PRESS RELEASE

GUmProDig research project gets underway

Digitalizing processes for more energy efficient production

Substantial CO_2 savings are still there to be made in industrial production. As part of the GUmProDig research project, Fraunhofer IPM and its partners are developing a quality control and component tracing system for formed light metal parts, which is intended to enhance energy efficient production. The aim of the system is not only to reduce rejects and recalls, but also to allow comparatively low energy forming technology to be used in fields where power-hungry machining has been the norm to date.

Cold forming offers several advantages in light metal fabrication compared to the machining production methods predominantly used at present. For example, metal forming uses less than half of the CO_2 consumed with machining. In addition, cold formed components have excellent mechanical properties, meaning that they are significantly more resistant to dynamic stress and thus smaller designs are possible. In order for cold forming to be used more widely, there is a need for new, inline-capable measurement techniques that can inspect geometric dimensional accuracy and surface quality in cold formed parts, and that can ideally assign this data to individual components. This is the only way it will be possible to develop and meet high production tolerance standards right through to accuracy grade IT-7 for cold forming. These standards chiefly apply to safety-related parts.

Optical testing in free fall – with marker-free tracing

The research team's goal is to create a free fall inspection system capable of inspecting individual components during production, which will gather precise data on a wide range of quality parameters during the production process and clearly assign them to each part. To achieve this, the single components are fed one at a time into an inspection sphere via a conveyor belt and inspected in free fall from every angle with the help of several cameras – removing the need for component handling. The mass and temperature of semi-finished products are determined before inspection, completing the set of parameters recorded. Fast, contour-based image processing allows component geometry to be inspected with high precision down to micrometer level. Surface anomalies can likewise be detected using the images. Furthermore, the unique surface structure at a pre-defined position on each part is used as a fingerprint for later component tracing. Machine learning methods are employed for image

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evaluation, process analysis and the development of a control strategy for the self-learning optimization of production plants.

The ongoing digitalization of process information not only enables 100 percent control, it also allows the entire process chain to be optimized. When looking to achieve more sustainable production, this not only ensures an energy efficient production process but also reduces rejects and component recalls, which have increased dramatically in recent years – primarily in the automotive industry.

About the GUmProDig project

Federal Ministry for Economic Affairs and Energy

The GUmProDig project (**G**anzheitliche **Um**form-**Pro**zess-**Dig**italisierung – Comprehensive Digitalization of the Forming Process) is funded by the Federal Ministry for Economic Affairs and Energy as part of the "Lightweight Technology Transfer Program (TTP LB)". The project partners are Fraunhofer IPM (coordinator), the Institute for Metal Forming Technology University of Stuttgart, Räuchle GmbH & Co. KG, Visometry GmbH, SOTEC Software Entwicklungs GmbH + Co., Mikrocomputertechnik KG and MARPOSS Monitoring, Solutions GmbH (associated partner). The project began on May 1, 2021 and is set to run for three years.

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