

Volkswagen Clean Diesel



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September 20, 2010

Volkswagen changes everything.

Increase efficiency
of gasoline engines



2.0-liter TSI engine

Create breakthroughs
in diesel technology



Jetta TDI SportWagen

TDI Clean Diesel—Good, Clean Fun

Good

Available at 40%
of gas stations

Quiet

Smooth

Affordable

Reliable

Durable

Economical

Clean

Approximately
25% less CO₂
than gas engine

Approximately
15% better fuel
consumption,
90% less
emissions than
previous diesels
of 1990

Fun

DSG

Diesel provides
50% greater
torque than
gasoline

Turbocharging
provides ample
performance

Diesel Perceptions

Traditional

Clean Diesel

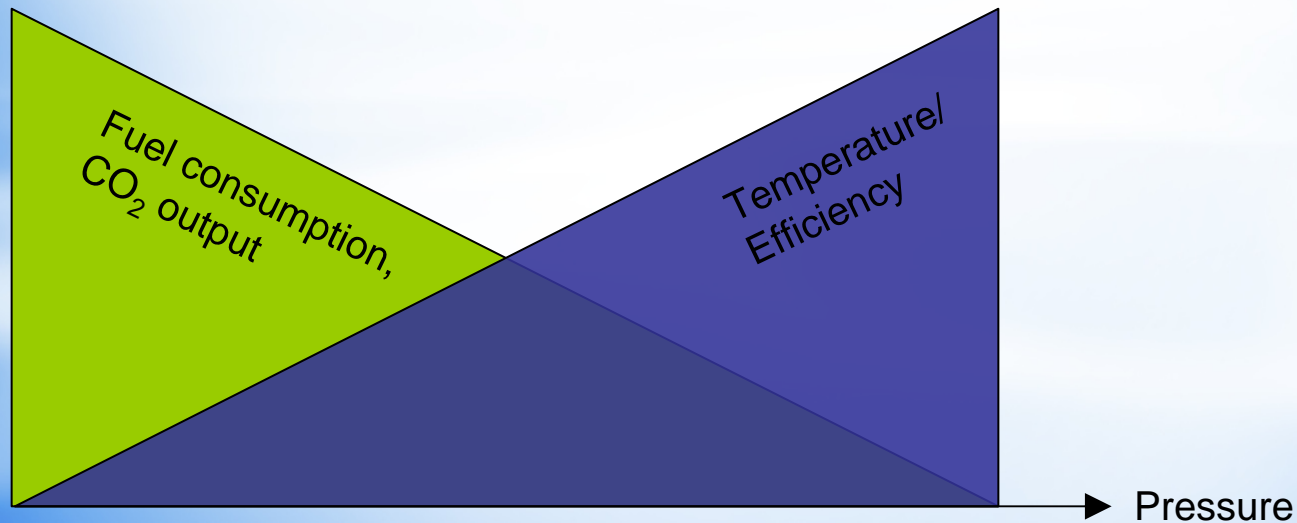
Dirty	Clean
Sooty	Clean
Smelly	Clean
Noisy	Quieter & Smoother
Slow	Fast & Torquey
Hard to Find Fuel	Accessible Fuel
Hard to Start	Easy to Start
Vehicle Cost	Residual Value

How the diesel engine works

Compared with a conventional gasoline engine, the diesel engine's efficiency is higher (up to 45% compared to 30%).

The reason is the diesel engine's high compression which enables higher temperatures inside the cylinder. Higher temperatures increase efficiency of the fuel combustion.

There are no spark plugs in a diesel engine.



