

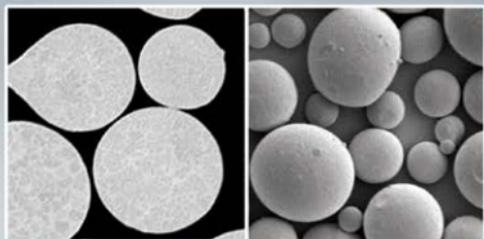
oerlikon metco

SUMEBore

SUMEBore
Technology



Production System



Coating Material

Know How



The SUMEBore™ solution package

Over the past 15 years, Oerlikon Metco has engaged extensively with leading OEMs and invested significant resources to develop a set of solutions for functional coatings in combustion engine cylinder liners, addressing issues, such as reduced oil and fuel consumption, increased performance, corrosion protection and reduction of wear. Such requirements come from different market segments – including passenger cars, high performance and race cars, trucks, heavy duty, medium speed diesel engines and leisure vehicles.

The SUMEBore™ solution package can be tailored to different applications & customer requirements and consists of the following items:

- The production system
- The coating material (customized powder)
- Development & prototyping capabilities
- The necessary know-how including the rights to use all the relevant intellectual property to carry out the coating process

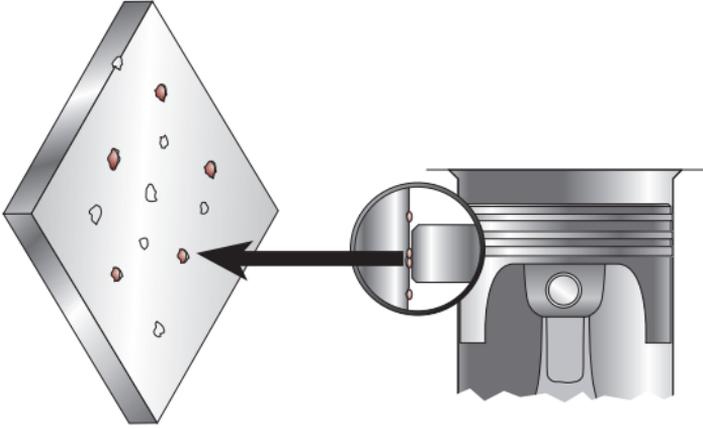
The SUMEBore™ package is offered as a complete turnkey solution allowing customers a rapid ramp up from prototypes to production.

Customers of Oerlikon Metco invest into SUMEBore™ for the following advantages:

- Enhanced tribological properties of the cylinder bore surface to reduce oil and fuel consumption and cylinder bore wear
- Improve the corrosion resistance of the cylinder bore surface to cope with bad fuels or condensates
- Improve the heat transfer from the combustion chamber into the cylinder block
- Elimination of existing design restrictions when reducing the weight of engine blocks
- Refurbish worn liners back to size with properties superior to those of the original OEM parts (repair shop)

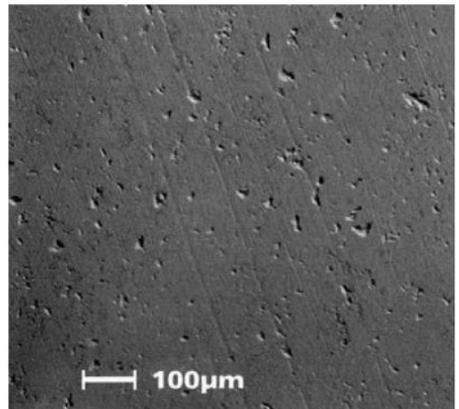
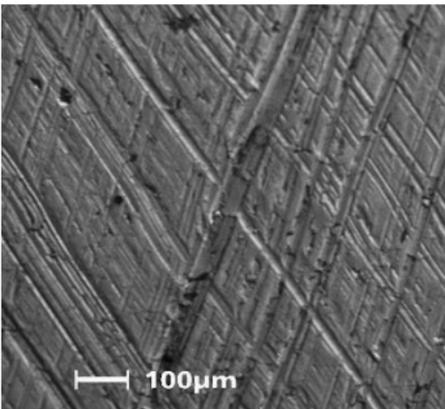
How SUMEBore™ coatings work

The porous plasma coatings are “mirror finished” by diamond honing. The oil is retained in the open pores on the surface and leads to enhanced hydrodynamic behavior with friction reduction potential.



