# PACCAR Engines: Driving Advancement

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By Landon Sproull, PACCAR Vice President for Powertrain

PACCAR is one of the premier diesel engine manufacturers in the world, with over 800,000 square-feet of production facilities in Columbus, Mississippi and Eindhoven, The Netherlands. PACCAR also operates two world-class engine research and development centers with 46 engine test cells and a full climatic chassis dyno to enhance its engine design and manufacturing capability. With 60 years of engine development and manufacturing expertise, PACCAR has delivered over 1.4 million engines, with the Columbus facility delivering over 140,000 engines to support Kenworth and Peterbilt trucks since its opening in 2010.

PACCAR has a long track record of innovation and success in Europe with PACCAR engines and is now equally recognized in North America. The successful integration of PACCAR engines into Kenworth and Peterbilt trucks has been achieved during a time of tremendous change in the industry. PACCAR engine development teams are leaders in incorporating new emissions technology and simultaneously improving engine performance, driver satisfaction, serviceability, and total cost of ownership.

## Diesel Engine Evolution

SCR (Selective Catalyst Reduction) in conjunction with a DPF (Diesel Particulate Filter) has become the established after-treatment technology for meeting EPA emissions standards. Over 500,000 vehicles in the industry are successfully performing with SCR and DPF technology today. Regulated emissions have been reduced to near-zero levels with no visible smoke emitted from the engine. A white handkerchief will stay white when held over the exhaust pipe.

Advanced electronic control technology provides more precise combustion timing, reduced emissions, and better fuel economy. A “smart” engine and emission control system can communicate real-time performance and diagnostic information to the customer and dealer efficiently and in simple language.

Engines with smaller displacements can provide power and torque that are comparable to larger engines, with the added benefits of less weight and better fuel economy.

Engine life is increasing. A B50 engine, once an industry standard for average life to overhaul, meant that at 1 million miles, 50 percent of the engines would need a rebuild. In 2010, PACCAR’s MX engine platform was designed with a B10 life, meaning that 90 percent of our engines will go beyond 1 million miles without the need for a major overhaul.

The advantages of proprietary engines have enabled Peterbilt and Kenworth to better integrate the engine to the vehicle. An example of this collaborative approach is access to preventive maintenance items on the truck like oil and fuel filters. Industry-leading serviceability of PACCAR engines and trucks is achieved through intense design collaboration of PACCAR engineers and dealer and customer technicians.

**Performance Improvements**

How has the industry accomplished so much in such a compressed period of time?

For PACCAR, it involves the use of materials and components that provide the right combination of strength and weight; advanced engine control technology; and a commitment to making the refinements necessary to exceed customer expectations.

The first step toward creating a B10 engine is the block and cylinder head casting process. PACCAR uses a compacted graphite iron (CGI) engine block and cylinder head instead of gray cast iron. CGI is 75 percent stronger and 20 percent lighter than cast iron. This allowed PACCAR engineers to balance wall thickness and stiffness to achieve optimal weight and thermal fatigue characteristics.


We also used bearings that are comparable in size to those found in a 15-liter engine, as well as other high-strength parts not typically used in an engine with a 12.9-liter displacement. Prior to introducing the PACCAR MX engine, we accumulated over 50 million test miles in rigorous and severe conditions in North America.

Since introduction in 2010, PACCAR MX engines have been continuously enhanced. In 2013, we engineered the MX-13 with a common rail system with two fuel pumps delivering 36,000 PSI. This allowed us to enhance the fuel injection for finer fuel atomization and optimized combustion in order to reduce fuel consumption, emissions, and noise levels.

We improved the exhaust after-treatment system. The cost of Diesel Exhaust Fluid (DEF) in North America was difficult to project prior to 2010. It turned out to be more economical than expected and allowed us to refine the DEF dosing. Advanced engine software, sensors, and actuators also played an important role, functioning faster with increased precision to ensure the best possible mixture of air, fuel, and exhaust gases at all times.

As a result of these and other changes, we improved fuel economy on the PACCAR MX-13 by up to 3.5 percent, depending upon the application, and increased horsepower from 485 to 500.

The 2017 PACCAR MX-13 engine delivers yet another 2 to 4 percent improvement in fuel economy, depending upon application. PACCAR engines use a clutch to fluctuate the coolant pump speed to match demand; combustion chambers are fine-tuned and a new variable geometry turbo is introduced.

We improved engine efficiency and increased horsepower to a top rating of 510 horsepower with peak torque at 900 RPM; an improvement from 1000 RPM in 2013 and 1100 RPM in 2010. Drivers appreciate more low-end power and less shifting.

Additional changes reduced the engine weight by 50 pounds compared to previous versions. A single-canister after-treatment system saves 100 more pounds and requires less frequent service intervals.

**More Choice for the Customer**

One of the most important developments in the North American engine market is the ability to produce more power and performance from a smaller displacement engine.

In 2016, PACCAR introduced the MX-11 engine for heavy-duty applications where customers need an engine with high power-to-weight ratio and low fuel consumption.

The power-output range of the MX-11 is 335 to 430 horsepower and 1,150 to 1,650 lb-ft of torque and complements the higher range of the MX-13. This gives weight-sensitive customers like bulk haulers and construction fleets the ability to choose an engine that weighs less, delivers the power they need, and has been tested and verified for a B10 life.

An engine that is designed for a million miles or more must deliver the lowest possible total cost of ownership. Some innovations appear subtle yet can provide significant benefits in terms of service life. One example is the “anti-polishing rings” on the MX engine. The ring breaks up carbon deposits that form on the piston eliminating wear on the cylinder liner and preserves oil life.

In 2010, the oil change interval for a PACCAR MX engine was 40,000 miles; in 2013 it was 60,000 miles. Today, in long-haul trucking applications, the oil change interval can be as long as 75,000 miles due to a larger capacity oil pan and primary oil filter, and a bypass filter that uses centrifugal force to filter the carbon out of the oil. We also thermostatically control engine oil temperature to help extend the oil’s life.

For PACCAR, it’s all about providing our customer with the right tool for the right job. While we’re in our 60th year as an engine company and have had tremendous success with our MX line of engines, we’re never done or satisfied. Like our truck companies—Peterbilt and Kenworth—we will continue to innovate and bring new ideas and products to market.

**About Landon Sproull**

*Landon Sproull is the PACCAR Vice President for Powertrain and has held this position since April 2015. Prior to this role, he was Peterbilt Chief Engineer for 10 years. He joined PACCAR in 1988 as a design engineer in Nashville, Tennessee.*

*In his current position, he has responsibility for powertrain strategic planning including global development, validation and compliance and the PACCAR Technical Center. He earned his engineering degree from University of Evansville and earned a master of business administration degree from Middle Tennessee State University. He is a licensed Professional Engineer.*