

Volkswagen TDI



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THE LEAN...

UP TO 30 MILES PER GALLON (4.7 LITERS PER 100 KILOMETERS).

GREEN...

SURPRISINGLY RESPONSIVE ACCELERATION. ENGINES SO

FUN-TO-DRIVE MACHINES

ADVANCED THEY WILL NEVER NEED A TUNE-UP. WELCOME TO



VOLKSWAGEN'S POWERPLANT TECHNOLOGY OF THE FUTURE.

It's in Volkswagen TDI series cars. TDI is an abbreviation for Turbocharged Direct Injection, a new engine series that will be available in several 1999 Volkswagen models: the Jetta, the Golf, and the Passat Sedan and Wagon. Volkswagen TDI models use the benefits of four advanced, seamlessly integrated technologies: compression ignition, turbocharging, a new generation of engine management systems, and a fuel injection system that is direct and precise.

Volkswagen's technology eliminates the compressor force traditionally associated with automobile turbocharging. The Jetta's gets up to 30 miles per gallon in the city. The Passat's gets up to 27 miles per gallon in the city. The Jetta's gets up to 30 miles per gallon on the highway. The Passat's gets up to 27 miles per gallon on the highway. For the first time, cars that can truly be called lean, green, fun-to-drive machines.

**LEAN... EXTRAORDINARY FUEL EFFICIENCY** Volkswagen new TDI models have not officially arrived in North America, so fuel economy figures are still preliminary. For these early estimates, we're impressive indeed. The preliminary estimated fuel economy is about 30 miles per gallon (12.7 L/100 km) in the city. Preliminary estimates for the Passat TDI with manual transmission are about 27 mpg (11.5 liters/100 km) in the city. Preliminary estimates for the Jetta TDI with manual transmission are about 27 mpg (11.5 liters/100 km) in the city.

Your use of mobility, whether it's around the corner or around the country, is lean compared to most cars available. For example, the average 1999 car in the Golf's and Jetta's "category" class gets about 20 miles per gallon (7.8 liters/100 km)



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on the highway. But if we compare a Golf or Jetta TDI to the average compact car, a consumer driving 20,000 miles (32,000 km) per year could save approximately \$300 each year. The same consumer driving a Passat TDI could save about \$400 compared to other cars in the Passat's "category." In fact, the cost of fuel in Canada is higher, the savings could be even more.

Plus, savings. There are tax benefits available to diesel vehicle buyers. Original purchasers in the U.S. are eligible for a \$600 income tax credit.

In Canada there is a credit of \$175.

**INCREASE FROM FREQUENT FLIGHTS**

Suppose that a new car gets 28 miles per gallon (11.7 liters/100 km) and has a 17-gallon (64 liter) fuel tank. From full to empty, the car would have a theoretical trip length of 811 miles (1304 km). Not bad. But the Passat TDI will have a maximum trip length (based on preliminary mileage estimates) of over 800 miles. So you can relax from Toronto to wherever you want in Ontario, North Carolina without refueling.

Or from St. Louis to New Orleans.

**AN ENVIRONMENTAL REVOLUTION** In Europe, 21 to 26 percent of the cars are diesel-powered, and in Canada, diesel vehicles account for about one out of every six Volkswagen sold. Volkswagen has long-term experience with diesel engine technology for passenger cars, dating back to 1977 when the first diesel Rabbit was introduced in North America. These vehicles have a well-earned reputation for durability and longevity, even under the toughest conditions.



technology. Jetta's come with an anti-theft system, which prevents anyone from starting. Using a special cylinder head and

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special design, the TDI engine works just like a carburetor (based on water through combustion). An engine-management system precisely regulates fuel injection activity. Unlike traditional diesel, TDI models are equipped with a catalytic converter for even lower emissions levels.

As a result, carbon monoxide, hydrocarbons, and nitrous oxide emissions are kept at a minimum—lower than TDI as approved in California, which has the toughest requirements in the United States. TDI also produces significantly less carbon dioxide than most cars. According to Popular Science magazine, "a diesel engine converts fuel into mechanical energy with far greater efficiency than today's prevalent Otto-cycle gasoline engines. (The remainder is lost as CO<sub>2</sub> output, a component of nitrogen oxides that is not currently regulated.)"

Since TDI models consume much less fuel than the average car, they contribute to the conservation of fossil fuel. Diesel fuel has another environmental advantage: it takes less energy to refine than gasoline.

**NO MORE TUNE-UPS** Volkswagen TDI will never need a tune-up because it does not have an ignition system in the traditional sense. Instead, combustion occurs automatically as the piston compresses the mixture. There are no spark plugs, no spark-plug wires, no distributor or rotor—no way for any of these components to degrade emissions performance, since there's less to wear out. In fact, TDI helps preserve your time and money, as well as your environmental commitment.



