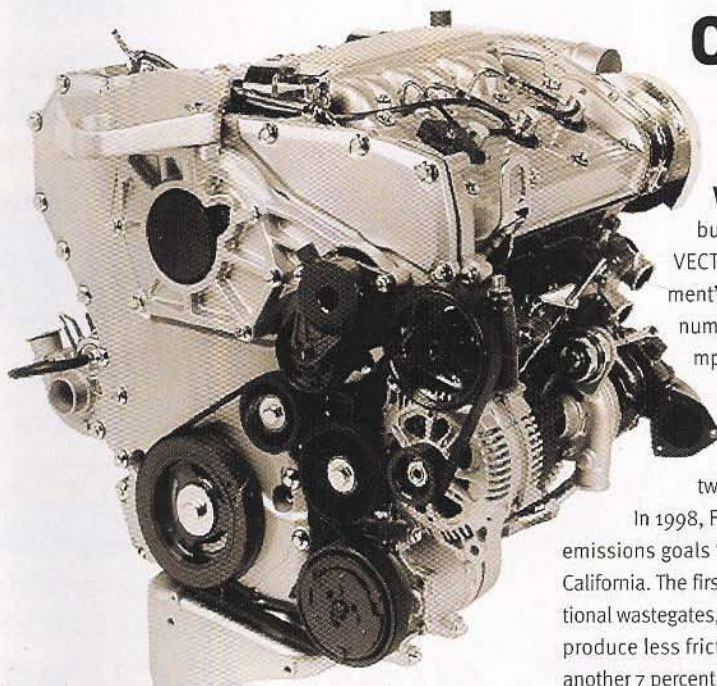


# THE NEW DIESELS

**COMING SOON:**  
POWERFUL ENGINES  
FOR LIGHT TRUCKS  
AND SUVS

**T**his is an exciting time for people who want to drive diesel trucks. The engines under the hoods of  $\frac{3}{4}$ - and 1-ton trucks are the most powerful and cleanest ever, and  $\frac{1}{2}$ -ton trucks will soon get the benefits of the technology behind the Cummins, Duramax, and Power Stroke turbodiesel engines we've all come to love. Here are some of the engines that have been developed in the past decade that we'd like to see in a  $\frac{1}{2}$ -ton pickup, SUV, or even a large car.



## CATERPILLAR/FORD 3.0L, V-6 HSDI

**WE'RE NOT SURE WHAT HAPPENED TO THIS ENGINE,** but like the Cummins V-6/V-8 and the Detroit Diesel Delta and VECTOR engines, it was developed to meet the goals of the government's Light Truck Clean Diesel program that "seeks to introduce large numbers of advanced-technology diesel engines that would improve mpg by at least 50 percent and reduce our nation's dependence on foreign oil." The development of the High Speed Direct Injection (HSDI) engine started with a partnership between Ford and Caterpillar designed to produce a Ford F-150 that would get twice the fuel economy of one using the 4.6L, V-8 gasser.

In 1998, Ford's participation was reduced as Caterpillar aimed at strict LEV 2 emissions goals that are nearly as tough as the current Bin 2 Tier 5 rules used in California. The first version of the HSDI engine used twin turbochargers with conventional wastegates, but it was determined that a single variable-geometry turbo would produce less friction in the engine at high speeds and improve fuel economy by another 7 percent.

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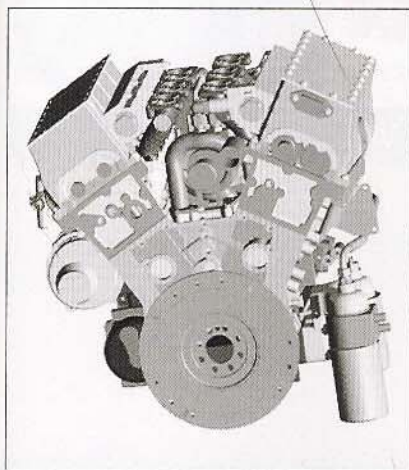
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While the relatively low-pressure Hydraulic Electronic Unit Injection (HEUI) fuel system limits power, fuel economy, and emissions, Cat already uses high-pressure, common-rail systems on its big Acert engines, and that



