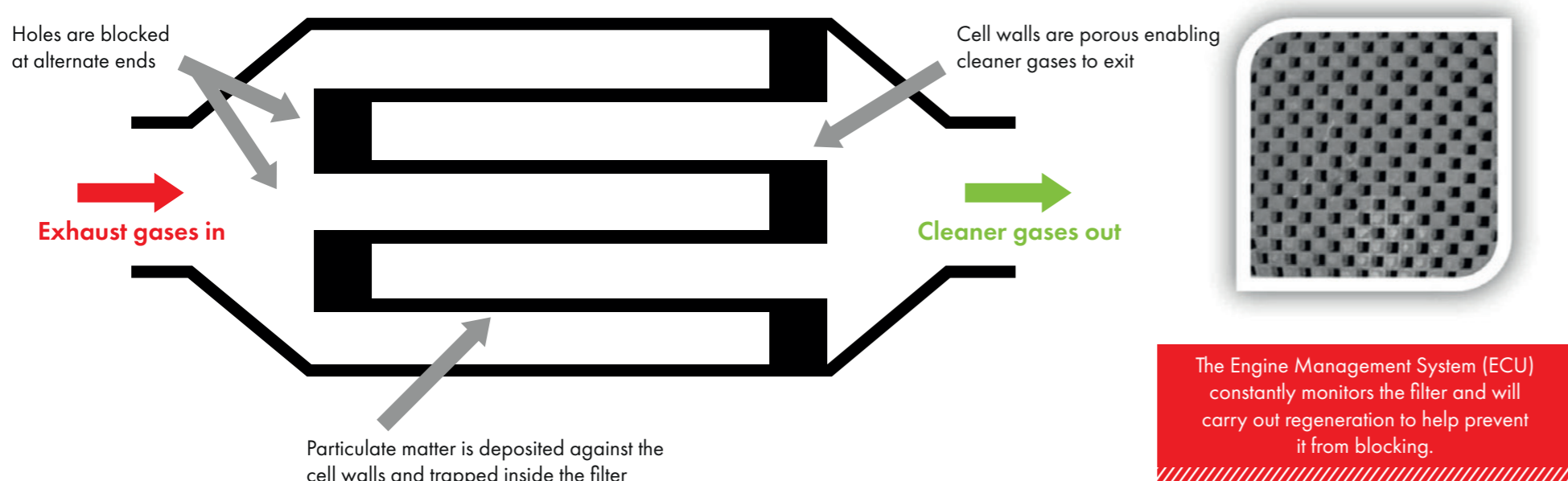


# DIESEL PARTICULATE FILTERS (DPFs)



## WHAT ARE THEY AND HOW DO THEY WORK?

- The Diesel Particulate Filter (DPF) is part of the exhaust system which helps reduce the amount of harmful particulate matter (soot) expelled within exhaust gases. It captures and contains these particles and when soot levels inside the filter reach their allowed limit, the regeneration process is initiated, burning off any trapped particles and converting them into carbon dioxide.
- Exhaust gases containing soot enter the DPF channels, which are closed off at alternating ends.
- The channel walls are porous, allowing exhaust gases to pass through, but retaining (trapping) the larger soot particles inside the DPF.
- Cleaner exhaust gases exit the DPF as the trapped soot particles are reduced to smaller ash particles during regeneration. The regeneration process also helps to prevent blockages and is integral to the function of the DPF and therefore the vehicle.



Because fuel and air do not mix as thoroughly in diesel engines as they do in petrol engines, fuel-dense pockets produce soot when ignited. This soot is the by-product of incomplete combustion.

## REGENERATION

There are three different types of regeneration – passive, active and forced. Regeneration “burns off” (oxidises) the particulates that have accumulated in the DPF:

- **Passive regeneration** - a process of soot reduction via natural conversion. Occurs when ideal driving conditions apply (60mph for 15 minutes – e.g. motorway driving). The DPF becomes hot enough to burn off some of the trapped particulates naturally between 350 and 500°C. The carbon soot particles are converted into carbon dioxide by a reaction with nitrogen oxide using the coating of the DPF, which works as a catalyst.
- **Active regeneration** - occurs when the optimum exhaust gas temperatures can no longer be maintained meaning passive regeneration can no longer take place. Therefore, active regeneration is an ECU led process that increases the exhaust gas temperature to 500-800°C. When the carbon soot deposits in the filter reach a certain level, the engine management system initiates the regeneration process, lasting around 10 minutes. DPFs can hold several hundred miles worth of soot before this process is initiated. The ECU may also trigger vehicles into limp mode to help protect other components when it senses that the DPF is becoming blocked.
- **Forced regeneration** - involves very high temperatures and is carried out by garages with diagnostics equipment.

