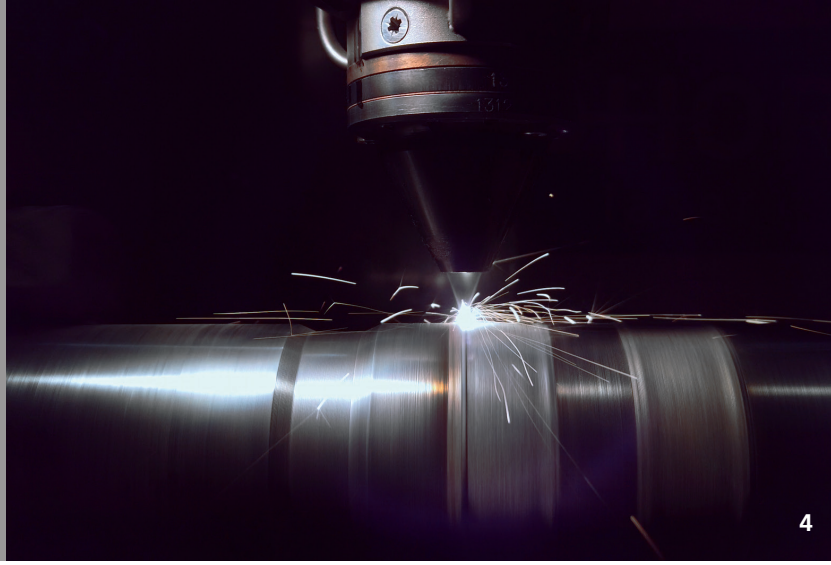
3



4

DEVELOPMENT OF A REPAIR PROCESS CHAIN FOR THE CIRCULAR ECONOMY

Task

Heavy-duty components often fail due to local surface damage as a result of wear or corrosion, but the damaged areas are small compared to the overall size of the component. Currently, defective components are usually replaced with new components in a process that uses a great deal of resources. Moreover, recycling metallic precision components also places a heavy burden on the environment, despite certain resource and energy savings compared with primary extraction (such as energy-intensive smelting processes). Not only are countries economically dependent on imports, but the industry also increasingly needs scarce raw materials, causing a significant environmental footprint due to the CO_2 emissions generated in the manufacturing process. Much more sustainable in this context is repairing the damaged components by processing the damaged areas locally.

Method

The components are repaired with an automated, hybrid process chain: First, the damaged areas on the component are detected, removed by a turning process and converted into a defined groove, which is then additively filled again by laser material deposition. This pre- and post-machining of the repair area can restore the component's required profile, and the component can be put back into operation.

Results

The individual production steps are supported by software that combines machine-integrated geometry acquisition, automated path planning and program generation. Thanks to an open machine design, the system can be used on different industrial machine concepts. The process chain, developed and qualified for the repair of metallic precision components, significantly increases not only resource and energy efficiency, but also decisively reduces the burden on the environment. A company needs fewer raw materials, is less dependent upon suppliers and, thus, more competitive.

Applications

The process chain can be used to repair rotationally symmetrical metal components. In addition to unfinished components, coated components made out of similar or dissimilar materials can also be repaired. In particular, resource and energy savings can be expected in the repair of large-volume components.

Contact

Matthias Brucki M. Sc., Ext: -314
matthias.brucki@ilt.fraunhofer.de

Dr. Thomas Schopphoven, Ext: -8107
thomas.schopphoven@ilt.fraunhofer.de

3 Principle hybrid process chain for the circular economy.

4 Additive repair using extreme high-speed laser material deposition.