

Accomplishing BACT

Certification and Verification

- **Engine Certification**
 - vehicle or engine emission standard
 - engine family name
 - Executive Order issued
- **Aftermarket Parts**
 - No negative effect on engine emissions
 - Executive Order issued
- **Verified Diesel Emission Control Strategy**
 - 25 to 85% Diesel PM Reduction
 - DECS family name
 - Executive Order issued

What Is BACT?

- **Retire**
 - Low usage, scrap, sell out of state
- **Repower**
 - 2004 optional standard alternative fuel, gasoline
 - 0.01 g/bhp-hr PM engine
- **Retrofit**
 - Highest level Diesel Emission Control Strategy

ARB Verification Program

- **Protects the municipality and utility**
 - by ensuring after-market diesel emission control strategies obtain claimed emission reductions, and
 - by providing a warranty.
- **Verified products based on model year and engine family**

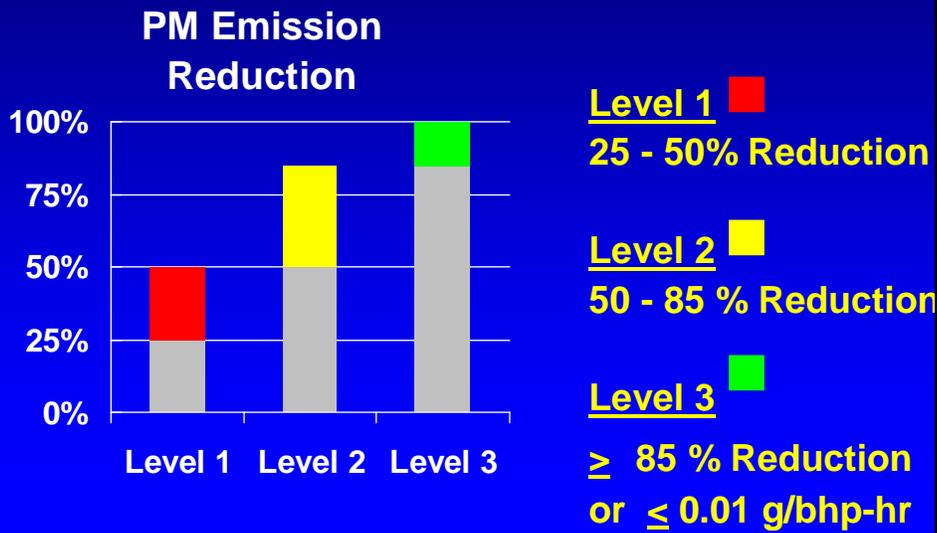
<http://arb.ca.gov/diesel/verdev/home/home.htm>

Diesel Emission Control Strategy Verification Process

- Description of the strategy or device
- Test data, field experience, & test plan
- Durability requirements
 - 50,000 miles or 1,000 hours
- Field demonstration
 - 10,000 miles or 200 hours
- Performance under real-world conditions
- Warranty requirements
 - 150,000 miles for HHD trucks

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PM Verification Levels



Verification of NOx Reductions

- Minimum Verified Reduction: 15%
- Not stand alone

| |
|---------------|
| NOx Reduction |
| $\geq 15\%$ |

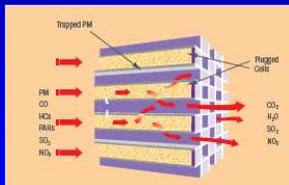
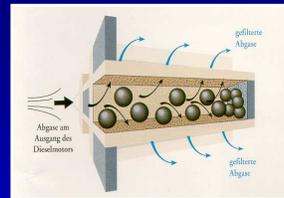


Verified Technology

Level 1 (25 - 50% Reduction)

Diesel Oxidation Catalyst, SCR

9 Systems Verified; Diesel Oxidation Catalysts, some with crankcase filter
1988 and newer on and off road vehicles



Level 2 (50 - 85 % Reduction)

Flow-Through-Filter, DOC, & Emulsified Diesel Fuels

5 Systems Verified; Flow Through Filter, Emulsified Diesel Fuel, & DOC + Em. Fuel 1988 through 2003 on and off road vehicles

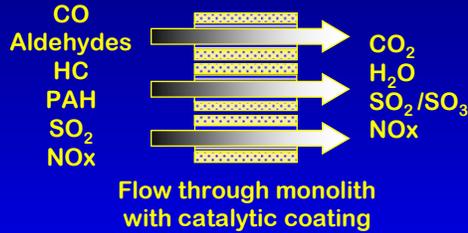
Level 3 (> 85 % Reduction or ≤ 0.01 g/bhp-hr)

Active and Passive Diesel Particulate Filters

13 Systems Verified; All Diesel Particulate Filters
Currently only works on 1994 and newer engines



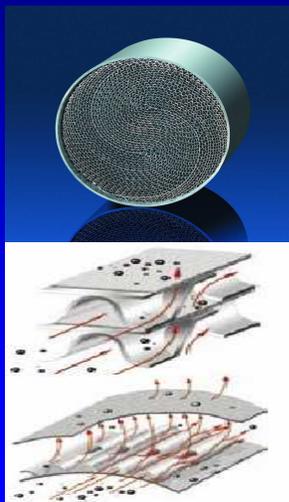
Retrofit Emission Control Technologies: DOCs Have Largest Experience Base



