



Mammoth

Equipment and Exhausts

DPM Management Insights from Around the World

MDEC 2017

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Mammoth: Who We Are


Mammoth Equipment & Exhausts – Global leading solution provider to the heavy diesel industry


- A family owned & operated company established in 1974.
- Specialists in developing & manufacturing standard and customised replacement exhaust components for all brands of marine, transport, earth moving and mining equipment.
- Constantly develop products for exhaust and emission solutions.
- Global reputation for industry proven products.
- Innovative solution provider to the industry


divisions of
MEI Group P/L













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Mammoth: Where We Are

Mammoth Equipment & Exhausts – Global leading solution provider to the heavy diesel industry

Office/Warehouse/Production

- Canada
- Mexico
- Argentina

Distribution

- USA / Elko

Australia

- Western Australia (HQ)
- Northern Territory
- Queensland Nth
- Queensland Sth
- New South Wales
- Victoria
- South Australia
- Tasmania




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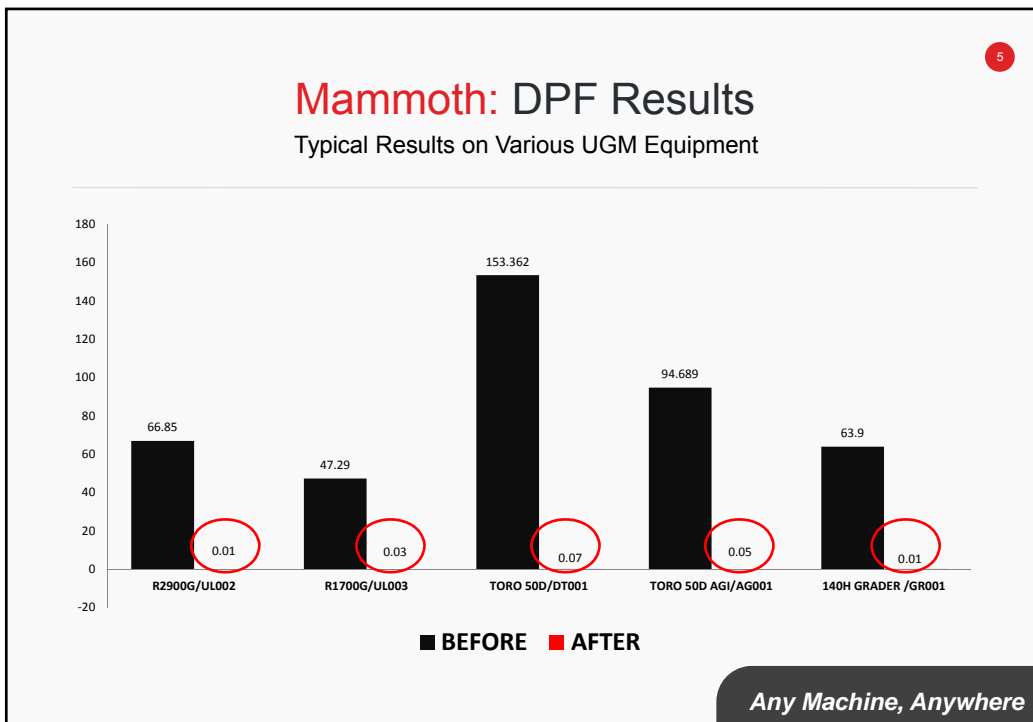
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Mammoth: What We Do

Diesel Particulate Filters

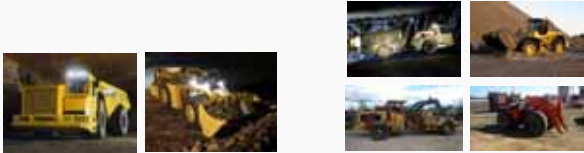
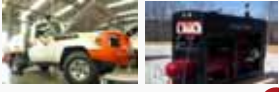


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Mammoth: What We Do

Diesel Particulate Filters:

Heavy Fleet
(Large Loaders and Dump Trucks)


- Heavy Duty Cycle
- Most suitable for full DPFs with 3000 hours servicing requirements

