

PRESS RELEASE

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Fraunhofer researchers develop measuring system for ZF factory in Saarbrücken

Modern and forward-looking manufacturing processes are essential building blocks for a company's economic success and efficiency. Production processes must be optimized continuously and intelligently under the aspects of resource savings, quality, and cost. A new measuring system developed by experts from the Fraunhofer IZFP is expected to increase productivity, significantly reduce material and test scrap, as well as provide support for optimizing production processes in transmission production at ZF Friedrichshafen AG's factory in Saarbrücken / Saarland.

ZF Friedrichshafen AG is a globally leading technology group specializing in drivetrain, chassis as well as active and passive safety technology. In order to remain successful with innovative products in the future, ZF annually spends about six percent of sales for research and development. With its 8,000 employees, the Saarbrücken factory produces automatic passenger car transmissions for the international automobile industry.

Ultrasonic weld seam measuring within a few minutes

Engineers and scientists from the Fraunhofer Institute for Nondestructive Testing IZFP in Saarbrücken have developed a measuring system for ultrasonic testing of weld seams on output shafts for supporting and optimizing the production processes. Output shafts are highly complex components integrated in functions; due to the client interface at the transmission output, they are highly variable, which results in significant test and approval efforts.

Output shafts are manufactured by welding together different components. For different components, production lines have to be retooled. So far, the first two components had to be scrapped in product change-overs because they had to be prepared metallographically for the purpose of microscopic examination and for assessing weld seam quality. Another metallographic

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microsection grinding process was necessary for interim inspection. These processes required a significant amount of time and resulted in finished output shafts partially becoming test scrap.

The *WeldInspector* system developed by the Fraunhofer IZFP measures 100 percent of the entire weld seam geometry of ZF's output shafts within a few minutes by means of high-frequency ultrasound. Ultrasonic testing is a nondestructive test procedure that is used to test components made of sound-conducting materials for internal faults without damaging the material itself or changing its surface.

Quality assurance due to automated test process

Stefan Caspary, the engineer responsible for the project at the Fraunhofer IZFP, explains the process as follows, "First, the component is scanned using a QR code scanner so that the appropriate test program can be selected automatically based on the QR code. Then the tester places the component in the test basin, which is filled with water. Finally, within a very short period of time, the output shaft weld seams are measured in a user-controlled ultrasonic immersion process without requiring any further setup time." Upon completion of the measuring process, the resulting image is displayed for the tester, and a detailed analysis using software developed by the Fraunhofer IZFP immediately follows the test. In addition, the partially automated system is capable of measuring 40 different types of waves. After validation of the system has been completed, it is scheduled to be used also for other components at the Saarbrücken site, as well as at global sites of the *Business Unit Powertrain Transmissions*.

For ZF Friedrichshafen AG, this newly developed system is of high significance – the system achieves a clearly higher degree of productivity and quality, while providing cost savings at the same time. The system was successfully commissioned at the ZF factory in Saarbrücken in September of 2017.

Application-oriented and industry-capable development projects

Caspary concluded, "The development and implementation of *WeldInspector* illustrates the core competencies and strengths of our institute – in particular, in the areas of nondestructive electronics and software development. *RK Schmidt Systemtechnik*, a company based in St. Wendel with many years of

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expertise in automation and systems technology, was tasked with the fabrication of the partially automated measuring system.

The application-oriented, industry-capable new and further developments of the Fraunhofer IZFP focus on improving its clients' product quality – in particular, from the point of view of increased safety, availability, and economy. Thus, the research institute addresses tasks of long-term, national and international significance from all industry-relevant areas.

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At left: Partially automated system for measuring the weld seam geometry of output shafts for the automatic 8-speed passenger car transmission from ZF Friedrichshafen AG, Saarbrücken factory

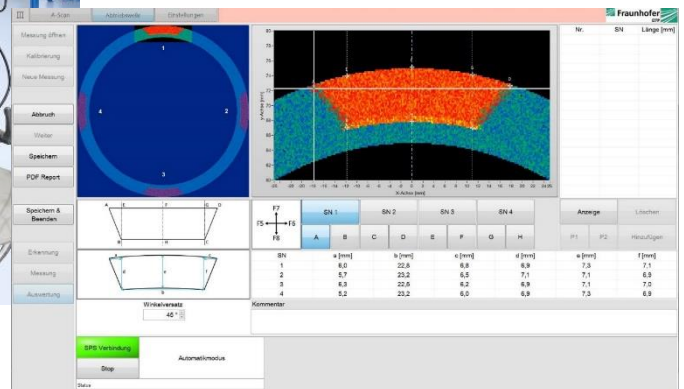
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Below: Analysis/results image for an output shaft

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