REAR VIEW OF ENGINE

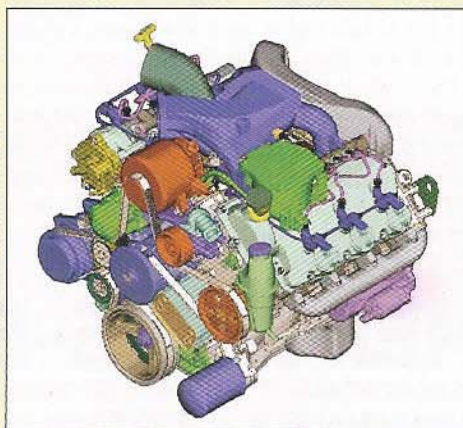
technology could make the HSDI cleaner and more efficient. It's a long shot, but we'd love to see a bright-yellow Caterpillar engine show up under the hood of a 1/2-ton truck (or maybe the Lincoln Town Car mentioned in the early stages of development).

## CATERPILLAR/FORD 3.0L, V-6 HSDI

- **DISPLACEMENT:** 3.0L
- **CONFIGURATION:** 60-degree V-6
- **HORSEPOWER:** 170 at 4,000–4,500 rpm
- **TORQUE:** 296 lb-ft at 2,000–2,500 rpm
- **HIGHWAY ECONOMY:** 29 mpg
- **CITY ECONOMY:** 23 mpg
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Cast iron (CGI possible)
- **BORE AND STROKE (IN.):** N/A
- **VALVETRAIN:** DOHC 24-valve
- **FUEL SYSTEM:** HEUI
- **TURBO(S):** Twin VGT or single VGT
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** N/A
- **POTENTIAL PLATFORMS:** Toyota Tundra; Ford F-150; Nissan Titan; Lincoln Town Car

# CUMMINS/CHRYSLER CUMMINS 4.2L V-6 AND 5.6L V-8

**THE DESIGN OF THE NEW CUMMINS V-6 AND V-8 ENGINES BEGAN BACK IN 1997** and has progressed to the point that the engines will soon be appearing in Chrysler vehicles such as the Jeep Wrangler and Dodge Ram 1500. Early on in the DOE clean-diesel project, engineers were confident that “there definitely exists a path to market for the light-truck diesel.” That belief led them to design fully functional engines that make more than 400 lb-ft of torque while getting 25 mpg and meeting the new emissions regulations. The 90-degree layout implies the engines were designed around the V-8 version, but the V-6 could save Chrysler sales if the company puts it under the hoods of the already popular Chrysler 300C or the Dodge Magnum or Charger and slaps a “Clean Cummins” badge on the front fenders.



## CUMMINS 4.2L, V-6 DIESEL

- **DISPLACEMENT:** 4.2L (256 ci)
- **CONFIGURATION:** 90-degree V-6
- **HORSEPOWER:** 270 at 3,800 rpm
- **TORQUE:** 420 lb-ft at 1,700–3,200 rpm
- **HIGHWAY ECONOMY:** 25 mpg
- **CITY ECONOMY:** 20 mpg
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Cast iron or CGI
- **BORE AND STROKE (IN.):** 3.70 x 3.94
- **VALVETRAIN:** SOHC 24-valve
- **FUEL SYSTEM:** High-pressure common-rail
- **TURBO:** Variable geometry
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** 663 lbs.
- **POTENTIAL PLATFORMS:** Dodge Ram 1500, Durango, Dakota, Charger, Magnum; Jeep Wrangler; and Chrysler 300C

## CUMMINS 5.6L, V-8 DIESEL

- **DISPLACEMENT:** 5.6L (342 ci)
- **CONFIGURATION:** 90-degree V-8
- **HORSEPOWER:** 300 at 4,000 rpm
- **TORQUE:** 460 lb-ft at 2,000 rpm
- **HIGHWAY ECONOMY:** 25 mpg
- **CITY ECONOMY:** 20 mpg
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Cast iron or CGI
- **BORE AND STROKE (IN.):** 3.70 x 3.94
- **VALVETRAIN:** SOHC 32-valve
- **FUEL SYSTEM:** High-pressure common-rail
- **TURBO:** Variable geometry
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** 788 lbs.
- **POTENTIAL PLATFORMS:** Dodge Ram 1500, Durango, Dakota, and may also be the base engine for Ram 2500 and 3500