Sketch of mirror finished surface with open pores for oil retention

Because of the porous surface topography, the tangential load of the oil control ring can be reduced to further reduce friction losses without increasing the oil consumption or blowby of the engine. After honing the plasma coatings are typically 120 to 150 μm thick. As the coating thickness decreases with wear during the lifetime of the engine, new pores appear on the surface and guarantee consistent performance. In contrast, a conventionally plateau honed surface may suffer from bore polishing, which can lead to scuffing failure. Iron oxides and/or the addition of ceramic particles provide superior wear resistance. The thin walled coating drastically improves the heat transfer from the cylinder bore into the cylinder block when compared to a cast iron sleeve.



Conventionally plateau honed surface (left) and diamond honed smooth, “mirror finished” surface of a plasma coating (right)

The process chain

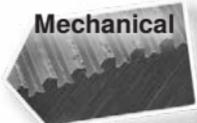
Casting & Pre-Machining



Surface Activation



Mechanical



Water Jet



Grit Blasting



Plasma Spray Coating



Coating Materials



Production System



Diamond Honing



Finish Machining



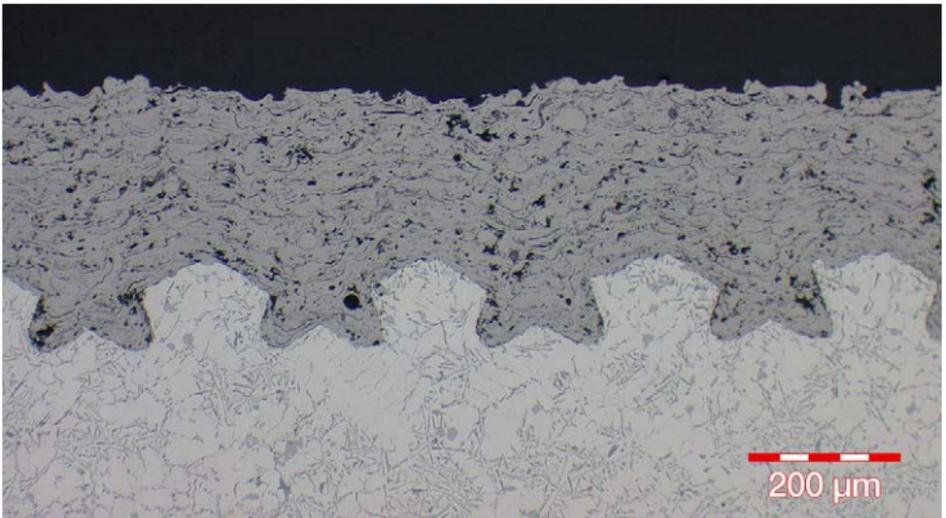
Flexible integration of the activation and coating technology into the manufacturing process of the crankcase

The Materials Toolbox

Matrix Material	Low Alloyed Carbon Steel	Low Alloyed Carbon Steel	Chromium Steel	High Chromium Steel	Cr_3C_2 - NiCr	Pure Ceramics
Blended Material 1		+ Solid Lubricants			+ Solid Lubricants	
Blended Material 2			+ Oxide Ceramics	+ Oxide Ceramics		
Blended Material 3				+ Carbides		
Friction	+	+(+)	+	+	++	+++
Wear			+	++	+++	+++
Corrosion				++	++	+++
Example SUMEBore™ Powders	XPT 512	F4301	F2071	F2256	F2259	F6250