Ancillary Equipment
(Water Trucks, Drill Rigs, Spraymec)

- Mid-Light Duty Cycle
- Most suitable for PDPFs with minimal servicing requirements. More frequent servicing requirements expected for full DPFs

LVs & Stationary Equipment
(LVs, Generators and Welders)

- Light Duty Cycle
- Most suitable for SMFs with minimal servicing requirements. More frequent servicing requirements expected for full DPFs



- Option for a back pressure monitor and data logger
- Standard kits also available

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Mammoth: What We Do

Full DPF on LVs

Emissions Results

← DPM mg/m3 pre filter

← DPM mg/m3 post filter

1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59

Temperature Profile & Back Pressure Results

Temperature over time with full DPF fitted

Back pressure over time with full DPF fitted

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Mammoth: What We Do

Diesel Particulate Filters: (Full)

Key Components:

1. Diesel Oxidation Catalyst (DOC)
2. Silicon Carbide or Cordierite Substrate
3. Offset Closed Cell Channels

Specifications:

- High Thermal Durability (Resistance to thermal shock, low specific heat)
- High DPM Reduction Efficiency (99%)
- DOC enables catalysed regeneration (280-330°C)
- Particulate Filtration efficiency not contingent on temperature

Application:

- Heavier duty cycle equipment (e.g. load and haul)

Typical Full DPF Results

Component	Efficiency
HC	90%
CO	90%
DPM	98%

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Mammoth: What We Do

Diesel Particulate Filters: (Partial)

Key Components:

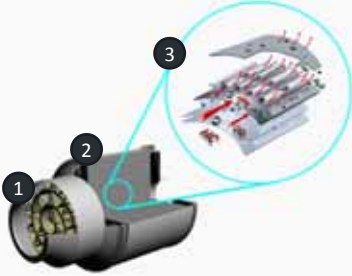
1. Diesel Oxidation Catalyst (DOC)
2. Herringbone pattern steel layered substrate
3. Open Cells

Specifications:

- Minimal Flow Restriction
- Herringbone pattern traps and deflects particulates enabling oxidation
- DOC enables catalysed regeneration (280-330-C)
- High thermal conductivity allows for greater filtration area

Application:

- Light duty cycle ancillary equipment



Typical Partial DPF Results

Component	Efficiency (%)
HC	90%
CO	90%
DPM	75%

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Mammoth: What We Do

Diesel Particulate Filters: (SMF)

Key Components:

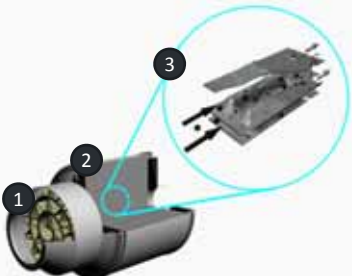
1. Diesel Oxidation Catalyst (DOC)
2. Herringbone pattern steel layered substrate
3. Open Cells

Specifications:

- Minimal Flow Restriction
- Herringbone pattern traps and deflects particulates enabling oxidation
- DOC enables catalysed regeneration (280-330-C)
- High thermal conductivity allows for greater filtration area

Application:

- Light duty cycle ancillary equipment and stationary equipment



Typical SMF Results

Component	Efficiency (%)
HC	90%
CO	90%
DPM	60%

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Mammoth: What We Do

Diesel Particulate Filters:

The industry has proven the service life of DPFs can vary

- Equipment to Equipment
- Site to Site
- Operator to Operator

Mammoth's in house engineering capabilities mean we can develop retrofit solutions to accommodate even the toughest operating conditions. The variations include;

- DOC catalytic efficiency
- Substrate types and performance
- Shape, size and capacity

We have active DPF systems available such as

- Fuel born catalyst
- SCR



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Mammoth: DPF Results

Golden Grove, Australia

Average DPM exposure before start of filter fit out – 0.16mg/TWA

STAGE 1: DP Filters fitted to:

- 6 x CAT R2900G bidders (scoops)
- 1 x CAT AD45B
- 2 x CAT AD55

At Stage 1: Average DPM exposure after filter fit out **0.09 mg/ TWA**.

