

Retrofit Emission Controls for Off-Road Diesel Engines

Joe Kubsh

Manufacturers of Emission Controls Association [MECA]

ARB Off-Road Fleet Workshops

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www.meca.org

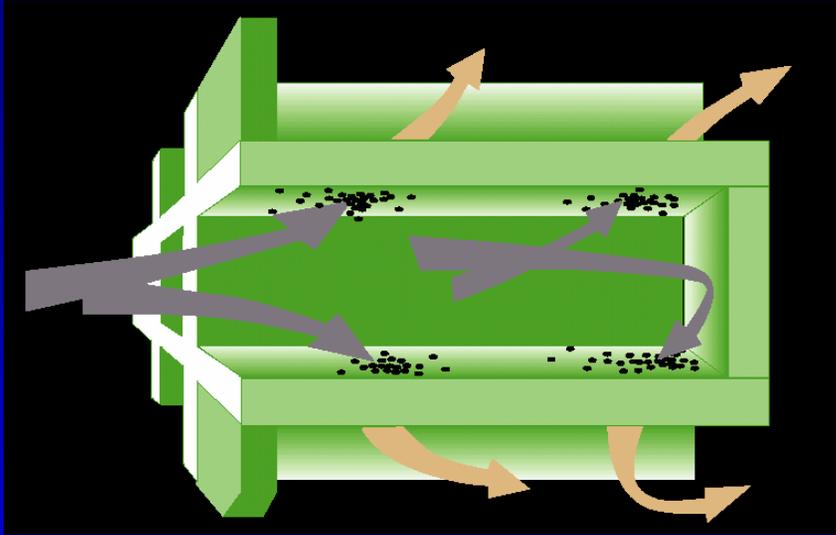
www.dieselretrofit.org



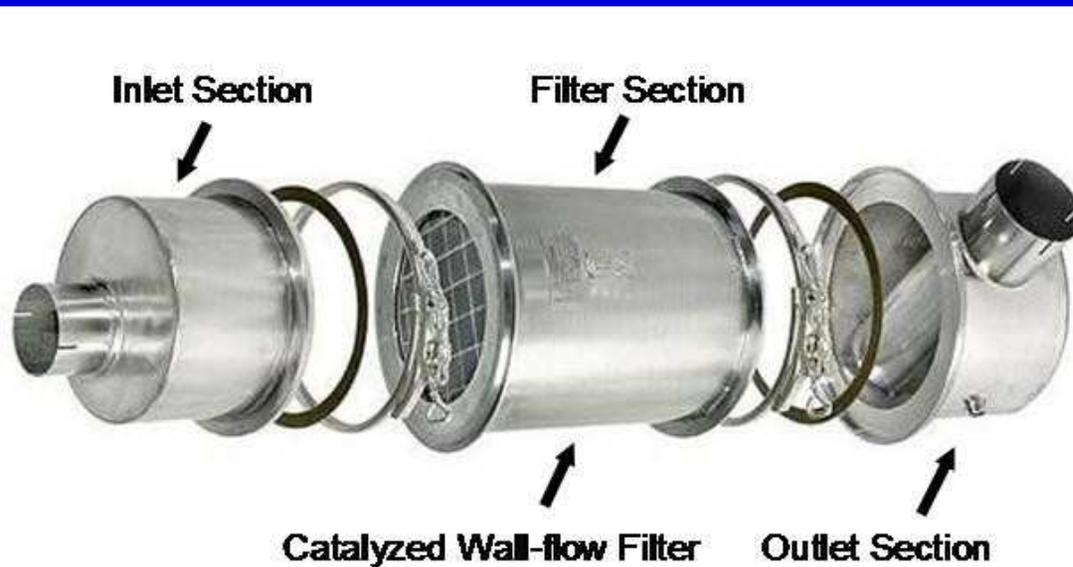
Retrofit Experience is Expanding to Off-Road Vehicle Applications



Wall Flow Filters Offer the Highest Filtration Efficiency



- Level 3 PM reduction (>85%)
- Large reduction in toxics from catalyzed filters
- ARB Level 3 filters include passive & active regen.
- > 200,000 retrofits worldwide
- > 3 Million OE applications
- Same technology as on 2007 OE trucks.



