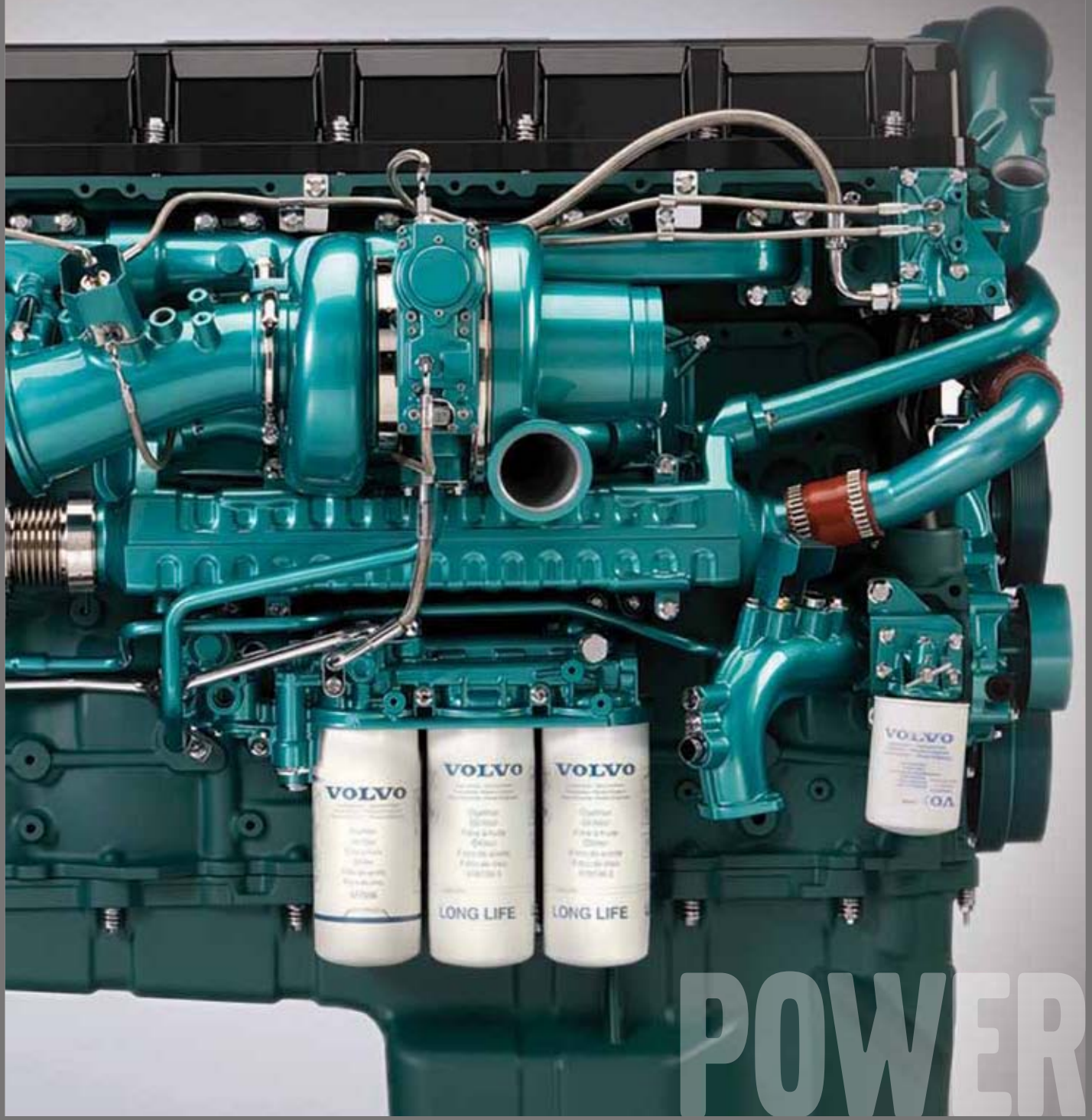


VOLVO POWER

Volvo Trucks. Driving Success.®



D16/D13/D11 POWERTRAIN - PRODUCT TOUR



Overview

The new series of Volvo Power engines represents a giant step forward in terms of fuel efficiency, emissions compliance and driver convenience. Best of all, they use the same proven Volvo technology that the industry has counted on for years. Today's Volvo Power engines are 94% identical in design, functionality and ease of service. And with the addition of Volvo's advanced SCR (Selective Catalytic Reduction) system, they maintain their power and performance without the need for active regenerations.

