



INLINE POWDER GAS JET MEASURING SYSTEM

Task

When laser metal deposition (LMD) is used to additively manufacture components and coatings, their quality depends highly on reproducible process parameters. Demanding components, such as those used in the aerospace industry, can only be produced faultlessly in a defined process window; here, even small deviations change the process result. For this reason, there is a need to standardize and document both the process set-up and to monitor the process itself.

Method

Since the setting of the powder-feed nozzle determines the process result in LMD, measuring the powder gas jet is of crucial importance. Therefore, together with Trumpf Laser- und Systemtechnik GmbH, Fraunhofer ILT has developed a process for the certification of powder nozzles and implemented it in an integrated system. This system has also been expanded with functions for process setup and online process monitoring.

Results

The system has been adapted to the camera interfaces of industrial processing heads and can be integrated into any TRUMPF-LMD optics as an »in-line powder-gas stream measuring system«. The following function modules are available in modular form:

- Support and documentation of process setup by measuring and marking the positions of processing laser, nozzle orifice, powder focus, and workpiece features,
- Measurement of the powder jet stream and characterization of powder feed nozzles by calculating characteristic numbers
- Monitoring of process stability based on geometric characteristics of the melt pool.

Applications

Applications include all activities in the LMD sector that require detailed knowledge of process equipment and process stability. This know-how can be used in the aerospace industry, which places the highest demands on machining and documentation, and in the manufacturing industry, which uses high-speed LMD to produce components or in any sector that requires extended machining times.

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3 Module for quality assurance during LMD.

4 Powder nozzle for LMD.