

DIESEL PARTICULATE FILTERS

HELPING SITES BRING DOWN DIESEL PARTICULATE EMISSIONS
AS LOW AS REASONABLY PRACTICABLE



Mammoth
Equipment and Exhausts



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Better Diesel Particulate Filters; Improve Conditions Underground

Not all mine site vehicles or their diesel particulate filters are made equally.

The **largest underground mining vehicles** typically with heavy duty cycles are in a class of their own for their power, performance and potential emissions (depending on engine type). Our Diesel Particulate Filters are purpose built to suit OEM specifications of these vehicles.

The **mid-range support vehicles** are often too compact to fit a standard Diesel Particulate Filter, add to that unpredictable duty cycles and most suppliers would be waving the white flag. However our catalysed substrate DPF has proven to be a key component in managing Diesel Particulate Emissions on these vehicles; purpose built to suit OEM specifications.

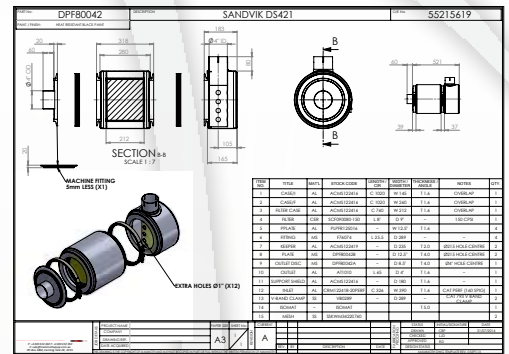
Finally the **light duty vehicles**, people movers, land cruisers, fuel and liquid trucks, shotcreters, etc are often the weak-link in the chain of holistic and thorough Diesel Particulate Management. The Mammoth Sintered Metal Filters are purpose built to suit OEM specifications.

Key Mammoth Advantages;

Guaranteed to Fit, Built to Last
We are committed to ensuring our products fit first time as a retrofit solution.

Any Machine, Anywhere
40 years of continuous improvement working with heavy diesel machinery developing standard and customised solutions across diverse mining fleets, operating in diverse environments spanning 12 countries across 6 continents. Our front-line approach to Research and Development keeps us working ahead of our competitors and alongside our Mining Partners.

Peace of Mind - 3D CAD Drawings;
Improve accuracy - save time and money when ordering parts with our comprehensive 3D parts catalogues complete with OEM cross reference and descriptions.



Zero Diesel Particulate Filters is the brand designation of Mammoth Equipment & Exhausts Diesel Particulate Filters division.

MAMMOTH FACT:
Mammoth Equipment's original home base is often referred to as 'the mining state' in a holistic case study spanning 4 years Mammoth Diesel Particulate Filters played an integral role improving the air quality underground.

Before: Areas on site in excess of 250%
After: Areas on site 'Below Detectable Limits'

Mammoth DPFs at a glance;



This material is an overview focused on our range of Diesel Particulate Filters.

We design filters to suit individual make, model and serial variations, this considers a range of relevant factors such as; Original Equipment muffler brackets and space, engine size, power and original equipment specifications (as a function for allowable back pressure), proximity to heat sensitive components and exhaust gas flow direction.

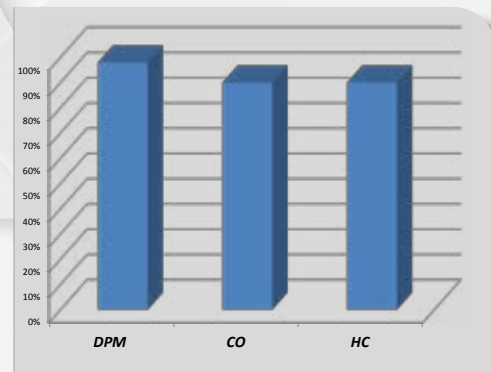
For the purposes of this overview we have simplified and segmented our DPFs in terms of three key factors;

- Application
- Design
- Function



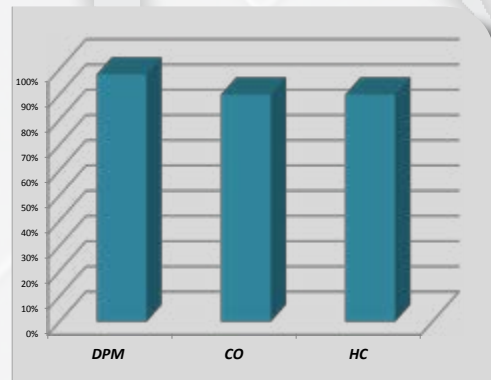
Mammoth Standard DPF:

Application: Heavy Duty Cycles
Design: DOC -> DPF
Function: Passive Regenerating
Examples: Sandvik TH663s
 Atlas Copco MT6020s
 CAT AD45/55
Typical Results: DPM: >98%
 CO: 90%
 HC: 90%



