FRAUNHOFER INSTITUTE FOR LASER TECHNOLOGY ILT

PRESS RELEASE

Optoelectronic inline measurement – accurate to the nanometer

Germany counts high-precision manufacturing processes among its advantages as a location. To retain this technological edge, many companies already have to process metal components to the exact micrometer with zero waste. It's not just the aerospace and automotive industries that require almost waste-free, high-precision manufacturing in the micrometer range to provide an energy- and resource-efficient way of testing the shape and orientation tolerances of products during the manufacturing process. Since current inline measurement technology not yet provides the required accuracy, the Fraunhofer Institute for Laser Technology ILT is collaborating with four renowned industry partners in the INSPIRE project to develop inline sensors with a new accuracy class. Funded by the German Federal Ministry of Education and Research (BMBF), the project is scheduled to run until the end of 2019.

New manufacturing technologies for new products

Implementing innovative concepts, such as for more efficient engines, mostly accompanies with advances in manufacturing technologies. Production tolerances of modern plants thus suffice to process metal components in the micrometer range and are just a thousandth of a millimeter thick. At the same time, a plant must be highly flexible so it can compensate for any fluctuations in raw materials and manufacture a wide range of products. That is why production technology's next aim is to have plants that can manufacture individual components with the precision and at the cost of mass production.

Laser measurement technology as a key component

Sensors that can work precisely and reliably even under unfavorable conditions are paramount to monitoring and regulating such manufacturing processes. Interferometers are used under laboratory conditions to measure the shape of components with the highest precision – for example, thickness of sheet metal, roundness of rollers, and eccentricity of waves. In fact, Interferometers are so precise that they can be used to determine not just the component's shape but also its surface roughness.

Editorial Notes
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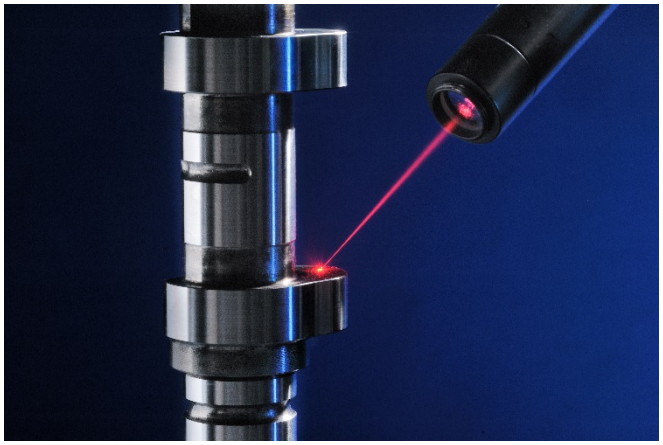
Sensors with digitized expert knowledge

To this end, an interferometer's settings must be adapted precisely to the measurement task at hand. This especially requires correct exposure time and focus; similar to taking a photo. In April this year, the collaborative project INSPIRE was started with the aim of developing an interferometer that can adapt to varying measuring conditions. "The sensors will have digitized expert knowledge and can autonomously optimize the settings," explains Dr. Hölters from Fraunhofer ILT in Aachen. He coordinates the INSPIRE project, in which four other small and medium-sized enterprises are participating. With the development of fast control electronics, the sensors can adapt to rapidly changing measuring conditions within microseconds. This development will benefit conventional processes such as the cold rolling of sheet metal as well as machining processes such as welding.

Collaborative project INSPIRE

The project idea of "Interferometric Distance Sensors with Automated Subsystems for Precision Inline Measurement to Regulate Automated Manufacturing Processes," which in German produces the acronym INSPIRE, convinced the German Federal Ministry of Education and Research (BMBF) to pledge half the funding for the three-year long collaborative project as part of the "Digital Optics" funding initiative. Companies participating in the INSPIRE project are LSA – Laser Analytical Systems & Automation GmbH and Beratron GmbH from Aachen, HIGHYAG Lasertechnologie GmbH from Kleinmachnow, and Friedrich Vollmer Feinmessgerätebau GmbH from Hagen.



Picture 1:
INSPIRE-Sensors for testing shape and positional tolerances on camshafts.
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