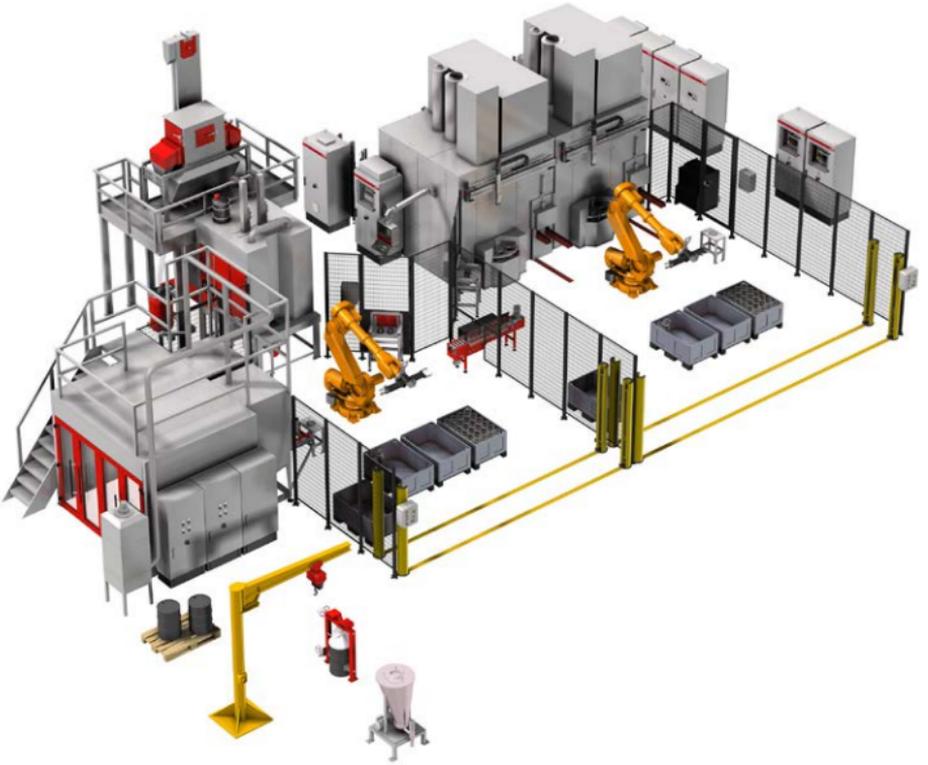
The SUMEBore™ materials toolbox is based on modular powder chemistries that can address all issues which occur in a combustion engine cylinder liner such as friction, scuffing, corrosion and abrasive wear.

The powder based nature of the materials is significantly flexible for customizable coatings. The range of materials extends from fully metallic powders (mainly iron based) to metal matrix composites (MMC), and ultimately to pure ceramics.

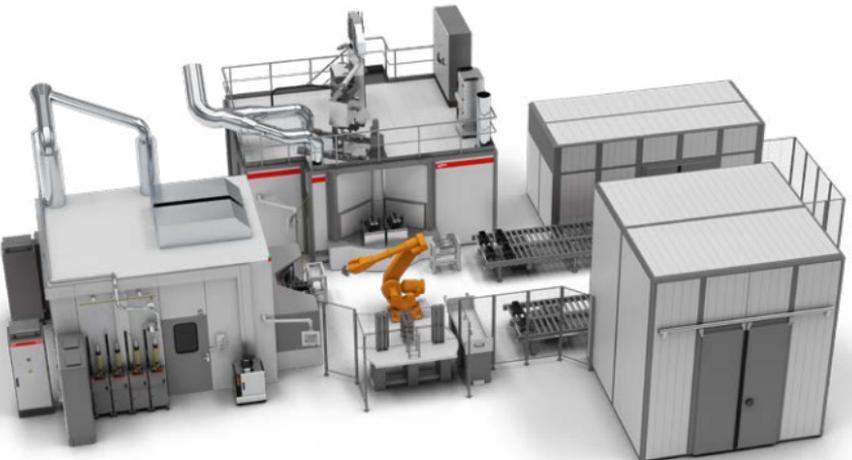


Metallographic section of XPT 512 — a low alloyed carbon steel on a mechanically activated bore surface (“as sprayed”). The profile shown above was developed by the University of Braunschweig, Germany.

