

# A particular issue

With diesel emissions under ever-closer scrutiny, the maintenance of particulate filters has become a key issue for fleet engineers.

Richard Simpson investigates

**D**iesel particulates are now the villain of the piece when it comes to air quality, with serious questions being raised about their impact on human health. The smallest particles, it has been argued, can pass through the lungs and into the blood with the potential to cause serious harm. This has been recognised by the enforcement authorities, with a clampdown on those who, instead of maintaining diesel particulate filters properly, remove them from vehicles (shown as red circle in a Scania exhaust filter cutaway, right).

DVSA was slow to realise that many operators are being tempted into removing or bypassing parts of the emissions-control systems of heavy trucks, as well as lighter duty diesels. But roadside checks at a growing number of locations now include examinations for attempts to defeat emissions control systems on trucks from Euro IV onwards, including DPF checks.

At the moment, these checks are confined to physical searches. But speaking at the Freight Transport Association's annual fleet engineers' conference, David Wood, DVSA roadworthiness policy manager, said the organisation was planning to introduce equipment to measure the exhaust gas output of heavy-duty vehicles both at the roadside and at annual test.



So why are the DPFs being removed in the first place? The reason is primarily to save money on maintenance. Even on a light-duty vehicle, the cost of replacing a DPF can run into four figures. Diesels that work in urban conditions may not get their exhausts hot enough to trigger the passive regeneration cycle that uses waste heat to burn carbon particles away from the filter's ceramic substrate. Even so, they can also trigger an active regeneration to clear a clogged filter, during which the filter temperature is raised to burn off combustible particles. To do so, the engine fires a diesel burner in the exhaust, upstream of the DPF, or injects extra pulses of fuel into the engine's combustion chambers when the exhaust valves are open.

Even a vehicle on the most filter-friendly of work cycles will eventually

need a DPF cleaning; truck service intervals range from about 200,000-400,000km. This is because over time they suffer from an accumulation of ash. These non-combustible deposits result mainly from the inevitable burning of small amounts of engine oil and engine wear metal, and can only be removed by a physical intervention.

The only solution is to replace or clean the filter. Cleaning can necessitate either having the vehicle off the road for days, or fitting an exchange replacement filter. The latter sounds like an attractive option, but it is recognised that the filters themselves will withstand only a finite number of cleans. You may be exchanging an otherwise serviceable filter for one which is on its last legs, unless you can trust the provider.

DPF maintenance has been highlighted by Mark Grant, Scania's UK service director, as an issue that is driving operators towards having servicing done exclusively within the manufacturer's network. "Vehicle servicing is now very difficult for third party workshops," he argues. "DPF servicing in particular requires specialist kit."

The DPF is also an integrated part of the vehicle's electronic architecture, and if a DPF warning light is triggered then it must be extinguished, and the ECU reset, before the vehicle can be returned to service after rectification. There are proprietary tools which can perform this task across a variety of heavy and light-duty vehicles: the Draper Diesel Particulate Service Tool, for instance, can do all of the above, and also force a filter regeneration which may clean a soot-clogged filter without its removal. Cost is around £200. But that still leaves the task of physically cleaning the DPF.

### DEEP CLEANING OPTIONS

American specialist company FSX, which has a European distributor based in Warsaw, Poland, offers a four-machine system that will clean and check a wide variety of filters, including difficult-to-access conical-flange units. The first machine, the 'TrapBlaster', blasts air through each individual filter cell: first from the dirty side to break up the ash deposits, and then from the clean side to remove the fragments. Broken cells are revealed by puffs of ash from the clean side of the filter. This process takes around 22 minutes, and is complete when material is no longer falling out of the filter. The debris is removed by a 'SootSucker' for disposal. A 'TrapTester' then mimics the exhaust flow of the engine to determine whether or not original performance has been restored. If the flow is still obstructed, then the filter can be carefully heated in the 'TrapBurner' thermal cleaner which will

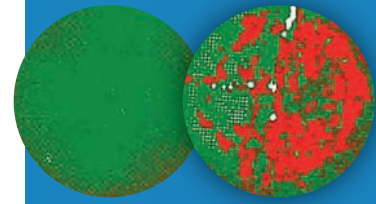
remove deeply embedded particles.

Ceramex is a supplier of cleaning services to the truck and bus OEMs, and a sister company of aftermarket exhaust filtration pioneer Eminox. It also offers its own cleaning service to fleets in the UK and elsewhere. Buy an exchange DPF for a truck or bus from one of the main dealers, and the chances are it has been cleaned by Ceramex. It does not offer its equipment to third parties.

Head of sales Marcus Beament explains that filter cleaning is not a DIY affair. He says: "We do hear tales of people blasting filters out with pressure washers. There's a great risk that the ceramic filter element will be damaged by this, and, in the case of a Euro VI vehicle where there is a chemical wash on the filter element, this can be spoiled by some of the chemicals in tap water. And your water company will be less than delighted if you are washing the residue down the drain," he warns.

Instead, Ceramex's patented Xpurge process involves filling the filter with purified water, which blocks the open cells. Pulses of air are then forced into the filter to dislodge accumulated material, and this flushes out with the water. Because the dislodged ash is suspended in the water, there is no danger of it becoming airborne, and the water and solids are separated and disposed of in controlled conditions, with the ash being sent as registered waste to landfill.

After cleaning, the filters then pass through the patented Veritex inspection process, where the internals of the filter are examined. "A flow pressure test alone is not sufficient," Beament asserts. "We pressure-test new OEM filters and find a 5-7% variance between the same parts from the same source. And while a higher-than-standard reading indicates a filter is still blocked, you can get a 'normal' reading from a filter that is still partially blocked, but has broken inside." **TE**



### FILTER TIPS

All filters need periodic cleaning, but the more care is taken, the less cleaning is required, says Marcus Beament from Ceramex. Here are the top tips:

- Use only the correct oil and fuel. DPF-equipped engines require low-sulphur diesel and low or medium-SAPS engine oil, according to the manufacturer's recommendation. Oils high in SAPS (sulphated ash, phosphorous and sulphur) can ash-up a filter very quickly.
- If possible, rotate vehicles between slow, congested, urban routes and faster, longer ones. This encourages passive regeneration of the filters. For instance, trucks on short-haul work will typically require routine filter cleans at 200,000km, but this interval may be doubled on long-haul work.
- Active filter regenerations occurring at decreasing intervals may indicate that the filter is becoming blocked with ash. Typically, when a filter is 40% blocked, it triggers the light on the dash for an active regen. If the filter is permanently 20% filled with ash, then the interval between active regens will be halved.
- Active regens are bad for fuel economy. An engine may burn seven times as much fuel during regen as it does in normal use.
- Never interrupt an active regen. Excess unburned fuel may drain into the sump, where it will cause further problems. If a filter change has been required, then it is wise to change the engine oil as a precaution.
- Major engine problems such as EGR issues, turbo failures and blown head gaskets are likely to contaminate the DPF. In these instances, the DPF should be cleaned and checked as a precaution as part of the repair. However, in some cases it may be too late to recover the poisoning effect that has occurred to the chemical washcoat on the filter itself.