



An Overview of the DPF Cleaning Market

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- > About SPX Service Solutions
- > The need for DPF's
- > How a DPF works
- > Regeneration and Cleaning of DPF's
- > DPF Cleaning Options
- > Thermal Processing / Regeneration prior to cleaning
- > Additional Considerations

- > Global, Fortune 500 multi-industry manufacturing leader
 - 2009 Revenue \$5.0 Billion
 - #21 on Barron's 500
 - # 402 on Fortune 500
 - NYSE: SPW
 - Operations in 40 countries

- > Key areas of expertise
 - Global Infrastructure / Energy
 - Transformers, Cooling Towers, Solar Panels
 - Process Equipment
 - Pumps, Valves, Heat Exchangers, Mixers, Homogenizers, Air Hydration Equipment
 - Supporting Food & Oil & Gas Industries
 - Vehicle Service & Support
 - Developing Information, Software, Hardware and Support Solutions for global OEMS and the automotive aftermarket

Flow Technology



Thermal Equipment & Services



Test & Measurement



Industrial Equipment & Services



End Markets Served

Food & beverage

- Power generation
- General industrial
- Chemical
- Oil & gas
- Air dehydration

Power generation

- HVAC
- General industrial

Vehicle information, tools & diagnostics

- Telecom
- Transportation

Power transmission & distribution

- Solar power generation
- General industrial
- Aerospace
- Broadcast

***In addition to Vehicle Service
Extensive Global Infrastructure and Support Capability***

SPX Service Solutions - Brands

Specialty Tools

**MILLER
SPECIAL TOOLS**

KENT-MOORE

OTC



Diagnostic Systems and Service Equipment

OTC



ROBINAIR

actron.

AUTOXRAY

Technical Information and Services



Spore

Commercial, Automotive, Construction & Agricultural



Powersports / Marine



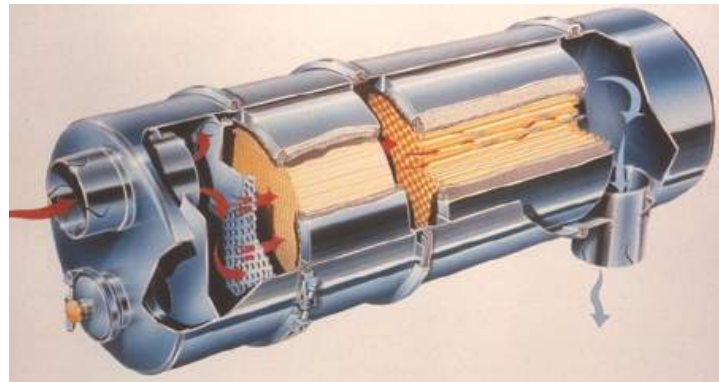
Other Industries



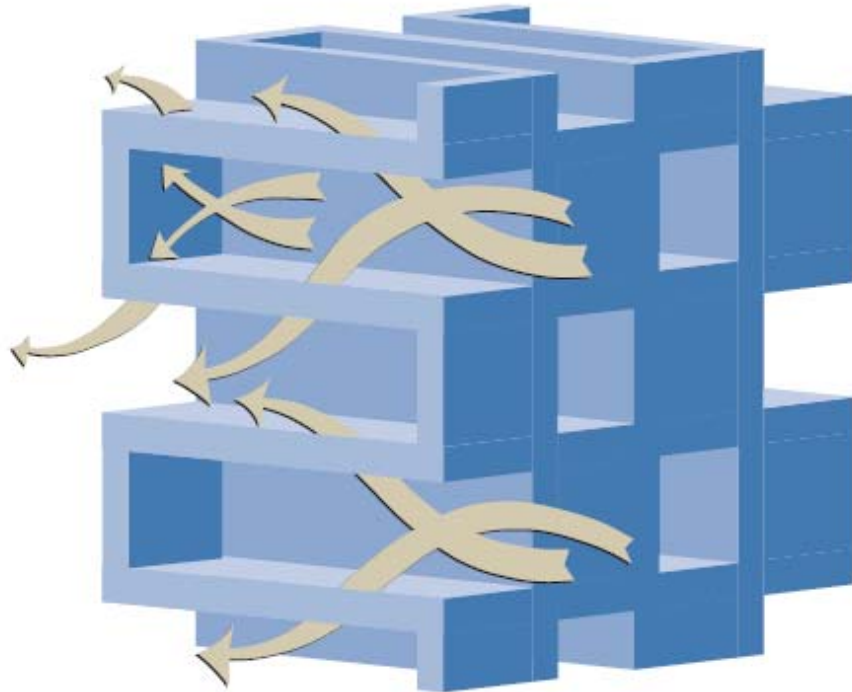
**Complete Solutions for After Sales Service ...
Comprehensive, Diverse Customer Base**

