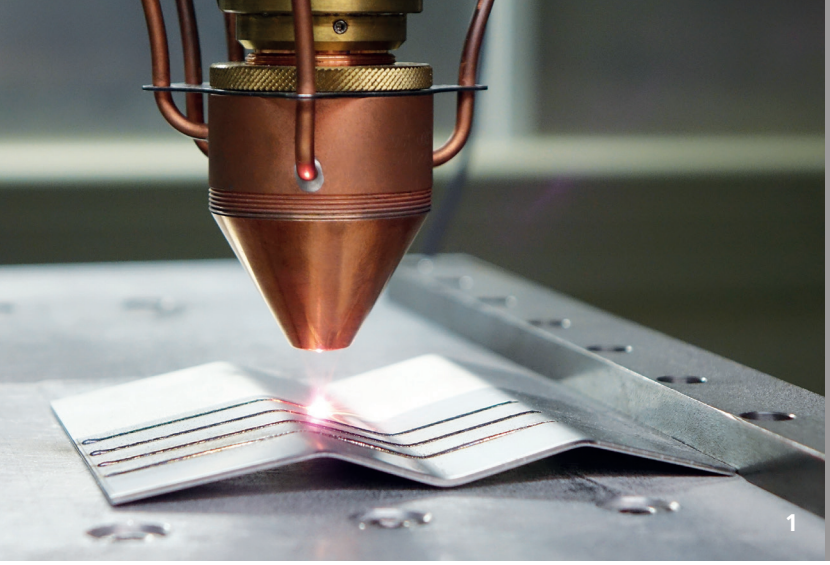

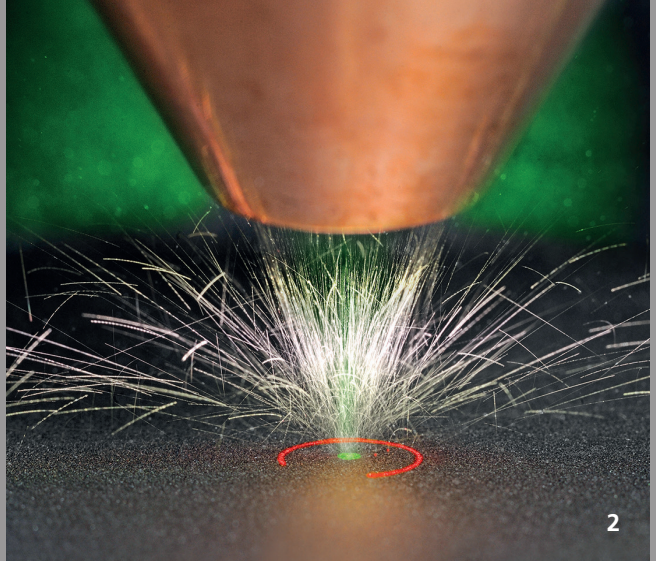

TESTING AN INLINE MEASURING SYSTEM FOR DISTANCE MEASUREMENT IN LASER MATERIAL DEPOSITION

Task

When laser material deposition (LMD) is set up, the working distance is typically determined and adjusted mechanically by means of various gauges. A disadvantage of this method is its limited applicability. It can only be used with good accessibility and not during the LMD process itself. Fraunhofer ILT has tested a newly developed coaxial in-line measuring system as to whether the distance to the surface can be detected during the process.

Method

The distance detecting system consists of an interferometric laser measuring system guided coaxially through the processing head. The measuring beam is projected as an ellipse around the processing point (Figure 2, red line) with a rotating mirror. As a result, the distance to the surface at all points of the elliptical orbit can be determined. The project aims to determine how robust the measuring system is against interference caused by the LMD process. For this purpose, Fraunhofer ILT investigated the extent to which the measurement was impaired by the injected metal powder and the process radiation. Subsequently, in a laboratory test, a distance control was implemented on an LMD robot system and tested on a demonstrator component (Fig. 1).

1 LMD process with distance control.

2 Projected ellipse of the measuring beam around the process point.

Results

The inline measuring system proves to be tolerant to disturbances caused by the LMD process. At powder feed rates of up to 100 g/min for IN718 powder, the distance can still be determined. The track geometry could be successfully measured offline and the distance control online during an LMD process with 750 W laser power in the laboratory on the demonstrator component. The measurement of the control resulted in a distance deviation of ± 0.1 mm, which is sufficiently accurate for the LMD process.

Applications

Since the distance is measured along a contour rather than just a single point, the surface can be scanned online around the process point during the process. Thus, the distance in front of the process point as well as the achieved track height can be measured simultaneously. Based on this data, for example, a control of the layer thickness can be installed. The system has particular advantages for inaccessible areas, distance-sensitive processes and components with deviations from the desired geometry (CAD data).

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