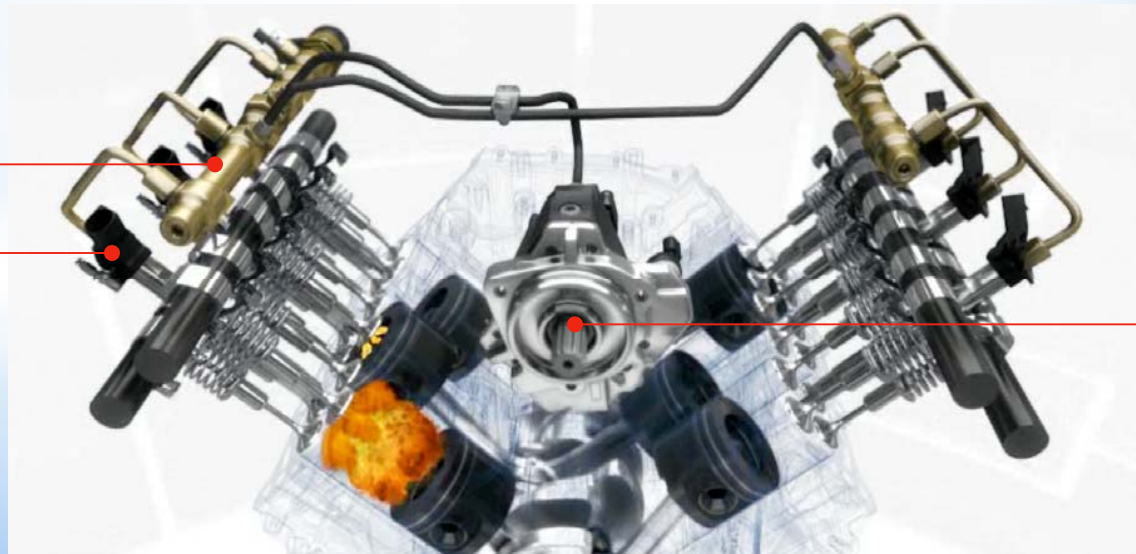
The Common Rail System – overview

The Common Rail System with electronic control:

- Diesel fuel is compressed and supplied to the fuel rail. Here, it is kept ready for injection at up to 2,000 bar (35,000 psi).
- Into each engine cylinder, a fuel injector is mounted. This is connected to the fuel rail via a short fuel line.

Rail

Injector



High-pressure pump

High-pressure pump – pressure for clean power

The higher the injection pressure, the better diesel fuel combustion.

The high-pressure pump of the Common Rail System compresses the fuel to up to 2,000 bar. (35,000 psi)

Injection pressure is constantly available at every engine rpm.

High pressure leads to a very fine atomization of the fuel, and an even distribution of the fuel droplets in the combustion chamber.

The result: the diesel fuel combusts with highest efficiency and minimal emissions.



Injectors – high speed for ideal combustion

A Common Rail fuel injector is mounted in each engine cylinder. Pressurized fuel is constantly available. To start injection, the injector's nozzle needle is opened.

The fast nozzle needles of the Bosch injectors can open and close several times during each injection.

Thus, the rate of discharge can be shaped individually for each combustion process.

The result is smooth running with low noise and vibration and increased efficiency.



Needle closed



Pilot injection



Needle closed



Main injection

Particulate filter – for keeping back particles

The electronically controlled high-pressure injection minimizes the generation of particulate matter during combustion.

The remaining particles in the exhaust are filtered out.

The Clean Diesel with particulate filter emits practically no particles.

In cooperation with Denso, Bosch is creating an economical all-in-one solution of particulate filter and regeneration management.



