



# Voluntary Diesel Retrofit Program

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[EPA Home](#) > [Transportation and Air Quality](#) > [Voluntary Diesel Retrofit](#) > [Technology](#) > Verified Products

- Overview
- Technology
- Your Fleet
- Air Quality
- Idling Reduction
- School Buses
- Contacts
- Latest News
- Retrofit Home

## Verified Products

[National Clean Diesel Campaign: EPA creates new campaign to reduce pollution from diesel engines](#)

### Verified Technology List

**Key Topics:**  
[Technology](#)

[Verification Process](#)

[Testing Protocols](#)




[In-use Testing](#)

[Technical Summary](#)

Verified Products

[Cost Survey](#)

This table summarizes all the diesel retrofit technologies that the U.S. Environmental Protection Agency (EPA) has approved for use in engine retrofit programs. Select the manufacturer link to learn more about the retrofit technology and its operating criteria. The table shows the percent reduction (of verified or tested levels) that EPA will recognize for emission reductions for each technology. See the [retrofit manufacturers contact](#) page for more information on these manufacturers.

Verified Retrofit Technologies						
Manuf.	Technology	Applicability	Reductions (%)			
			PM	CO	NOx	HC
<a href="#">Caterpillar, Inc.</a>	Catalyzed Converter/Muffler (CCM)	Highway, heavy-heavy and medium-heavy duty, 4-cycle, non-EGR, model year 1998 - 2003, turbocharged or naturally aspirated	20	20	na	40
<a href="#">Caterpillar, Inc.</a>	Diesel Particulate Filter	Nonroad, 4-cycle, non-EGR equipped, model year 1996-2005, turbocharged engines with power ratings 130 ≤ KiloWatts < 225 (174.2 ≤ Horsepower < 301.5)	89	90	na	93
<a href="#">Clean Diesel Technologies, Inc.</a> 	Platinum Plus Purifier System (fuel borne catalyst plus DOC)	Highway, medium-heavy and heavy-heavy duty, 4 cycle, model year 1988 - 2003, turbocharged or naturally aspirated	25 to 50	16 to 50	0 to 5	40 to 50
<a href="#">Clean Diesel Technologies, Inc.</a> 	Platinum Plus Fuel Borne Catalyst/Catalyzed Wire Mesh Filter (FBC/CWMMF) System	Highway, medium-heavy duty, 4 cycle, model year 1991 - 2003, non-EGR, turbocharged or naturally aspirated	55 to 76*	50 to 66*	0 to 9*	75 to 89*
<a href="#">Donaldson</a> 	Series 6000 DOC & Spiracle (closed crankcase filtration system)	Highway, heavy-heavy and medium-heavy duty, 4 cycle, non-EGR, model year 1991 - 2003, turbocharged or naturally aspirated	25 to 33 <sup>a</sup>	13 to 23	n/a	50 to 52
<a href="#">Donaldson</a>		Highway, heavy-heavy and medium-heavy duty, 4 cycle,				

	Series 6100 DOC	non-EGR, model year 1991 - 2003, turbocharged or naturally aspirated	20 to 26	38 to 41	n/a	49 to 66
<a href="#">Donaldson</a> 	Series 6100 DOC & Spiracle (closed crankcase filtration system)	Highway, heavy-heavy and medium-heavy duty, 4 cycle, non-EGR, model year 1991 - 2003, turbocharged or naturally aspirated	28 to 32 <sup>a</sup>	31 to 34	n/a	42
<a href="#">Engelhard</a>	DPX Catalyzed Diesel Particulate Filter	Highway, heavy-duty, 4 cycle, model year 1994 - 2002, turbocharged or naturally aspirated	60	60	n/a	60
Engelhard	CMX Catalyst Muffler	Heavy Duty, Highway, 2 cycle engines	20	40	n/a	50
Engelhard	CMX Catalyst Muffler	Heavy Duty, Highway, 4 cycle engines	20	40	n/a	50
<a href="#">Engine Control Systems</a> 	Purifier - Diesel Particulate Filter	Highway: Heavy Heavy-Duty, Medium Heavy-Duty; Urban Bus; 4 cycle; model years 1994 - 2003; turbocharged or naturally aspirated; non-EGR engines	90	75	n/a	85
<a href="#">Engine Control Systems</a>	AZ Purimuffler or AZ Purifier Diesel Oxidation Catalyst with Low Sulfur Diesel Fuel (30 ppm S max)	Highway Medium Heavy-duty, 4- cycle, model years 1991 - 2003 Cummins and Navistar/International engines originally manufactured without any aftertreatment which are turbocharged or naturally aspirated, non-EGR engines	40	40	n/a	70
<a href="#">Engine Control Systems</a>	AZ Purimuffler or AZ Purifier Diesel Oxidation Catalyst with Low Sulfur Diesel Fuel (30 ppm S max)	Highway Heavy Heavy-Duty, 4-cycle, model years 1991 - 1993 Cummins engines originally manufactured without exhaust aftertreatment which are turbocharged or naturally aspirated, non-EGR engines	35	40	n/a	70
Engine Control Systems	AZ Purimuffler AZ Purifier	Heavy Duty, Highway, 2 cycle engines	20	40	n/a	50
Engine Control Systems	AZ Purimuffler AZ Purifier	Heavy Duty, Highway, 4 cycle engines	20	40	n/a	50
<a href="#">International Truck &amp; Engine Corp.</a>	Green Diesel Technology-Low NOx Calibration plus Diesel Oxidation Catalyst with Ultra Low Sulfur Diesel (ULSD)	Highway Light Heavy-Duty, 4-cycle, Navistar/International engines, model years 1999 - 2003 in the following families: XNVXH0444ANA, YNVXH0444ANB, 1NVXH0444ANB, 2NVXH0444ANB, 3NVXH0444ANB	0 to 10	10 to 20	25	50
<a href="#">Johnson Matthey</a>	Catalyzed Continuously Regenerating Technology (CCRT) Particulate Filter	Highway, heavy-heavy, medium-heavy, light-heavy duty, urban bus, 4-cycle, non-EGR model year 1994 - 2003, turbocharged or naturally aspirated engines.	60	60	n/a	60
	Continuously	Heavy Duty, Highway, 2 & 4				

