

# 2005 F-Series Super Duty Powertrain

## 2005 FORD SUPER DUTY OFFERS THE MOST OPTIONS – STRONG, STRONGER AND STRONGEST

The 2005 Ford Super Duty offers an unequaled lineup of powertrain options, including the segment's most powerful gasoline engine, backed by chassis and frame improvements that make the strongest pickup on the road even stronger. Together, they deliver the highest available payload ratings in the industry.

The most respected name in truck diesel engines, with more than 3 million on the road – Power Stroke – also benefits from upgrades for 2005, with 10 more pound-feet of torque from the quiet 6.0-liter V-8 diesel, and the widest power band in the market.

Ford's strong and sophisticated five-speed TorqShift automatic transmission, previously available only with the Power Stroke diesel, now will be offered with all Super Duty engines, gas and diesel.

The powertrain lineup for 2005 includes:

- **6.8-liter Triton V-10** – for the first time, Ford's aluminum 3-valve cylinder head, introduced on the 2004 F-150, is available on a V-10 engine. The new 6.8-liter, 3-valve Triton V-10 is the most powerful gasoline engine in the class, with 355 horsepower and 455 pound-feet of torque – both class-leading figures. Like all of the Super Duty engines, it uses electronic throttle control for efficiency and quick response.
- **5.4-liter, 3-valve Triton V-8** – Super Duty's "base" engine also benefits from three-valve architecture and sophisticated technology, including variable valve timing and electronic throttle control, to deliver 300 horsepower and an unrivaled combination of performance and economy, which is particularly important for fleet users.
- **6.0-liter Power Stroke diesel** – Ford set a new standard with the original 7.3-liter Power Stroke in 1994, then did it again with the 6.0-liter Power Stroke in 2003. For 2005, the Power Stroke gets 10 more pound-feet of pulling power.
- **TorqShift** – Ford's premium heavy-duty automatic transmission is now offered with every Super Duty engine, offering the smoothest, crispest shifts in the class, the exclusive computer-controlled tow-haul mode, plus the economy and performance benefits of five speeds, compared with competitors' four.

### Segment Leading 6.8-liter, 3-valve Triton V-10

Ford's proven modular engine strategy pays dividends yet again by bringing the company's acclaimed three-valve architecture – introduced on the F-150's 5.4-liter Triton V-8 engine – to the 6.8-liter Triton V-10 gasoline engine available in the 2005 Super Duty.

The result is a 45-horsepower boost in peak power – to 355 hp at 4,750 rpm – with improved smoothness, reduced emissions and no significant fuel economy penalty during normal use. Peak torque rises from 425 to 455 pound-feet at 3,250 rpm.

The Super Duty powertrain engineers assured the broadest, flattest power band in the segment by equipping the 6.8-liter Triton V-10 with variable intake runners. This means that power is available in every gear, at every speed – for pulling a heavy boat up a ramp or for passing a truck on a two-lane road.

“At lower RPM, the engine uses the long intake runners to generate maximum torque,” said Harold Lowman, Commercial Vehicles powertrain manager. “At higher engine speeds, the intake shifts to

the shorter runners. This gives you a very flat torque curve and good response across the rev range.”

The new cylinder head incorporates three valves per cylinder – two intake and one exhaust – for better engine breathing and better fuel-air mixing prior to combustion. This means the engine is able to provide all the fuel and air needed to meet higher peak demands, such as when hauling a heavy load uphill.

At the same time, the powertrain controller automatically varies spark timing to optimize combustion. With the spark plug now located precisely in the center of the combustion chamber, the engine operates at maximum efficiency, producing more power than before while still using regular octane gasoline.

### **Modern Electronic Throttle Control**

Both gasoline engines also use electronic throttle control, which gives Super Duty powertrain engineers far more ability to assure engine performance matches the driver’s intent. When the driver calls for maximum acceleration, the throttle plate opens at the optimum speed to match fuel flow, cam timing and other engine parameters with gear selection of the five-speed TorqShift automatic transmission.

