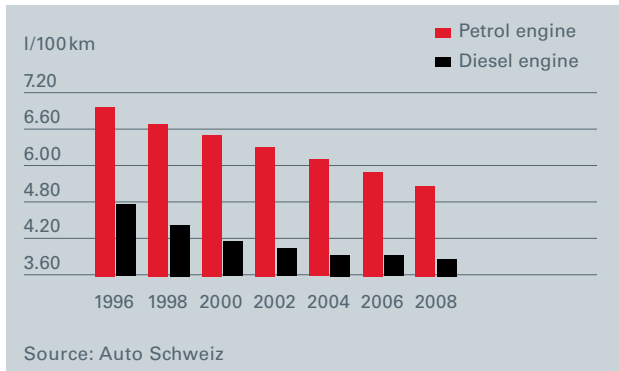


AUTOMOTIVE



Higher Demand for Lower Emissions



Average fuel consumption per 1000 kg vehicle weight

There is a constant pressure placed upon the automotive industry to further reduce the emissions of their vehicles which is forecast to tighten in the years ahead. This encourages the use of new materials and innovative treatment processes in order to increase the efficiency of engines and drive trains. Modern vacuum coating technology is one of the key contributors in meeting these new requirements which are inevitable from policy makers in Europe, Asia and America for the coming generations of cars and trucks.

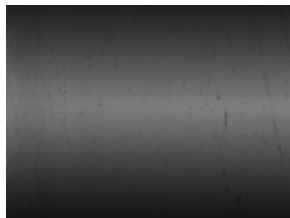
Surface Engineering

Depending on the requirement and load profile for a given application the component coating can consist of bonding layers, one or several support layers and a functional layer. The coating makeup, the choice of material and the thickness of each layer are optimized for function and economy.

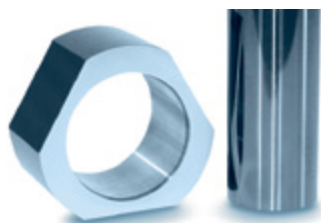
The enhanced tribological properties of Tribobond™ coatings not only protect the components from wear but also polish the counter parts during running-in.



Tribobond™ 41 on piston pin before running in Rz 0.5 μm



Tribobond™ 41 on piston pin after running in Rz 0.1 μm



Efficiency gains and lifetime increase

Ionbond's Tribobond™ coatings are applied onto components to increase the efficiency of engines by reducing friction. Tribobond™ coatings are often the enabling technology for higher load demand situations and increase the lifetime of the component.

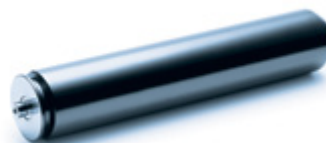
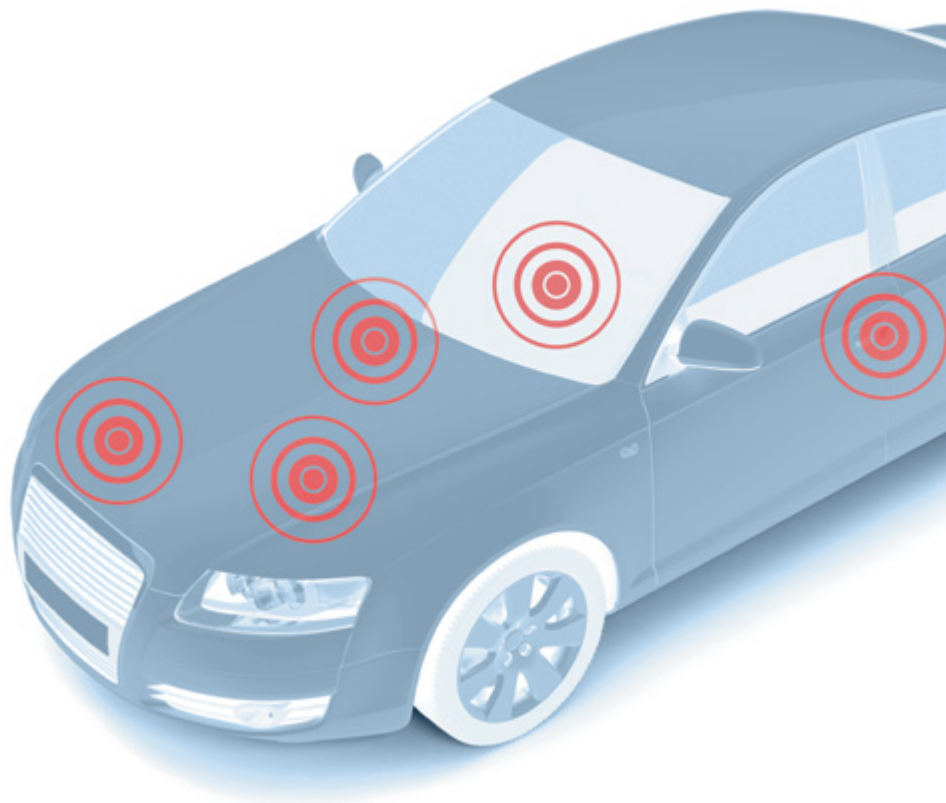
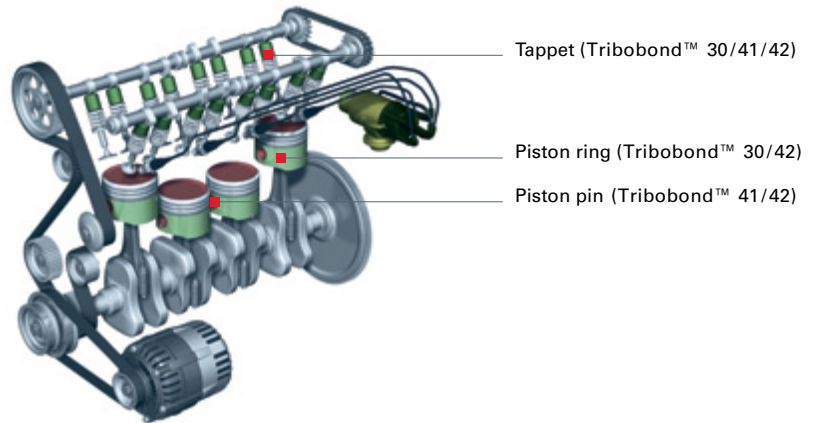
Lower friction