Fact: Volvo Power engines for EPA 2010 and beyond deliver the best fuel economy of any heavy-duty diesel engine out there. They're ready to work with our innovative I-Shift transmission and I-VEB engine brake. And they're ready to help drive operational savings right to your bottom line. Which is exactly what you'd expect from the world's leading manufacturer of heavy-duty diesel engines.

VOLVO POWER

THREE PROVEN WAYS TO KEEP YOUR BUSINESS MOVING FORWARD.

Volvo D16

Extra power for big loads and steep grades.

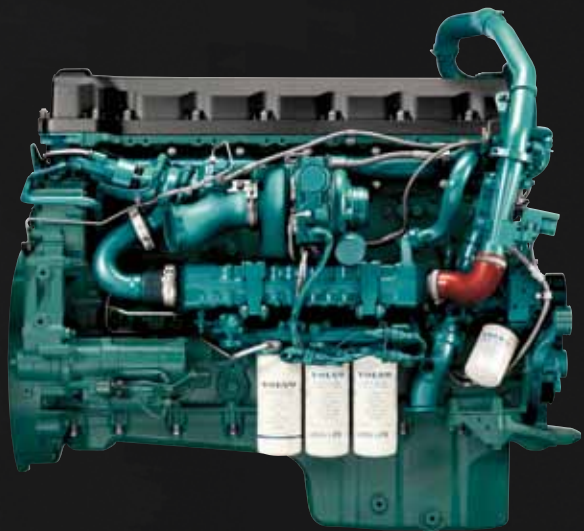
The ultra-reliable D16 provides the increased horsepower and torque needed to move large payloads with ease, even on steep grades. This engine features advanced technology that requires less oil, fuel and maintenance. Three power ratings are available in the range of 500 to 550 hp, with up to 1850 lb-ft of torque for excellent driveability. A variable geometry turbo also makes the engine highly responsive while maximizing fuel economy. In other words, it's the perfect engine for line haul and heavy haul operations.



Volvo D13

Power and efficiency for every application.

Fuel-efficient, powerful and lightweight. That's the Volvo D13. Designed to meet current and future EPA regulations while improving reliability and lowering operating costs. Available in 12 power ratings from 375 to 500 hp, each providing impressive performance with excellent low-end torque. The variable geometry turbo keeps the engine responsive while improving fuel economy. It's a great choice for line haul, regional and vocational operations.



Volvo D11

Lightweight, heavy-duty performance.

The Volvo D11 is the ultimate hardworking, lightweight engine. It's built for reliability and economy. It delivers impressive performance without all the weight. Available in six power ratings from 325 to 405 hp, all with superb low-end torque for improved driveability. A variable geometry turbo ensures that the engine is as responsive as it is fuel-efficient. For regional and city operations, the D11 is the business partner you want.



FEATURES THAT IMPROVE PERFORMANCE, EFFICIENCY AND ENGINE LIFE.

PUMP

- The water pump powers a high flow through the cooling system with minimal parasitic losses.



FUEL FILTER

- The five-micron fuel filter traps the smallest impurities, providing clean fuel and extending injector life. The primary filter has a built-in water separator that is drained from inside the cab.



EXHAUST MANIFOLD

- The three-section exhaust manifold redirects high-pressure exhaust to the Exhaust Gas Recirculation (EGR) system.



CAMSHAFT DAMPER

- A damper on the back of the camshaft reduces torsional vibrations. On D11 and D13 engines, a rear Power Take-Off (PTO) can be attached to the rear gear train, driving a hydraulic pump or a driveshaft. Its "live" operation allows operation independent of the transmission clutch.



REAR DRIVE

- Today's Volvo Power engines drive the camshaft and other components from the rear. This focuses torsional vibrations (induced by the camshaft-driven, Ultra-High Fuel Injection Pressure system) directly into the flywheel for a smoother-running engine and extended component life.



TORSIONAL VIBRATION DAMPER

- The crankshaft torsional vibration damper smooths engine rotation by reducing twisting of the crankshaft. It also reduces noise by smoothing gear train speed. The results are improved driver comfort and longer engine component life.