Diesel Oxidation Catalysts

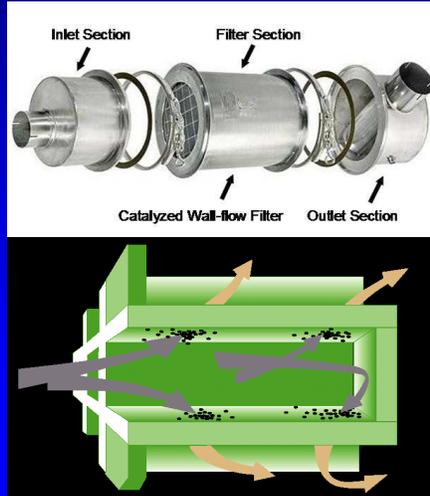
- Level 1 PM Reduction (25-49%)
- Large Reduction in Toxics
 - Carbon monoxide and HC (90%)
- Nearly Universal Application with Millions of Retrofits Worldwide
- Tens of Millions of OE Applications

Flow Through or Partial Flow Particulate Filters



- Level 2 PM Reduction (50-75%)
 - Options include catalyzed filter elements or DOC + uncatalyzed filter
- Has applicability on older engines (e.g., 1991 and newer)
- Minimum exhaust temperature requirements for regeneration
- Filtering achieved with sintered metal sheets (shown) or wire meshes
- Resistant to plugging

Wall Flow Filters Offer the Highest Filtration Efficiency



- Level 3 PM reduction (>85%)
- Large reduction in toxics
With catalyst-based filters
- Many ARB verified level 3 filters have minimum exhaust temperature requirements for regeneration (passive)
- Passive DPFs generally applicable to 1994 and newer engines
- > 200,000 Retrofits worldwide
- > 2 Million OE Applications
- Similar filter technology to new 2007 diesel trucks.

Integrated Solutions for Combined PM/NOx Reductions ARB Verified On-Road Retrofits

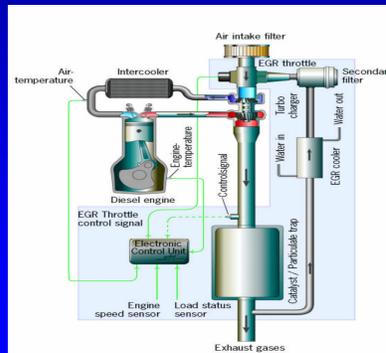
Lean NOx Cat. + DPF
– 25% NOx reduction + Level 3 PM



Emulsified Diesel Fuel + DOC
– 15% NOx reduction + Level 2 PM



Low Pressure EGR + DPF
– 40% NOx reduction + Level 3 PM



What you need to provide

- Engine manufacturer
- Engine model year
- Engine family name
 - Engine label
 - Dealer
 - Manufacturer website
 - Manufacturer helpline
 - DECS installer needs to know prior to installation

What You Should Receive

- Equipment warranty
- Installation warranty
- User manual
- Reporting information

13 CCR 2706(i)

Fleet operator is responsible for BACT

- Provide a vehicle in good working order
- Check BACT before purchasing
 - If not level 3, get documentation
- Check your installation after purchasing
 - DECS label properly installed?

13 CCR 2706(i)

Currently Verified Technologies: Level 3

<http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/cvt.htm>

| PM Level | Product Name | Technology Type | PM Reduction | NOx Reduction | Applicability |
|----------|--|---------------------------|--------------|---------------|---|
| Level 3 | Cleaire Flash and Catch CRT | DPF | 85% | 25% | 1994+ on-road (limited - Cummins off-cycle NOx engines); 15 ppm sulfur diesel. |
| | Cleaire Flash and Catch DPX | DPF | 85% | 25% | 1994+ on-road (limited - Cummins off-cycle NOx engines); 15 ppm sulfur diesel. |
| | Cleaire Horizon | DPF | 85% | N/A | 1994-2005 on-road; 15 ppm sulfur diesel; CARB diesel |
| | Cleaire Longview | Lean NOx Catalyst and DPF | 85% | 25% | 1993-2003 model year on-road; 15 ppm sulfur diesel. |
| | Clean Air Power | CPF | 85% | N/A | Specific 1994-2002 Power System Associates and Caterpillar bifuel engines on-road; 15 ppm sulfur diesel. |
| | CleanAIR Systems PERMIT | DPF | 85% | N/A | Stationary emergency generators; 15 ppm sulfur diesel. |
| | Donaldson DPM | DPF | 85% | N/A | 1993-2004 on-road; 15 ppm sulfur diesel. |
| | International Truck and Engine Corporation DFX | DPF | 85% | N/A | 1994-2003 on-road Navistar (International); 15 ppm sulfur diesel. |
| | Johnson Matthey CRT | DPF | 85% | N/A | 1991-2006 on-road; 2002-2006 Cummins ISM and ISB with EGR; 15 ppm sulfur diesel; B20. Stationary emergency and prime generators. Conditionally verified for stationary pumps. |

What You Should Receive: Reporting Information

- DECS manufacturer
- DECS family name
- DECS serial number
- Date installed
- Reason (if Level 1 or Level 2 DPF is installed instead of Level 3 DPF)
- Installation of legible label

Diesel Emission Control Strategy Family Name

CA/MMM/YYYY/PM#/N##/APP/XXXXX

CA: California verified strategy

MMM: Manufacturer code, usually the company's initials

YYYY: Year of verification

PM#: Level of PM reduction (Level 1, 2, or 3)

N##: Level of NOx reduction, if any

APP: Application or use such as stationary (ST), on-road (ON) or off-road (OF)

XXXXX: Alphanumeric code issued by the E.O.