Another benefit of electronic throttle control is a new elevated idle function standard on all vehicles, which allows elevated idle control for aftermarket accessories such as hydraulic pumps for tow trucks or dump beds. This feature raises the idle speed to provide the necessary power to run these applications, without a complicated manual throttle linkage. The optional transmission mounted Power Takeoff (PTO) continues to be available.

### **Power Plus Economy – 5.4-liter, 3-valve Triton V-8**

The 5.4-liter, 3-valve Triton V-8 engine introduced last year on the Ford F-150 now migrates to Super Duty. It brings 300 horsepower and 365 pound-feet of torque to the table, giving gas-engine customers two strong choices – maximum power with the V-10, or power plus economy in a V-8 package.

That’s an improvement of 40 horsepower and 15 pound-feet of torque over the 2004 Super Duty, thanks in part to the use of variable valve timing that especially boosts low-end torque, which has always been a strength of the 5.4-liter Triton engine. Now, more than 80 percent of peak torque is available starting as low as 1,000 rpm.

A large amount of torque is especially valuable in pulling a heavy load from a standstill.

With variable valve timing, the computerized powertrain control module automatically adjusts timing of the single-overhead camshafts to optimize intake and exhaust valve actuation at any engine speed. By varying pressure inside the hydraulic solenoids at the camshaft sprockets, the system can shift between fully advanced cam timing and fully retarded timing in milliseconds.

Variable valve timing offers several benefits in addition to the added torque. It reduces internal pumping losses, making the engine more efficient. By allowing part of the exhaust gases to re-enter the cylinder at higher engine speeds, it reduces temperatures within the combustion chamber, for cooler running, and reduces production of the pollutant NOx. Both Super Duty gasoline engines are expected to meet more stringent emissions standards.

Both gasoline engines also feature the so-called “limp home” mode, which selectively cuts power to individual cylinders in the event of complete coolant loss, to control engine temperatures and allow the vehicle to move a short distance for repairs.

### **A More Powerful Power Stroke Diesel**

Revised mapping of the electronic engine control system brings even more torque to the strong, quiet 6.0-liter Power Stroke diesel engine. With 570 pound-feet of torque and 325 horsepower, the 6.0-liter Power Stroke offers more torque and is now rated for an even longer service life – 250,000 miles, with proper maintenance.

The 6.0-liter Power Stroke diesel engine uses modern technologies such as the high-pressure fuel rail, which delivers fuel to the individual direct-injectors at pressures of up to 26,000 pounds per square inch (1,800 Bars). This allows precise metering and complete atomization of the fuel mixture, for clean burning.

With four valves per cylinder, the 6.0-liter Power Stroke is able to move large volumes of air and fuel at peak load.

Other modern technologies in the Power Stroke include electronic throttle control and an Electronic Variable Response Turbocharger with variable vanes that tailor boost to demand, allowing the turbocharger to “spool up” faster under peak demand to reduce “turbo lag,” and offer better efficiency than fixed turbo vanes.

Two out of every three Super Duty trucks sold are equipped with Power Stroke diesel engines. Ford sells more diesel-powered pickup trucks than Dodge and General Motors combined – more than 200,000 per year in Super Duty alone. Super Duty’s Power Stroke is the longest lasting diesel available, with more than 98 percent of Power Stroke diesel engines produced over the past decade still on the road.

“Customers buy the Power Stroke diesel knowing that it’s there for the long haul,” said Doug Scott, Ford Truck Group marketing manager. “At 100,000 miles, they expect that it’s just getting broken in.”

### **TorqShift Five-Speed Automatic Transmission**

Ford’s modern five-speed TorqShift automatic transmission – first offered on 2003 Super Duty trucks equipped with the 6.0-liter Power Stroke diesel engine – becomes available with all Super Duty powertrains for 2005.