Demand Driven by Regulatory Standards:

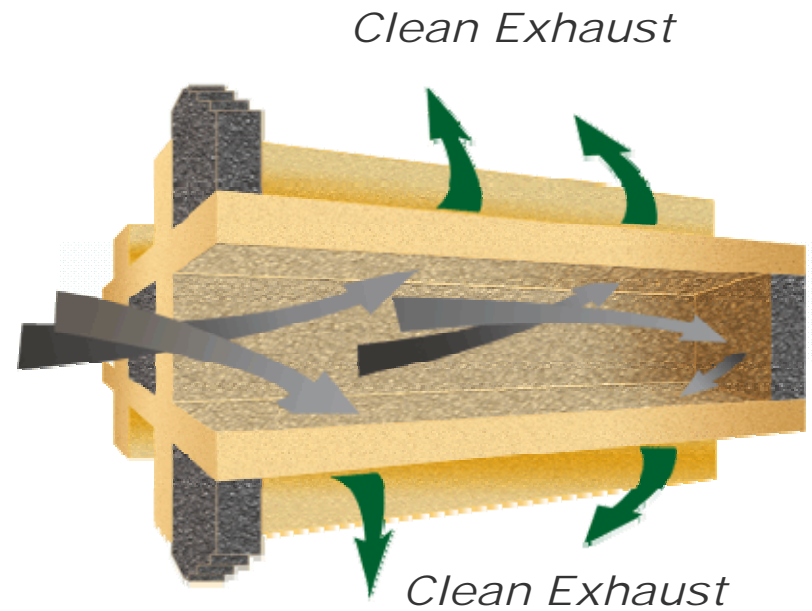
- EPA Requirements – Starting in 2007, all **NEW** On-Highway diesel engines must limit the emission of diesel particulate matter. In 2010, these standards will also apply to most **NEW** off-highway engines.
- In 2008, the California Air Resources Board (CARB) voted to require retrofit of pre-2007 engines with DPF's starting in 2011 (CARB 2011). Implementation has been delayed due to economic conditions.
- To comply with this standard, OEM's have decided to incorporate Diesel Particulate Filters (DPF's) as part of a comprehensive emissions control system. DPF's trap diesel particulates (soot) through an extensive filtering process.



How a DPF Works*:

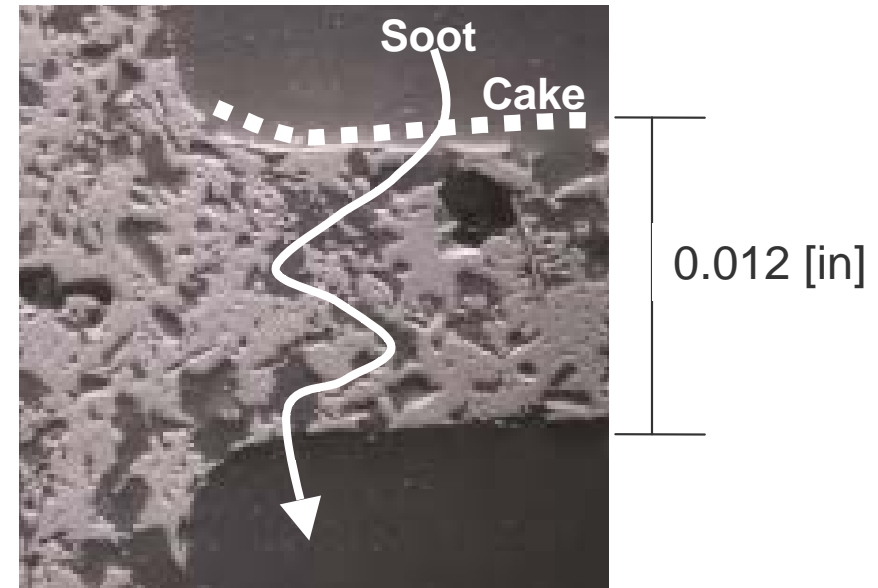


PM in Exhaust



A diesel particulate filter has thousands of small channels that are alternately sealed. This close-up illustration shows how exhaust flow enters one channel and is forced to exit out an adjacent channel. The filtering occurs as the flow passes through the wall.