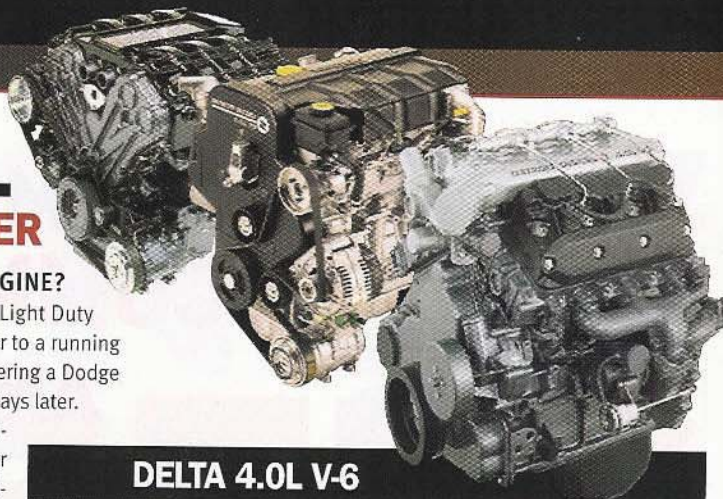
# DETROIT DIESEL

## 4.0L V-6 DELTA/3.0L V-6 VECTER

### WHAT HAPPENED TO THE DETROIT DIESEL DELTA ENGINE?

That's a good question. It was designed for the government's Light Duty Clean Diesel program and progressed from a clean sheet of paper to a running engine in only 228 days. Just 12 weeks later, the engine was powering a Dodge Durango, and that package was on display for journalists only 18 days later.

In this short amount of time, Detroit Diesel was able to build a high-pressure, common-rail engine that rivals the others on this list for power output, low noise levels, and greatly reduced emissions (including a patented EGR cooler design). In tests using that Durango, the Detroit Diesel team more than doubled the highway fuel-economy numbers by getting 30 mpg with the diesel compared with just 14 mpg in the 5.2L V-8 gas engine—and that was using a single common-rail for all cylinders. The 4.0L Delta eventually led to a more refined 3.0L VECTER V-6 with dual overhead camshafts, two common rails, a side-mounted turbo, and intake passages built into the valve covers (does that sound familiar to fans of the new 4.5L Duramax?). The VECTER is a bit of a mystery, but we fear it was shelved when DaimlerChrysler took over Detroit Diesel in favor of the Mercedes-Benz engine that's now being used in the Jeep Grand Cherokee.



### DELTA 4.0L V-6

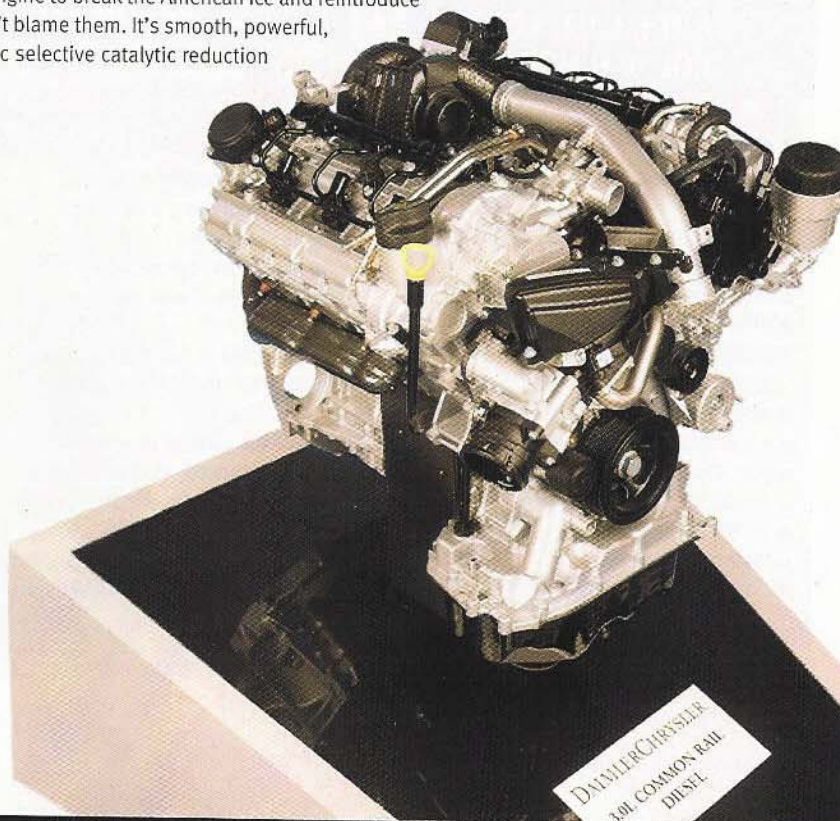
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| ■ <b>DISPLACEMENT:</b> 4.0L (246 ci)        | ■ <b>VALVETRAIN:</b> SOHC 24-valve   |
| ■ <b>CONFIGURATION:</b> 60-degree V-6       | ■ <b>FUEL SYSTEM:</b> High-pressure common-rail (single rail)                |
| ■ <b>HORSEPOWER:</b> 230 at 4,000 rpm       | ■ <b>TURBO(S):</b> Twin VGT or single VGT                                    |
| ■ <b>TORQUE:</b> 375 lb-ft at 2,000 rpm     | ■ <b>INTERCOOLER:</b> Air-to-air   |
| ■ <b>HIGHWAY ECONOMY:</b> 30 mpg            | ■ <b>ENGINE WEIGHT:</b> 639 lbs.   |
| ■ <b>CITY ECONOMY:</b> 22 mpg               | ■ <b>POTENTIAL PLATFORMS:</b> Dodge Durango, Dakota, Ram 1500; Jeep Wrangler |
| ■ <b>HEAD MATERIAL:</b> Cast iron           |  |
| ■ <b>BLOCK MATERIAL:</b> Cast iron          |  |
| ■ <b>BORE AND STROKE (IN.):</b> 3.62 x 3.98 |  |

