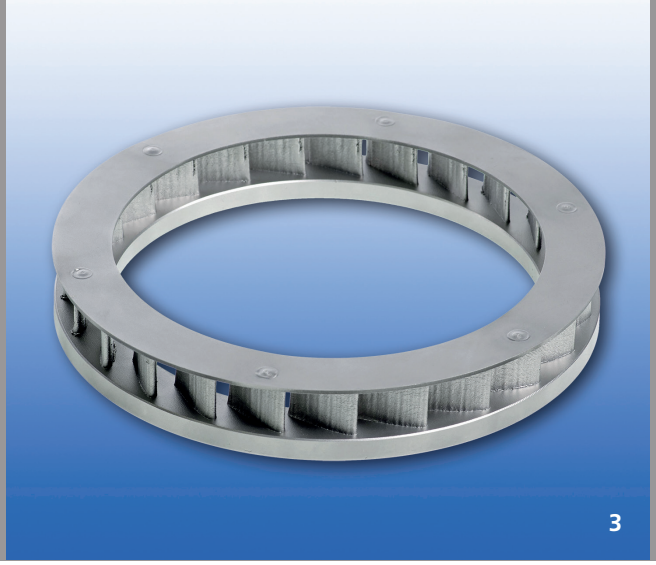

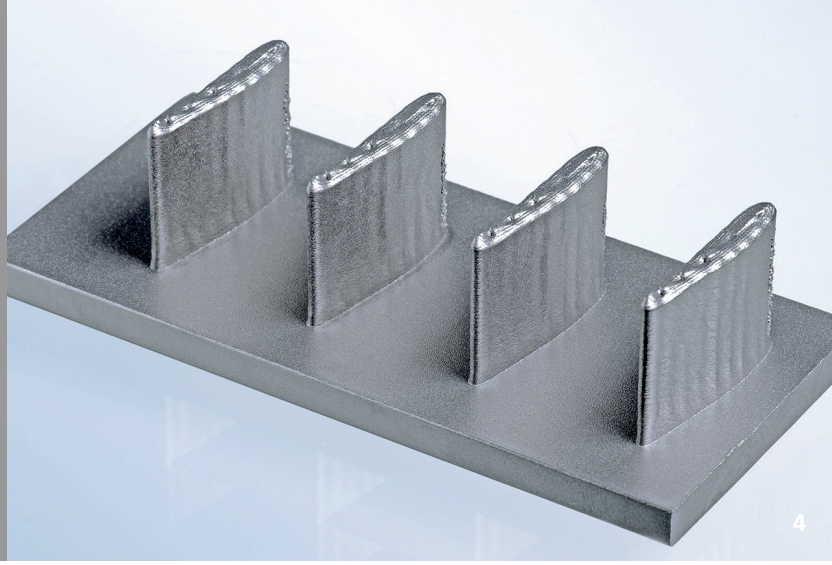

ADDITIVE MANUFACTURE OF A TURBOCHARGER COMPONENT WITH LASER MATERIAL DEPOSITION

Task

As part of the EU project »HyProCell«, Fraunhofer ILT is studying additive manufacturing by laser material deposition (LMD) as a technology in hybrid production cells. The demonstrator component for this project is a turbocharger nozzle ring commonly used in turbochargers for marine diesel engines. Turbocharger nozzle rings are manufactured conventionally in a very wide variety (> 1000 models). The hybrid production cell (machining and LMD-based production) makes it possible to customize numerous variants with one machine. The decisive criterion for industrial application is the economic viability of hybrid production cells, in addition to technological aspects. Both aspects will be examined in the EU project »HyProCell«. For this purpose, Fraunhofer ILT is developing the LMD process for the additive production of the turbocharger nozzle ring. Together with the project partners, the LA process will be transferred to a hybrid production cell and the profitability of this production route evaluated.

Method

The turbocharger nozzle ring is made of a stainless steel alloy. The CAD data provide the starting point for the production of the turbocharger. For the design of the LMD process, a suitable build strategy for the vanes was developed. The CAD data was used to implement near-net-shape path planning for the construction of the vanes using the software »LMDCAM«. The structure of the vanes took place on a prefabricated base ring. After the wings were manufactured with LMD, the upper vane surface was machined, and, subsequently, the upper ring joined to it with a laser.

Results

The turbocharger nozzle ring was manufactured with the elaborated parameters and the developed build strategy and its dimensional accuracy checked. The material allowance of the vane side walls is a maximum of about 800 µm. The LMD process will be transferred to the hybrid production cell, and the cost-effectiveness of the production route will be determined for various post-processing strategies.

Applications

The investigations are primarily focused on applications in turbomachinery. However, the know-how gained can also be used in other sectors, such as in tools and automotive engineering.

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Contact

Dipl.-Ing. Moritz Alkhayat
Telephone +49 241 8906-445
moritz.alkhayat@ilt.fraunhofer.de

3 Turbocharger nozzle ring made with LMD, (CAD data: ABB Turbo Systems AG).

2 Single vane geometric forms to evaluate the geometric accuracy, (CAD data: ABB Turbo Systems AG).

Subject to alterations in specifications and other technical information. 08/2018.