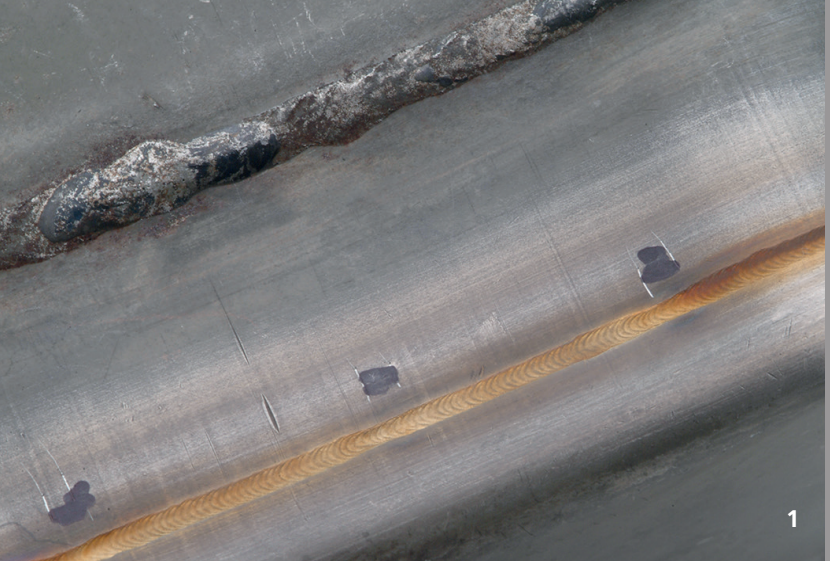

REPAIR OF JET ENGINE COMPONENTS BY LASER-BASED CUTTING AND WELDING

Task

Depending on their function and operation, engine components are subjected to high thermal and mechanical wear. For aircraft that were put into operation in the 1960s, it is becoming more and more difficult to find spare parts. For these reasons, the repair of specific components is an important method to preserve the value and function of these engines. Laser Metal Deposition has become an important method for their repair and overhaul.

Method

The target of various studies is to find the operational capability of the laser cutting and welding as a repair method for aircraft engine components. Fraunhofer ILT has developed a process oriented to the variety of the machined components and materials and that is a reliable approach for the reprocessing of previously used components. The process begins at the first weldability testing and ranges from apparatus construction, via the definition of service regulations all the way to the acceptance of procedures and components.

Result

Initially, the suitability for welding has to be checked for materials aged during operation. Here, precipitates can form at the grain boundaries depending on operating temperature, which can result in liquation cracks during joining. It is possible to prevent them when a minimum supply of energy is set, which is one of the strengths of laser welding. The concentrated energy input also enables design changes to components that will be accepted due to the limited thermal influence by the licensing authorities. Prior to the application of laser cutting, internal structures may not be damaged or their damage must be minimized. In many cases this is possible by a suitable cutting control.

Applications

The methods developed here are primarily used for components of aircraft engines. Beyond reprocessing, they can also be used for the production of new components. A transfer to other components subjected to wear and high temperatures is also conceivable.

Contacts

Dipl.-Ing. Martin Dahmen
Telephone +49 241 8906-307
martin.dahmen@ilt.fraunhofer.de

Dr. Dirk Petring
Telephone +49 241 8906-210
dirk.petring@ilt.fraunhofer.de

1 Separated, purified and re-welded lubricant container.
2 Exchange of connecting protrusions on a compressor outlet housing.

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
DQS certified by DIN EN ISO 9001, Reg.-No.: DE-69572-01