



THE

# SOURCE

World-Class Engine Solutions from FP Diesel®

## The Complete Power Package

*From Design to Installation, FP Diesel Components Bring Proven Technologies to Every Commercial Engine*

Restoring the power and durability of a large-displacement diesel or natural gas engine requires the best replacement engine technologies and components.

Having an extensive commercial-engine OE portfolio is absolutely imperative. Being a global OE manufacturer means investing in advanced technologies and on a daily basis working to create engine and sealing system solutions that address the dynamic forces found in each generation of engines.

Federal-Mogul is instrumental in the development of every new generation of diesel engine technology, with a proven commitment to best-in-class product performance and reliability. The company's global research centers are pioneering the use of new materials and designs that will become tomorrow's industry standards. Consistent deployment of leading-edge technologies across this extensive research network ultimately means better designs for replacement applications.

"The mission of the FP Diesel brand includes doing everything the right way – manufacturing only the best components, hiring the best people to interface with customers, developing a complete product offering that covers every repair need for leading engine platforms, and standing

behind the product with tremendous warranty coverage," said Raymond King, Global Product Director, Engine and Sealing Systems, Federal-Mogul. "The brand is

even stronger today as a result of

Federal-Mogul's extensive engineering and



manufacturing resources. We know which materials and designs are ideal for virtually any engine and operating environment."

Federal-Mogul has leveraged its global engineering and manufacturing footprint to develop a comprehensive offering of best-in-class engine repair solutions for virtually any application, all offered through the trusted FP Diesel brand.

"Every FP Diesel replacement part reflects Federal-Mogul's investment in world-class research, design and production technologies," said Mike Sadowski, Aftermarket Engineering Manager, Hard Parts. "By choosing FP Diesel, repair providers and fleet customers can ensure that the job will be completed with the finest materials and

technologies for each engine."

This commitment to leading-edge technology can be seen in each FP Diesel replacement engine and sealing component. The FP Diesel line of pistons, for example, includes virtually every type of piston needed to service today's heavy-duty engines, including cast iron, one-piece aluminum, articulated steel, and, very soon, Federal-Mogul's POWERFORGED® one-piece steel pistons.

In many cases, Federal-Mogul aftermarket engineers improve on original materials and designs based on the real-world operating demands of today's engines. "Some

aftermarket manufacturers now widely use a less-expensive micro-alloy steel for their crown forgings. We have chosen to stay with a higher quality 4140 forged crown for all severe-and medium-duty applications because this material allows for greater overall consistency from part to part," Sadowski said.

Federal-Mogul also excels in piston coating technologies. FP Diesel articulated steel pistons feature a manganese phosphate crown coating that helps prevent corrosion and pin bore scuffing. Many of these pistons also feature a precisely contoured pin bore that evenly distributes pin load over a broader surface area.

An important new trend in engine technology is the adoption of

# Delivering the Perfect Seal

## New FP Diesel Gasket Technologies Solve Tough Sealing Challenges

Designing the best head gasket for any heavy duty diesel or gasoline engine is like conquering a complex puzzle. Head gaskets must provide an ideal combination of several characteristics, including combustion and fluid sealability, resistance to extreme temperatures, conformability to a variety of surface finishes, and the ability to adapt to controlled lateral and vertical casting motion caused by peak combustion pressures and temperatures.

“Each of these characteristics becomes increasingly important with the continued evolution of engine design. Today’s smaller, lighter-weight yet more powerful commercial engines present real challenges for the head gasket. They also make the choice of a replacement gasket more important than ever when performing an engine repair,” said Steve Kuiltzo, Director of Aftermarket Engineering, Sealing, Federal-Mogul.

