

Donaldson Diesel Emission Control Systems

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CTA Retrofit Conference
January 31, 2006
www.donaldson.com



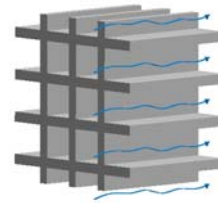
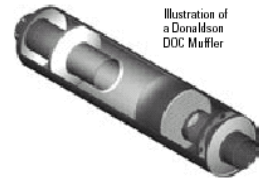
Donaldson DECS Technologies

- Existing CARB Verified Technologies (see www.arb.ca.gov/diesel/verdev/verdev.htm)
 - Level 1 ($\geq 25\%$ PM reduction)
 - Diesel Oxidation Catalyst (DOC) and Closed Crankcase Filtration System (Spiracle)
 - ❖ **New** Level 2 ($\geq 50\%$ PM reduction): Verification request 7/05
Flow through Diesel Multi-stage Filter (DMF) and Closed Crankcase Filtration System (Spiracle)
 - Level 3 ($\geq 85\%$ PM reduction)
 - Diesel Particulate Filter (DPF) Passive Regeneration
- Future CARB Technology Verifications
 - Level 3 ($\geq 85\%$ PM reduction): Target verification request late 2005
 - Active Regeneration DPF system



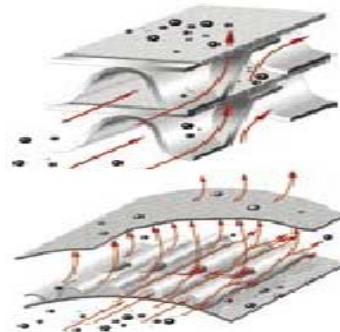
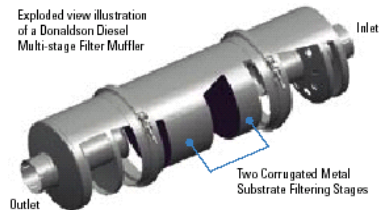
Diesel Oxidation Catalysts (DOC)

- Flow through technology
- About 20% PM reduction
- Very reliable
- Operates with any fuel
- Usually maintenance free
- Allows direct replacement mufflers
- EPA & CARB verified
- 1.0-1.5 hr installation



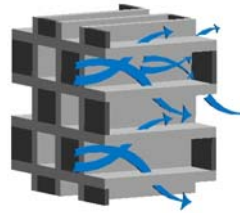
Flow Through Diesel Multi-Stage Filter (DMF)

- Offers CARB Level 2 performance ($\geq 50\%$ reduction)
 - Between DOC and DPF
- Exhaust temperature sensitive
- Requires ULSD fuel
- Resistant to plugging
- Meets NO₂/NO_x regulation



Diesel Particulate Filter (DPF)

- Wall through technology
- 85+% PM reduction
- Exhaust-temperature sensitive → Data-logging required to determine suitability
- Requires ULSD
- Periodic cleaning
- EPA & CARB verified
- 3 hr installation



DPF Cleaning Maintenance

Two-Stage DPF Cleaner System



1st Stage

Pulse Cleaner



2nd Stage

Thermal
Regenerator



Total PM Emissions Control

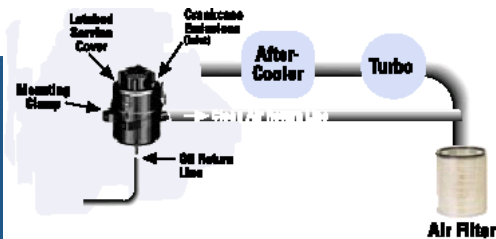
- Both tailpipe and crankcase vents are emission sources
- Open crankcases emit blow-by emissions into the environment
- Crankcase emissions account for a significant amount of particulate matter

Engine Model Year	PM Tailpipe Regulation	PM Crankcase Contribution	
	(g/bhp-hr)	(g/bhp-hr)	Relative %
1988-1990	0.60	0.01-0.04	5%
1991-1993	0.25	0.01-0.04	10%
1994-2006	0.10	0.01-0.04	25%
2007+	0.01	0.01-0.04	50+%

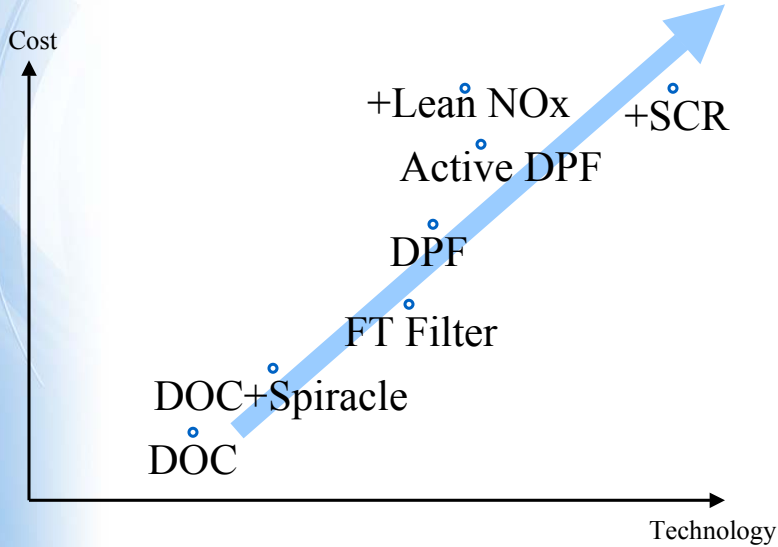


Closed Crankcase Filtration System

- Eliminates emissions from crankcase
- Two stage filter protects engine
- Filter change required every 500 hr
- 2.5-3.0 hr installation



Product Transition



Donaldson DECS Support

- Retrofit Experience
 - School bus ~ 5000
 - Refuse ~ 3000
 - Municipal fleets ~ 1000
 - Urban bus ~ 100s
 - Port Vehicles ~ 600
- CARB/EPA Verified Products
- Fleet Analysis / BACT Assessment
- Technical support
 - Installation manuals, operating guide
- Train, assist or provide installation
- Warranty



Donaldson Information Help

- Contacts
 - Fred Schmidt (National Sales Director)
(952) 887-3835
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 - Chris Dutton (California Representative)
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- Additional Retrofit Information
 - Emissions Resource Center
www.donaldson.com/en/erc