VENTILATION SYSTEM

- A centrifugal-type crankcase ventilation system filters and recycles crankcase gases, eliminating the need for periodic maintenance.



FLYWHEEL SERRATION RADIUS

- The large radius of flywheel serrations used for crank positioning improves fuel injector control and performance by providing more accurate sensor readings.



MAXIMIZING FUEL EFFICIENCY WITH PRECISION-FLOW COOLED EGR.

Smart application of EGR – combined with SCR – is key to maximizing fuel efficiency in the 2010 era. Volvo's Precision-Flow Cooled EGR delivers the optimum amount of EGR to your engine, to lower fuel consumption and operating costs.

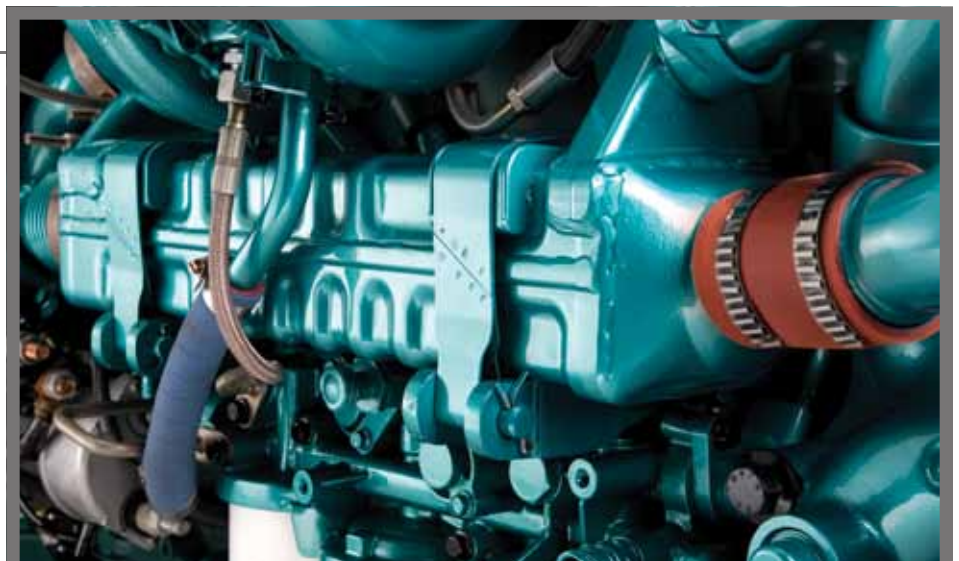
MIXING CHAMBER

- The mixing chamber thoroughly mixes the cooled exhaust gas with the air from the Charge Air Cooler (CAC) before going into the intake manifold.



EXHAUST GAS COOLER

- The dual-chamber stainless steel exhaust gas cooler efficiently cools exhaust gases up to 932°F (500°C).



AIRFLOW

- Dual inlet and exhaust valves provide maximum airflow for optimal engine breathing, performance and fuel efficiency.



DELTA-P FLOW SENSOR

- The Delta-P flow sensor, part of Volvo's Precision-Flow Cooled EGR system, provides a flow signal to the VECTRO Engine Management System (EMS). This integrates the turbo-charger back pressure with EGR valve flow rate, to provide exactly the right amount of EGR for maximum fuel economy.



INJECTOR

- The centrally located injector operates with Ultra-High Fuel Injection Pressure—as high as 35,000 psi—for more efficient injection, atomization and combustion. The dual-solenoid fuel injector is controlled by the EMS. It provides flexibility in injection events, lowering the combustion temperature and creating less NOx emissions.



VOLVO'S ADVANCED SCR: THE TECHNOLOGY BEHIND OUR "NO REGEN ENGINE."

Today's Volvo Power engines use Selective Catalytic Reduction (SCR) to solve the problem of NOx emissions and particulate matter. Our approach combines the best aspects of Exhaust Gas Recirculation (EGR) with a Diesel Particulate Filter (DPF) and Catalytic Converter to provide a dependable solution that saves fuel, time and money.

THE VOLVO SCR SYSTEM

Our SCR solution is an aftertreatment, which means that Volvo Power engines can be set for optimal highway performance. We use the NOx in the exhaust to enable a system that requires no active regeneration under normal driving conditions. Volvo's SCR system relieves drivers of concern about regeneration and provides improved fuel efficiency when compared to other EPA-certified systems.