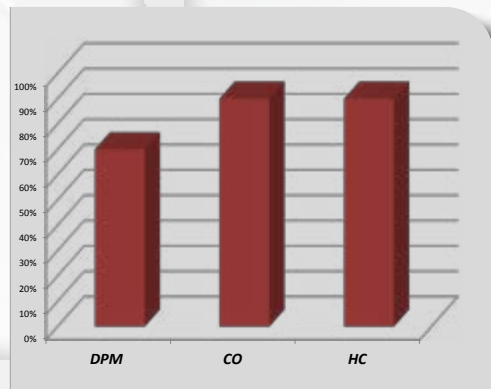
Mammoth Catalysed Substrate DPF:

Application: Medium Duty Cycles
Design: Catalysed Coating on DPF
Function: Passive Regenerating
Examples: Normet 1610B
 Jetcrete
 Jaco Transmixer
Typical Results: DPM: >98%
 CO: 90%
 HC: 90%



Mammoth Sintered Metal Filter SMF:

Application: Light Duty Cycles
Design: DOC -> SMF
Function: Passive Regenerating
Result: 60-91% Reduction
Examples: Land Cruiser
 Forklift
Typical Results: DPM: 60-91%
 CO: 90%
 HC: 90%



Standard DPFs

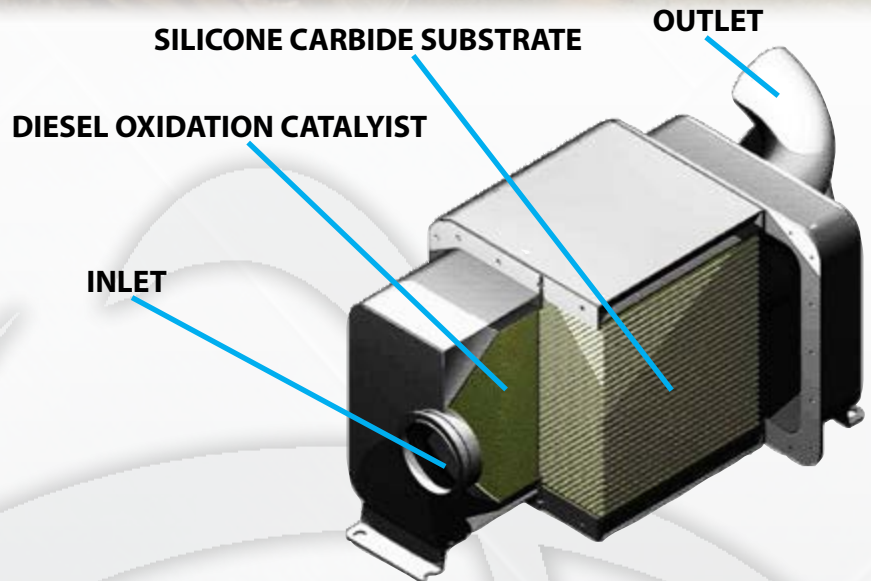
Application: Heavy Duty Cycles

Mammoth's enduring commitment to improve the operational conditions of mining professionals over the last 40 years led to our development of a Diesel Particulate Solution for your heavy duty fleet.

All of Mammoth's Diesel Particulate Filters are purpose built for application, engine type, back pressure specifications and deliver >98% reductions in Diesel Particulate Matter consistently.

Using robust and durable recrystallised silicone carbide (SiC), known for its Mohs hardness rating close to diamond (9) and a very low thermal expansion coefficient ($4.0 \times 10^{-6}/K$) the Mammoth Diesel Particulate Filter is built stronger, enabling high soot loading and thermal capacity.

This passive regenerating monolith is further enabled by the Diesel Oxidation Catalyst module before the substrate ensuring the atmosphere within the filter is optimised for passive regeneration, high performance and reliability.



Key Benefits of the Zero Diesel Particulate Filters (DPF);

- Proven to reduce DPM emissions by >98%.
- Remove & replace - equipment specific retrofit solution
- No regeneration aids or fuel additives required
- Require Minimal Maintenance Intervals.
- Cost effective solution for DPM emissions
- Eliminates Diesel Soot at the Source

MAMMOTH TIP:

When it comes to Diesel Particulate Filters on your fleet do away with the guess-work of sizing charts and universal filters. There are a number of factors which have implications on DPF performance and suitability (Size is only one aspect). All of our DPFs have been developed specifically for application we now have a portfolio of DPFs, off-the-shelf-ready, to bolt and replace to meet your fleet requirements.

