

**E** FOR IMMEDIATE RELEASE

**S** **MAHLE Is Solving Fuel-Efficient Engine Problems**

*Low-Speed Pre-Ignition Presents Challenges for Car Makers*

**A** **FARMINGTON HILLS, Mich.** -- Downsized engines designed to meet stringent new fuel-economy standards are creating engineering challenges for auto makers and their suppliers.

**E** More than 50 percent of all vehicles sold by 2025 are expected to have downsized engines, according to EPA (Environmental Protection Agency) and NHTSA (National Highway Traffic Safety Administration) reports.

**E** Engineers at MAHLE are developing solutions to help improve the performance and durability of components such as pistons and piston rings for this new generation of engines.

**R** Modern turbocharged direct-injection gasoline engines are more fuel efficient and more powerful than conventional naturally aspirated engines. Power ratings in excess of 120-horsepower per liter are common. To maintain vehicle drivability, however, high torque at low speeds and good throttle response are required, especially as downsized engines find their way into larger vehicles such as SUV's and trucks that typically used V-8 engines.

**S** High levels of low-speed torque have led to an increase in the occurrence of an abnormal combustion phenomenon called low-speed pre-ignition (LSPI). LSPI can generate extremely high combustion-chamber pressure which can result in damage to pistons, rings and other engine components.

**E** "LSPI has the potential to catastrophically damage individual components," says Dr. Joachim Wagenblast, director of R&D for engine systems and components at MAHLE USA, Inc.

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“MAHLE Group is at the forefront of research on LSPI-related problems,” Wagenblast notes. “Our development teams are focused on creating engine components and systems designed to withstand low-speed pre-ignition events, as well as assist in preventing their occurrence.”

MAHLE research engineers in Farmington Hills and Stuttgart, Germany, have been actively working on understanding and finding solutions to LSPI-related problems for several years. Lab-based ring testing helps with the understanding of LSPI occurrences and effects. The knowledge gained is being used to refine simulation techniques and enable MAHLE to design more robust components. For example, incorporating a high-strength ring carrier in a piston’s first ring groove has been shown to avoid piston land breakage which is a common issue with LSPI.

Engine-based testing also is used to validate component designs and rank these designs based on robustness to LSPI events. MAHLE uses a robustness test that induces LSPI on a turbo-charged direct-injection engine. Low-speed pre-ignition can damage piston ring running surfaces and coatings that potentially affect long-term oil consumption, blowby and durability, and also increase OEM warranty costs.

“Having the ability to rank ring coatings has already proved useful in recommending technology to customers that experience LSPI in their engine development programs,” Wagenblast reports.

Other MAHLE engine test programs are looking to determine how MAHLE components can help to reduce the likelihood of LSPI events by addressing triggers thought to be responsible for LSPI, such as oil droplets in the combustion chamber or high component surface temperatures.

“All this research is helping MAHLE develop products to meet customer demands and enable engine manufacturers to further push the boundaries of performance and fuel economy,” Wagenblast concludes. “Today we are working with a number of engine manufacturers and car makers to develop next-generation piston and ring components that are expected to go into production within the next one to five years.”

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## **About MAHLE**

MAHLE is a leading international development partner and supplier to the automotive industry. With its products for combustion engines and their peripherals as well as solutions for electric vehicles, the group addresses all the crucial issues related to powertrain and air conditioning technology - from engine systems and components to filtration to thermal management. MAHLE products are fitted in at least every second vehicle worldwide. MAHLE components and systems also are used off the road—in stationary applications, for mobile machinery, rail transport, as well as aerospace and marine applications.

In 2015, the group generated sales of approximately EUR 11.5 billion with around 76,000 employees and is represented in 34 countries with over 170 production locations.

At 15 major development locations in Germany, Great Britain, Luxembourg, Slovenia, the USA, Brazil, Japan, China, and India, about 6,000 development engineers and technicians are working on innovative solutions for the mobility of the future.

More information is available at [www.mahle.com](http://www.mahle.com) or [www.mahle.com/mahle/en/news-and-press/](http://www.mahle.com/mahle/en/news-and-press/)

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