

Innovative, Non-Contact Piston Ring Measuring Process Jointly Developed by Federal-Mogul Powertrain and NanoFocus AG for Enhanced Production Control and Quality Assurance

Precise and efficient: automated optical measurement for determining the roughness and micro structure of piston ring running surfaces

Burscheid/Oberhausen, Germany, August 29, 2017 ... Federal-Mogul Powertrain and NanoFocus AG (Oberhausen, Germany) have jointly developed an automated process for non-contact, optical-confocal measurement of the roughness and micro structure of piston rings. This joint development for production control and quality assurance in piston ring manufacturing at Federal-Mogul Powertrain in Burscheid, Germany is a specific combination of an optical measuring system from NanoFocus and software and a piston ring product database from Federal-Mogul.

Piston rings play a decisive role in regard to the function and emissions behaviour of engines in vehicles. The piston ring solutions from Federal-Mogul Powertrain, with their optimised friction, wear and durability properties, enable reduced fuel consumption and CO₂ emissions and a longer engine service life. As components subjected to strong mechanical stresses in the tribological system of piston, piston ring and cylinder, their friction and wear behaviour is defined by functional surface structures.

A tactile roughness measurement on DuroGlide®-coated LKZ® oil control rings with their conical-cylindrical running surfaces as well as on steel rails is relatively complex. In addition, operator influence cannot be ruled out in regard to the selection of the right measuring points. Therefore, a measurement solution that was better and more efficient than tactile methods was needed.

“With NanoFocus AG, we have found the right measuring technology partner for developing a robust, non-contact measuring process for determining the roughness and micro structure of piston ring running surfaces which optimally meets our requirements with regard to precision, quality and efficiency,” said Ulrich Lenhof, Manager Metrology Lab Burscheid and head of the project team at Federal-Mogul Powertrain.

“The optical-confocal μ surf measuring system from NanoFocus AG has been adapted both in terms of hardware and software especially for the analysis of piston ring running surfaces at Federal-Mogul Powertrain and offers the option to carry out production-related measurement of large quantities,” explained Marcus Grigat, COO of NanoFocus AG. This is realised through user-friendly and efficient sample handling, as piston rings can be quickly inserted and precisely positioned for measurement. In addition, the measuring process and the evaluation of the data are fully automated.

The target measuring position on the piston ring running surface is approached semi-automatically by the system and measured over a defined measuring spot (0.8 x 0.8 mm²). This is followed by an automatic analysis and evaluation using Federal-Mogul Powertrain proprietary special software that draws upon the information regarding Rk (core roughness) and Rpk (reduced peak height) roughness parameters stored in the in-house piston ring product database.

In addition to Burscheid, there are also plans to use this efficient solution over the coming years at other Federal-Mogul Powertrain development and production sites for piston rings.

About Federal-Mogul

Federal-Mogul LLC is a leading global supplier of products and services to the world's manufacturers and servicers of vehicles and equipment in the automotive, light, medium and heavy-duty commercial, marine, rail, aerospace, power generation and industrial markets. The company's products and services enable improved fuel economy, reduced emissions and enhanced vehicle safety.

Federal-Mogul operates two independent business divisions, each with a chief executive officer reporting to Federal-Mogul's Board of Directors.

Federal-Mogul Powertrain designs and manufactures original equipment powertrain components and systems protection products for automotive, heavy-duty, industrial and transport applications.

Federal-Mogul Motorparts sells and distributes a broad portfolio of products through more than 20 of the world's most recognized brands in the global vehicle aftermarket, while also serving original equipment vehicle

manufacturers with products including braking, wipers and a range of chassis components. The company's aftermarket brands include ANCO® wipers; Beck/Arnley® premium OE quality parts and fluids; BERU®* ignition systems; Champion® lighting, spark plugs, wipers and filters; Interfil® filters; AE®, Fel-Pro®, FP Diesel®, Goetze®, Glyco®, National®, Nüral®, Payen®, Sealed Power® and Speed-Pro® engine products; MOOG® chassis components; and Abex®, Ferodo®, Jurid® and Wagner® brake products and lighting.

Federal-Mogul was founded in Detroit in 1899 and maintains its worldwide headquarters in Southfield, Michigan. The Company has nearly 53,000 employees in 24 countries. For more information, please visit www.federalmogul.com.

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About NanoFocus AG

As specialist for industrial 3D measuring technology, NanoFocus AG (Oberhausen/Germany) has more than 20 years of experience in measuring and analyzing technical function surfaces at micro and nano dimensions. The company develops, produces, and sells optical surface analysis systems for applications ranging from the laboratory to inline production control. Well-known users from almost all industries – from the automotive, electronics and semiconductor sectors to medical technology as well as micro and nanotechnology, research institutes and universities – place their trust in the company's economical and flexible solutions. The 3D measuring systems installed worldwide allow users to achieve shorter development times, safe quality control checks, and reliable process control systems.

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