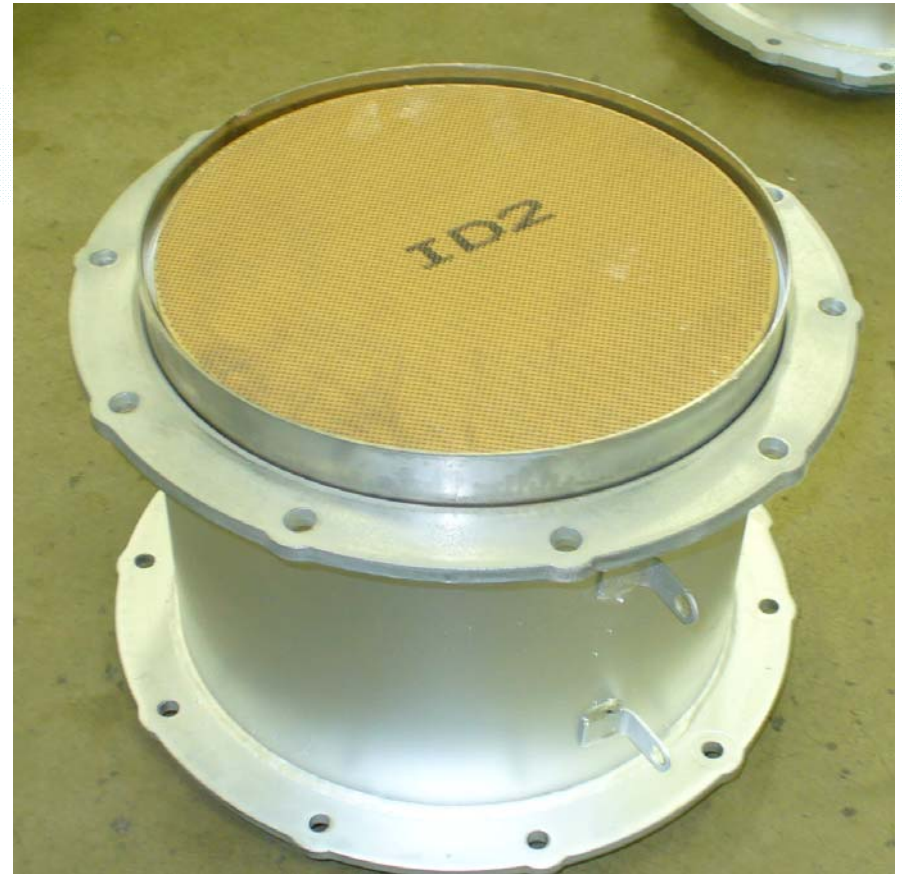
**Source: Cummins Emission Solutions*



Diesel Particulate Filters vary by manufacturer and engine type.



A Detroit Diesel 13" DPF clamped in position for cleaning.



An ISUZU 9" DPF

DPF Regeneration

- To extend filter life, newer vehicles convert the trapped soot to ash through a process of burning it at high temps, called “regeneration”.
- Passive Regeneration:
 - Occurs naturally when the engine runs at highway speeds for extended periods.
 - This causes the engine out oxides of nitrogen (NOx) to oxidize the soot (carbon), converting most of the contaminants into carbon dioxide gas.
- Active Regeneration:
 - Requires the drive to stop and idle the truck for 30 minutes, then switch on an injector that sprays doses of fuel into the exhaust system.
 - The resulting combustion raises the temperature of the exhaust to about 1,100 degrees which converts the trapped soot to ash.

Ash is the material that is left when all the carbon on the filter is oxidized to carbon dioxide (CO₂)

➤ Primary constituents

- Remains of the lubricating oil additive package
- Engine wear metals

➤ Fuel contains almost no ash

- Most fine particulate matter is filtered out of the fuel before it gets through the fuel system
- Fuel contains almost no dissolved constituents that are not carbon based

➤ Ash will remain permanently in the filter until cleaned

- Over time, this ash build-up reduces the soot handling capability of the filter and requires more frequent regenerations to maintain exhaust flow and fuel economy.