<a href="#">Johnson Matthey</a>	Regenerating Technology (CRT) Particulate Filter	cycle, model year 1994 - 2002, turbocharged or naturally aspirated engines	60	60	n/a	60
<a href="#">Johnson Matthey</a>	CEM™ Catalytic Exhaust Muffler and/or DCC™ Catalytic Converter	Highway, heavy-heavy, medium-heavy, light-heavy duty, non-urban bus, 4-cycle, non-EGR model year 1991 - 2003, turbocharged or naturally aspirated engines	20	40	n/a	50
Johnson Matthey	CEM Catalyst Muffler	Heavy Duty, Highway, 2 cycle engines	20	40	n/a	50
<a href="#">Lubrizol</a>	PuriNOx Water emulsion fuel	Heavy Duty, Highway & Non-road, 2 & 4 cycle	16 to 58	-35 to 33	9 to 20	-30 to -120
Various	<a href="#">Biodiesel</a> (1 to 100%)	Heavy Duty, Highway, 2 & 4 cycle	0 to 47	0 to 47	0 to -10	0 to 67
Various	<a href="#">Cetane Enhancers</a>	Heavy Duty, Highway, 4 cycle, non-EGR-equipped	n/a	n/a	0 to 5	n/a

<sup>a</sup> - Total PM reduction figures reflect reductions from both tailpipe and crankcase emissions.

\* - These effectiveness figures are provisional values subject to change pending final review of the test data.

Note: For after-treatment devices the reductions are based on the installation of retrofits to engines that were originally produced without diesel oxidation catalysts or diesel particulate filters.

### Memorandum of Agreement (MOA) with California Air Resources Board (ARB)

The Environmental Protection Agency's (EPA's) Voluntary Diesel Retrofit Program signed a Memorandum of Agreement (MOA) [ [200KB PDF](#) ] with the State of California Air Resources Board (ARB) for the Coordination and Reciprocity in Diesel Retrofit Device Verification. The MOA establishes reciprocity in verifications of hardware or device-based retrofits, and further reinforces EPA's and ARB's commitment to cooperate on the evaluation of retrofit technologies. This agreement commits EPA and ARB to work toward accepting particulate matter (PM) and oxides of nitrogen (NOx) verification levels assigned by the other's verification programs. Additionally, as retrofit manufacturers initiate and conduct in-use testing, EPA and ARB agreed to coordinate this testing so data generated may satisfy the requirements of each program. This MOA is intended to expedite the verification and introduction of innovative emission reduction technologies. Additionally, this MOA should reduce the effort needed for retrofit technology manufacturers to complete verification.

In addition to the above list of EPA verified retrofit technologies, EPA recognizes and accepts those retrofit hardware strategies or device-based systems that have been verified by the California Air Resources Board (CARB). Information about CARB's Verification Program and their list of verified technologies can be found at the ARB verification page, <http://www.arb.ca.gov/diesel/verdev/verdev.htm> [EXIT disclaimer](#)

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 URL: <http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm>