Retrofit Emission Controls for Off-Road Diesel Engines

Joe Kubsh
Manufacturers of Emission Controls Association (MECA)
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www.meca.org
www.dieselretrofit.org

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

Horizontal and Vertical Filter Installations Possible

Retrofit Experience is Expanding to Off-Road Vehicle Applications
DPFs with Active Soot Regeneration
Available for Retrofits

- 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

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**

- 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.dieselretrofit.org – your retrofit resource on the web**

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