1. Volvo starts with a highly efficient engine with already excellent fuel efficiency and low particulate emissions.
2. To eliminate NOx emissions, our SCR system injects Diesel Exhaust Fluid (DEF) downstream from the DPF.
3. The exhaust gas combined with the DEF enters a catalytic converter, which turns the NOx into harmless nitrogen gas and water vapor.



COMPACT DIESEL PARTICULATE FILTER (DPF)

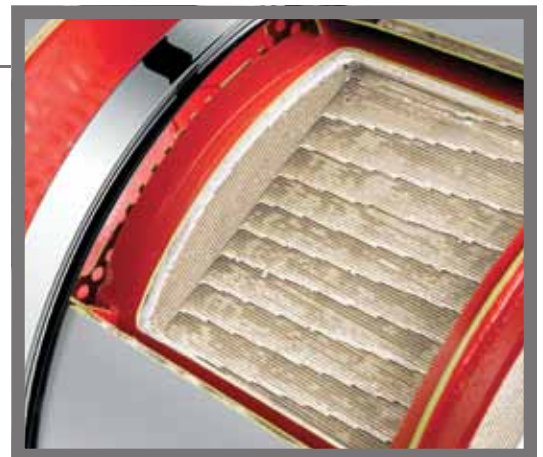
- Volvo Power engines feature a Compact Diesel Particulate Filter (DPF) that filters soot from the exhaust. Exhaust gases exiting the DPF meet or exceed EPA 2010 clean air standards for particulate matter.

The frame-mounted design keeps it as close to the turbocharger as possible to maximize fuel economy via passive regeneration. DPF maintenance is easy to perform and does not require a hoist in this location.



CERAMIC SUBSTRATE

- The DPF uses a ceramic substrate. Exhaust gas that enters, flows through the porous ceramic wall and comes out the other end, leaving soot in the filter. Through passive regeneration, the soot is removed and all that remains is an ash of low volume, resulting in long maintenance intervals.



7TH INJECTOR

- If an active regeneration is ever required (due to unusually demanding driving conditions), a water-cooled “7th injector” delivers a small amount of fuel. This travels to the DPF as a mist and coats the catalyst to react and provide the heat needed for regeneration.



FAN DRIVE

- The 32" fan has 11 blades for optimum cooling. A new electronically controlled viscous fan drive engages only to the amount needed, yet stops dead when not engaged for reduced parasitic losses. The larger-diameter fan and shroud also increase ram-air, which means less operational time for the fan, saving fuel.



INNOVATIVE ENGINE FEATURES. LEGENDARY VOLVO PERFORMANCE.

As the latest generation of Volvo Power engines, the D11, D13 and D16 have a proven history of outstanding performance. Each design innovation has earned its place in the powertrain, saving weight, improving efficiency, adding power and increasing durability. Volvo has been refining the diesel engine since 1937. That's why ours works so well today.

VALVE COVER

- The composite construction of the valve cover reduces weight and provides noise reduction.



VOLVO ENGINE BRAKE

- Four valves per cylinder and the Ultra-High Pressure Fuel Injection system are driven from a large-journal-diameter overhead camshaft. The Volvo engine brake offers best-in-class performance at cruising speed.



THERMOSTAT

- The thermostat and housing are integrated, with a full flow feature for better engine performance due to lower flow restriction.



PISTON

- The piston is an oil-cooled, one-piece monotherm design for maximum strength. The top piston ring's keystone twist-steel design creates a more efficient seal between the piston and cylinder liner, for cleaner combustion and reduced oil consumption. The steel bottom piston ring controls oil blow-by, reducing oil consumption thanks to improved conformity with the cylinder liners. A water jacket in the cylinder block cools the cylinder liner down below the piston travel, extending engine life.



ENGINE MOUNTING

- The engine is mounted at one point in the front and two points in the rear to eliminate the introduction of stresses from frame flex.



DRAIN PLUG

- A magnetic drain plug and a fine mesh strainer on the oil pickup complement the oil filtration provided by the three oil filters for extra-long engine life.



AIR COMPRESSOR

- The twin-cylinder 31.8 CFM air compressor offers smooth operation with ample air capacity for demanding applications.



ENGINE MANAGEMENT SYSTEM

- The EMS uses signals from the air inlet temperature and turbo boost sensors to optimize combustion and reduce unwanted emissions.