The TorqShift transmission features improved gear ratios, higher capacity pumps for better cooling, robust components for durability and simplified shift controls for smoother shifts and quieter operation, compared with the previous four-speed automatic.

### **Tow-Haul Mode**

Those who tow or haul heavy loads will appreciate the tow-haul mode, which automatically adjusts transmission operation to reduce unnecessary shifts and keep the engine in the power band when needed. It can sense, for example, when the vehicle is driving over hilly terrain, and hold the current gear longer, to reduce “hunting” for the proper gear.

The transmission also works in concert with the engine in downhill sections of roadway, to prevent the vehicle from speeding up unintentionally. This helps improve the driver’s feeling of control, while supplementing the vehicle’s braking system.

An adaptive shift function monitors the transmission’s performance over its lifetime, and adjusts shift pressures in real time to assure consistent shift feel and compensate for wear.

For ease of maintenance, the transmission oil filter is a spin-off style, mounted on the exterior of the transmission. Larger fluid lines and a larger transmission oil cooler help to assure cooler operating temperatures, even under the most demanding conditions.

## **Chassis Improvements Provide Strong Support**

The Super Duty chassis serves as a foundation for all of this added power, and improvements for 2005 assure that it will be more than up to the task. Properly equipped, the 2005 Super Duty offers the highest payload capacity, most towing capability, highest gross vehicle weight rating and gross combined vehicle weight ratings in the class.

Maximum pickup payload reaches 5,800 pounds – an increase of 300 pounds and the highest in the class. Front axle ratings are increased by 800 pounds on F-250 and F-350 4x4 models, and 1,000 pounds on all F-450 and F-550 trucks. Maximum combined weight rating for the dual-rear-wheel F-350 – including truck, payload and trailer – is now a massive 23,500 pounds.

At the same time, chassis improvements provide better ride and handling, especially when towing or hauling. This complements improvements to the steering gear and suspension geometry.

### **Stronger, Tougher Frame**

The front portion of the Super Duty frame, on either side of the engine, has been boxed in, for additional strength and torsional stiffness. This provides a stiffer support for the front suspension, improving handling response.

The rear portion of the frame – everything behind the fully boxed section – now uses steel that is 10-percent to 17-percent thicker. This is the thickest gauge steel used on any pickup frame.

A new rear cross member and new hitch – with 2.5-inch receiver on some models – provides more structural strength for towing or heavy hauling. The upsized hitch is recommended for towing loads over 12,500 pounds. The F-350 Super Duty can pull 15,000 pounds with the 2.5-inch hitch, and up to 17,000 pounds with a fifth-wheel or gooseneck hitch.

Thanks to modular design, these changes were achieved very efficiently. Common tooling is used for the front portion of every truck frame from the F-250 through F-550. Adding modular elements creates 18 total frame options for the truck configurations customers want – Regular Cabs to Crew Cabs, long bed or short bed, single- or dual-rear-wheel – without undue complexity.

### **Proven Durability**

“This architecture has been proven over hundreds of millions of miles by our engineers and our customers,” said David Watts, supervisor of Ford Super Duty Frame Design and Chassis Engineering. “We’ve maintained the qualities that produced this great performance, while adding more capability.”

Among the engineering torture tests that Watts’ team conducts is driving again and again over a rugged off-road route at Ford’s Arizona Proving Ground – while the truck has 5,000 pounds of pig iron on its back.

“We look at what our toughest customers demand from their trucks, and then duplicate those conditions repeatedly, all with the truck loaded to its full rated capacity,” Watts said. “Our standard of success is zero failures – not one. Most competitors wouldn’t come close to surviving this.”

As an example of the engineering team’s attention to detail, the 2005 Super Duty now uses microcellular urethane, compression-style body mounts, which provide good isolation for the passenger compartment and offer better durability than rubber mounts.

“It’s all about strength and durability,” Watts said.

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