Powerstroke Powertrain Updates

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6.0L Power Stroke Customer Benefit: Trailer Tow Performance

Performance at Max GCW

- Competitor [2/22/02]
- F-350 SRW 3.73 7.3L [3/05/02]
- F-350 DRW 3.73 6.0L [4/14/02]
6.0L Power Stroke Customer Benefits:

- Best-in-Class Torque & Horsepower
- Best-in-Class Performance
- Best-in-Class Towing Capability
- Best-in-Class Interior Quietness
- Best-in-Class Shift Quality
- Best-in-Class Fuel Economy
- Best-in-Class Emissions
Powerstroke Powertrain Updates

**Customer Benefits:**

- Best-in-Class Towing Capability w/ Driver Selected Tow-Haul Feature
  - 40% Gradability Improvement
  - Grade Braking
- Improved Drivability
  - 0-60 mph: 20% Better than 7.3L
  - 5-20 mph: 15% Better than 7.3L
- Improved Fuel Economy (over 10% vs. 7.3L)
- Improved Durability (250,000 miles) & Reliability
- Refined Noise & Vibration Characteristics
- Improved Serviceability
- Cleaner Emissions
  - Satisfy Post-2004 Standards
  - 20 to 38% NO$_x$ Reduction
Powerstroke Powertrain Updates
6.0L V8 Diesel Engine Architecture

- Direct Injected Diesel Engine
- 90° Bank Angle
- OHV with 4-Valves per Cylinder
- Turbocharged
- Charge Air Cooled
- Cast Iron Cylinder Heads
- Cast Iron Block with Bedplate
- Stamped-Damped Steel Oil Pan
  - Improved NVH
Powerstroke Powertrain Updates
6.0L V8 Diesel Engine

• Aggressive New Engine Rating
• Dramatic Power & Torque Increases Over 7.3L V8
• Electronic Variable Response Turbocharger (EVRT™)
  – Electronically Controlled & Hydraulically Actuated
  – Variable Position Turbine Blades
  – Aggressive Low-End Torque
  – Reduced Turbocharger Lag
  – Efficient Performance Over Operating Range
  – Improved Operation at Altitude
Powerstroke Powertrain Updates
6.0L V8 Diesel Engine

• New Combustion System
  – Efficient Air System Management
  – Direct Injection with 4-Valves per Cylinder
  – Cooled Exhaust Gas Recirculation (EGR) System

• New Hydraulic Rail Fuel System
  – High Injection Pressure Capability
    • 26,000 psi
    • 66% Increase vs. 7.3L
  – Pilot Injection
    • Improved Idle Noise
Powerstroke Powertrain Updates
6.0L V8 Diesel Engine

• Exceptional Reliability & Durability with Extensive Testing
  – Designed for 250,000 miles
  – Redesigned High Mileage Water Pump
    • Patterned After Best-In-Class Design

• Robust Cam & Crank Sensor Upgrades

• Joint & Seal Improvements
  – 30% Fewer Wetted-Joints
  – Press-in-Place Gaskets
  – Face Seal O-Rings
  – Carrier Gaskets vs. RTV
  – New Oil Pan w/ Single Plane Oil Seal
Powerstroke Powertrain Updates
6.0L V8 Diesel Engine

- **Improved Serviceability**
  - Cartridge Oil Filter
    - Easily Removed from Above Engine
    - Captured Design Avoids Spilling Oil
    - Same Design Used on Transmission
  - Water Pump with No Hose Connections
  - Externally Accessible Glow Plugs
  - Direct Mount Accessories
Powerstroke Powertrain Updates
Driveline & Accessories

- **Dual Mass Flywheel**
  - Reduced Driveline Noise
  - Improved Shift Characteristics
- **Alternator Efficiency Improved**
  - 10% Better than 7.3L
- **Vistronic Fan Clutch**
  - Fan Stator to Reduce Fan Power by 50%
Powerstroke Powertrain Updates
5-Speed Automatic Transmission

• Improved 1\textsuperscript{st} & 2\textsuperscript{nd} Gear Ratios vs. 4R100

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• Improved Reliability
  – Cooling System Upgrades
  – Major Transmission System Upgrades
  – Filtration System Improvements

• Direct Electronic Shift Control (DESC)
  – Improved Shift Control
  – Faster Response to Driver Demand
Powerstroke Powertrain Updates
5-Speed Automatic Transmission

- **Customer Benefits:**
  - Improved Durability & Reliability
  - Increased Torque & Power Capacity
  - Improved Shift Quality
  - Increased Vehicle Load Capacity
    - 22,000 lb GVW
    - 30,000 lb GCW
  - Driver-Selected Tow-Haul Mode
    - Improved Towing Characteristics
  - Upgraded Transmission/PTO Powerflow for Improved Reliability
  - 15% Lighter than Competitive Transmission
Powerstroke Powertrain Updates
5-Speed Automatic Transmission

• Increased Cooler Flow Capacity by 127%
  – High Flow - Cast Iron Pump Body
  – ½ in. Diameter Cooler Lines
  – High Capacity OTA & In-Tank Coolers
  – Externally Mounted Cartridge Oil Filter
• Larger Diameter Tempered Output Shaft
• Robust Planetary Gearset Upgrades
• Robust Clutch System Upgrades
  – High Energy Friction Material
  – Bonded Piston Seals
  – Improved Lubrication
• External Joint & Seal Improvements
• Robust Torque Converter Upgrades
Powerstroke Powertrain Updates
Durability & Reliability Verification

• Much More Demanding Transmission Design Verification Tests
  – Transmission Key Life Tests
    • Extended Test Hours by 70%
    • Increased Maximum Test Towing Load by 120%
    • Adopted Over-8,500 lb GVW Operating Cycle
  – Full Load Shift Cycle Tests
    • Extended Test Cycles by 60%
  – Gear Fatigue Test
    • Extended Test Hours by 60%
  – Powertrain Reliability Growth Fleet