GEAR REDUCTION STARTER

- The gear reduction starter is half the weight of a non-reduction starter. It's also more compact, with much higher reliability and performance life.



OIL FILTERS

- Volvo full-flow and bypass oil filters are manufactured to have the correct balance between flow rate and size. This ensures that oil flow saturates the entire filter media, and provides for extreme oil cleanliness throughout the service interval.



COOLANT FILTER

- The coolant filter conditioner removes impurities and increases coolant life, protecting the engine from cavitation and internal corrosion.



TURBOCHARGER

- The single, variable geometry turbocharger compresses and moves the intake air while providing the correct back pressure to drive the EGR process. The sliding nozzle style has only one moving part in the hot-air stream.



ENGINE MANAGEMENT SYSTEM

- The EMS is located on the cold side of the engine with positive lock/quick disconnect harness clamps. Fuel is passed around the EMS to cool the unit. Volvo's state-of-the-art processor and smart engine optimization help improve performance and fuel economy over '07 engines.



BELT TENSIONER

- The belt tensioner automatically provides the correct tension on the serpentine drive belt. It improves belt life and wear, eliminates squeal, and reduces maintenance time and belt replacements to lower overall operating costs. The alternator and A/C compressor are pad mounted for easier replacement, improving uptime.



WORLD-CLASS FEATURES FOR EXCEPTIONAL PERFORMANCE.

WITH I-SHIFT, YOU'LL ALWAYS BE IN THE RIGHT GEAR AT THE RIGHT TIME.

Volvo I-Shift is a 12-speed, two-pedal, automated manual transmission that maximizes driver comfort, payload and fuel economy. It integrates seamlessly with all Volvo Power engines. The gearshift is operated by intelligent electronics, so there's no clutch pedal.

I-Shift monitors changes in grade, vehicle speed, acceleration, torque demand, weight and air resistance. Then it selects the best gear for the engine, allowing every driver to shift like a fuel-efficiency expert. This puts less stress on the driveline, for longer life and less maintenance.



Key Features

- Grade sensor
- Kick-Down Mode for instant power and maximum acceleration
- Performance Mode for maximum gradeability
- Brake Program Mode for maximum retardation

EXHAUST GAS RECIRCULATION (EGR) VALVE

The EGR valve is critical to the engine's performance and fuel economy. It sends a portion of the exhaust gas flow through the EGR cooler, and from there into the engine. The recycled exhaust gas serves to lower the percentage of oxygen in the intake mixture of the engine, so that NOx emissions are reduced.

Volvo's unique EGR valve is fed by two ports from the exhaust manifold. With the pressure from one port acting on one side of the piston assembly, and the pressure from the other port acting on the opposite side, forces are cancelled so that there is a negligible force needed to open the valve.

Then we use a powerful hydraulic-driven piston, energized by the oil system pressure, to move the valve. The result is a valve that minimizes sticking, with ample cooling despite the high temperatures involved. The valve delivers just the right amount of EGR—no more, no less—for optimum emission reduction and performance.



REAR-MOUNTED PTO PROVIDES POWER ON THE MOVE

Volvo's rear-mounted engine power take-off makes it easy to perform multiple tasks with your truck. The design features few moving parts, for dependable performance.

- Clutch-independent design consists of a bearing housing mounted on the right rear side of the engine geartrain.
- Since the power is taken directly from the engine, PTO can be engaged or disengaged while the vehicle is stationary or being driven.

PTO Applications Include:

- Dump truck
 - Crane-equipped vehicle
 - Cement mixer
 - Refrigerator/freezer units
 - Container lift/load exchanger
 - Refuse collector
 - Snowplow/sand spreader
-
- Output options are an SAE1400 flange connection or DIN5462 for a direct-mount pump.



VOLVO POWER AND THE ENVIRONMENT.

When it comes to environmental responsibility, Volvo is a pioneer. Volvo Power engines lead the industry with technology that meets or exceeds future EPA regulations. Our engines boast high efficiency EGR, DPF and SCR systems, with the proven ability to operate with ultra low sulfur diesel fuel. When we set out to meet the EPA's 2010 challenge, we committed ourselves to solving the problem in a way that not only satisfied all emissions requirements, but also made life better—and healthier—for all who share the road.



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