

2008 F-Series Super Duty Special Features

FOCUS ON REFINEMENT DELIVERS THE QUIETEST SUPER DUTY EVER, BOTH INSIDE AND OUT

- Class-exclusive Quiet Steel technology provides the base for Super Duty's quiet interior.
- Unique rear bulkhead sound package improves interior quietness by eight percent
- Expandable gull wings in fender wells are among many innovative technologies that reduce engine and road noise
- Every component and system of Super Duty's drivetrain and chassis has been optimized to reduce NVH
- New more powerful, 6.4-liter clean diesel is fine-tuned to further reduce noise vibration and harshness
- Exhaust system tuned for refined sound features the industry's toughest hanging system for better off-road durability

The 2008 Super Duty delivers on new levels of quiet sophistication that truck customers have come to expect. Building on the precedents set by the F-150, Super Duty engineers have developed a vehicle that sets new standards for what customers will come to expect from a work truck.

"Customers are looking for higher levels of refinement," said Peter Reyes, Super Duty Chief Engineer. "They want a truck that can work hard, yet be as refined as the luxury car they just climbed out of. They don't want to suffer any penalties for having to get a big truck."

Innovative technologies deliver luxury-level interior quietness

Super Duty does double duty, serving as everything from an on-site office to the cabin of a long-haul family cruiser. Either case necessitates the need for a rugged, tough interior that doesn't compromise on quiet comfort. Super Duty engineers have incorporated a host of technologies, delivering luxury car-like sound quality.

"The goal was to deliver a "wow" factor," said Giri Nammalwar, Super Duty Vehicle NVH Supervisor, "and give Super Duty customers a level of sophistication that's unexpected, yet appreciated. We made sure we let in only the good sounds."

Super Duty's refined sound package utilizes Quiet Steel, a technology that has proven itself in the F-150. Quiet Steel, a composite laminated steel sheet, makes up the vehicle's dash panel, and works with extra sound padding in the dash and floor to provide the foundation for Super Duty's quiet cabin.

One of the measures used by NVH engineers to set goals for interior quietness is something known as the articulation index, or simply put, the ability to carry on a normal conversation with anyone, anywhere inside the cab.

Sound engineers increased Super Duty's articulation index through the use of a unique sound damping back panel that works with the rest of the sound package to balance the levels of quietness throughout the cabin. This technology not only improves the articulation index, it creates the perfect environment for all occupants to better enjoy the available Panasonic Audiophile sound system and DVD video entertainment system.

"The back panel makes a substantial improvement," said Nammalwar. "With the panel installed, the new cab is six to eight percent quieter than a regular cab without the technology."

Attention to exterior detail further reduces wind and road noise

Delivering an exceptionally quiet cabin involves focusing on more than what's going on inside the interior. Innovative engineering was utilized on the exterior areas as well to further isolate the cabin from intrusive wind and road noise

For example, expandable "gull wings" fit tightly inside the fenders just in front of the doors. These plastic panels are hemmed with a material that expands under heat in the paint oven during the curing process, effectively sealing the wings tightly to the fender and bulkhead. Working in conjunction with the Quiet Steel dash panel, the wings further reduce unwanted road and wind noise.

The vehicle's redesigned climate control system relocates the mechanicals from the engine compartment to inside the interior compartment. This unique strategy reduces the number and size of the openings in the bulkhead, resulting in an improvement in interior quietness.

Thicker, 4.8 mm side glass, a revised steering column boot with improved sealing and an improved instrument panel seal (located between the top of the instrument panel and the windshield) reduce both wind and powertrain noise. Foam-filled A-pillars and C-Pillar stuffers muffle wind noise as it moves around the cabin and help balance out the sound package. Even Super Duty's front air dam was tuned in the wind tunnel and revised to better control airflow around and under the vehicle.

Team-work results in a refined and balanced Powertrain and chassis

A quiet, confident ride involves much more than just a quiet interior. Peter Frantzeskakis, Vehicle Development Manager, led the development team on an eight-month journey, fine-tuning every aspect of Super Duty from front to back. Every department worked together with the NVH teams to optimize each component and system, finding the perfect balance between performance and refinement.

"The people in the NVH group have a lot of valuable experience and a lot of passion in the product," said Frantzeskakis, "They really took it upon themselves to make the 2008 Super Duty the best yet."

