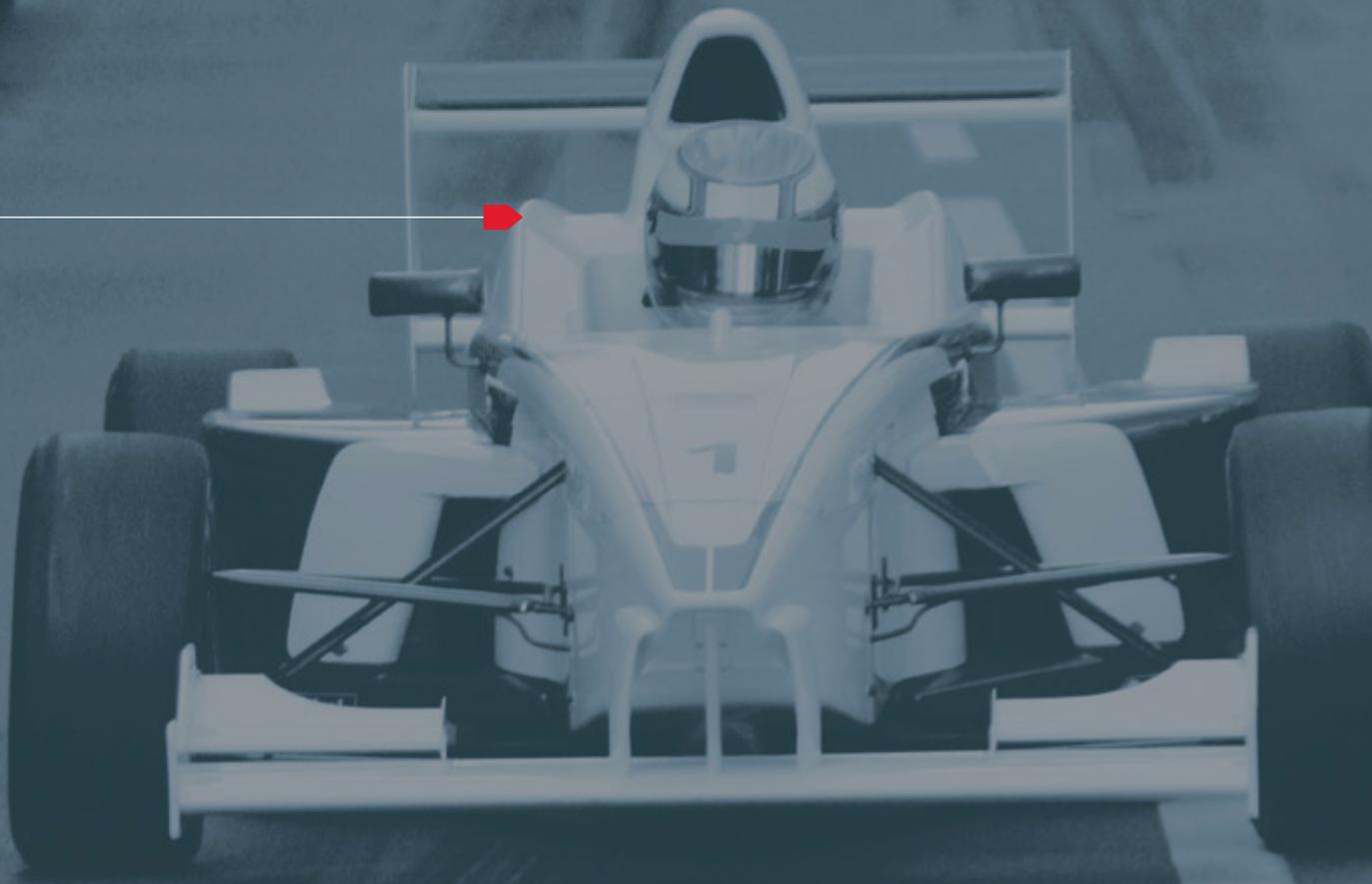


RACING



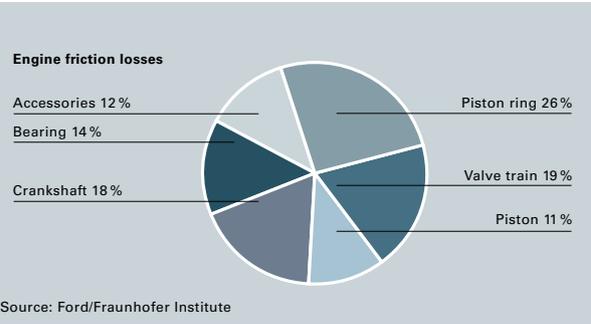
IHI GROUP

THE SURFACE ENGINEERS™

ionbond

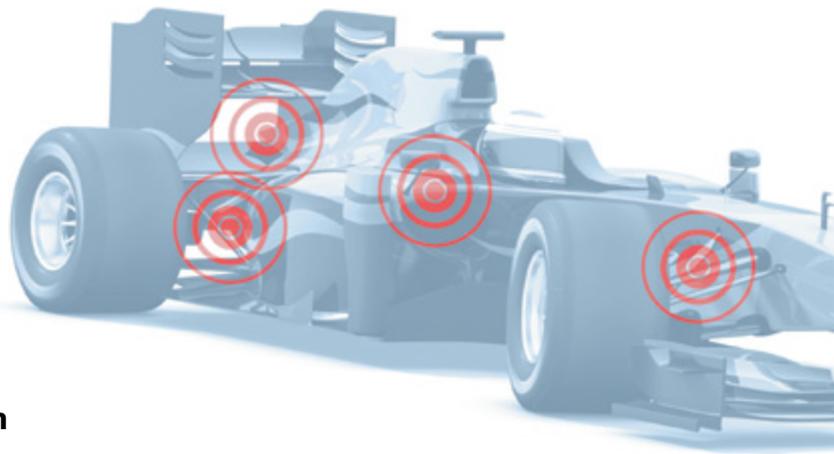


Pushing the Limits of Performance



Friction distribution within internal engine

F1, Nascar, MotoGP, WRC, DTM, OSS powerboat, etc. In any motor sport every ounce of weight has to be shaved off. Lightweight and modern materials are stressed to their limits, frictional losses have to be reduced. That's where lonbond coatings come into the equation.



Quality Assured

lonbond facilities hold an extensive range of international accreditations, including ISO 9001, AS 9100, ISO 9002, TS 16949, and are approved by numerous customers in the racing industry. On top of the quality system lonbond has a mindset that focuses on the needs of its customers and constantly works on improving products and processes to ultimately contribute to winning the race.

Friction

The friction in internal combustion engines account for around 10 percent of the energy efficiency loss. The primary contribution comes from the piston assembly, valve train and crankshaft. Transmissions lose efficiency when the gears are required to move lots of oil for their lubrication.

The application of lonbond's coatings to a component surface reduces friction thereby allowing higher loading densities and lower lubrication requirements. Materials like titanium that tend to suffer from fretting and galling can be used thanks to coatings and surface treatments that offer a low friction coefficient and high hardness while maintaining the core characteristic of the base material.

Engineering

lonbond engineers coatings with its customers from the start of the design of a component to suit every individual application.



Engine Efficiency

Titanium Valve

Ionbond has developed a range of dedicated coatings including pre- and posttreatments that outperform conventional coatings such as CrN and TiN traditionally employed in these applications. Tribobond™ 15 TiAlCrN has the perfect mix of oxidation resistance, high load impact and wear resistance for titanium materials, yet it offers enough resilience to follow valve deformation.



Valve Train

The tappet or finger follower interface to the camshaft is where the material is exposed to the highest loads and where lots of energy is lost due to friction. Tribobond™ 42 is designed to handle these loads and provides lower friction thus making the valve train more efficient and offers the engineer the option to design more aggressive cam lobe profiles to increase the power output.



Piston Assembly

This is where the combustion force is transformed into mechanical power but generally results in the majority of wear and frictional losses. The poor lubrication conditions associated with the high displacement velocity can lead to immediate galling. The Tribobond™ 40 series of DLC (diamond-like carbon) coatings are designed for just this application on piston pins, rings, conrods and crankshafts. Tribobond™ 40 reduces friction, resulting in greater efficiency and enhancement of the life time of the engine ensuring the race is finished.

