

Clean Diesel Technology Options

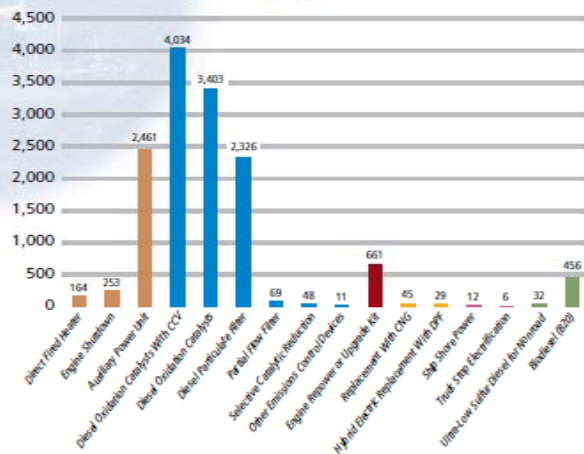
*Dr. Joe Kubsh
Clean Diesel 10
October 2010*

Manufacturers of Emission Controls Association
www.meca.org
www.dieselretrofit.org



DERA Funding Utilizes a Variety of Clean Diesel Technology Options

Figure 7. Technologies Employed in FY 2008 DERA Grants



- Retrofit
- Repower
- Replacement
- Refuel
- Anti-idling & Shorepower



The List of Verified Level 3 Technologies Continues to Expand

- 8 - Active On-Road DPFs (includes one DPF + LNC)
- 7 - Passive On-Road DPFs (includes one DPF + SCR)
- 5 - Active Off-Road DPFs (includes one DPF + LNC)
- 4 - Passive Off-Road DPFs
- 10 - Level 3 Devices for Stationary Engines
- 4 - Level 3 Devices for other applications like TRUs and APUs



Diesel Retrofit Technology – What's Coming

- Marine DOC, CCV, PM & NOx Control Systems
- Locomotive DOC + SCR System
- On-Road DPF with Syn-Gas Regeneration
- On-Road and Off-road DPF + SCR Systems for EGR and non-EGR Engines
- Off-Road and On-road SCR-only Systems for EGR and non-EGR Engines
- On-road DPF, LNT + SCR system for EGR and non-EGR engines



From U.S. EPA's Emerging Technology List

U.S. Diesel Retrofit Technology MECA Sales Survey Results for '07, '08, '09

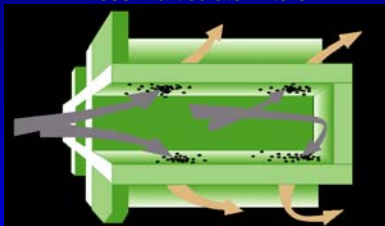
		DPFs	Flow-thru Filters	DOCs	Crankcase Filters
CA	07	3,193	66	305	126
	08	5,390	3	164	22
	09	4,962	0	0	124
Rest of U.S.	07	5,174	411	11,881	5,625
	08	4,640	2,018	12,106	6,892
	09	3,329	2,435	11,906	6,424
Totals	07	8,367	477	12,186	5,751
	08	10,030	2,021	12,270	6,914
	09	8,291*	2,435	11,906	6,548

* 913 DPFs sold into off-road applications, 556 in CA



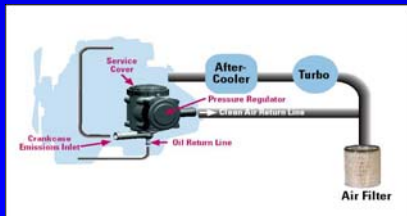
DOCs and DPFs Form the Technology Base for Reducing PM Emissions from US 2007-10 & 2011 Interim Tier 4 On- and Off-Road Diesel Engines

Diesel Particulate Filters

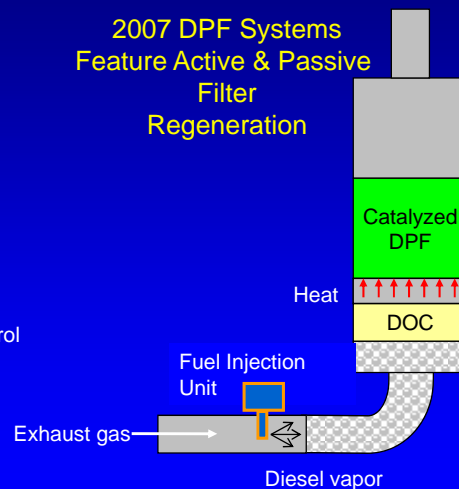


- Significant experience base with LDD in Europe (> 6 M) & HDD retrofits (> 250 K)

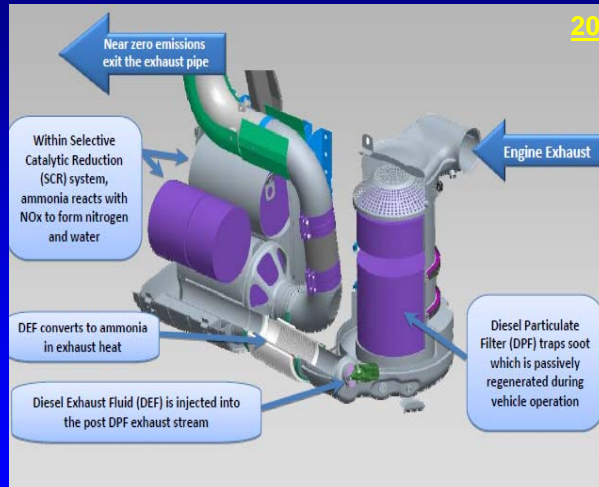
Crankcase Filters Provide Additional PM Control



2007 DPF Systems Feature Active & Passive Filter Regeneration



US 2010 HD Engines Launched with DPF+SCR Systems



2010 DPF+SCR HD System

- Zeolite-based SCR with low NH_3 slip
- Achieves 0.2 g NO_x 2010 EPA standard
- DEF usage of 1.5-2% of diesel fuel usage (10 gal. of DEF for about 5,000 miles)
- Up to 5% lower diesel fuel consumption
- Lower PM load on DPF

Source: Volvo Truck EPA 2010 Presentation



Clean Diesel Technology Challenges

- Ten years of progress, but still millions of legacy diesel engines operating across the U.S.
- Manufacturers continue to invest and expand the options available for reducing PM and NO_x emissions from existing diesel engines.
- Incentives need to be expanded or re-invented to capture more of the health and climate change benefits of clean diesel technologies
- Technology verification continues to be an expensive, slow process that could benefit from more resources at both ARB and EPA. More needs to be done to harmonize verification requirements between these agencies.

