

**MDEC 2007 - ROUNDTABLE FORUM****Diesel Particulate Filters – Experience, regeneration and implementation****FACILITATOR: Alain Landry, Xstrata Nickel**

The moderator invites the delegates to participate freely in the discussion. There is a small number in attendance and regrettably, there are no representatives from the after-treatment technology industry. There are however some representatives from the diesel engine industry with a fair amount of experience in the implementation of DPFs.

A question is posed by a mining industry delegate related to experiences with engine failures related to the application of DPFs. The engine manufacturer rep says that there is limited experience of failures due to the implementation of DPFs because this technology is not a regulatory requirement at this point. In spite of that, they have had or known of good and bad experiences. The biggest problem with DPF implementation is the backpressure (BP) it produces and the impact on engine performance. Some direct impacts include engine fouling, turbo charger temperature increase and decreased fuel economy. As a follow-up question, the industry rep asked if the Tier 3 engines are more susceptible to higher BP. The engine rep said that to his knowledge this was not the case. To recap, massive engine failures have not been observed as a result of DPF use. As a rule, for warranty purposes, this particular engine manufacturer requires BP in a range below 10 kPa (100 mbar).

Then next question asked whether or not the regeneration process for DPFs is affected by higher BP. No one could answer this question, but the engine manufacturer said that until 2011 (Tier 4?) there is no regulatory requirement to install DPFs at the engine manufacturer factory. All applications are retrofit and so regeneration needs to be monitored carefully and cold cycles should be avoided (long idling periods). The system also has to include diagnostic tools (real-time BP measurement) so the engine is protected.

A mine representative stated that in his view it is the engine manufacturer's responsibility to provide a clean engine package which includes the engine, the radiator, the DPF, etc. At present these aren't available, but Tiers 4 should fix that in any case. In addition, the point was made that this package should be able to handle any situation including cold cycles. As an analogy, the delegate said that when you buy a car you aren't asked whether you'll be driving mostly in town or on highway in order to decide what exhaust treatment technology to select, it should be a package that can deal with all situations, likely an on-board, actively regenerated system. The engine manufacturer seemed to agree with this statement.

The next question stated that with Tier 3 engines we are seeing CO levels as low as 50 to 60ppm and 30 NO<sub>2</sub>. His concern is that implementation of DPFs may further increase the NO<sub>x</sub> emissions. The engine manufacturer said that when they deliver engines with DPFs, they will meet Tier 4 requirements and that includes NO<sub>x</sub> emissions control. Secretary's note: unfortunately, the EPA Tier 4 standard is an environmental standard and it may not be sufficient to keep NO<sub>2</sub> levels to below the TLV or TWAEV in an underground environment where we have to meet a health standard and not an environmental standard.

One delegate seemed to think that sintered metal traps seemed to be gaining ground over the ceramic and cordierite versions according to some of the presentations made at the conference. These certainly seem to be better able to handle rough service. A mining industry rep said that after the ceramic DPF field trials are over at his operation, they may abandon ceramic filters in favour of other technologies, maybe sintered metal. Another issue was raised with respect to off-board regeneration and maintenance of DPFs and that is the damage that is incurred while handling, they can get banged around significantly. This is a training and education issue.

Sintered metal technology may have other advantages in that it may be easier to clean them, they conduct heat and electricity better than their ceramic counterpart and they may stand up to flooding better. The only problem with flooding and durability of sintered metal DPFs may be associated the fact that they may contain built-in electronic controls. There is no doubt that in a mining application that DPFs will be banged around (handling, wetting and mucking).

One delegate mentioned that sophisticated DPFs and Tier 4 technology will create a very sophisticated and complex package. Will we be able to diagnose problems and maintain the engine package? The engine manufacturer said that their diagnostic tools will be ready and available for their trained mechanics and the mining industry. One delegate asked whether or not these diagnostic tools needed to be calibrated or if they can go “off”. There was not a clear answer to this question.

One comment that was made was that with all of the electronic gadgetry on engines, maintenance gets to be harder and more time consuming. Many modules need to be removed in order to gain access to the area that needs attention.

Another delegate stated that while older mechanics are a bit worried about new technology and diagnostics modules, the younger crowd is not at all put off. They enjoy electronic gadgets. There is no doubt that diagnostic tools are a must. In some cases it is better to let a manufacturer’s representative do the tougher less frequent maintenance.

An important point that was made is that DPF technology often can “mask” engine problems. In other words an engine can be in very bad shape but if the DPF is working well on a “hot cycle” it may not be obvious. At the very least this consumes fuel needlessly. In some instances, (If there are pre-DPF leaks) it may make matters worse for the concentration of DPM in the environment. This can be dealt with by DPM sampling ahead and after the trap during scheduled maintenance sessions or if a problem is suspected.

The possibility of having real-time on-board diagnostics to monitor the engine and the DPFs was mentioned. This may be a requirement for Tier 4 engines.

One delegate mentioned a trial on a 50-ton truck that they plan to undertake at their operation. He thinks that in this particular application a passively regenerated filter will probably work since this truck will haul along a 7 km run, mostly incline.

This concluded the session, moderator Alain Landry thanked everyone and informal discussions carried on past 12h00.