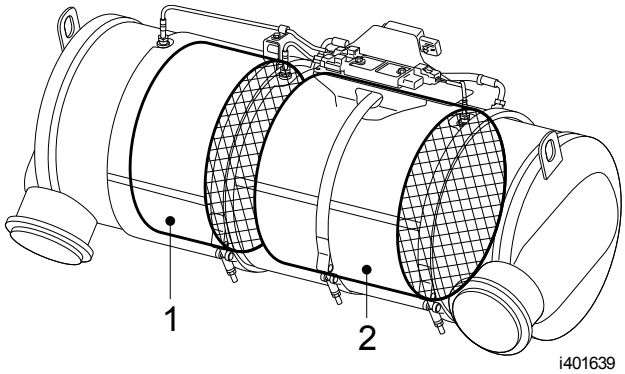
# DPF unit

The DPF consists of a Diesel Oxidation Catalyst (DOC) and a Diesel Particulate Filter (DPF). The catalyst and the DPF are integrated into the exhaust silencer.

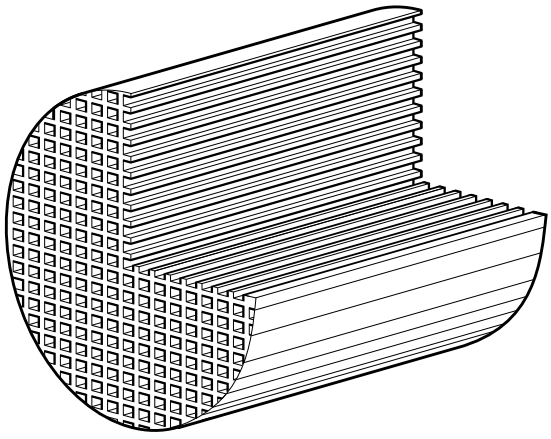



1 Diesel Oxidation Catalyst (DOC)
2 Diesel particulate filter (DPF)

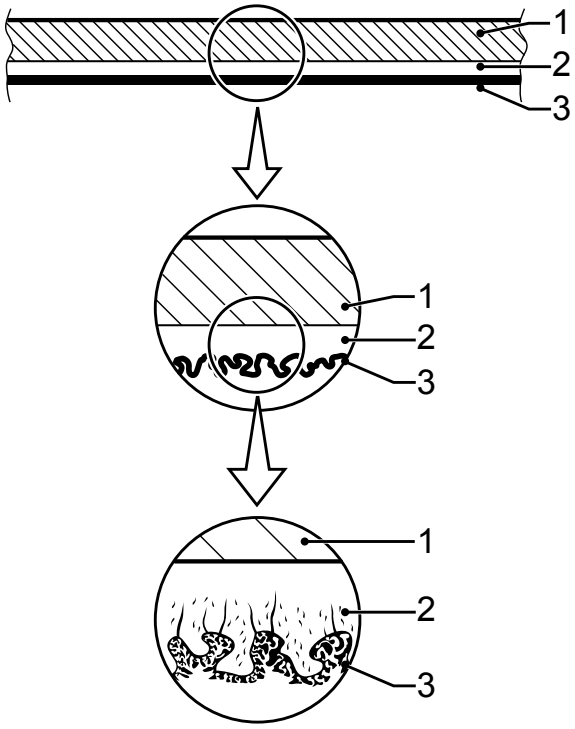
## Design of DOC

A catalytic converter initiates a chemical reaction, but it does not actually take part in the reaction.

The catalytic converter is a cylindrical element that has many fine channels to create a very large surface.




A carrier material (2) that holds the active catalytic agent (3) is applied to the element (1). The catalytic agent for the DOC is platinum. The surface of the carrier material is very rough and porous, so the effective area through which the exhaust gas flows is very large.

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## Operation of DOC

The DOC, which is located before the DPF, is used to decrease the nitrogen oxide (NO) and increase the nitrogen dioxide ($NO_2$). The nitrogen dioxide ($NO_2$) is used to 'burn' the soot that is collected in the DPF.

Exhaust gasses from the engine consist of approximately 90% nitrogen monoxide (NO) and approximately 10% nitrogen dioxide ($NO_2$) and are referred to as NOx.

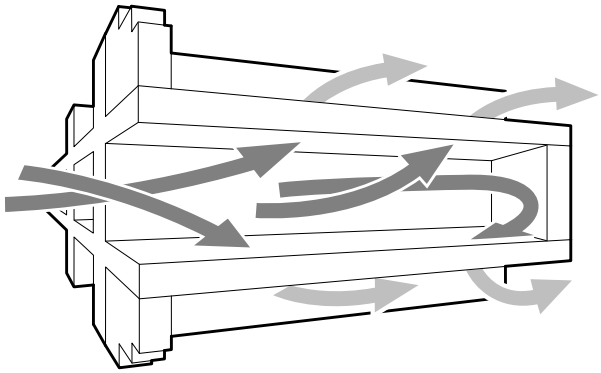
Because there is a small layer of platinum on the surface of the oxidation catalyst, the nitrogen monoxide (NO) reacts chemically with the oxygen ($O_2$) in the exhaust gas. As a result, there is less nitrogen monoxide (NO) and more nitrogen dioxide ($NO_2$). The NOx ratio when leaving the DOC is approximately 50% NO and 50% $NO_2$.

The chemical reaction in the DOC depends on the temperature. When the exhaust gas temperature is above ±572°F (300°C), the nitrogen dioxide ($NO_2$) reacts with the carbon (C) in the DPF. The carbon particles are 'burned' by the nitrogen dioxide in the exhaust gas. This results in nitrogen ($N_2$) and carbon dioxide ($CO_2$). This is called a **passive regeneration**. If the exhaust gas temperature is below ±572°F (300°C), the nitrogen monoxide (NO) hardly reacts with the oxygen ($O_2$). In this case, there is not enough nitrogen dioxide ($NO_2$) in the exhaust gas after the DOC to burn all the soot.

## DPF Design

The particulate filter is a wall flow particulate filter. The wall flow particulate filter is made of ceramic material with a small layer of platinum.

The channels in the filter are alternately plugged at one end, thus forcing the exhaust gas to flow through the porous walls, which act as a filter medium.



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## Operation of DPF

The exhaust gas flows from the DOC to the DPF.

If the exhaust gas temperature is below ±572°F (300°C), there is not enough nitrogen dioxide ($NO_2$) to burn all the soot. The soot particles are now 'collected' in the DPF.

After a certain period, the particulate filter becomes full. Now the system must carry out a regeneration to burn all the soot in the particulate filter. This is called an **active regeneration**.

Fuel is injected into the exhaust to increase the temperature after the DOC to approximately 977°F–1067°F (525°C–575°C). Fuel (CH) + oxygen ($O_2$) generates carbon dioxide ($CO_2$), water ($H_2O$) and heat.

The carbon particles (C) in the particulate filter are 'burned' by the oxygen ($O_2$) in the exhaust gas and converted into carbon dioxide ($CO_2$).

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