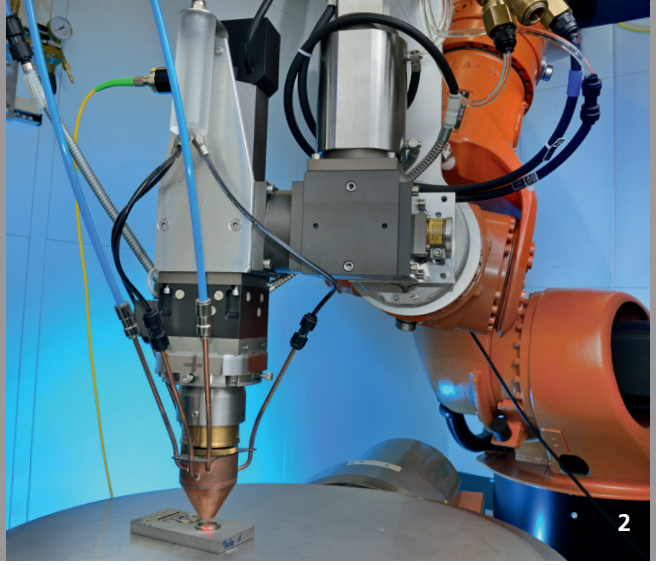

INLINE SENSOR TECHNOLOGY FOR SCRAP-FREE LASER MATERIAL DEPOSITION

Task

Using laser material deposition (LMD), the industry can produce metallic functional components in lots from single pieces all the way to series production at the same cost per part. A challenge is posed, however, by deviations of the LMD tracks actually applied from the planning data, deviations that add up layer by layer so that the final component geometry lies outside tolerances. To minimize this resulting scrap or even to produce scrap-free, Fraunhofer ILT is aiming to better control the LMD process with an interferometric sensor system that detects the actual geometry inline.

Method

The measuring radiation of the interferometric sensor system is coaxially superimposed on the processing radiation and describes a circular path around the deposition location. The component geometry is recorded in advance and in retrospect, irrespective of the feed direction. The height information contained therein is synchronized with the position data provided by the LMD system for the respective job location and combined into 3D data records.

Results

From these time-resolved 3D data sets, the surface contour of a component can be determined as it is being built. In the next step, a model-based determination of component topography shall be carried out so as to compare it with the CAD nominal data in the data processing chain. Based on this, control actions will be established to stabilize the laser material deposition process. This real-time control based on the inline measured geometry data shall be used to implement a self-parameterizing LMD system for the rapid development of novel components made with LMD.

Applications

This innovative approach for a controlled laser material deposition system enables the industry to produce complex system components, for example, bionically optimized functional components in vehicle construction.

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1 Powder focus with circulating measuring beam.
2 Robot-guided laser material deposition optics with integrated coaxial measuring beam guidance.

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