Federal-Mogul and the FP Diesel brand have revolutionized head gasket technology for Detroit Diesel Series 60 engines and other popular applications with the new ML<sup>7</sup>™ seven-layer gasket design. This exclusive multi-layer-core technology brings significantly improved combustion and fluid sealing capabilities and superior heat

The FP Diesel ML<sup>7</sup> gasket features an advanced graphite material over a thicker, perforated stainless steel core for significantly increased rigidity. Federal-Mogul engineers designed each gasket to achieve optimal load balance among all component materials, including the gasket body, combustion armor and wire.

resistance to high-output engines.

These new head gaskets feature three separate solid steel cores sandwiched within an advanced graphite composite material. The multiple layers are tied together through precisely engineered perforations in the graphite material and an intermediate sealing layer. This innovative design enables the gasket to withstand significantly higher combustion pressures and temperatures as well as increased motion between the block and cylinder head.

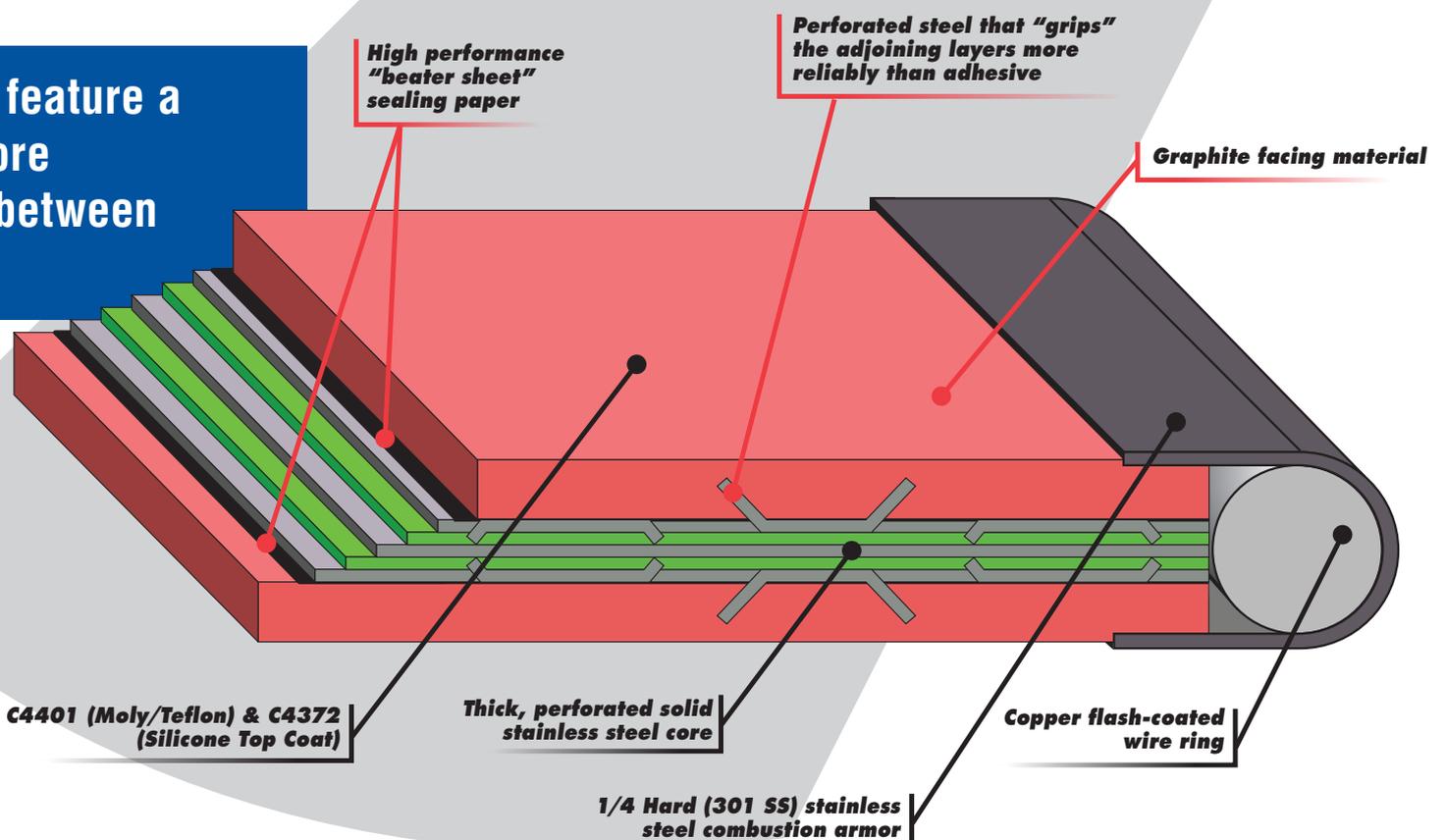
Each gasket also features a special moly coating to address the unique requirements of the aftermarket service environment. This coating helps seal imperfections in the head and block mating