Feature	Advantage	Benefit
SiC Substrate High Thermal Conductivity	The atmosphere contained within the substrate is optimised for soot oxidation	Low running costs due to reliable passive regeneration, no aids or fuel additives required (heavy drive cycle vehicles).
SiC Substrate High Thermal Expansion Coefficient	Does not expand or warp, even at high temperatures	Lasts considerably longer than ceramic filters under the same conditions
Robust Design (80-150 CPSI) maximised volume	High soot load capabilities against other filters	Lower service costs able to compensate for temporarily light drive cycles
High efficiency particulate trap	Able to effectively capture and oxidise >98% of diesel particulates in 10um and above range (microfines)	Help you meet emissions regulations and site requirements

Catalysed Substrate DPFs

Application: Medium Duty Cycles

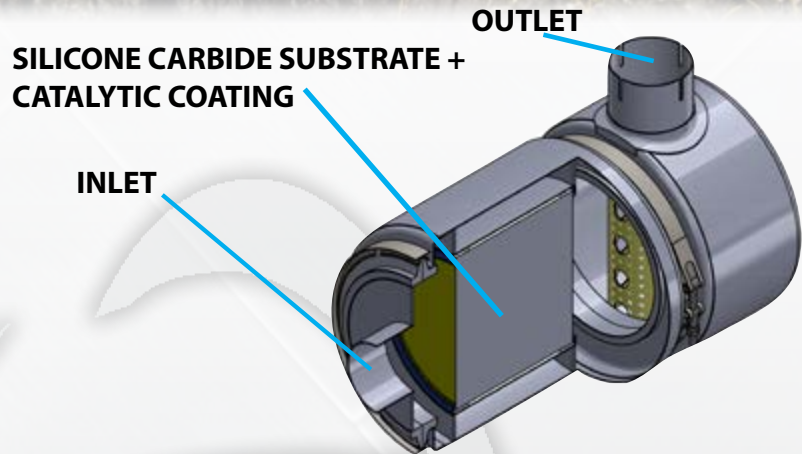
Mammoth's enduring commitment to Guaranteed to Fit, Built to Last meant the development of a new type of Diesel Particulate Filter that included catalytic coating on the substrate face.

The same great results, improved regenerative conditions in a more compact design. Making them the ideal choice for managing diesel particulate emissions on mid-range mining fleet such as Normets, Jetcretes and Jacons.

Compact Catalysed Diesel Particulate Filters provide highly efficient removal of diesel particulate matter. The **key difference** is the Diesel Oxidation Catalyst or Precious Metal catalytic coating being integrated onto the substrate face (as opposed to being a separate module upstream from the substrate (saving up to 30% of space) without any sacrifice of results.

The catalytic coating oxidises harmful exhaust gas such as Carbon Monoxide (CO) and Nitrous Oxides (NOx) as well as Hydrocarbons.

The porous channels within the silicone carbide substrate trap soot particles as low as 10um and regenerates in the presence of NOx at an improved ratio due to the compact design.



Key Benefits of the Sintered Metal Filters (SMF);

- Proven to reduce DPM emissions 60-91%
- Remove & replace - equipment specific retrofit solution
- Enhanced durability due to the metallic substrate
- No regeneration aids or fuel additives required
- Maintenance Free - Fit and Forget
- Suitable for light duty cycle equipment
- Cost effective solution for DPM emissions

Feature	Advantage	Benefit
SIC Substrate High Thermal Conductivity	The atmosphere contained within the substrate is optimised for soot oxidation	Low running costs due to reliable passive regeneration, no aids or fuel additives required (heavy drive cycle vehicles).
SIC Substrate High Thermal Expansion Coefficient	Does not expand or warp, even at high temperatures	Lasts considerably longer than ceramic filters under the same conditions
Robust Design (80-150 CPSI) maximised volume	High soot load capabilities against other filters	Lower service costs able to compensate for temporarily light drive cycles
High efficiency particulate trap	Able to effectively capture and oxidise >98% of diesel particulates in 10um and above range (microfines)	Help you meet emissions regulations and site requirements
Coated Substrate	Save Space without the DOC module, improved regeneration efficiency	Minimum space maximum results, able to uphold our commitment to bolt-on exchange solutions

MAMMOTH FACT:

We often offer emissions testing before and after the installation of a Mammoth Diesel Particulate Filter, having tested hundreds of machines the results are very consistent:

DPM: >98% reduction
 CO: >90% reduction
 HC: up to 90% reduction

Sintered Metal Filters

Application: Light Duty Cycles

Mammoth's enduring commitment to **Aim For Zero**, does not stop at Heavy Duty haul-trucks and loaders.

As a key partner in your holistic approach to diesel particulate management our product range caters for light duty vehicles which would otherwise not be suitable for a standard wall-flow DPF.

SMF Partial flow Diesel Particulate Filter provides effective removal of diesel particulate matter with lower maintenance requirements than wall-flow particulate filters.