**Warning!** The very high temperatures applied during active and forced regeneration can lead to an accumulation of ash, otherwise known as ‘ageing’. The build-up of ash is treated by physical intervention such as, chemical cleaning, ultrasonic cleaning or replacement of the DPF.

## WHAT ARE THEY MADE FROM?

- Cordierite DPFs look quite similar to catalytic converters. Cordierite is an ideal material for DPFs as it filters out a large percentage of particles and is very thermally stable; often used in aftermarket products.
- Silicon Carbide (SiC) DPFs are constructed from small sections cemented together. SiC has superior hardness, low thermal expansion and good thermal shock resistance. Tends to be used in OE applications; classed as a Premium product.

## DPF TECHNOLOGIES

These days, most diesel vehicles employ one or more different built-in systems to treat exhaust emissions and reduce the levels of soot being emitted during use. These include:

- Delayed fuel injection to increase the temperature of the exhaust system
- One or more diesel oxidation catalysts to work alongside the DPF
- An additive system which lowers the temperature at which soot combusts
- Alternative technologies such as microwave or heater coils to raise the temperature within the DPF
- Exhaust Gas Recirculation or Selective Catalyst Reduction technologies

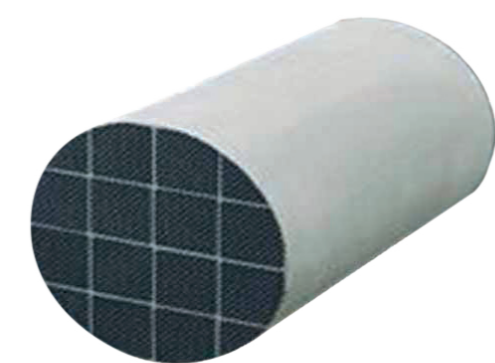
# NO DPF NO MOT

If a vehicle has had its DPF removed or tampered with, it will **FAIL** its MOT



## WHY ARE SiC DPFs A PREMIUM PRODUCT?

- 3-year warranty
- 99% filtration efficiency
- Higher melting point - 2700°C
- Higher thermal conductivity
- More resistant against monolith fractures
- Corrosive resistant



## DPF MAINTENANCE AND REPAIR

### PREVENTION OF DPF BLOCKAGE

- Correct and regular use of quality fuel additives
- Correct use of oils and lubricants
- Use of quality fuels
- Correct driving technique and operating environment – i.e. short journeys will cause the DPF to block due to lack of time for successful regeneration to take place
- Full, regular servicing of the vehicle is essential
- Use of high quality replacement parts
- Always use new gaskets and fittings and replace sensors where possible
- The inappropriate use of sealing paste can damage substrates and lead to local hot spots
- Follow manufacturer’s guidelines when resetting the ECU

### DPF RECOVERY

When a DPF can no longer be regenerated, a DPF warning light will illuminate on the dashboard. A garage would then look to perform a forced regeneration, dependent on the level of blockage.

- Regeneration should **NOT** be attempted on an adversely blocked DPF system without the prior removal and cleaning of components to reduce blockage
- Recovery additives (chemical treatments) aid conversion by loading the DPF with products that help increase temperatures sufficient to oxidise soot. These “washing” methods require product knowledge and training if critical damage is to be avoided
- Water-based cleaning can deteriorate DPF efficiency by 25-30% as it can remove the precious metal coating

### BLOCKED DPF?

When a DPF becomes blocked, the cause is very unlikely to be the DPF itself. The main reason for a blocked DPF is failure of regeneration. This is often caused by unsuitable driving conditions:



Other causes of a blocked DPF can be ash build-up or defects elsewhere within the engine. Replacing a blocked DPF without correct diagnosis of the genuine fault will only cause the new DPF to also become blocked!

### DIAGNOSING THE FAULT

The following components are used in the control of soot combustion, therefore faults with any of these will either result in the DPF becoming blocked, or will lead the ECU to think the DPF is blocked when it is not. Ensure the following components are operating correctly before assuming a replacement DPF is required:

- Air Mass Meter
- EGR Valve
- Heater Plugs
- Swirl Flaps
- Injectors
- Lambda Sensor
- Exhaust Gas Sensor
- DPF Pressure Sensor
- Oxidation Cat
- Turbo

### DPF REPLACEMENT

A DPF will find it impossible to convert soot into carbon dioxide once it has been impaired by excessive regeneration cycles, ageing (ash accumulation) or due to inappropriate cleaning methods that have damaged the coating. In such cases, replace with a high quality DPF.

Some vehicle manufacturers recommend that the DPF is replaced from 60,000 miles.