Engineers determined that the stainless steel wire material used in other gaskets was both excessively hard and unforgiving. FP Diesel ML<sup>7</sup> gaskets feature a copper flash-coated low-carbon steel wire that better absorbs stress without cracking.

surfaces and allows the gasket to adapt to controlled casting motion. It also ensures a no-stick release for future engine work.

Federal-Mogul’s global network of research and development facilities contributed to the design of this innovative sealing solution. The company’s dedicated aftermarket engineering group in Skokie, Ill., adapted the technology to the needs of FP Diesel customers. ♦

**ML<sup>7</sup> gaskets feature a solid steel core sandwiched between dual layers**



# The Gold Standard in Piston Technology

## 2 New, Proven Repair Solutions for Series 60 and M11 Engines



Want to understand how the latest engine technologies have affected the design and construction of internal components? Look no further than the piston, where ever-rising combustion pressures and temperatures have exceeded the capabilities of many conventional technologies.

As a premier global OE supplier of engine components, Federal-Mogul has worked closely with leading engine manufacturers to develop a variety of next-generation piston technologies. Two of these leading-edge designs are now available for Detroit Diesel Series 60 and Cummins M11 engines. ♦

### Detroit Diesel Series 60 'Crosshead' Piston

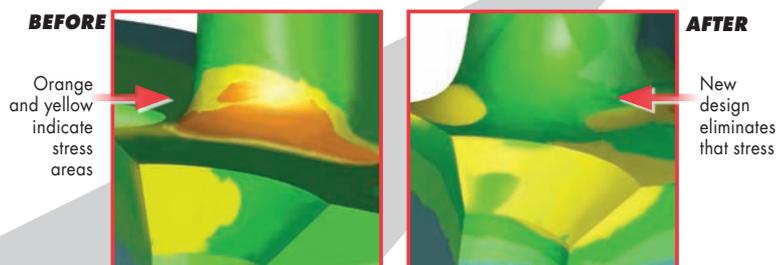
Among the world's most powerful and efficient engines, Detroit Diesel Series 60 engines are equipped with ultra-high-strength pistons engineered to withstand extreme pressures and temperatures. Some replacement pistons for these engines, however, have experienced fatigue cracking at the crown-to-saddle interface.

Federal-Mogul engineers have solved this issue through an all-new FP Diesel Series 60 "crosshead" piston. The new design incorporates the company's latest metallurgical advances to deliver 17 percent more tensile strength and 30 percent greater yield strength than earlier designs.

The engineers used Finite Element

Analysis to identify areas of greatest piston stress under a full range of operating conditions. In particular, they were able to pinpoint the causes of cracking along the struts that attach the crown to the saddle.

"Our new piston features significant enhancements to the rib structure and the radius at the bottom of the strut where it blends into the saddle," said Mike Sadowski, Aftermarket Engineering, Manager, for Federal-Mogul's FP Diesel brand. "Extensive testing has shown that these stress areas and the potential for



cracking have been eliminated."

