ISO 9001
CERTIFIED

PAI HIGH PERFORMANCE ENGINE PARTS

SKIRTS I CROWNS I PINS I RINGS I BEARINGS I LINERS

HIGH PERFORMANCE TRUCK PARTS

We are proud to be an American Manufacturer for over 40 years. Our goal is to ensure customer satisfaction by maintaining the high level of quality for all products and services we provide. For that reason, we perform rigorous testing to ensure our products meet or exceed OEM Quality.

"PAI ensures that our High Performance Truck Parts exceed industry standards for quality and performance. As an added advantage to our customers, High Performance Truck Parts come with an extended warranty "

PAI INDUSTRIES®

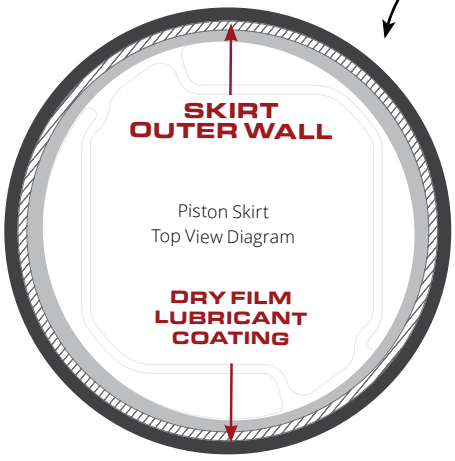
HIGH PERFORMANCE

High Performance Piston Skirts

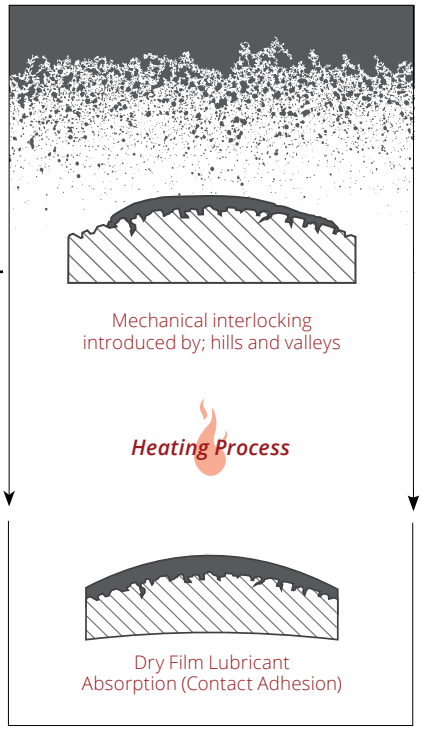
Coating Process / Advantages / Material Specifications

PAI's Piston Skirts are treated with a new and highly developed anti-friction coating process. The coating is designed to lower scuffing and wear while providing dry lubrication that is highly resistant to contamination, and reduces parasitic drag. **PAI's GEN-3 Dry Film Lubricant** is a proprietary formulation of anti-friction coating applied to the piston skirt, to decrease friction on the liner walls.

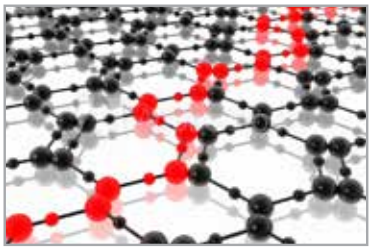
As the largest friction area, the liner wall represents the largest loss of power and efficiency anywhere in the engine. The **Dry Film Lubricant** coating drastically reduces friction and allows for tighter clearances between the piston and the liner wall. This reduction in friction and clearance improves overall performance, lowers oil usage and oil temperature; ultimately increasing the life of the Skirt.



Mechanical Bonding Stage



Chemical Bonding Stage



"Coating drastically reduces friction and allow for tighter clearances between the piston and the Liner Wall."

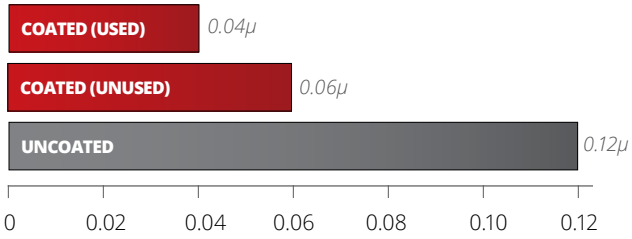
MANCE PISTON SKIRTS

GEN-3 Dry Film Lubricant

Coating Process

GEN-3 Dry Film Lubricant coating is applied as a spray process. Different surface preparatory methods appropriate for the substrates are used prior to the coating process. A thin coated film is applied to the piston skirts, measured in the micron ranges and varied to suit application.

