Magnum Monosteel™ Piston
Monosteel®

• First production of the Monosteel Piston for a heavy-duty commercial customer diesel engine in 2003

• The Monosteel Piston pioneered an innovative friction welding process to join the piston head and skirt, enabling optimum gallery designs for both efficient oil cooling and maximum strength

• Over 3.5 million Monosteel Pistons have now been produced; annual production by 2012 will exceed 1.5 million

• Current customers include major U.S., European and Korean commercial vehicle engine manufacturers

• Euro 6 and Tier 4 emissions regulations place a premium on enabling technologies for strength, cooling, and fuel economy improvement

• The Monosteel Piston was awarded a prestigious Automotive News PACE Award in 2006
Heavy-Duty Piston Market Evolution

Monosteel®

Articulated

Aluminum

Peak Cylinder Pressure, bar

110 bar
130
160
180
220
250 bar!


Years

2.3 bar/year
7.0 bar/year

Federal-Mogul Corporation
Monosteel® Technology Evolution

Original Monosteel® with bushing – first production

Next generation Monosteel® bushingless, MnP coated pin

Future Monosteel® Magnum, bushingless, MnP coated pin bores

2003
2005
2012
High PCP Piston Architecture
Steel Piston – Enabling Technology

Monosteel Piston Box Structure Gallery Design

• The welded closed gallery design significantly increases the structural strength of the piston, improves fatigue safety factor (SF) and stability of the ring belt

Unsupported ring belt
SF=1.4
Low-life prediction = Crack!

Monosteel®
SF>5
• Crack-free piston
• High-safety factors determined by finite element analysis (FEA)
High Combustion Temperature Steel Piston – Enabling Technology

Monosteel Piston Cooling Gallery Design

• The two-piece welded piston design allows the cooling gallery to be closer to the top of the piston, resulting in significant piston temperature reductions.

Other Piston

Top groove 282°C
Bowl rim 485°C
Undercrown 309°C

Monosteel®

Top groove Δ20-60°C
Bowl rim Δ50-100°C
Undercrown Δ20-40°C
Monosteel®
Technology Evolution - Magnum

Key features include:

• Double-band piston skirt design, a first for modern diesel pistons

• Dual friction-welded construction, enabling large cooling galleries for high-temperature resistance and strength

• Friction reduction of 17 percent, when compared to conventional steel piston designs

• Reciprocating mass reduction of up to 7%

• On test with major engine manufacturers in the U.S. and Europe