

## 2012 Jeep® Wrangler Powertrain

More fuel efficiency, power and torque result in improved on-road refinement and off-road capability

- **More refined engine and transmission translate into greatly improved on-road dynamics and comfort**
- **New 3.6-liter V-6 engine produces 285 horsepower and 260 lb.-ft. of torque with improved fuel efficiency**
- **New five-speed automatic transmission offers smoother shifting and greater performance**
- **All-new powertrain combination is shared with Jeep® Grand Cherokee**

It's the most powerful and capable Jeep® Wrangler ever – and the most fuel efficient. Moreover, it offers consumers substantially improved on-road dynamics and real-world driving comfort.

Equipped with Chrysler Group LLC's new 3.6-liter Pentastar V-6 engine that debuted in the Jeep Grand Cherokee last year, the powerplant for the 2012 Jeep Wrangler is better both on- and off-road, with an 83 horsepower increase over the previous 3.8-liter V-6 engine. Torque also is up measurably, from 237 lb.-ft. to 260 lb.-ft. The new engine is easily the most powerful, best-performing engine ever offered in a Wrangler.

For the first time, there's also a new five-speed automatic transmission that provides smoother shifting throughout the rpm range with shift "busyness" and gear hunting virtually eliminated. The A580 five-speed automatic transmission is a first for the Wrangler and is ideally geared for smoother highway driving without compromising off-road capability. The new transmission also helps contribute to better fuel economy, pushing Wrangler to 21 mpg for the first time.

"The new 2012 Jeep Wrangler is the latest vehicle in our lineup to be equipped with the advanced Pentastar 3.6-liter V-6 engine," said Bob Lee, Vice President and Head of Engine Powertrain — Chrysler Group LLC. "This award-winning engine combined with the proven five-speed, fully electronic, automatic transmission sets new standards for lower interior noise levels and overall vehicle refinement in all driving conditions for the new Wrangler."

### **3.6-liter Pentastar V-6 Engine**

Compact and lightweight, the all-aluminum Pentastar V-6 engine is more than 90 lbs. lighter than the previous 3.8-liter engine that was constructed with a cast iron block. Weight savings also were realized with accessories bolted directly to the block. Exhaust manifolds are deleted with exhaust gases flowing through passages cast directly into the cylinder head of the Pentastar V-6.

The new Pentastar V-6 is an extremely quiet engine that has set the standard for power, performance and interior quietness and was recently recognized by the editors of *Ward's* as one of the "10 Best Engines for 2011."

Constructed with a high-pressure, die cast aluminum block fitted with cast iron bore liners and aluminum cylinder heads, the 60-degree 3.6-liter Pentastar engine is compact and lightweight. At 503mm in total length, the new V-6-liter is 94mm shorter than the 3.8-liter V-6 engine that was previously used in the Jeep Wrangler.

With this shorter length, engine packaging constraints are reduced. On Wrangler, for example, this allowed engineers to improve the intake flow resulting in more power. Living up to its reputation as an off-road vehicle that can go anywhere, engineers have relocated the alternator higher to achieve maximum water fording.

Bore and stroke measure 96mm by 83mm, respectively. Cast aluminum pistons with low friction rings are fitted to forged steel connecting rods. Pistons have been designed with a reduced skirt area to help reduce both weight and friction. Compression ratio for the engine is 10.2:1.

The strong, lightweight pistons are cooled with piston cooling jets fitted in each cylinder that spray oil on the piston to more effectively control temperature and help reduce the onset of detonation in the combustion chambers.

A nodular iron crankshaft offering superior rigidity also is standard fare with the Pentastar engine. Fatigue strength of the crankshaft is increased 83 percent with the rolled fillet process. The crankshaft is fitted with four bolts on the main bearing supports. Two additional bolts are cross-fitted in the main bearing caps providing an extremely rigid bottom end. Additionally, as part of the overall refinement of the Pentastar V-6, a structural windage tray is included to help reduce oil splash on the crankshaft and reduce power losses from the rotating assembly. The tray also improves structural stiffness and contributes to lowering engine noise.