Friction Reduction



Advantages

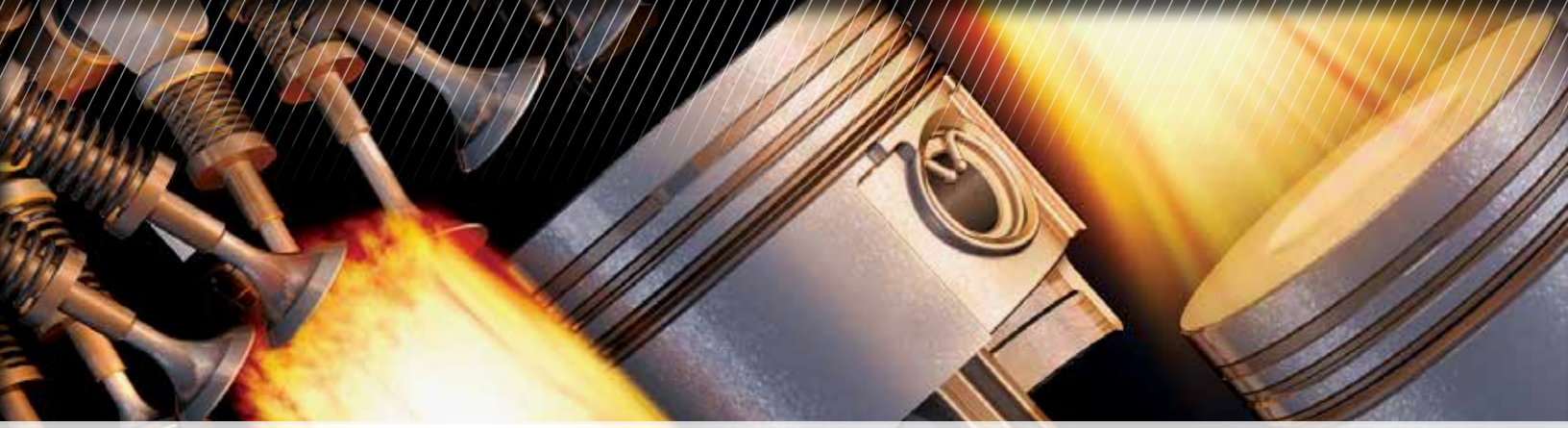
Low coefficient of friction, provides intermittent dry lubrication, Increased load carrying capacity, wear resistance, corrosion protection.

Low Coefficient of Friction	Wear Resistant	Corrosion Protection

Material Specifications

Substrates	Temp. Rating
Aluminum Steel Stainless Steel	Process Temp: 375°(190°C) Max Temp: 475°(246°C)

Thickness	Color
Thickness (mil): 1-1.5	Black



Engine Combustion Heat Resistant

High Performance Piston Crown

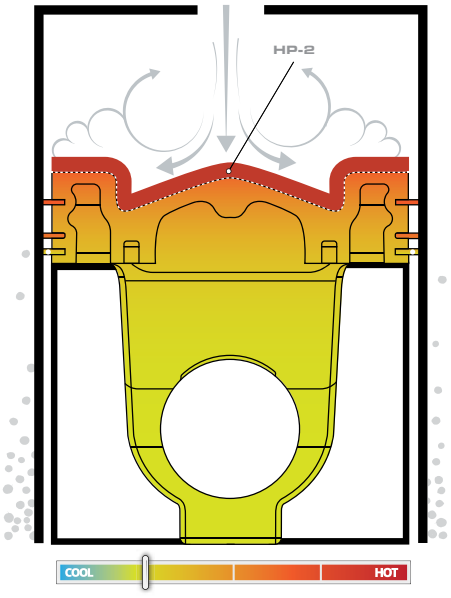
Coating Process / Advantages / Material Specifications

PAI's GEN-3 Ceramic Thermal Barrier Coatings are applied to piston domes by a proprietary process that literally co-mingles the coating material with the substrate for a super high- strength bond.

This ceramic coating provides a more effective, even fuel burn throughout the combustion chamber while maintaining a higher nominal temperature. This high temperature build-up is turned into usable energy. This surplus of energy is then converted into horsepower, rather than dissipated through the pistons. This process is proven effective with all engine types, including turbocharged engines.

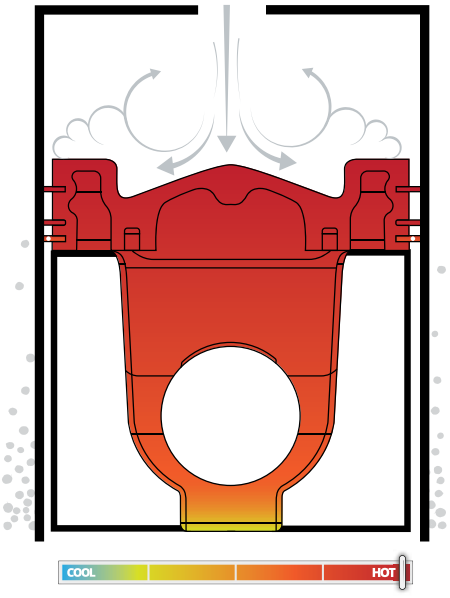
This thin, smooth ceramic coating insulates the piston so oil contacting the underside will not absorb a high amount of heat. This in turn helps reduce oil temperature.

CERAMIC COATED CROWN



Piston Crown Temperature

STANDARD CROWN



Piston Crown Temperature

"Ceramic Thermal Coating directs the heat back into the Combustion Chamber raising the temperature. The retained thermal energy is translated to an increase in horsepower while allowing the Crown to remain cooler."

ANCE PISTON CROWNS

GEN-3 Ceramic Coating

Coating Process

Metallic Ceramic Coating is applied as a wet spray process. Different surface preparatory methods appropriate for the substrates will be used before the coating process can be applied to both ferrous and non-ferrous substrates.

Advantages

Protective to above 2000°F, survives bending and flexing, resistant to most solvents, fuels and various chemicals highly resistant to thermal shock, low cure temperature and resists effects of detonation.

Protects 2000°F +	Corrosion Protection	Heat Resistant

Material Specifications

Substrates	Temp. Rating
Aluminum Steel Stainless Steel	Process Temp: 450°(232°C) Max Temp: 1100°(593°C) Int Temp: 2000°(1093°C)

Thickness	Color
Thickness (mil): 0.5 - 2	Gold

Smooth Reflective Surface

High Performance Piston Pins

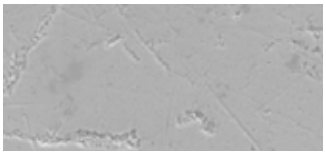
Finishing Process / Advantages

Parasitic loss due to friction robs the engine of power, creates higher temperatures and excessive wear. PAI's HP Piston Pins have been specially treated with a **Isotropic Superfinish** to combat parasitic loss.