# MERCEDES-BENZ 3.0L V-6 CRD

**THIS ENGINE HAS A LEG UP ON ALL THE OTHERS ON THIS LIST BECAUSE IT'S ALREADY BEING USED IN THE REAL WORLD UNDER THE HOODS** of a Jeep, the Dodge Sprinter, and various Mercedes-Benz cars and SUVs. We were extremely impressed with the performance and refinement of this engine when we tested the '07 Jeep Grand Cherokee 3.0L CRD ("First Drive," Nov. '07), which made all of the advertised 376 lb-ft of torque at the wheels, clicked off low-16-second quarter-mile times (15s, if you correct for altitude), and barely made more noise than a gas engine. It appears Mercedes-Benz will be using this engine to break the American ice and reintroduce diesel engines to the luxu-cruiser crowd, and we can't blame them. It's smooth, powerful, efficient, and will be 50-state clean when the Bluetec selective catalytic reduction (SCR) system is in place.

### MBZ 3.0L CRD

- **DISPLACEMENT:** 3.0L (182 ci)
- **CONFIGURATION:** 72-degree V-6
- **HORSEPOWER:** 215 at 3,800 rpm
- **TORQUE:** 376 lb-ft at 1,600–2,800 rpm
- **HIGHWAY ECONOMY:** 24 mpg
- **CITY ECONOMY:** 20 mpg
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Cast aluminum with iron cylinder liners
- **BORE AND STROKE (IN.):** 3.27 x 3.62
- **VALVETRAIN:** DOHC 24-valve
- **FUEL SYSTEM:** High-pressure common-rail
- **TURBO:** Variable geometry
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** 500 lbs.
- **POTENTIAL PLATFORMS:** MBZ E-class, ML-class, GL-class, R-class; Dodge Sprinter; Jeep Grand Cherokee



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# FORD/PSA

## LION V-6/V-8

IN 1998, THE SAME YEAR IT REDUCED ITS ROLE IN THE CATERPILLAR LIGHT TRUCK Clean Diesel program, Ford along with PSA Peugeot Citroën signed a large agreement to design and build four families of common-rail, direct-injection diesel engines. The third phase of the partnership produced the Lion family of 60-degree V-engines that debuted in the European Jaguar S-type as a dual-turbo 2.7L (AJD-V6) that gets 49 mpg on the highway.



That engine also found its way into the Land Rover Discovery and Range Rover Sport as the TDV6 along with an eight-cylinder version dubbed the TDV8. While that V-8 involved little more than adding two cylinders, the version that will likely be used in the next Ford F-150 adds two cylinders along with a longer stroke to increase the displacement to 4.4L, which should be good for around 350 hp and 500 lb-ft of torque. The longer stroke should also help the engine

burn cleaner, although it will probably still need a urea-injection system to meet '10 rules. In addition to the next generation of F-150 pickups, there's a good chance you'll be able to get the 4.4L V-8 diesel in the Expedition—and possibly in the Explorer. As long as we're making a wish list, let's dream about owning a Ford Escape with the 2.7L V-6 or a Mustang that's packing the 3.6L, twin-turbo V-8.

