

# Cleaner diesel with FAP

eXponentia looks at the Filter Air Particulate (FAP) system, the aims of the system and the opportunities it presents for the independent garage.

I suspect few technicians would argue that diesel engines have changed beyond all recognition within the last 10 years, and that the technology responsible for this is really at the cutting edge of automotive design. Delphi ceased production 5 years ago, of their traditional rotary pump in favour of their common rail pump, and Bosch produce 20% more diesel components than petrol components.

One of the principal forces behind this relentless development, has been for the cleanest diesel emissions possible. In the late 90s, we saw the first use of oxidation catalysts for diesel engines. Around this time, we also saw the introduction, by the PSA group, of the HDi series of diesel engines. This French manufacturer has been synonymous with diesel engine design; even their XUD engines of the early 90s were regarded as one of the best diesel engines of their day.

As stated earlier, one of the principal driving forces behind this development has been the relentless demand for ever lower emissions. Whilst common rail direct-injection engines have made great improvements, not only in efficiency and output but also on emissions, the emissions goal is a moving target, with successive governments demanding even lower and lower output. Of principal concern to health specialists, are the tiny soot particulates which are emitted by all diesels engines.

The PSA group was the first volume manufacturer to introduce particulate trap systems on their diesel-powered vehicles. This system, known as Filter Air Particulates (FAP), was first introduced in 2000 on their 2.2 litre HDi powered vehicle. FAP is now available on the 1.6 and 2.0 litre models. Unfortunately, whilst a main dealer may be fully conversant with this new system, my own personal experience tells me that most independent garages are totally oblivious to this system. As with all new technology, whilst it presents a challenge, it can also offer an opportunity to the independent garage to successfully understand and manage new technology.

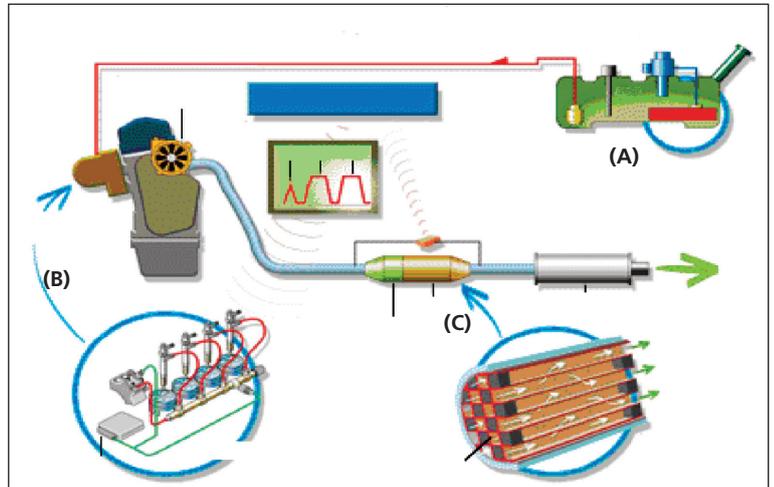
## What is FAP?

Let's first look at what the PSA group wanted to achieve. They wanted a system that dramatically reduced particulate emissions, required minimal maintenance and that remained reliable. So how have they achieved this? Firstly, there is an additional storage tank for the diesel additive. This liquid additive contains a rare earth metal called cerium. The diesel additive is injected into the main diesel fuel tank and mixes with the fuel every time

the tank is refilled. A sensor within the fuel cap lets the system know that the fuel cap has been removed and then replaced. Within the additive storage tank, there is a pump, injector and a level sensor. As you can see, we have barely passed the additive storage tank and have encountered several new pieces of technology! We will come back to the purpose of the diesel additive later.

So, what other new technology do we have on the vehicle? Well, there is an oxidation catalyst. Okay, this is not new technology in its own right, but this is now placed in front of the diesel particulate filter (DPF), a complete one-piece assembly within the exhaust system. The DPF utilizes a porous silicon carbide substrate that traps the soot particulate. As you might guess, the particulate trap would become saturated with particulate matter and would stop functioning properly within a few hundred miles, unless there was a way to regenerate the filter.

This is where the diesel additive comes in. The cerium in the additive attaches itself to the soot particulate, which are trapped within the DPF. The function of the additive is to lower the combustion temperature of the soot particulate, so the system knows when to regenerate the filter. There are two pressure take-off points within the one piece assembly; the first just before the oxidation catalyst portion of the assembly and the second at the very back end of the DPF section. When a pressure differential greater than 10% exists, the system will regenerate the filter (about every 300 to 500 miles). This is achieved by multiple post injections of fuel, which increases the combustion temperature. The catalysts oxidises unburnt hydrocarbons generated by the post injectors releasing additional quantities of heat. These two actions will increase exhaust temperatures to 450° centigrade, which is the combustible temperature of the soot particulates. Simply put, the soot is burned away by periodically raising the exhaust temperature.



Some of the FAP system components: Additive tank (A) which injects the additive into the fuel supply (B) at regular intervals and the Diesel Particulate Filter Assembly with an integral oxidation Catalyst (C)

So there you have it! The reason why we have FAP and how it works. So, what opportunity does this bring to our modern independent garage? Although the system is fairly straightforward, there are equally many things that can cause the system to malfunction, including something as innocuous as an emergency filler cap. The emergency filler cap will never trigger the injection of the diesel additive into the main fuel tank, and the soot in the DPF will accumulate because the ordinary exhaust is not hot enough to combust the soot.

At some point, about 100,000 miles, the DPF will need to be either cleaned or replaced as it will become clogged with ash from the combustion of soot particulate. However, the most immediate point of concern is the replenishment of the diesel additive. Whilst in the trial stages, it was envisaged that the additive tank would need refilling at around the 70,000 mile scheduled service. However, it has become very apparent that many vehicles are running out of the additive at around 30 to 40,000 miles. This may be due to many things, such as the quality of diesel, driving style and vehicle usage. Unfortunately, something as straightforward as topping up the additive tank does require a particular procedure in order to cancel the low-level indicator. In some cases, diagnostics may be the only option.

Without a doubt, if you service a large fleet of PSA vehicles, you need to seriously consider the ability to interrogate this system as a priority, given its widespread use today.