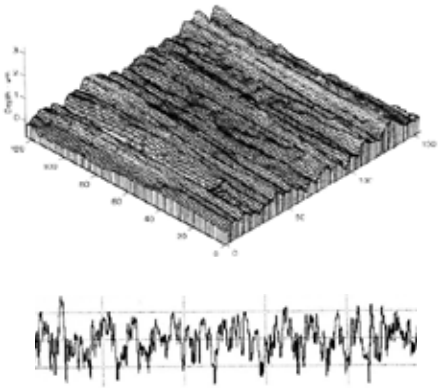
The resulting low friction surface allows the Drivetrain to run smoother; freeing up power and improving fuel economy. In fact, the surface is so smooth you can visually see the difference.

Set any PAI HP Piston Pin next to the competition and you'll notice our Pins have a brighter finish with a significantly higher reflective surface.

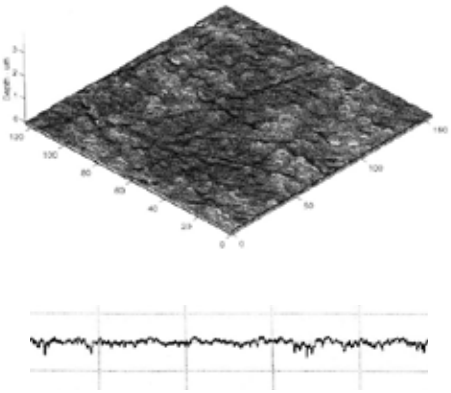
Standard Pin



Isotropic Superfinish Pin (HP)



STANDARD PIN SURFACE FINISH



HIGH PERFORMANCE PIN ISOTROPIC SUPERFINISH

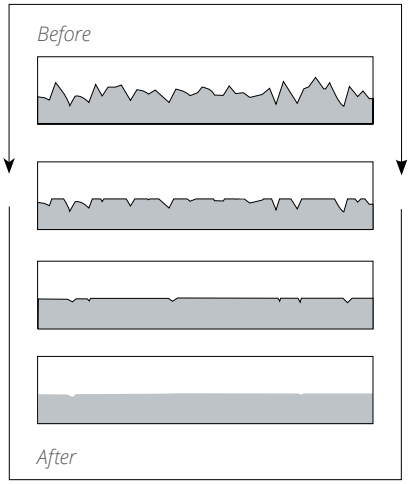
" The Isotropic Superfinish process ensures the Pins have identical surface finish values in all directions. This uniform surface finish translates to smooth, reflective, low friction surface area."

ORMANCE PISTON PINS

Isotropic Superfinish (ISF)

Finishing Process

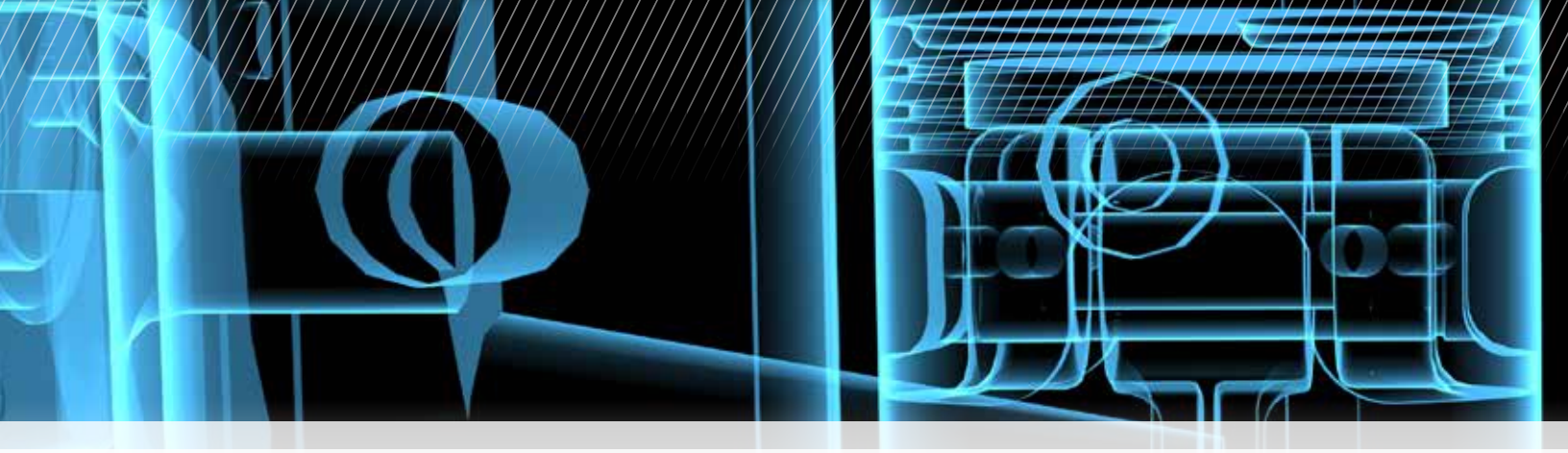
The **ISF** process is a two stage chemically enhanced vibratory finishing process. First the parts are subjected to a proprietary chemical that prepares the surface. During this stage, the vibrating action of the media removes microscopic surface peaks which smooths the surface to a mirror like finish.



Advantages

The extremely smooth, low friction surface produced by the ISF process is free of the machine marks left by other directional processes. This means that stress has no direct path to propagate across a part due to microscopic surface irregularities.