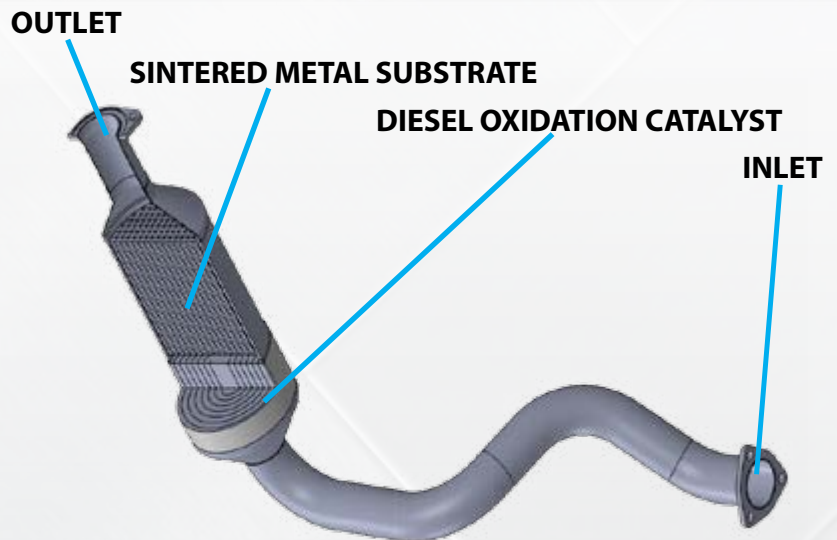
Making them the ideal choice for managing diesel particulate emissions on light duty cycle vehicles.

SMFs are functionally similar to the standard Diesel Particulate Filter; hot gas (including DPM) flows into the filter structure, where the microscopic metallic pores trap and oxidise DPM.

The **key difference** is the sintered metal substrate, which when coupled with the Diesel Oxidation Catalyst enables soot oxidation at lower temperatures and partial flow, virtually eliminating the risk of over-sooting; maintenance and manual regeneration not required.

MAMMOTH TIP

Our range of filters are built rugged and ready for the harsh mining environments in which they have operated for as long as 18,000 hours. However eventually the oxidation process of soot to ash will require a thorough cleaning service (more info on our related services on the next page)



Key Benefits of the Sintered Metal Filters (SMF);

- Proven to reduce DPM emissions 60-91%
- Remove & replace - equipment specific retrofit solution
- Easy integration into exhaust system
- No regeneration aids or fuel additives required
- Built as a 'fit and forget' solution
- Suitable for light duty cycle equipment

Feature	Advantage	Benefit
Sintered Metal Structure	Enhanced durability due to the metallic substrate	In most cases the filter will out-last the vehicle.
Compact Design	Enables bolt on exchange with OEM muffler / filter	Quick and easy fitting for site personnel
Flow Through Design	Does not clog or accumulate soot particles	Will consistently remain well within OEM back pressure specifications
Resilient steel construction	Resistant to even the harshest mining environments	Very reliable, lower running costs

DPF Options and Related Services



The Largest DPF Cleaner in the world (FSX).

Thorough Thermal Pneumatic Clean and Refurb of DPFs.

Endorsed by major OEM engine manufacturers.

Reporting and review services.



Back Pressure Monitoring and Data Loggers.

Real time feedback that checks the operation and condition of your DPF.

Historical data recording

Reporting and review services.



Emissions Testing and Reporting.

Before and After emissions testing including; DPM, CO, NOx, NO2, CO2

Reporting and review services.

DPF Best Practices and Recommendations

Factor	Cause	Solution
Impact	Hitting the wall, falling rocks	Protective housing, hazard and risk assessment, caution and use of proximity sensors
Soot overloading	Caused by duty cycle with high idle times, dirty engines	Reduce engine idle times, adjust operating procedures
Ash overloading	High ash oil	Use low ash oil (CJ-4 Spec)
Operating Temperature	Incorrect filter for duty cycle, high idle times	Correct filter, reduce idle times
Soot Characteristics	Oil quality, fuel quality	Use low ash oil (CJ-4 specifications) and Low Sulphur Fuel (ULSD - 10-15 ppm)
Engine Condition	Wear out, oil consumption, air filter conditions and turbo issues	Maintenance and servicing, monitor oil slip



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Mammoth Equipment & Exhausts is known

- Replacement Exhaust Products
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- Diesel Purifiers
- Custom Built Silencers
- SCR Silencers
- Universal Exhaust Products
- Diesel Particulate Filters
- Thermal Products & Accessories
- Air Quality Testing Machines
- Emissions Testing Analysis
- EcoBlue Storage & Dispensing Equipment
- EcoBlue Diesel Exhaust Fluid

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