In another key enhancement to the Series 60 pistons, the company's engineers optimized oil passages and strut standup height to increase the volume of oil within the piston crown. This, in turn, has helped reduce piston crown temperatures for longer life. ♦

### Cummins M11 Replacement Piston

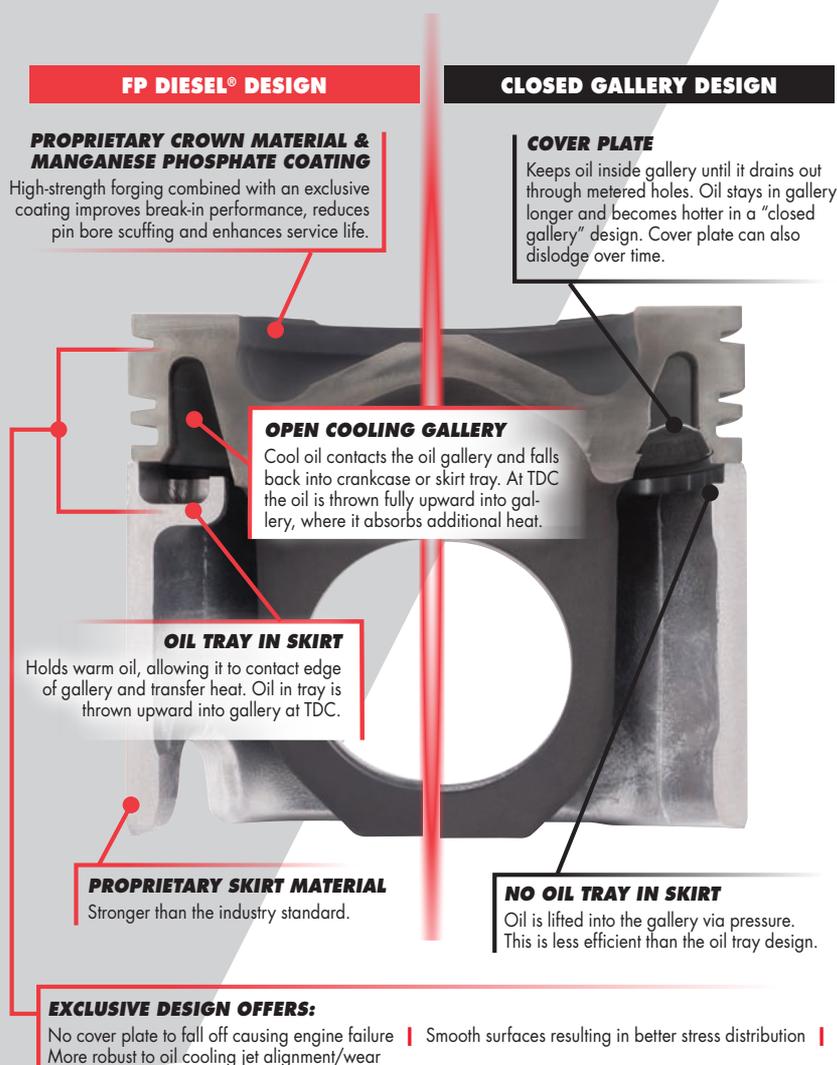
Adding to its portfolio of piston innovations, Federal-Mogul recently introduced an exclusive "open gallery" style replacement piston for Cummins M11 engines.

Conventional pistons for this engine platform feature a closed gallery design featuring a separate cover plate. This approach has a number of drawbacks: oil trapped within the gallery cannot effectively transfer heat away from the crown; there is no oil in the piston skirt area to be lifted into the gallery; and the cover plate itself can become dislodged, leading to potential engine failure.

To improve on conventional designs – and significantly enhance piston service life – Federal-Mogul engineers developed an innovative open cooling gallery that is augmented by an oil tray located high within the piston skirt. Through this new design, cool oil now contacts the oil gallery then falls back into the crankcase or skirt tray. Warm oil in the skirt tray contacts the edge of the gallery for additional heat transfer. This oil is also thrown upward into the gallery when the piston is at top-dead-center.