Longer Life	Run Smoother	Better Fuel Economy



Continuous Fluid Motion

High Performance Rings

Coating Process / Advantages / Material Specifications

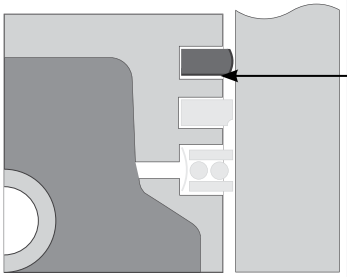
Power loss due to sliding contact between parts and micro-welding are all problems created by excessive friction. Built to survive in highly demanding, performance engine; PAI's High Performance ring sets increase the engines performance and durability. **PAI's GEN-3 Dry Film Lubricant Coating** provides a solid lubrication to the contact faces resulting in higher load carrying capacity and friction reduction.

"Dry Film Lubricant Coating prevents the two metal surfaces from contacting each other virtually eliminating the any chance of Micro-Welding to occur."

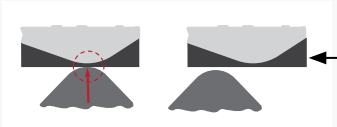
How HP Ring Sets Prevent Micro-Welding?

When the engine is running; the microscopic peaks of the surface of the piston ring groove and the piston ring rub against each other. Micro-welding occurs when the combination of the cylinder temperature and the friction created from these peaks rubbing together is enough to momentarily melt the peaks. When the peaks melt they bond together, but because the area is so small; the bonds are weak and quickly broken. The result is part of the metal from the piston ring groove or the piston ring is transferred to the other surface.

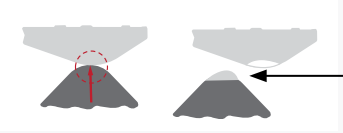
The result is an increase in roughness and an abundance pronounced sites for more micro-welding to occur.



The HP coatings reduce the friction in this area allowing the rings to float freely in the ring groove. They prevent the two metal surfaces from contacting each other virtually eliminating the any chance of micro-welding to occur.

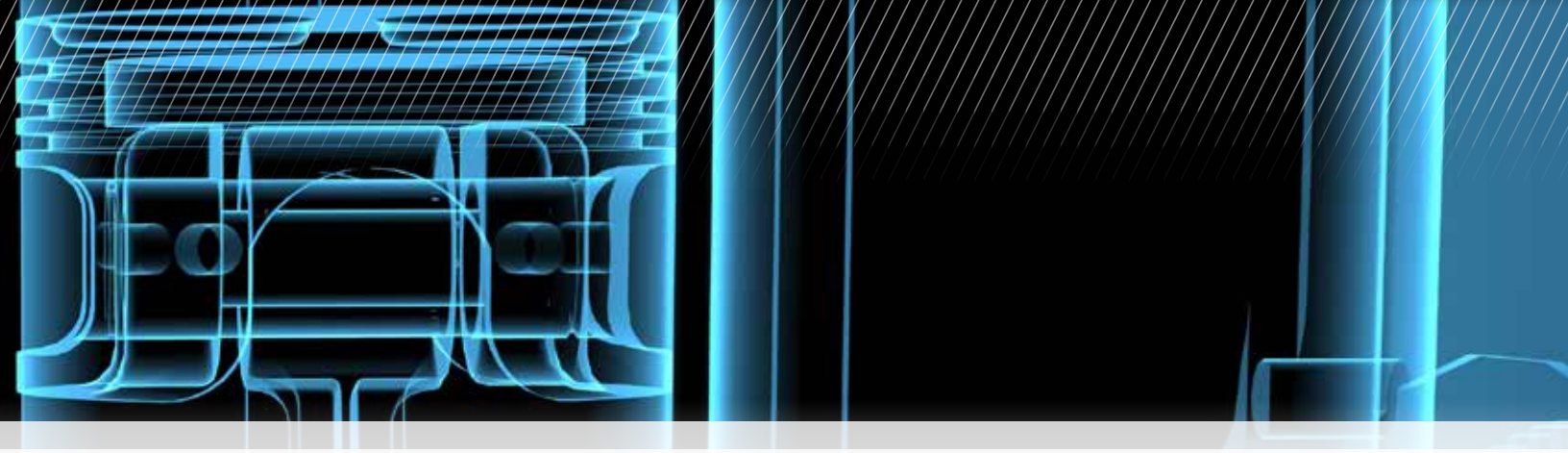


Dry Film Lubricant Protective Coating



Not Coated

Ring particles transferred due to Micro-Welding



GEN-3 Dry Film Lubricant

Coating Process

Dry Film Lubrication coating is applied as a spray process. Different surface preparatory methods appropriate for the substrates are used prior to the coating process.

A thin coated film is applied to the top ring, measured in the micron ranges and varied to suit application.

Top Rings Only

Advantages

Not affected by dust or dirt, low friction, provides intermittent dry lubrication and excellent load carrying capacity.

