in the mines. So, we look at the size of the engine and we let a certain number of engines in a ventilation area and you can't put any more engines in there until another one comes out.

(R) So, now we get to the bottom of the hierarchy, PPE, and being an airborne hazard, we're going to talk about respiratory protective equipment. What type of RPE should workplaces be considering looking at for DPM?

(H) So, we're looking at our disposable respirator. You'd be looking at a P2 disposable respirator because it is a thermally generated particle. We need to look at our P2. So, it's not just mechanically generated, so we need to move up from P1 up to our P2.

(R) I know doing other episodes, we spoke about silica being P1, but they mentioned about the other hazards and DPM was one they brought up, so you've got to think about all the hazards in a workplace or an environment. We're talking P2 for DPM, but what are those other things that may be present that may also impact that side of things. Half face and full face? They'd be suitable as well, I assume, with that P2 filter?

(H) That's right, as long as you've also got your filter cartridges that protect against the gases and vapours as well that come from it.

(R) We've done many episodes on respiratory protective equipment and filters, but once again, understanding what is the hazard and matching that up with the appropriate filter or level of protection as well. Lots of options and all air purifying respirators don't protect against all hazardous gases, so it really comes down to understanding your workplace, what are those gases, and select those appropriate controls in the RPE space as well. And it goes without saying, all workers wearing close fitting RPE must be clean shaven, fit tested and trained. I mean, speaking about the clean shaven, you mentioned in the previous episode about the size of the particulates being around 0.1 of a micron. We're talking a nano material type space. They're going to easily bypass those facial hairs if people aren't clean shaven. So, as always, a really important factor to make sure that is being done. So, when it comes to training for workers, what should training cover?

(H) Training needs to really cover off to make sure that the workers that you're talking to understand what they're being exposed to. They need to know the health effect of it, the hazards and the risks that they're involved with exposure to it. They need to know the controls that they have got available for them to use within their



workplace. It's all well and good to rattle off all of the controls that we've talked about here today, but if they're not applicable to their actual workplace, then that's not going to help them. That's only going to confuse them more. Certainly, when it comes to things like your respirators, they need to have all of the training on how to use and maintain those, but it's the same with all of the controls that they've got in place. So, if they are using an air-conditioned cab, they need to know that those filters are being changed at the appropriate times, or how to change them or how to detect if it's not working as well as it should.

(R) Talking about the cabs, shutting the door; it may seem like a simple thing, but we hear the stories of they're in the cab, but they left it open for whatever reason to maybe communicate. It has a huge impact on exposure levels. Any other things that you've seen that things in workplaces are the simple things but make a big difference when done correctly?

(H) Well, even things like the seals on the cab door that you're talking about. So, often you can open your door, close your door, but it's not sealing properly because the seals around it aren't working well. One of the major things that I've seen in underground coal mines where they're using the particulate filters that are disposable, the filter housing for those has got a seal around them and if that seal isn't intact properly, the exhaust just bypasses those filters completely and shoots out the side. So, no use to anybody whatsoever.

(R) Much like an ill-fitted respirator that you've got filters on there, but it's going to take the path of least resistance, whether that's between a face and a seal or the housing on one of those filters. So, every little thing needs to be in place to give us that confidence.

(H) Absolutely, and that's why the training is so important because workers are relying on their workplaces to make it as safe for them as they can. We need to educate the workers so that if something isn't going how it should be, if it's not being maintained how it should be, then they've got the understanding to know

that and to be able to help themselves because ultimately, it's their health. And they are the ones that really should be looking out for these finer things and making sure that all of the controls are in place and working efficiently.

(R) I mean, like all hazards, it's the individual worker that has the biggest impact, influence on what they do. They have the decision on what they do. But if they aren't aware of those controls needing to be in place, how do they even know to pick that up and to actually stop that and protect all workers and their co-workers? So, some important stuff there.

(H) Yes, the workers do need to know about the controls. They do need to make sure that they're working properly, but it is ultimately up to the employers to make sure that all of the correct things are in place.

(R) PCBUs, a lot of responsibilities there, but it's all for the right reasons. In summing up controls and DPM and they're the two conversations that we've had, what are some of those key takeaways you really want to leave with our listeners when it comes to DPM and making a safe environment?

(H) So, DPM is a carcinogen. We've talked about that in our first episode. It's a nasty. There's lots of different things that we can do in our workplace to control exposure to diesel exhaust. It doesn't have to be the most expensive and biggest control. Just start small, work through the controls and make sure that your workers aren't breathing in diesel exhaust wherever possible. Make sure that we're reducing down how much they are having to breathe in, because if you've got a diesel machine in your workplace, then yes, you're going to create diesel exhaust. But we just need to make sure that we do reduce that as much as possible.

(R) Lower is always better. So, for those that do want to do a bit more reading online or get more information, where's a couple of places you'd recommend they should search?

(H) So, I think if they go to Safe Work Australia and the state regulators, the Cancer Council has got some good information. The Australian Institute of Occupational Hygienists has got an excellent position paper on diesel particulate matter and how to control for it. HSE or the NIOSH websites as well are some of the areas that I would go to, to have a look. And this area is evolving, so make sure that you try and find the most up to date information all of the time.

(R) And for those listeners that do want to get in contact with yourself, if they want help with DPM assessment in their workplace, what would be the best way to get in contact with you?

(H) They can find me under [ehssolutions.com.au](http://ehssolutions.com.au) or through LinkedIn or even through the AIOH website under the consultancy area.

(R) We'll put those details on our transcript and our blog posts so we can make it nice and easy for them. Well, thank you once again Jen for coming in and talking to us about DPM.

(H) My pleasure. Thank you very much for having me.

(R) Well, thanks for listening everyone. You can get in contact with the show by sending an email to [scienceofsafetyanz@mmm.com](mailto:scienceofsafetyanz@mmm.com). If you have any questions, topic suggestions or other guests you think would be great to get into the studio, or you need some help around DPM PPE and respiratory equipment in your workplace, 3M are certainly here to help. You can also visit our website, [3m.com.au/sospodcast](http://3m.com.au/sospodcast) for further resources diesel particulate matter as well as a transcript of the chat that Jen and I have just had. Be sure to subscribe and share through Apple Podcasts, Spotify, Google Podcasts or wherever you get this podcast from. And as Doug Firebaugh said, "Every day do something that will inch you closer to a better tomorrow." Thanks for listening and have a safe day.