



COAXIAL WIRE FEED FOR LASER METAL DEPOSITION

Task

Laser metal deposition (LMD) with wire-shaped filler material is an alternative to LMD with powdered filler materials. Indeed, the overspray, the catchment efficiency, the insufficient quality of the powder, or the contamination of the component and the system are factors that make powder-based LMD unfeasible for some applications. A disadvantage of the state-of-the-art wire processing heads, however, is the lateral feed, which makes direction-independent processing impossible. Exceptions are the coaxial designs developed at Fraunhofer IWS and ILT, which permit a direction-independent processing but are only of limited suitability for applications on robotic systems due to their size. The two institutes will continue to develop, therefore, a smaller and more compact machining head with a system weight of about 5 kg for LMD. Here, a coaxial wire feed shall enable direction-independent 3D processing.

Method

Before a compact processing head can be developed, the process for the generation of a ring beam, patented by Fraunhofer ILT, has to be revised. The use of reflective optics not only enables the plant size to be reduced, but also allows the processing head to operate independently of the wavelength.

In addition to adding laser beam guiding and shaping, the institutes have integrated a coaxial process monitoring system into the machining head.

Results

A machining head has been developed for LMD with coaxial wire feed; it weighs approx. 5 kg and has a size of 200 x 100 x 200 mm³ (W x D x H). During the testing of the processing head, a direction-independent LMD process could be verified, which was demonstrated by using the system to weld Ti6242. The integrated coaxial process monitoring was used to precisely position the machining head.

Applications

The processing head developed here can be used for LMD with wire-shaped filler materials for coating, repair and additive manufacture. The system weight and size allow use in systems with low load capacity and/or high dynamics.

Contact

Jana Kelbassa M.Sc.
Telephone +49 241 8906-8331
jana.kelbassa@ilt.fraunhofer.de

Dr. Oliver Pütsch
Telephone +49 241 8906-617
oliver.puetsch@ilt.fraunhofer.de

1 Machining head with coaxial wire feed.

2 Schematic representation of the beam paths.