Corrosion Protection	Increased Lubricity	Oil & Fuel Resistant

Material Specifications

Thickness	Color
Thickness (mil): 0.2 - 0.4	Black

Load Carrying Capacity

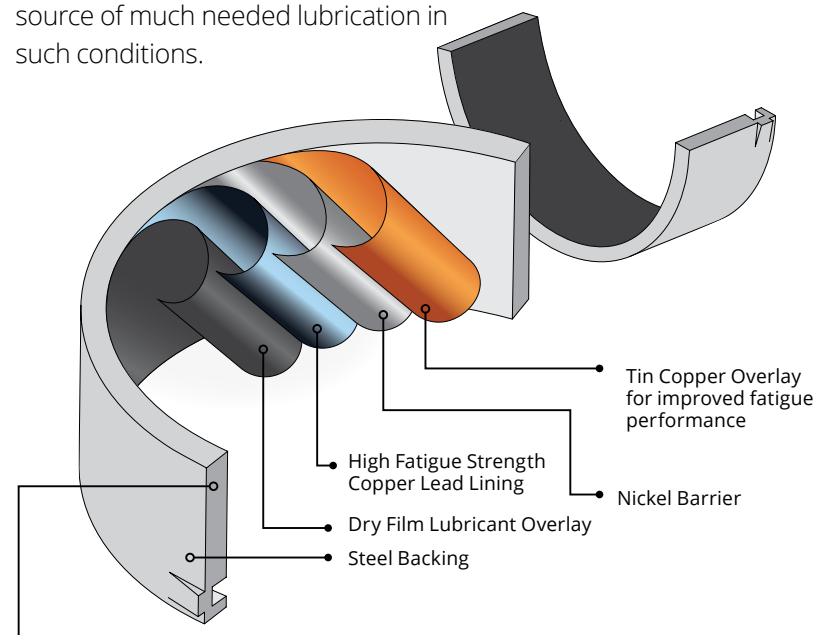
High Performance Main Bearings

Coating Process / Advantages / Material Specifications

At the heart of PAI's High Performance Bearings, is the new **GEN-3 Dry Film Lubricant Overlay** which provides higher load capacity, a longer life and an improved fatigue resistance over any other standard bearing material. The latest addition of the **Dry Film Lubricant Overlay** lowers friction to 1/3 of the original value, thus preventing abrasive wear.

Despite there being several systems in place today to prevent engines from experiencing low or no oil pressure, these conditions still exist. The extreme pressure of the crankshaft imparted onto a non-lubricated bearing can have devastating effects on the life of the bearing. PAI's High Performance Bearings provide a source of much needed lubrication in such conditions.

"Engineered to withstand the extreme conditions of High Performance, heavily loaded engines; PAI's High Performance Bearings are guaranteed to improve the engines life and increase performance."



Parting Line un-plated to maintain accuracy. Wall thickness is held to ± .002mm tolerance.

Bearing Crush Increased to provide greater force in housing bore, to ensure full back contact, efficient heat transfer, and more resistance to insert movement

MANCE MAIN BEARINGS

GEN-3 Dry Lubricant Overlay

Coating Process

Dry Film Lubricant Overlay is applied as a spray process. Different surface preparation methods appropriate for the substrates will be used prior to the coating process. A thin coated film is applied to each bearing, measured in the micron ranges and varied to suit application.

Advantages/Benefits

Corrosion Protection	Lower Friction	Oil & Fuel Resistant
Longer Life	Better Fuel Economy	Better Lubrication

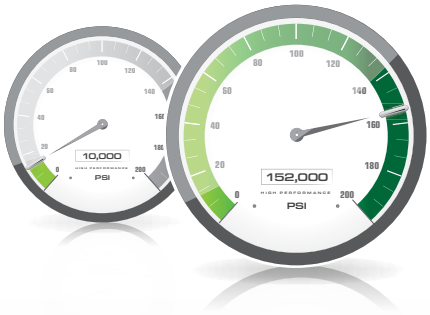
Material Specification

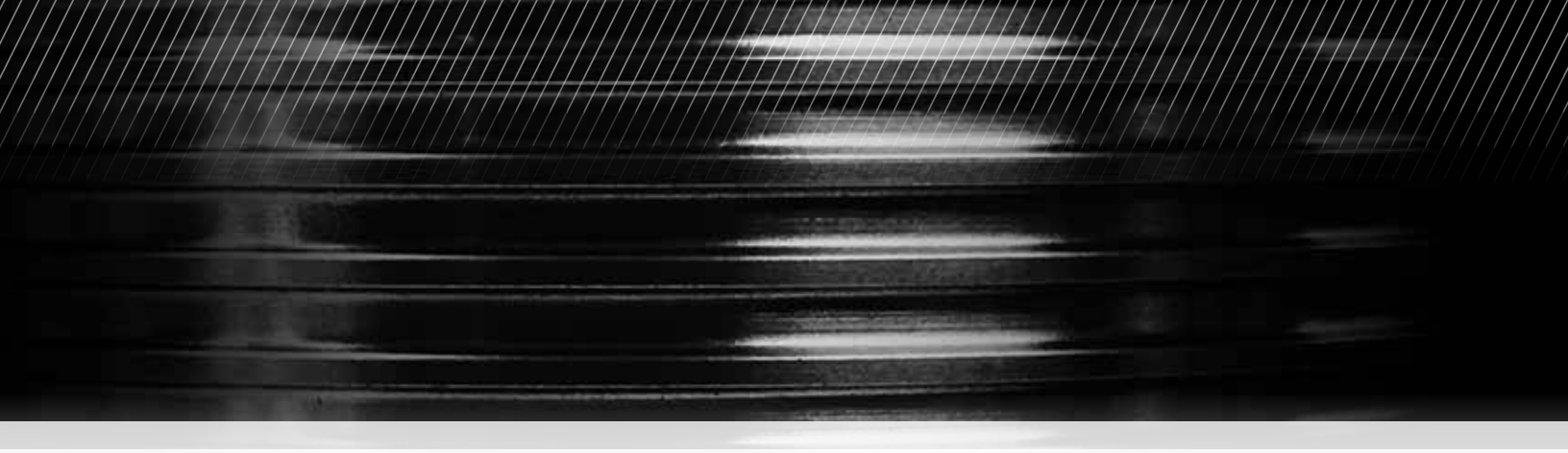
Substrates	Temp. Rating
Aluminum Steel Stainless Steel	Process Temp: 450°(232°C) Max Temp: 1100°(593°C) Int Temp: 2000°(1093°C)

Thickness	Color
Thickness (mil): 0.2-0.4	Black

Load Carrying Capacity

After a standardized test, it was found that the load carrying capacity increased significantly.