➤ Most manufacturers recommend cleaning ash at a regular fixed interval.

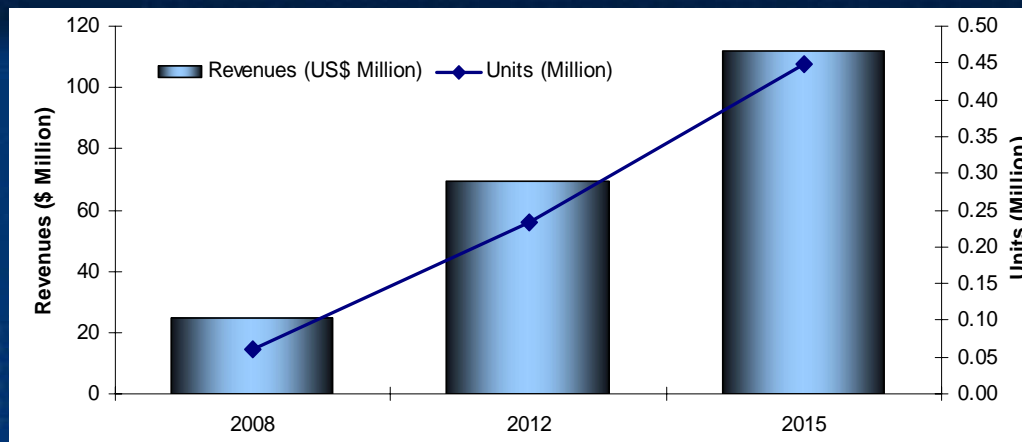
- Some fleets have begun to clean filters as part of a regular Preventive Maintenance activity (i.e. every 120,000 miles).

DPF Cleaning or Replacement Intervals:

- DPF's are designed to run for 200,000 to 500,000 miles or more without cleaning as long as conditions are *IDEAL*.
 - Ultra Low Sulfur Diesel is used (ULSD)
 - CJ-4 Low Ash Oil is Used
 - High On-Truck Passive Regeneration Activity
 - Properly Working Turbo and EGR Systems
- If any of the above conditions are not satisfied, DPF's will require cleaning or replacement much earlier than 200,000 miles.
- OEM Replacement filters can cost over \$5,000. This makes cleaning or exchange of the DPF the best option for most operators.
- Prices charged for DPF Cleaning range between \$350 and \$500, depending on location and cleaning method used.
- Some manufacturers offer exchange programs in lieu of cleaning, which usually run between \$600 and \$800.

DPF Cleaning Service Aftermarket: Unit Shipment and Revenue Forecasts, Class 4-8 (North America), 2008-2015

	Revenues (US\$ Million)	Units (Million)
2008	24.6	0.06
2012	69.7	0.23
2015	112.1	0.45
CAGR	31.2%	32.8%



Unit shipments for DPF cleaning are considerably higher than that of DPF replacement. This is because more than 95% of diesel trucks that have DPF installed enter the aftermarket for cleaning services as they are more economical in nature.

1. One unit is defined as DPF being cleaned once.
2. Unit shipments and revenues are based on number of diesel retrofits in use, number of class 4-8 DPF installed new diesel trucks in use, average annual miles travelled, average number of DPFs per vehicle, and average service interval. Of the total number of class 4-8 DPF installed new diesel trucks in use as well as retrofits, nearly 95% are expected to enter the aftermarket for regular cleaning services.
3. The DPF cleaning service for Class 4-8 trucks is in the 50,000- 215,000 miles. Range depending upon the duty cycle.
4. The average retail price for DPF cleaning in all of Continental U.S. for 2008 was found to be in the range of \$300-\$500.
5. In 2005 and 2006, unit shipments as well as revenues were insignificant due to a negligible number of retrofits and zero number of EPA 2007 compliant trucks.

Note: All figures are rounded. Source: Frost & Sullivan

Source: Sandeep Kar, Frost & Sullivan, HDAW 2010

Considerations in DPF Cleaning Process:

- > Sufficient burst energy to maximize efficiency of cleaning cycle
 - If using “pulse” system.
 - Air Scan utilizes different technology
- > Initial Mini-Burst Quick Check
 - Identifies some damaged/cracked filters or filters too plugged for proper cleaning without a high temp bake (regeneration)
- > Cleaners can be mobile in the shop with small physical footprint
- > Programmable computer controlled process
 - Programmed to unique OE requirements while allowing “start to end” cleaning without constant technician monitoring
- > Full containment of ash and HEPA filtering of exhaust air

The SPX Solution: High Pressure Air Burst System




- > Co-developed and tested with major Engine OEM's



- > Several adapter/cone configurations to clean DPF's from multiple manufacturer engines.