Special attention was focused on the 6.4-liter Powerstroke® diesel, fine-tuning the already-quiet state-of-the-art powerplant to further reduce NVH. For example, the valve covers were redesigned to minimize injector noise and the NVH team even recommended changes to such specifics as the micron fits of the piston rings to get just the right sound quality, further reducing diesel clatter.

"The Powertrain and NVH teams set very aggressive targets for exterior idle," said Frantzeskakis. "It's a night and day difference over the previous model."

The diesel's high-tech sequential turbocharger system also came under the scrutiny of the NVH team. Extensive efforts went into the development of the system to insure quiet-smooth operation during both low-speed and high-speed operation.

Powertrain engineers and designers worked side-by-side, tuning the new air induction system and exhaust to give Super Duty its powerful, yet refined note, while a new engine mount further reduces idle NVH.

No issue was left unresolved. Ford's NVH lab specialists were enlisted to help in eliminating a harmonic hum caused by the alignment of the engine's cooling fan with the pulley's turning behind it. The lab technicians helped design a special offset fan blade pattern that eliminated the hum without affecting the fan's performance.

Shifting attention to the transmission, the team developed a new three-plate torque converter architecture that reduces idle NVH and improves shift quality. The transmission received all-new gear sets to reduce gear whine and the clutches were optimized to eliminate ticking by changing the

groove pattern.

To further improve shift quality and reduce unwanted vibration, Super Duty uses a bellows-type center support bearing on the two-piece driveshaft, a first-time use on a heavy truck. The redesigned isolator vastly improves isolation at that joint

The eight-inch longer rear leaf springs were redesigned to better manage the torque as it moves to the rear of the vehicle. The springs feature stiffer front and rear bushings and a modified rear linkage to further increased stiffness and reduce vibration under acceleration.

Tough-truck exhaust designed for robust performance

The pleasing sound coming from the 2008 Super Duty's exhaust system was specifically designed to represent tough truck capability with the refinement of a car. The team focused heavily on upgrading the acoustics of the exhaust system for a good overall sound from idle to full throttle.

"The muffler is our tuning device," said John Roberts, exhaust supervisor, "In the end you want a smooth sound. You don't want to hear a fluctuation in sound, but a linear transition."

Computer-Aided Engineering (CAE) played an extensive role in the development of Super Duty's exhaust system acoustics. Sound engineers "built" the sound of the muffler before prototypes were actually built and put on the vehicle. Working in this way presented the opportunity to develop a specific exhaust sound for each powertrain, further optimizing refinement.

"We would run hundreds of iterations of mufflers until we felt we had something that we should build," said Roberts. "The prototype was used for confirmation."

Roberts and his group also addressed the issue of cool-down ping. The Super Duty is the first Ford vehicle to utilize premium heat shields made of a multilayer sandwich of stamped stainless steel and aluminum. The shields create a very good sound barrier as well as provide excellent thermal protection.

The new exhaust system hangs from the toughest exhaust hangers in the industry. Large, 14-millimeter wire hangers, Torca clamps and bigger isolators have been designed for ease of serviceability and to better isolate the exhaust system, preventing it from moving around and causing unwanted squeaks and rattles.

"Our customers often take these vehicles off-road and the exhaust tended to move around," said Roberts. "The new system holds everything firmly in place and in addition the structure is very robust. You could do chin-ups off of some of the hangers in this system. They're that rigid."

Multi-Objective Optimization

Super Duty's high level of refinement can be attributed to a new strategy implemented by the development team. In the past, vehicle teams were divided by attributes, such as vehicle dynamics, ride and handling, noise vibration and harshness (NVH) and shift quality. Multi-Objective Optimization breaks down the walls between attributes, focusing on the entire vehicle.

"For us it's about trying to optimize the vehicle for all the attributes, working together to develop the truck, to get the right refinement," said Peter Frantzeskakis, Vehicle Development Manager. "It's a lot more challenging to solve the problems, but the results are worth it."

Frantzeskakis says that there are only a certain number of tuning parameters, and those parameters need to address all the attributes. The team worked up front to established the assessments to address all of the attributes. When one attribute was changed, the team could see how it would affect all the other attributes.

“You can also see how improvements to some systems can improve others,” said Frantzeskakis. “For example, the revised rear bushings not only helped improve the ride, but showed improvements in shift quality as well.’