PAI HP Cooling Groove Technology
United States Patent: US 7,337,756 B1

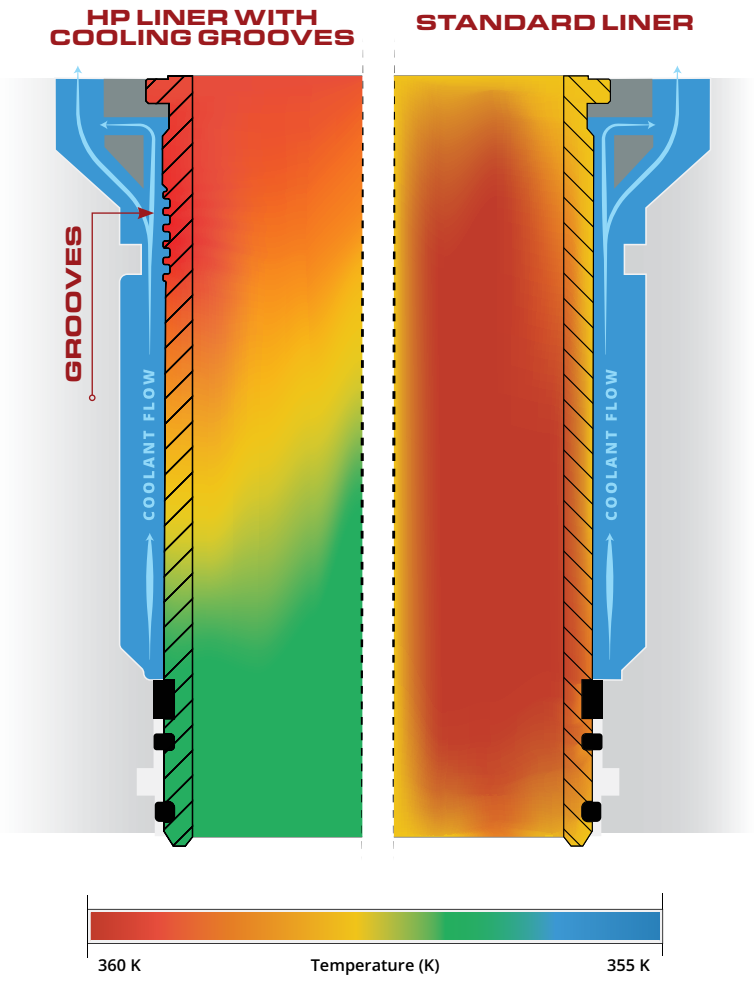
High Performance Liners

Design / Advantages / Material Specifications

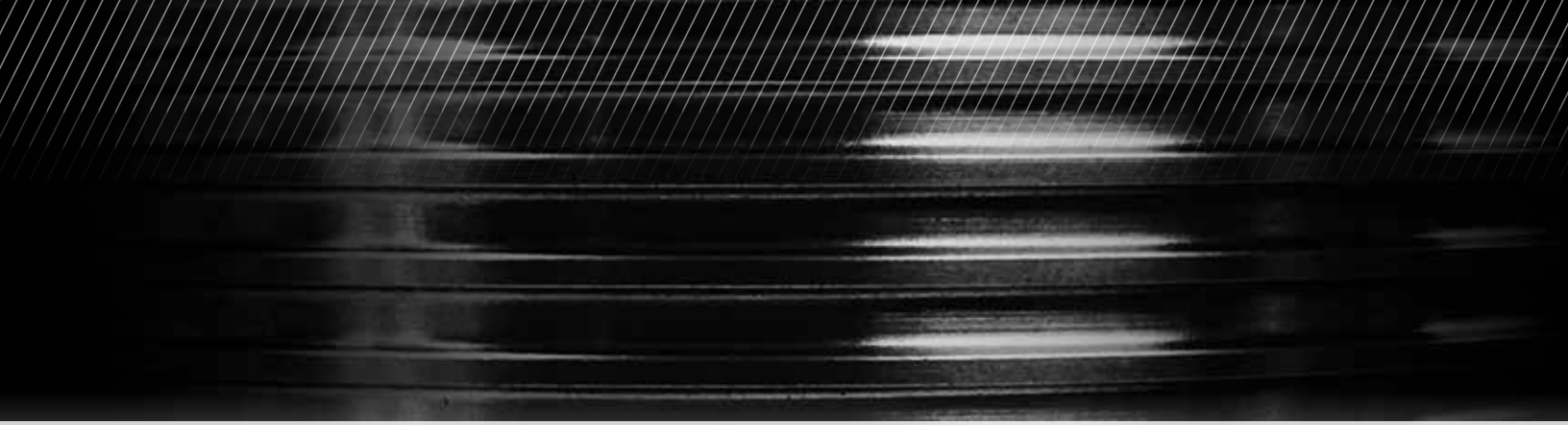
To meet more stringent emission standards and fuel economy, today's modern engines are continually being challenged to increase pressure and temperature conditions in the combustion chamber. Even older engines that were previously designed for 400 horsepower output are now being modified to run at 600+ horsepower. The increase in combustion pressure can cause numerous problems such as liner scuffing, flange breaking, increased blow-by, high oil consumption and high heat transfer.

PAI's patented **Cooling Groove** design improves the temperature stability of the liner. Combined with high alloy gray iron material to increase tensile strength, the PAI liner is able to handle the extra load that new engines demand.