### 2.7L LION V-6

(JAGUAR AJD-V6, LAND ROVER TDV6)

- **DISPLACEMENT:** 2.7L (166 ci)
- **CONFIGURATION:** 60-degree V-6
- **HORSEPOWER:** 207 at 4,000 rpm
- **TORQUE:** 320 lb-ft at 1,900 rpm
- **HIGHWAY ECONOMY:** 49 mpg
- **CITY ECONOMY:** 27 mpg
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Compacted graphite iron (CGI)
- **BORE AND STROKE (IN.):** 3.19 x 3.47
- **VALVETRAIN:** DOHC 24-valve
- **FUEL SYSTEM:** High-pressure common-rail with piezo injectors
- **TURBO(S):** Twin VGT (AJD-V6) or single VGT (TDV6)
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** 445 lbs.
- **POTENTIAL PLATFORMS:** Jaguar S-Type; Ford Taurus, Escape; Lincoln LS

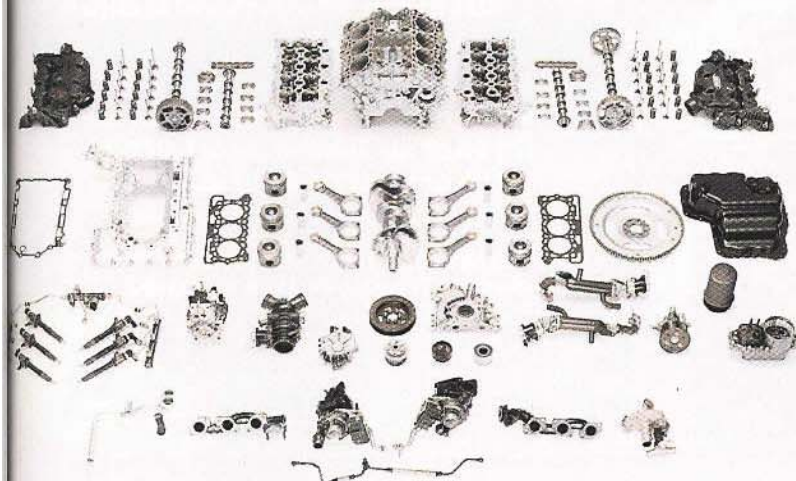
### 3.6L LION V-8

(LAND ROVER TDV8)

- **DISPLACEMENT:** 3.6L (222 ci)
- **CONFIGURATION:** 60-degree V-8
- **HORSEPOWER:** 272 at 4,000 rpm
- **TORQUE:** 472 lb-ft at 1,900 rpm
- **HIGHWAY ECONOMY:** 26 mpg
- **CITY ECONOMY:** 16 mpg
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Compacted graphite iron (CGI)
- **BORE AND STROKE (IN.):** 3.19 x 3.47
- **VALVETRAIN:** DOHC 32-valve
- **FUEL SYSTEM:** High-pressure common-rail with piezo injectors
- **TURBO(S):** Twin VGT
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** N/A
- **POTENTIAL PLATFORMS:** Range Rover Sport; Land Rover LR3; Ford Mustang

### 4.4L LION V-8

- **DISPLACEMENT:** 4.4L (296 ci)
- **CONFIGURATION:** 60-degree V-8
- **HORSEPOWER:** 350
- **TORQUE:** 500 lb-ft
- **HIGHWAY ECONOMY:** N/A
- **CITY ECONOMY:** N/A
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Compacted graphite iron (CGI)
- **BORE AND STROKE (IN.):** 3.19 x 4.63
- **VALVETRAIN:** DOHC 32-valve
- **FUEL SYSTEM:** High-pressure common-rail with piezo injectors
- **TURBO(S):** Twin VGT
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** N/A
- **POTENTIAL PLATFORMS:** Ford F-150, Explorer, Expedition; Range Rover; Land Rover Discovery; may also be the base engine for Super Dutys





## VM MOTORI S.P.A. RA 630 DOHC

ITALIAN ENGINE BUILDER VM MOTORI GAINED A LOT OF ATTENTION when the Jeep Liberty diesel showed up in the U.S. with a 295-lb-ft, common-rail, 2.8L diesel under the hood for '05 and '06. While Jeep ditched the Italian motor in favor of a Mercedes-built oil-burner for the new Grand Cherokee, General Motors snapped up 50 percent of the company. The General quickly announced this new 24-valve, 3.0L, RA 630 DOHC for use in the second-generation Cadillac CTS—even the Caddies coming to the U.S. in '10.