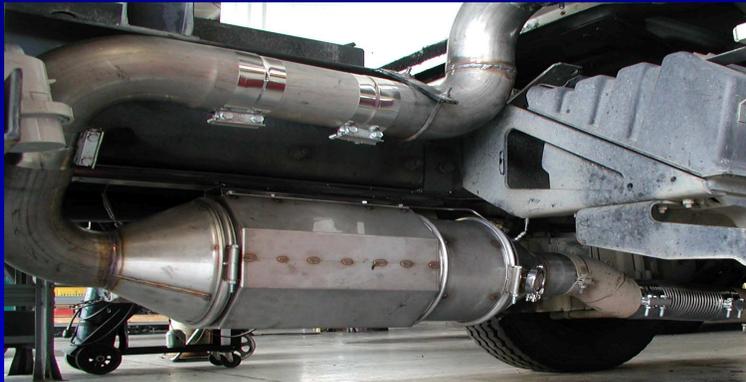
Passively regenerated filters employ catalysts and available exhaust heat to burn captured soot – specified exhaust temp. requirements

MECA

Horizontal and Vertical Filter Installations Possible

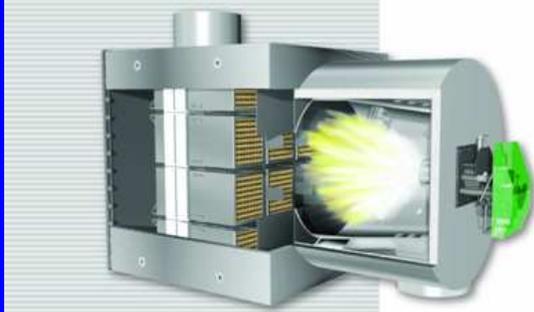


DPFs with Active Soot Regeneration Available for Retrofits



SOOT PARTICLE FILTER SYSTEMS

for mobile diesel engines.
Regeneration without NO₂!



- Example: uncatalyzed wall-flow filter with electrical regeneration
 - 1-8 hour regeneration cycle
- Example: uncatalyzed wall-flow filter with a fuel burner
- Suited for on- and off-road applications with low exhaust temperatures including locomotives & marine engines

Active DPFs in Materials Handling, Construction Equipment, and Locomotives



More Off-Road Retrofits with Active Filters



Backpressure Monitors / Loggers

- BP monitors emerging with added features
 - Extended datalogging capability (1-2 yrs)
 - BP and Temperature
 - Multi-light displays to indicate system faults, warnings and alarm conditions
 - Real time monitoring
- Systems come with software to allow data analysis

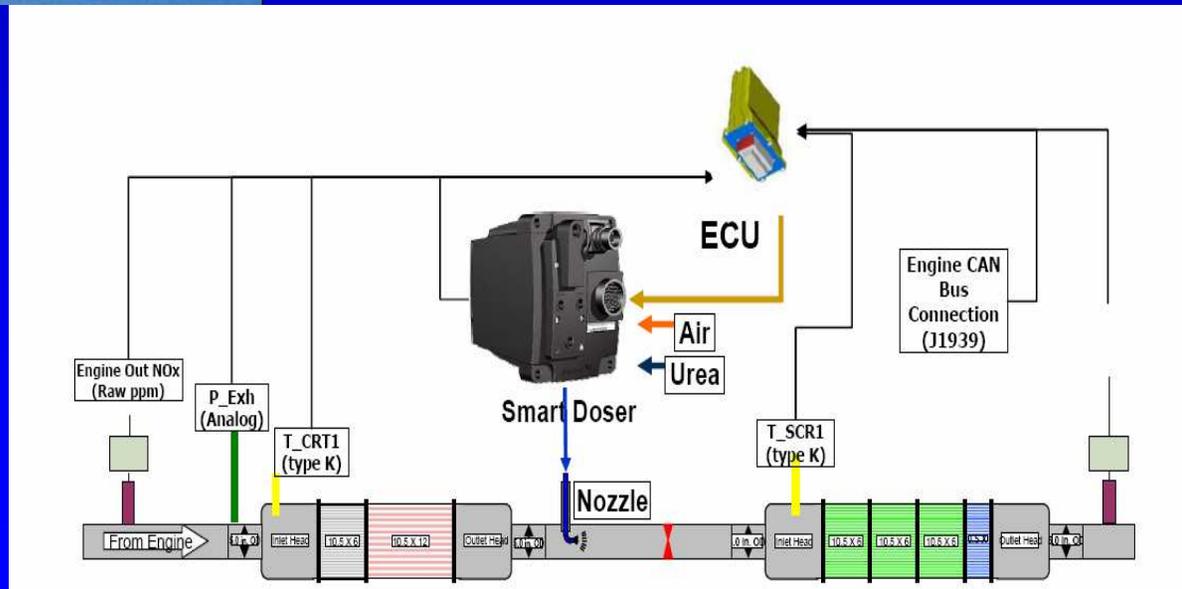


Integrated Solutions for Combined PM/NOx Reductions Emerging for Off-Road Retrofits



