



Cut-open DPF as used by Ford on its 6.4-litre diesel engine in its F-series trucks.

### REGENERATION PROCESS

The term "regeneration" is used to describe the process where a DPF is cleaned. Elevated exhaust temperature is needed to burn off the particulate matter in the filter. Passive regeneration is the process in which the soot gets burned off during the normal operation of the vehicle, normally during constant high load conditions like driving on a motorway. Active regeneration is triggered by the soot level of the filter or distance since a previous regeneration event. This involves using the throttle and post injection/vaporiser to increase the temperature of the exhaust gases entering the filter. The cleaning of the filter would normally require between three and 10 minutes to complete, depending on the drive cycle and soot level of the filter. This process may happen every 600 to 1 000 km, and should be undetectable to the driver.

coat to lower the combustion temperature of soot and resist ash build-up over time.

### EXOTHERMIC CATALYST

This sits upstream in close proximity of the filter element, normally in the same metallic-can structure. Its main purpose is to provide the exothermic (rise in temperature) reaction when subjected to a fuel-enriched exhaust gas mixture during cleaning process (regeneration) of the filter.



Intake throttle with intelligent throttle-plate position control by Denso.

**To achieve the target temperature of around 600 to 650°C during the regeneration process...**

### THROTTLE

This is not a misprint – modern diesel engines do come with a throttle plate in the intake. During regeneration, it helps to increase exhaust temperature at low load and speed conditions of a diesel engine by reducing the amount of excess air.

### VAPORISER

Passenger diesel-engine exhaust-gas temperature rarely exceeds 450°C under normal driving conditions. Therefore, to achieve the target temperature of around 600 to 650°C during the regeneration process of the filter,

extra fuel needs to be added to the exhaust stream. This can be done by either post injection in the engine (late injection during the exhaust stroke) or by adding a vaporiser to the exhaust upstream of the DPF. This device consists of an injector and glow-plug element to vaporise the diesel fuel in the exhaust stream before it reaches the exothermic catalyst.



### EXHAUST-GAS TEMPERATURE (EGT) SENSOR

The system will at least include one EGT sensor to monitor the temperature of the filter during the regeneration process. Intelligent engine and post injection/vaporiser calibration is needed to ensure that the optimum temperature is adhered

ABOVE: exhaust-gas temperature sensor by Denso. BELOW: diesel vapouriser unit by Continental.

### WITNESS ACCOUNT

During the first introduction of DPFs on diesel development vehicles, it was noted during an engineering sign-off cold trip in Finland that, for the first time after a cold start (-30°C), there were no black carbon residues on the glistening white snow – proving that the technology works!