The engine is designed to make 406 lb-ft of torque, which is more than

the Corvette engine in the special-edition CTS-V, and will rev smoothly to 4,000 rpm while making 250 hp. The engine has all the emissions equipment required to meet 50-state standards, including cooled EGR, an intake throttle, a variable-geometry turbo, a DPF in the exhaust, and piezo cylinder-pressure sensors. That last item should allow GM to fine-tune fueling for quiet and strong combustion events. VM Motori packaged the lightweight engine so it can be transversely or longitudinally mounted in different vehicles, which means we'll probably be seeing it in a lot more cars and trucks than just the CTS.

### RA 630 DOHC 24-V

- **DISPLACEMENT:** 3.0L/2.9L (182 ci)
- **CONFIGURATION:** 60-degree V-6
- **HORSEPOWER:** 250 at 4,000 rpm
- **TORQUE:** 406 lb-ft at 2,000 rpm
- **HIGHWAY ECONOMY:** N/A
- **CITY ECONOMY:** N/A
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Compacted graphite iron (CGI)
- **BORE AND STROKE (IN.):** 3.27 x 3.56
- **VALVETRAIN:** DOHC 24-valve
- **FUEL SYSTEM:** High-pressure common-rail with piezo injectors
- **TURBO:** Fixed or variable geometry
- **INTERCOOLER:** Air-to-air
- **ENGINE WEIGHT:** 485 lbs.
- **POTENTIAL PLATFORMS:** Cadillac CTS;

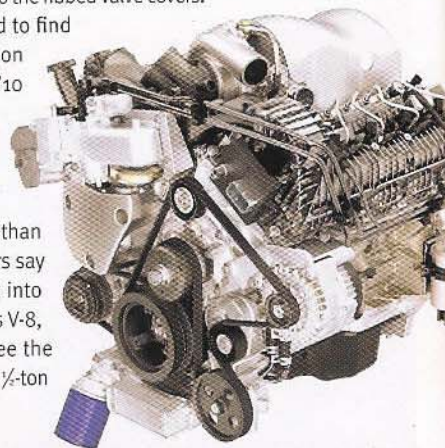
Chevy Malibu, Colorado; GMC Canyon; Hummer H3



## GENERAL MOTORS 4.5L, V-8 DURAMAX

IN ADDITION TO TEAMING WITH ITALIAN ENGINE BUILDERS TO PUT A diesel in the Cadillac CTS, General Motors has been working on its own diesel to power the popular Silverado/Sierra 1500 and Hummer H2. Not much information has been released yet, but we can't wait to find out more about the integrated camshaft covers/intake manifold that appears to route air from the intercooler into the ribbed valve covers.

We're not very excited to find out the engine will rely on urea injections to meet '10 emissions rules, but it's supposed to create 90 percent less NO<sub>x</sub> than current diesel engines and 13 percent less CO<sub>2</sub> than a gasoline V-8. Engineers say the lil' Duramax will fit into the same space as a gas V-8, so you can expect to see the engine primarily in GM's ¾-ton trucks and SUVs. **DP**



### 4.5L DURAMAX V-8

- **DISPLACEMENT:** 4.5L (275 ci)
- **CONFIGURATION:** V-8
- **HORSEPOWER:** 310
- **TORQUE:** 520 lb-ft
- **HIGHWAY ECONOMY:** N/A
- **CITY ECONOMY:** N/A
- **HEAD MATERIAL:** Cast aluminum
- **BLOCK MATERIAL:** Compacted graphite iron (CGI)
- **BORE AND STROKE (IN.):** N/A
- **VALVETRAIN:** DOHC 32-valve
- **FUEL SYSTEM:** High-pressure common-rail, cylinder pressure sensors
- **TURBO:** Variable geometry
- **INTERCOOLER:** Air-to-air, integrated cam cover/intake manifold
- **ENGINE WEIGHT:** N/A
- **POTENTIAL PLATFORMS:** Hummer H2; Chevy Silverado, Tahoe; GMC Sierra, Yukon; Cadillac Escalade; base engine for ¾- and 1-ton trucks

### Sources

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www.vmmotori.it

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