Lubrication of the engine is through a variable displacement pump that adjusts the flow rate and pressure to minimize the energy used. The engine management system determines the oil pressure needs of the engine and commands an electronic solenoid to drive the pump into low or high pressure mode. If the engine is running below 3,500 rpm, for example, the pump operates in the low pressure mode to conserve energy. When the engine is operating at more than 3,500 rpm, the pump switches to high pressure.

A force balance mechanism inside the oil pump adjusts the size of the pumping chambers to deliver the appropriate oil flow to meet engine demands. If the oil is cold, less oil is needed and the pump reduces the size of the internal chambers. When the oil is hot and gets thinner, more oil is needed. A spring located inside the pump increases the size of the pump chambers. This action helps minimize the amount of energy required to pump the oil.

With Wrangler, specific upper and lower oil pan requirements have been engineered into the engine to provide increased grade requirements, keeping the oil within reach of the pump when the vehicle operates at steep angles.

For consumers, oil changes are simplified with a paper filter located on top of the engine. To help reduce long term environmental impacts, the paper filter can be incinerated rather than disposed in a landfill. Crankcase capacity is six quarts of oil with a filter change. Traditional, non-synthetic motor oil with an International Lubricant Standardization and Approval Committee (ILSAC) standard of GF5 is recommended. Change interval is 8,000 miles under normal driving conditions.

Cylinder heads are constructed of 319 T7 heat treated aluminum and feature dual overhead camshafts with roller finger followers. On the intake side, valve diameters are 39mm with 17 degrees relative to the bore axis. Exhaust valves are 30mm in diameter and angled at 18.8 degrees. Combustion chamber volume is 52.7cc.

Independent cam phasing also is used on all four camshafts. Torque actuated, the phasers use the natural action of the valve springs to pump the phasers into position, lowering the amount of energy required to move the phasers very quickly. The small size of the phasers combines to reduce weight and allows the camshafts to be spaced very closely together for optimum valve angles and combustion chamber geometry.

Induction is handled through a multi-point port fuel injection system and a lightweight composite intake manifold. Throttle bore diameter is 74mm. Both the intake and exhaust systems have been designed to provide efficient flow characteristics with a minimum amount of restriction in the passages. For Wrangler, the Pentastar includes a unique intake manifold specifically tuned for mid-range torque.

The engine also is equipped with an acoustic cover that helps provide reduced intake noise and easy engine maintenance. The entire intake system is unique to Wrangler with induction now handled through a revised throttle body located on the left side of the engine. All other Pentastar versions have the intake system on the right side of the engine.

On the exhaust side, spent gases exit through integral exhaust manifolds that are cast into the cylinder heads—unique in the Pentastar V-6 engine lineup. Equal length down pipes, coupled with an optimized collector location, also help provide exceptional mid-range torque. To help reduce back pressure and maintain the exceptional exhaust flow characteristics, the Wrangler’s exhaust system features a new intermediate pipe resonator along with a decreased internal restriction muffler.

The integral exhaust manifolds eliminate the need for separate cast iron or steel exhaust manifolds and contribute to improvements in engine refinement and weight.

Extremely efficient with advanced emission technology, the new 3.6-liter Pentastar is designed for future emission standards. This requires no Exhaust Gas Recirculation (EGR) and helps reduce the mass of the engine. The 3.6-liter V-6 meets Federal Tier 2 BIN 5 emission requirements and Ultra-low Emissions Vehicle II standards. The engine also has been designed to meet all known future worldwide emission standards including LEV III and PZEV California standards.

Despite the impressive gains in power, the engine is designed to run on regular unleaded fuel with an octane rating of 87.

Before the first aluminum block was cast, the new Pentastar V-6 benefitted from more than 45,000 hours of computer analysis to optimize the design of the engine. Once assembled, the engines were thoroughly tested and evaluated on dynamometers and in vehicles. More than 12 million customer equivalent miles were logged on the dynamometers followed by millions of vehicle testing miles.