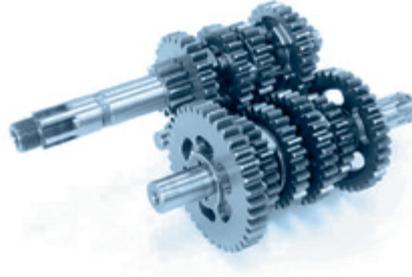




Outside the Engine

Gears

High torque and velocity combined with low lubrication can destroy gears by pitting and scuffing and end a race instantly. Tribobond™ 40 enhances the fatigue resistance and in combination with a superfinish posttreatment offers more power output.



Chassis and Suspension

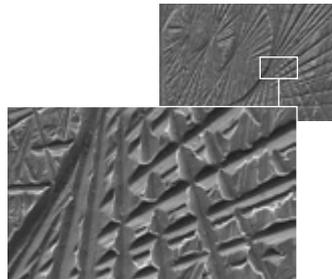
There are many components like wheel hubs, shock absorber tubes, bolts and bearings that benefit greatly from coatings for safer function.



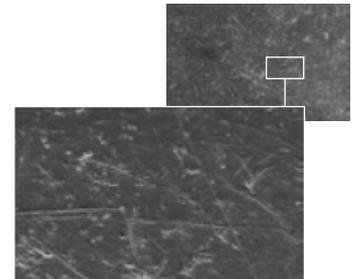
More Than Just a Coating

To achieve optimal performance, Ionbond employs a number of pre- and postcoating surface treatment technologies specifically developed in conjunction with coatings in order to take full advantage of the improved performance that coatings offer.

Ground surface structures of valve train components before and after Ionbond's pre- and postcoating processes.



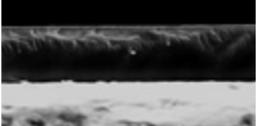
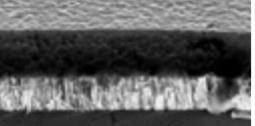
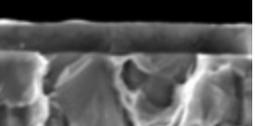
Surface before finishing



Surface after finishing



Ionbond Coatings for Racing Applications

Technology	PVD	PVD / PACVD	PACVD	Arc-PVD
Coatings	Tribobond™ 43 a-C:H	Tribobond™ 40 Cr+a-C:H:W	Tribobond™ 42 CrN + a-C:H	Tribobond™ 15 TiAlCrN
Cross-section micrographs				
Deposition temperature	160–200 °C	160–250 °C	180–250 °C	250–450 °C
Characteristics	<ul style="list-style-type: none"> ▶ High hardness ▶ Amorphous structure ▶ Low friction coefficient 	<ul style="list-style-type: none"> ▶ High impact resistance 	<ul style="list-style-type: none"> ▶ High adherence ▶ Low friction coefficient ▶ Hardness gradient 	<ul style="list-style-type: none"> ▶ High adherence ▶ High temperature resistance ▶ High hardness
Friction	< 0.1	< 0.2	< 0.1	< 0.60
Hardness HV 0,05	2800	1800	2800	3000
Thickness range µm	2–5	1–5	2–5	2–5
Max. operating temperature	300 °C	350 °C	300 °C	700 °C
Wear mechanisms				
Fatigue (impact)	✓	✓ ✓ ✓	✓ ✓	✓ ✓ ✓
Adhesive (galling/scuffing)	✓ ✓ ✓	✓ ✓	✓ ✓ ✓	✓
Abrasive	✓ ✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Fretting	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓
Erosion	✓ ✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Oxidation	✓	✓	✓	✓ ✓ ✓
Component applications				
	Piston pins Piston Bolts Suspension Wheel hub	Gears Pinion bearing	Tappets Finger followers Camshaft lifters	Inlet and outlet valve Turbo charger parts

For a complete coating listing please see www.ionbond.com



Competence and Innovation – Worldwide

Ionbond is a leader in surface enhancement technology and provides advanced coating solutions featuring a broad range of hard, low friction, wear resistant coatings based on PVD, PACVD and CVD technologies for a wide range of applications. It has a global presence with coating centers in strategic locations across Europe, Asia, and North America and has one of the largest coating networks in the world.

Ionbond is part of the IHI Group, a Japanese industrial group with significant R&D resources that operates through multiple business fields including: Energy and Resources, Social Infrastructure, Industrial Machinery and Aero Engines.



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See our website for a full list of all coating centers and local equipment sales offices. www.ionbond.com