- > Cleaning efficiency for 13" DPF's approximately 85% with a 10 burst process.
 - Higher for smaller DPF's
 - Higher with additional bursting

Feature/Benefit			
Part Number	OTC 5280	Donaldson DPF Pulse Cleaner	FSX TrapBlaster 7
Price	\$20,750 List	Not provided. Estimated street price of \$15K. When sold with Thermal Regenerator – \$25K	\$44,800 plus cost of air dryer and dust collector
OEM Tested / Recommended?	Yes – Caterpillar, Cummins, Isuzu approved and endorsed	Cummins – approved for retrofit DPF's only (non-regenerating)	Volvo, Paccar - endorsed Cummins – approved
Method of Cleaning	High Pressure Pulse	Low Pressure Pulse	Air Knife
Air tank Size Pressure Rating ASME Certified Tank	Volume = 30+ Gal., WP = 100 psi ASME Certified	Volume = 20 Gal., WP < 15 psi Tank not ASME certified	N/A N/A Unknown
Incoming Air Treatment	Coalescing filter and desiccant dryer to assure completely dry clean and dry air.	Specifies “clean, dry, compressed air source”	Requires additional Air Dryer (not included in price of unit)
Mobility	Locking wheels Built-in Forklift pockets	Adjustable leveling pads No provision for lifting or moving.	None - Stationary

OTC 5281 Diesel Particulate Filter Thermal Processing Unit

- Used to prepare soot-laden filters for cleaning (i.e. non-regenerated filters) by converting soot to ash to ensure maximum efficiency of 5280 cleaning cycles
- Pre-programmed Controller “ramps up” temperature in specific gradients to prevent cracking of filter substrate
- Includes both standard cycle and pre-treat cycle for oil-soaked filters
- Includes 18” stand with optional casters for added mobility (UL requirement)
- Redundant door latch / electronic safety lock for maximum protection of user / shop.
- Includes cordierite shelf and stainless steel tray to protect internal insulation of unit.
- Powered exhaust fan (std 4" exhaust connection)





FSX TrapBurner 7 Thermal Cleaner - Model 1627

- > Programmable Logic Controller with pre-loaded programs matching manufacturer specifications for Cordierite, Silicon Carbide, and oil-soaked filters.
- > Designed for medium volume users – can process 1 DPF every 12 hours, up to 24" long and 18" in diameter.
- > Can process up to 3 standard size class 8 filters every 24 hours, or a larger filter up to 39" long.
- > Top loading for use with overhead crane.

Donaldson DPF Thermal Regenerator

- > Burns soot/hydrocarbons off filter
- > Heating cycle enhanced with low-volume, low-pressure pulse
- > Enclosed cleaning system
- > Collection hopper for ash
- > Built-in safety features
- > Accommodates competitive filters and Donaldson filters (DPF sizes from 11" to 15" diameter and up to 20" long)

OTC 5281 Thermal Processing Unit

- > Pre-programmed Controller “ramps up” temperature in specific gradients to prevent cracking of filter substrate.
- > Redundant door latch / safety lock for maximum protection of user / shop.
- > Includes cordierite shelf and stainless steel tray to protect internal insulation of unit.
- > Powered exhaust fan (std 4" exhaust connection)
- > UL499, UL201, and CE

J-47399 – Horizontal DPF Handler

- > All service shops will need to remove / install DPF's, even if they don't perform the cleaning on site.
- > This will require a safe and efficient means of doing this.

- Universal mounting assembly adjusts front to back a side for easy DPF handling
- Height range of 6-1/2" to 29-1/2"
- Safety strap holds the load securely while moving ab
- Size allows for handling of all known DPF's

SPECIFICATIONS:

Overall Length: 34-1/2"

Overall Width: 19-3/8"

Max. Height: 29-3/4"

Min. Height: 7-1/2"

Side: 30°

Tilt Front: 15°

Back: 15°



Thank You