Result: 56% of heavy vehicle fleet fitted with a Mammoth DPF resulted in **44% overall TWA reduction**.

STAGE 2 DP Filters fitted to:

- 7 x CAT AD55B

At Stage 2: Average DPM exposure after filter fit out **0.021 mg/ TWA**.

Result: 100% of heavy vehicle fleet fitted with a Mammoth DPF resulted in **80.35% overall TWA reduction**.



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Mammoth: DPF Results

Golden Grove, Australia

2010 – 2011:

- Tested the DPM exposure levels to establish baseline levels
- Alarmed by the consistent high readings of up to **250% above exposure limits**.
- Research began to establish an effective Diesel Particulate Management Solution.
- **TWA 0.16mg**

June 2011 – December 2011: Tested and trialled Mammoth DPFs.

April 2012 – July 2012: Installed Mammoth DPFs to:

- 6 x R2900G boggers
- 1 x AD45B
- 2 x AD55A
- **TWA 0.09mg (44% reduction, from 56% of HV fleet fitted)**

Jan 2013 – June 2013: Contractors installed Mammoth DPF Filters

- 7x AD55B
- **TWA 0.021mg**

- High >100%
- Medium 60-90%
- Low <50%
- BDL

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Mammoth: DPF Results

Innovation and Leadership for management of DPM underground

What some global leaders are implementing

“Not just about compliance, but doing everything we can to achieve ALATF (As Low As Technically Feasible) **because we care about our people”**


| Olympic Dam

Craig Barttrop/Sasha Miric

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Mammoth: DPF Results

Innovation and Leadership for management of DPM underground

Client learnings as a result from trials undertaken at Olympic Dam

- *Partial flow filters will require much less maintenance but do not capture all DPM.*
- *Our tests showed a capture rate of between 20% and 50%.*
- *Walled filters showed an extremely high capture rate of 96% to 100% however require a much more frequency maintenance strategy.*

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Mammoth: DPF Results

Innovation and Leadership for management of DPM underground

BHP Mandate

- Every piece of diesel equipment to be fitted with an emission control device
 - To achieve tail pipe DPM results of <1 mg/m³
 - This means full filtration sustained through regular maintenance / filter substrate cleaning

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Mammoth: DPF Results

Innovation and Leadership for management of DPM underground

- **Stage 1:** Load and Haul (Complete)

Model++	DPM Reduction	Recommended Service intervals	Current Hours of Operation
AD55B	>98+%	2000 hours	3750+
AD60	>98+%	2000 hours	3750+
MT65	>98+%	3000 hours	4500+
R2900G	>98+%	2000 hours	3000+
R3000H	>98+%	2000 hours	3000+



OEM: Truck Filter



OEM: Loader Filter



Mammoth: MT65 Filter

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Mammoth: DPF Results

Innovation and Leadership for management of DPM underground

- **Stage 2:** Drills (Complete)

Model	DPM Reduction	Recommended Servicing Intervals	In Operation Since
AC DRILL	>98%	3000 hours	March 2017

- **Stage 3:** Light Vehicles (Complete)

Model	DPM Reduction	Recommended Servicing Intervals	In Operation Since
V6 LAND CRUISER	>98%	4 weeks	June 2017
V8 LAND CRUISER	>98%	8 weeks	July 2017



Mammoth:
ATLAS COPCO
Drill Filter



Mammoth:
Toyota Land
Cruiser Filter

- **Stage 4:** Generators, Welders, Pumps (TBC)

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Mammoth: DPF Results

Innovation and Leadership for management of DPM underground

This mandate has resulted in contractors and suppliers on site being forced to develop a solution or establish an alternative

No TWA air quality test have been performed yet – however .01mg tailpipe result.



Thank you to **BHP** | Olympic Dam

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Mammoth: DPF Cleaning

Innovative onsite DPF cleaning systems by Mammoth



Mammoth is a specialist dealer of FSX DPF Cleaning Equipment supplying and supporting turnkey DPF Cleaning package solutions.

- Most proven DPF Cleaning equipment in the world
- Endorsed by major OEMs such as Caterpillar, Cummins, Navistar, Paccar and Volvo

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Mammoth
Equipment and Exhausts

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