"PAI Patented Cooling System provides better Control of excessive temperatures. Stringent cylindricity control prevents blow-by and oil consumption. "



HP-Liners only available for Detroit Diesel Engines



ORMANCE MAIN LINERS

Cooling Groove Technology

United States Patent: US7,337,756 B1

Design

The patented radial grooves in PAI's cylinder liner increases the surface contact area between the liner wall and the coolant. The result is a greater thermal transfer rate and a cooler liner. Combined with stronger materials and improved manufacturing techniques, the PAI liner shows greater durability than the OEM liner.

Advantages/ Benefits

Temperature Stability	Prevent Blow-Out	Control Oil Consumption
Longer Life Performance	Increase Strength	Prevent Flange Cracks
Cavitation Resistant	Corrosion Resistant	

Material Specification

Substrate	Color
High Alloy Iron	Gray

HP-Liners only available for Detroit Diesel Engines

HIGH PERFORMANCE

HP Engine Parts Dyno Test

High Performance Engine Parts

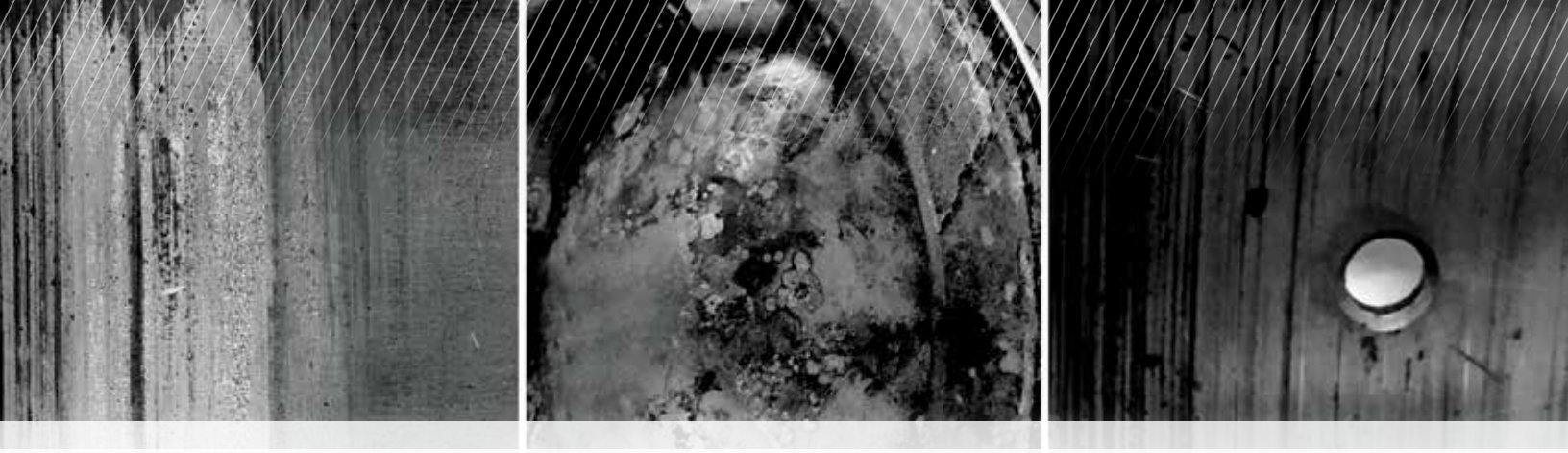
100 Hour Dyno Test / Physical Wear Reduction

HP Piston Skirt
Longer Life
Wear Resistant
Low Coefficient of Friction

HP Main Bearings
Longer Life
Higher Load Carrying Capacity
No Visible Wear Pattern

HP Piston Crown
Longer Life
Less Carbon Build Up
Thermal Resistant

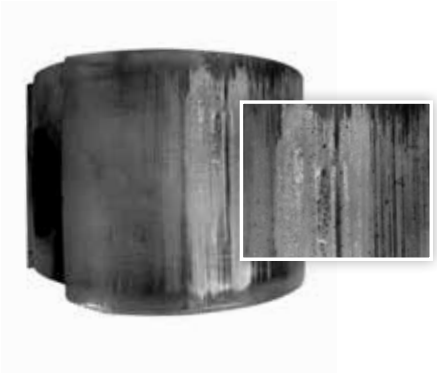
As part of our rigorous testing procedures we compared our HP product line against standard OEM components. Both engine kits were subjects to an independent 100 hour Dyno Test and the results speak for themselves. The HP line showed a 94% reduction in oil consumption, a 72% reduction in piston blow-by and increased horsepower. Upon visual inspection, the HP product line showed less wear than the standard components.



ANCE WEAR REDUCTION

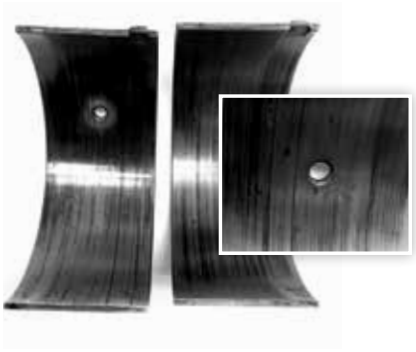
Standard Engine Component Wear

Common wear characteristics found in non-coated parts.