Lean NOx Cat. + DPF
25% NOx reduction

**Catalyst-based Filter +
Urea-SCR Catalyst**
70+% NOx reduction



CRTTM Filter

SCR



Off-Road Retrofit Installations of Lean NOx Catalyst + Filter Systems



Air Compressor Retrofit Installation of a Filter + SCR System



SCR Catalysts

CRT™ Filter



Off-Road Retrofit Experience Example: NY City Croton Construction Project

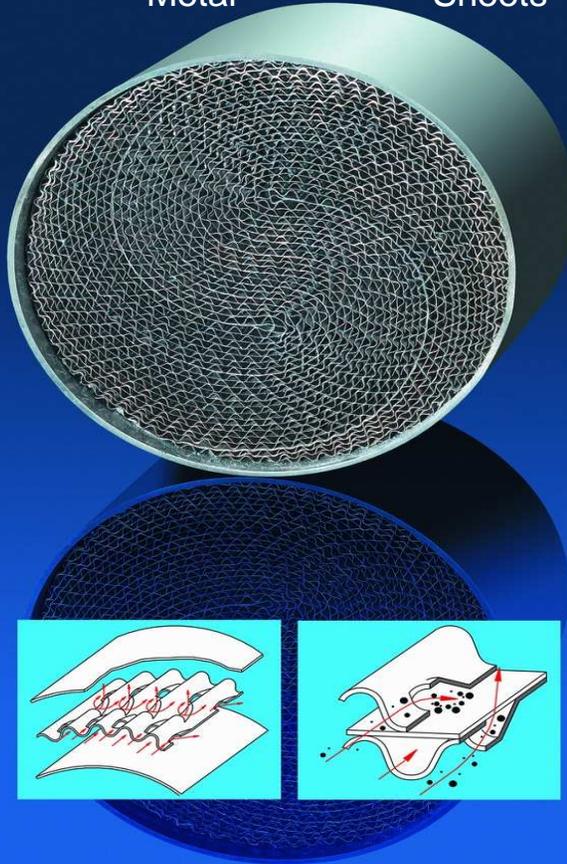


- \$1.5+ billion water treatment plant in the North Bronx; project extends through 2012
- 25-30 non-road machines (Tier 2 & Tier 3 engines)
- ARB or EPA verified retrofit technologies including passive & active DPFs, DPF+SCR system



“Flow-Thru” or “Partial” Filter Technologies Emerging for Diesel Retrofits

Metal Substrate with Sintered
Metal Sheets



Quelle: Emitec / pm_filter_kat1.tif

- 50-75% Level 2 PM reduction
- Can be catalyzed, used with a DOC
- Has applicability on older engines
- Resistant to plugging
- Verifications for off-road may depend on breadth of Level 3 application coverage

Challenges for Off-Road Retrofits

- More diverse engine/equipment application space than on-road
 - skewed toward older equipment
- Lack of preventative equipment maintenance
 - especially air filters, injectors and turbochargers
 - basic inspection and maintenance of installations
- Vibrations
 - can require extensive use of high grade vibration isolators especially in track drive equipment
- Maintaining driver visibility
- User interference with the installation process
 - taking short cuts to get machines done now

Key Considerations for Successful Retrofit Programs

- Application engineering – matching the right technology to the vehicle or equipment
 - Proper professional installation
 - On-vehicle monitors – provide important user feedback on performance
 - Maintenance – vehicles & retrofit equipment require frequent inspections and maintenance; variety of filter cleaning machines available (see MECA Filter Maintenance White Paper at www.dieselretrofit.org or www.meca.org)
- **Successful Retrofits Require a Team Effort Between Fleet Owners, Operators, and Technology Providers**

www.dieselfetrofit.org – your retrofit resource on the web



The screenshot shows the homepage of the MECA website. At the top, there is a navigation menu with links: What's New, What is Retrofit?, Manufacturers, Projects, Funding, News, Useful Documents, Links, and Contact Us. Below the menu is a header banner with the MECA logo and the text "Diesel Retrofit Technology for Clean Air". The main content area features a photograph of a blue semi-truck on a road. To the right of the photo is a text box describing MECA's mission. Below the photo is another text box explaining the website's purpose. To the right of the photo is contact information for MECA, including address, phone, fax, and email. At the bottom of the page, there is a footer with a navigation menu: Home, Site map, What's New, What's New, What is Retrofit?, Manufacturers, Projects, Funding, News, Useful Documents, Links, and Contact Us.

MECA Diesel Retrofit Technology
for *Clean Air*

The purpose of this web site is to provide useful information related to diesel retrofit emission control technology. By making this information available, MECA hopes to assist interested stakeholders in establishing and operating more effective diesel retrofit programs.

The **Manufacturers of Emission Controls Association (MECA)** is a non-profit association incorporated in Washington, DC. MECA's mission is to provide technical information on emission control technology, thereby facilitating the establishment of strong and effective state, federal, and international air quality programs that promote public health, environmental quality, and industrial progress.

For an overview of this website, please refer to our [Site map](#).

For more information, contact MECA:

1730 M Street, NW tel: (202) 296-4797
Suite 206 fax: (202) 331-1388
Washington, DC 20036 e-mail: info@meca.org

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- Technology descriptions
- Contacts for retrofit suppliers
- Case study reports