Catalyst with Denoxtronic – for low NO_x emissions

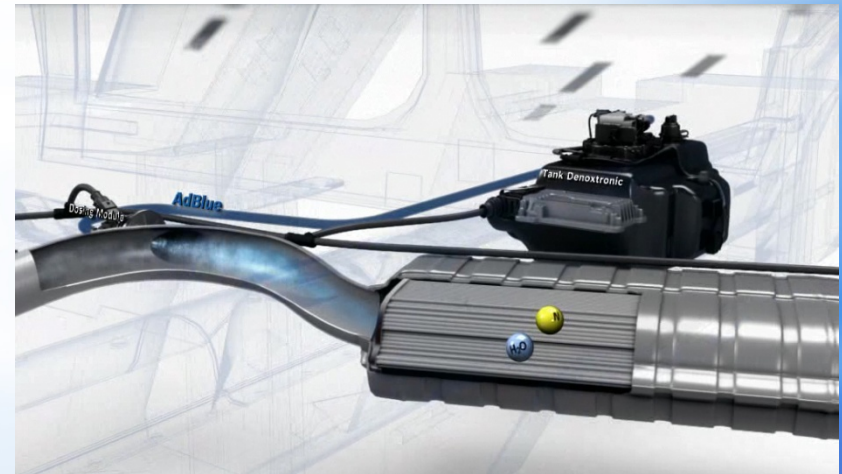
The combustion of diesel fuel generates nitrous oxides NO_x.

Using SCR Selective Catalytic Reduction, NO_x emission can be reduced without increasing fuel consumption. The SCR converter works with a reduction agent sprayed into the exhaust gas stream by the Bosch Denoxtronic metering system.

With Denoxtronic, the SCR catalyst reduces NO_x emission by up to 85%.



Reduction agent NH₃ and NO_x...



...are converted into water and nitrogen

Aren't hybrids better?

“New VW Jetta Diesel Tops Prius in Fuel-Economy Marathon Test”

—*Popular Mechanics*, September 24, 2008

Out on the highway...

Prius: 44.8 (EPA 45)

Jetta TDI: 45.4 (40 EPA +5.4)



Clean Diesel TDI

50-State – Jetta TDI first in the volume segment

30% of Volkswagen sales are in states where diesels could not be sold, primarily NY and CA

Environmental alternative – Responsible

Sporty – 140 hp / 236 lb-ft torque

Proven technology – Leverage of 30 years of diesel heritage in the US market (over 850,000 units sold)

Halo message – To position Clean Diesel as environmental halo over VW brand



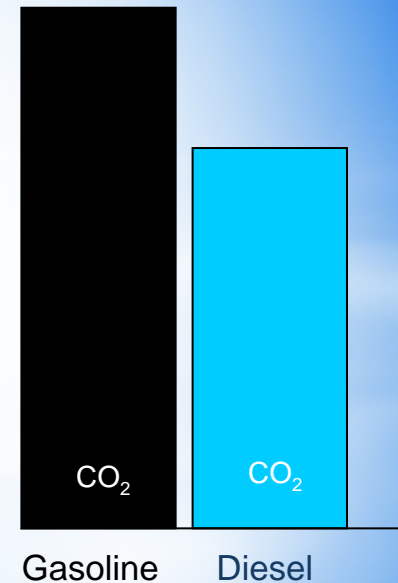
How “clean” is Clean Diesel?

It's called Clean Diesel for a reason.

Its emissions are more than 90% lower than that of a 1990 diesel.

The Clean Diesel emits about 25% less carbon dioxide than a *gasoline* engine.

It even fulfills Tier2 Bin5—the strictest Federal emissions standard to date.



Doesn't diesel cost more than gas?

Seasonally, yes. But the efficiency of TDI (35% better mileage) more than makes up for it.

Other diesel benefits:

- Longer engine life
- Reduced maintenance cost
- 50% more torque
- Fewer fuel stops (luxury of time)
- Reduced CO2 and Nox emissions output

Gasoline



TDI



2010 Volkswagen Clean Diesel Offerings for the U.S. Market

- Jetta TDI Sedan
 - 30 city/42 highway
 - 6-speed manual or 6-speed DSG automatic
 - \$22,830
- Jetta TDI SportWagen
 - 30 city/42 highway
 - 6-speed manual or 6-speed DSG automatic
 - \$24,615
- Golf TDI Hatchback
 - 30 city/42 highway
 - 6-speed manual or 6-speed DSG automatic
 - \$22,354
- Touareg TDI SUV
 - 18 city/25 highway
 - 6-speed automatic with Tiptronic
 - \$44,350

Clean Diesel

T D I

Good Clean Fun