"This design runs as cool or cooler at the piston crown," Mike Mickelson, Senior Product Engineer, Engine Hard Parts said. "It also makes cover alignment much less critical in the overall durability of the piston."

This new design is now available in all FP Diesel pistons for Cummins M11 engines. Contact your FP Diesel supplier for more information. ♦



# The Best Solutions, When You Need Them

## FP Diesel Brand Leads the Market in Coverage of Today's Engines

Industry-best product quality and performance are just two elements of the FP Diesel advantage; you can also count on the best coverage of today's heavy duty engines.

In keeping with its commitment to coverage leadership, Federal-Mogul recently introduced in-frame engine kits for **Caterpillar C7** and **C12** engines equipped with articulated steel or aluminum pistons.

Also now available are five new piston kits, complete cylinder kits and an in-frame overhaul kit for **Caterpillar 3406E** engines with articulated pistons. FP Diesel piston kits include the crown, skirt, rings, pin and pin retainer. Cylinder kits include crown, skirt, rings, pin, retainer, liner and liner seals. In-frame overhaul kits feature all of these components plus rod and main bearings, thrust washers and an in-frame gasket set.

Unlike the articulated pistons offered by other manufacturers, the FP Diesel pistons for 3406E engines are manufactured through an advanced forging process that ensures superior strength, durability and consistency. Other pistons now sold for these engines are produced through a less expensive casting process that can reduce component service life.

Earlier this year, the FP Diesel team introduced articulated-piston cylinder kits and an in-frame overhaul kit for **Cummins N14** engines. Each cylinder kit features a premium forged-steel crown, skirt, rings, pin, pin retainer and cylinder liner. The in-frame kit includes these parts as well as all required FP Diesel gaskets.

FP Diesel engine components are developed using the latest computer aided design technology and predictive engineering to ensure exceptional dimensional accuracy and performance. When FP Diesel products are installed together, customers benefit from the enhanced performance of a world-class power cylinder system. ♦

## Need To Find a Part?

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electronic catalog!

## The Complete Power Package

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Federal-Mogul's open-gallery design for articulated pistons. Conventional articulated pistons feature a closed gallery formed in part by a separate cover piece. Due to concerns about covers separating from the piston, Federal-Mogul engineers pioneered the use of a "tray" formed within the skirt that retains oil beneath the crown for improved cooling.



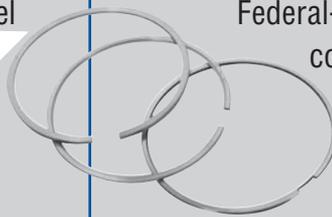
## Rings Around the Competition

Manitowoc, Wis., is the capital of piston ring production in North America and home to Federal-Mogul's extensive ring manufacturing operations. It's in this highly advanced facility where the company's latest ring technologies – developed within a global network of research and development centers – become reality for leading engine manufacturers and aftermarket customers.

A key area of emphasis for engine designers is the reduction of parasitic horsepower loss caused by ring drag. This objective requires engineers to perform a delicate balancing act between reduced ring tension and increased oil control.

Federal-Mogul's ring expertise also extends to coating technologies. The company applies an array of advanced surface treatments, including chrome, "CKS" (chrome ceramic coating), and "GDC" (Goetze® diamond coating), to ensure superior wear characteristics.

"The challenges and solutions associated with pistons obviously go hand-in-hand with those in the ring category. That's why it's so important to rely on a single supplier with a high degree of expertise in both products," Sadowski said. "As a basic manufacturer in multiple engine systems, Federal-Mogul ensures that all FP Diesel pistons and rings are fully interchangeable. This is often not true in the case of other suppliers." ♦



## We Want to Hear from You!

Would you like more information on how to apply FP Diesel engine parts solutions within your business? Simply call your FP Diesel distributor, or contact us via toll-free phone call or e-mail.

Toll-free customer line: **1-800-237-7425**  
Customer fax line: **1-800-370-7444**  
Web: **[www.federal-mogul.com](http://www.federal-mogul.com)**