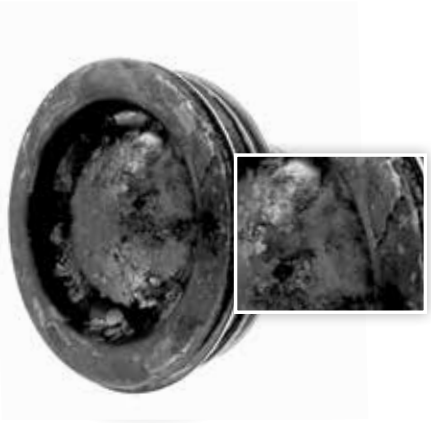
Piston Skirt

Visible vertical line abrasion from scuffing is common for standard skirts. This type of wear is caused from contact with the liner wall. The result is parasitic loss due to friction



Main Bearings

Standard wear patterns are caused by the presence of dirt, dust or other abrasive particles. Combined with insufficient oil clearance of low pressure conditions such as dry start can lead to premature failure.



Piston Crown

Visible carbon buildup on the combustion bowl normally evident on piston crowns. These carbon deposits can affect top clearance with cylinder heads.

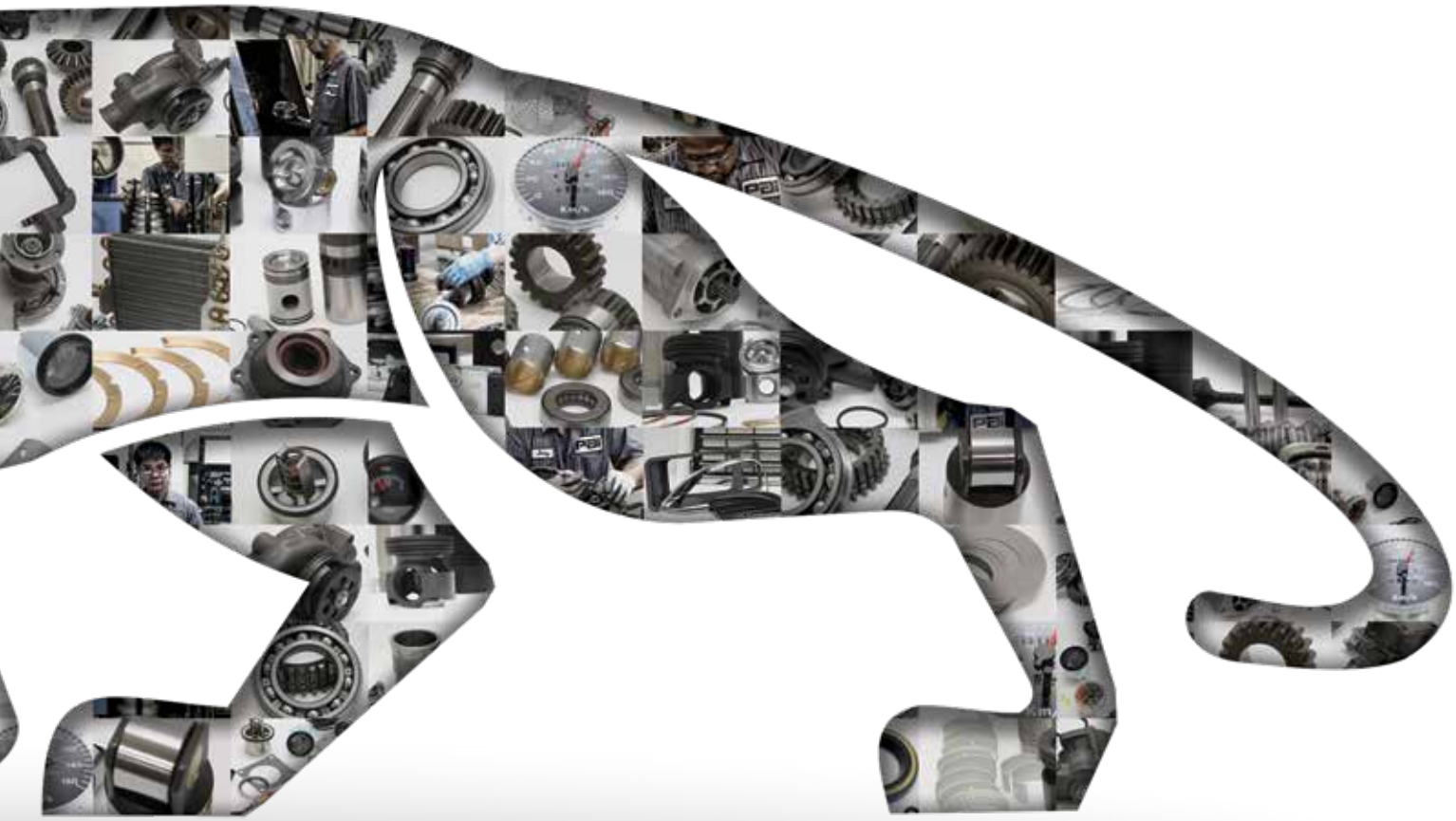
Dry Film Coating significantly reduces the friction and mechanical wear from abrasion. Less friction equates to more horsepower and longer lasting parts.

Dry Film Overlay increases embed-ability, provides lubrication for dry start conditions, and cuts friction to a third (1/3) of the standard bearings. The result is a cooler running, longer lasting engine with more power.

Ceramic Coating educes carbon build up keeping thermal energy out of the crown and into the fuel. The result is a more complete burn, lower emissions, improving fuel economy and power.

HIGH PERFORMAN

3-YEAR WA



CE ENGINE PARTS

ARRANTY

HIGH GRADE MATERIAL
ANTI FRICTION PROPERTIES
WEAR RESISTANT
TEMPERATURE STABILITY
BETTER FUEL ECONOMY
LONGER LIFE

3 YEAR WARRANTY

PAI is Proud to be an American Manufacturer Since 1973.
Plant Tours are Available Monday - Thursdays.

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Information available at: www.paiindustries.com/highperformance

NOV1331 High Performance Engine