**A FUN-TO-DRIVE MACHINE** How can lean plus Green be synonymous with a Fun-to-Drive Machine? The idea that a fuel-efficient, low-emission car can truly be "fun-to-drive" seems like a contradiction. But that's precisely what TDI offers. The TDI engine develops around 90 horsepower (preliminary estimated figure)—as much power as some sports cars. But one horsepower is not the key to TDI's spirited performance. Torque is because the TDI engine operates at such high compression, it develops surprising amounts of torque—as estimated 199 foot-pounds (267 Nm) at a very useful 1800 rpm (preliminary figure). All of which adds up to TDI's fun-to-drive personality.

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torque (blue line) horsepower (red line)

## HOW TDI WORKS

Volkswagen TDI (Turbocharged Direct Injection) combines proven engine technologies in a new way, marrying performance, economy, and environmental concerns.

The first technology is the compression ignition principle developed by Rudolf Diesel in 1890. A TDI engine runs on inexpensive, plentiful Diesel fuel. It has the exceptional torque and pulling power of a Diesel, as well as the simplicity and durability that come from eliminating the need for an elaborate ignition system.

But unlike some traditional diesels, with their sooty exhaust and unexciting performance, a TDI uses additional technologies to achieve very low emissions and remarkable driving enjoyment. A turbocharger increases power at the same time that it more thoroughly atomizes fuel to reduce emissions; the turbocharger is an ingenious device since it is powered by otherwise wasted exhaust gases. As a bonus, the turbo also greatly reduces diesel clutter. And a catalytic converter similar to those used in gasoline-powered cars further reduces emissions.

An electronic fuel injection brain controls a new type of fuel injection system, which sprays a fine mist of fuel directly into the combustion chamber with millisecond-precision timing. A sophisticated electronic diesel control (EDC) system promotes smooth running.

Where traditional diesel injection systems inject fuel into a pre-chamber, TDI sends fuel directly into each cylinder. This promotes more

complete—and more efficient—combustion. Ward's Engine and Vehicle Technology Update sums up TDI's benefits this way: "In terms of NVH (noise, vibration, and harshness), performance, and responsiveness, the TDI engine is virtually indistinguishable from gasoline counterparts, yet offers nearly improved fuel economy."



## VOLKSWAGEN TDI PRELIMINARY SPECIFICATIONS



	GOLF TDI	JETTA TDI	PASSAT TDI SEDAN
<b>INTERIOR, CARGO, AND FUEL CAPACITIES</b>			
Passenger volume cubic feet	80	80	90
Cargo volume cubic feet	17	15	16
Fuel capacity gallons	14.5	14.5	18.5
<b>FUEL CONSUMPTION ESTIMATES*</b>			
City/Highway (miles per gallon)	Est. 40/50	Est. 40/50	Est. 30/41
(miles/100 miles)	Est. 5.8/4.7	Est. 5.8/4.7	Est. 6.3/5.3
Maximum trip length (miles)	Est. 725	Est. 725	Est. 832
(gallons)	Est. 1367	Est. 1367	Est. 1339

## DRIVETRAIN

Type	In-line four-cylinder, turbocharged diesel		
Displacement	1.9 liter, 1890 cc		
Horsepower	Est. 90 (80 SAE) @ 4000 rpm		
Torque	Est. 149 lb. ft. (202 Nm) @ 1900 rpm		
Compression ratio	18.5:1		
Valve train	Single overhead cam, belt-driven		
Fuel/air supply	Distributor injection pump, Electronic Diesel Control, Turbocharger		
Ignition system	Self-igniting compression system		
Emission control system	Exhaust gas recirculation, oxidation catalyst		
Transmission	Five-speed manual standard, optional automatic		
Drive layout	Front-wheel drive		

## BODY, CHASSIS, AND SUSPENSION

Body type	Steel unitized construction with built-in front leaders		
Front suspension	Independent MacPherson struts with coil springs and stabilizer bar		
Rear suspension	Independent cross-beam axle with coil springs, electronic shock absorbers, and stabilizer bar		
Steering	Power-assisted rack and pinion		
Wheels	Power-assisted 16.1" vented front discs, 7.9" rear drums	Power-assisted 16.1" vented front discs, 7.9" rear drums	Power-assisted 16.1" vented front discs, 8.9" rear discs

\*Voluntary EPA fuel economy estimate, subject to change.

\*\*According to the Energy Information Administration in Washington, D.C., the average price for all grades of unleaded gasoline was \$1.20, the average cost of highway diesel fuel as of 10/1/99 was \$1.28. Based on mathematical averaging, the highway mpg/lt "consumption" rates are 30.7 for "mid-size cars" and 36.4.

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