Production systems



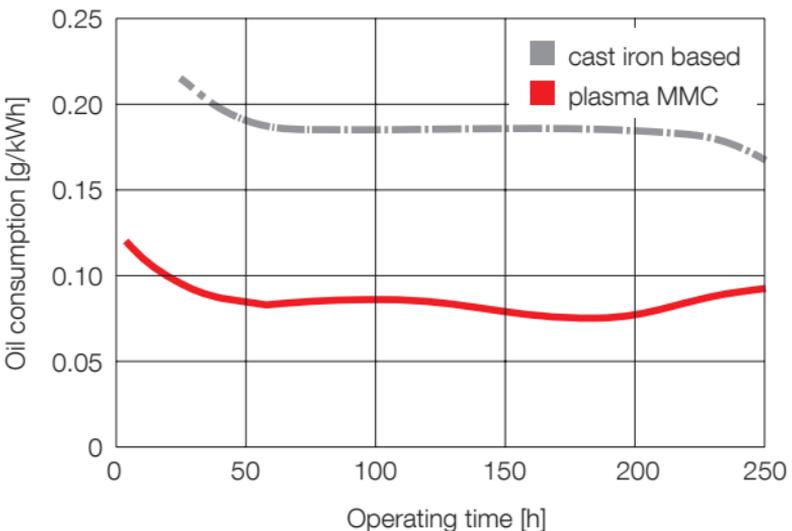
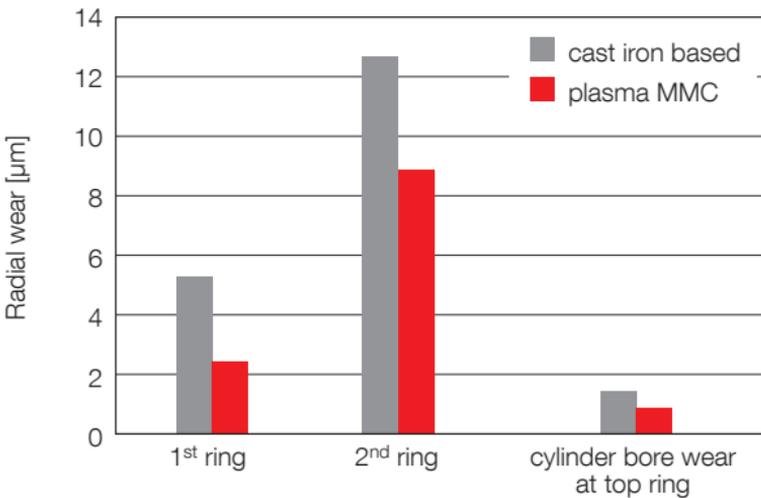
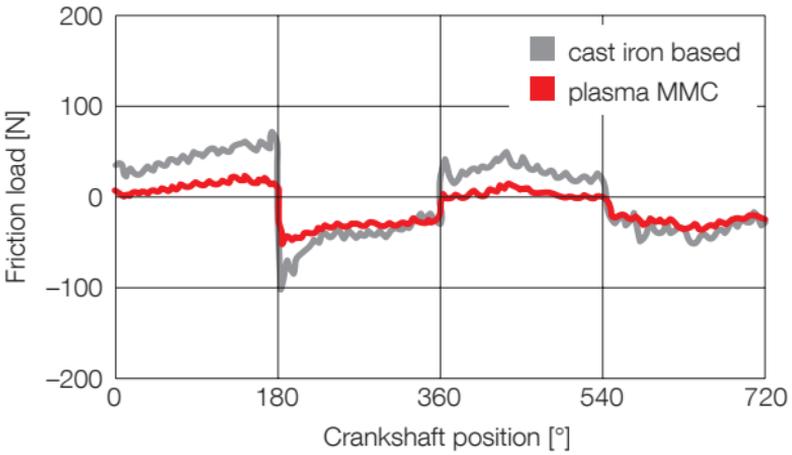
A high throughput manufacturing set-up for high speed diesel engine liners



Versatile modular production equipment for cylinder bore coatings capable of handling parts from cylinder liners up to 4-cylinder blocks

How you can profit from SUMEBore™

The benefits of SUMEBore™, can clearly be quantified and result in reduced friction and oil consumption in addition to lower wear on the liner surface.



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Information is subject to change
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