

Piston pin layering process

STUTT GART, September 2006 – The Stuttgart supplier MAHLE coats piston pins with diamond-like layers, called DLC. DLC stands for “diamond like carbon” and describes modern layer systems increasingly used for components subject to high tribological loads. Piston pins that are DLC-coated with layers measuring only a few thousandths of a millimeter guarantee minimum wear and maximum seizure resistance.

Combined properties of graphite, diamond and polymers

Is your engine subject to unfavorable lubricating conditions, and is the bushing in the small connecting rod eye supposed to be eliminated? This is where a coated piston pin will come in handy. Eliminating the bushing offers the potential of reducing the installation space of the entire crank gear and the moving mass. In addition, a phosphate-treated bearing surface on the connecting rod or on the steel piston may improve the run-in behavior of the parts. DLC-layers are made primarily of carbon, however the atoms are not oriented as those in a diamond, but instead exist as crystals in random orientation. These layers combine the properties of graphite, diamond and polymers. They significantly lower friction and in general are extremely hard.

The properties of the DLC-layers can be designed such that the layers, despite being very thin, tolerate extreme surface pressures without resulting in the seizure of the pin. The layers can be produced in a chemical vapor deposition process (PACVD – plasma activated chemical vapor deposition) at relatively low temperatures of less than 250°C. Due to the low temperatures, proven case-hardened steels can be used for the piston pins and more complex nitrided steels can be avoided. Frequently, a chromium nitride coating is applied beneath the DLC-layer. This coating ensures minimal wear, even if the DLC-layer should be worn through due to friction. Chromium nitride coating produced

with physical vapor deposition (PVD) methods act similar to the DLC-layers, however are inferior in their effectiveness to prevent seizing of the piston pin.

The MAHLE Group ranges internationally among the top 3 system suppliers for piston systems, cylinder components, valve train systems, air management systems and liquid management systems. With its unique systems competency in the field of the combustion engine and engine peripherals, MAHLE is a globally leading development partner for the automotive and engine industry. All established manufacturers of combustion engines are customers of MAHLE.

With above-average enthusiasm for performance, precision, perfection and unique innovation, MAHLE enhances the development of vehicle and engine technique and keeps setting benchmarks – for more than 80 years.

The company is locally present in all important markets of the world. Approximately 37,500 employees are engaged in 80 production locations and in seven research and development centers. More than 2,000 development engineers and technicians worldwide are working on trend-setting concepts, products and systems for the development of the combustion engine.

In 2006, the MAHLE Group expects a turnover of approximately 4.3 billion EUR and is therefore one of the 30 largest suppliers of the automotive industry worldwide.

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