Already recognized as one of the quietest V-6 engines available, world-class NVH levels start with a stiff and lightweight block. To help reduce vibration, all components including the power steering and air conditioner compressor housings, are bolted directly to the block eliminating bracket assemblies and improving NVH characteristics. To further reduce vibration, the engine and transmission connection is extremely rigid to eliminate motion between the two major assemblies.

Engine cooling and air conditioning performance for 2012 Wrangler also have been improved. A new 600-watt pulse-width-modulated fan with variable speeds offers improved cooling performance and improved NVH. Also, an upgraded full-face condenser is more than 20 percent larger and improves air conditioning performance.

“The new Pentastar V-6 represents the best technology to deliver exceptional refinement, fuel economy and performance,” Lee said.

### **A580 Five-speed Automatic and NSG 370 Six-speed Manual Transmissions**

Two transmission choices will be offered for the new 2012 Wrangler — a first-ever five-speed automatic and the first application of a six-speed manual backing up the new Pentastar engine. Both are proven gearboxes that will provide the outstanding performance and durability required through the 4x4 transfer case either on the highway or off-road.

Originally designed for vehicles equipped with the legendary 5.7-liter HEMI® V-8, the fully electronic A580 five-speed automatic has been refined to handle the different torque and horsepower levels that come with the 3.6-liter, 285 horsepower V-6 Pentastar engine. The move from four speeds to five speeds also improves fuel economy and helps reduce interior noise levels with quieter operation due to reduced engine rpm at highway speeds and acceleration.

“The transmission plays as big a factor for improved NVH levels for the 2012 Jeep Wrangler as does the new Pentastar engine,” said Ray Durham, Vehicle Line Executive, SUV. “Elevated engine noise from shifting and gear hunting has virtually disappeared.”

Available on the 2012 Wrangler, the A580 five-speed automatic required no packaging revisions and with its robust design, provides 260 lb.-ft. of torque and helps deliver up to 3,500 lbs. in towing capacity.

Designed for “fill for life,” the transmission requires no maintenance under normal operation.

Throughout the gear range, the A580 for Wrangler has been designed to provide smooth shifting throughout the rpm range. The transmission also has closer ratios that help improve shifting characteristics with smoother gear-to-gear changes.

Electronic Range Select is standard for all automatic-equipped 2012 Jeep Wranglers. When the console-mounted shifter is in Drive, this feature allows the driver to move the shifter right or left and allows the selection of the desired top gear, providing more control.

The electronic stability control (ESC) also has been optimized to perform effortlessly with the new Pentastar engine. In addition to independent brake control in the event of wheel slippage, ESC also will reduce engine torque.

With the proven NSG 370 six-speed manual transmission, a new clutch housing, flywheel and long travel damper clutch are engineered for the 2012 Jeep Wrangler. The improvements are a result of the adaptation of the transmission to the new engine.

### **Axles and Transfer Cases**

A variety of transmission axle ratio selections to better match customer's specific needs for fuel economy and towing also are offered. Final drive axle ratios range from 3.21, 3.73 or 4.10.

Both the Sport and Sahara models include a Dana 30 front and Dana 44 rear axle. The two-speed, Command-Trac NV241 transfer case includes a 2.72 low range gear ratio. An available Trac-Lok limited-slip differential may be ordered for individuals needing more traction capability in environments such as sand, mud or snow. Also, a lower first gear ratio in the new automatic transmission gives the Wrangler more off-road capability via a lower overall crawl ratio.

The Rubicon model features heavy-duty Dana 44 front and rear axles and the Rock-Trac<sup>®</sup> NV241 two-speed transfer case with a 4.0 low-range gear ratio. Rubicon also includes electric front and rear locking differentials, disconnecting front sway bar and 32-inch tires, taking the Wrangler to the highest level of capability.

"The heart and soul of every Jeep vehicle starts with the powertrain," said Durham. "For 2012, Jeep Wrangler delivers on power, fuel economy and reduced sound levels that every driver can appreciate."