Hard and wear-resistant coatings, in particular carbon-based Tribobond™ 40 series coatings, play an important role as they offer low friction, high load bearing capabilities, and extended component lifetimes. Applied on components in the valve train they reduce frictional losses in lubricated operation by up to 40%.

Wear-resistant surface

Modern common rail and unit systems operate at pressures of up to 3000 bar. Fuel becomes very abrasive on metal surfaces at these high pressures, and surfaces need protection. Tribobond™ coatings are applied to valve needles, control and pumping pistons.

- ▶ Increased surface hardness
- ▶ Self-lubricating
- ▶ Low wear properties
- ▶ Reduced friction, galling, erosion and fretting
- ▶ Temperature resistance up to 350 °C
- ▶ Chemically inert





ISO/TS-16949-certified quality in volume production

With more than 25 years experience in vacuum-based coating technology Ionbond has developed a reputation as a dependable and innovative partner to the automotive industry and its suppliers.

Application-optimized solutions are engineered in our coating centers to suit small series right through to mass production.

All Ionbond centers for automotive component coatings in Europe, Asia and North America are certified according to ISO/TS 16949 and follow their customers quality standards.

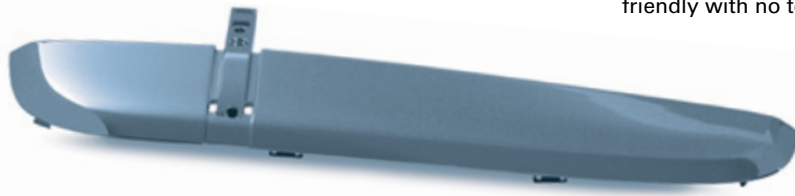


Component and Decorative Coatings

Apart from engine and drive train components many parts in the interior and on the car body benefit from coatings.

Decorative coatings on plastic components in various colors guarantee the perfect look for a lifetime. Functional coatings on exposed components can eliminate the need for servicing.

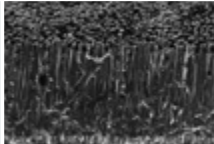
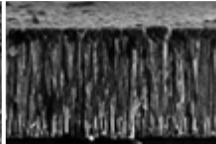
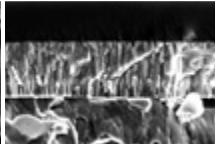

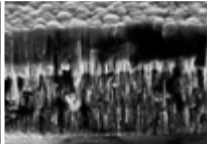
Unlike many conventional surface finishes Ionbond's PVD technology is environmentally friendly with no toxic byproducts and waste.



THE SURFACE ENGINEERS™

ionbond

Ionbond Automotive Coatings

Technology	PVD	PVD	PVD/PACVD	PVD/PACVD	PVD
Coatings	Tribobond™ 30 CrN	Tribobond™ 40 Cr + a-C:H:W	Tribobond™ 41 Cr + a-C:H:W + a-C:H	Tribobond™ 42 CrN + a-C:H	Tribobond™ 46 CrN + a-C:H:W
Thickness range μm	2 to 40	2 to 10	1 to 5	2 to 5	2 to 8
Cross section micrographs					
Microhardness HV 0.05	2000–2600	1000–1800	2000–2800	2000–2800	1000–1400
Friction vs. steel	≤ 0.55	≤ 0.2	< 0.1	< 0.1	≤ 0.2
Service T	700 °C	350 °C	300 °C	300 °C	350 °C
Deposition T	150–400 °C	160–250 °C	160–200 °C	180–250 °C	180–250 °C
Color	silver	black	black	black	grey
Wear mechanisms					
Fatigue (impact)	✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓ ✓
Adhesive (galling/scuffing)	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Abrasive	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓
Fretting	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Erosion	✓ ✓	✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Oxidation	✓ ✓ ✓	✓	✓	✓	✓
Component applications					
	<ul style="list-style-type: none"> ▶ Tappet ▶ Piston ring ▶ Fuel injector components 	<ul style="list-style-type: none"> ▶ Roller bearing ▶ Sliding bearing ▶ Plunger ▶ Gear 	<ul style="list-style-type: none"> ▶ Piston pin ▶ Plunger ▶ Sliding bearing ▶ Tappets ▶ Door lock components ▶ Fuel injection components ▶ Fuel pump components ▶ Camshaft 	<ul style="list-style-type: none"> ▶ Piston pin ▶ Plunger ▶ Sliding bearing ▶ Tappets ▶ Fuel injection components ▶ Fuel pump components ▶ Camshaft ▶ Valves 	<ul style="list-style-type: none"> ▶ Roller bearing ▶ Sliding bearing ▶ Plunger ▶ Gear ▶ Fuel injection components ▶ Valves

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

