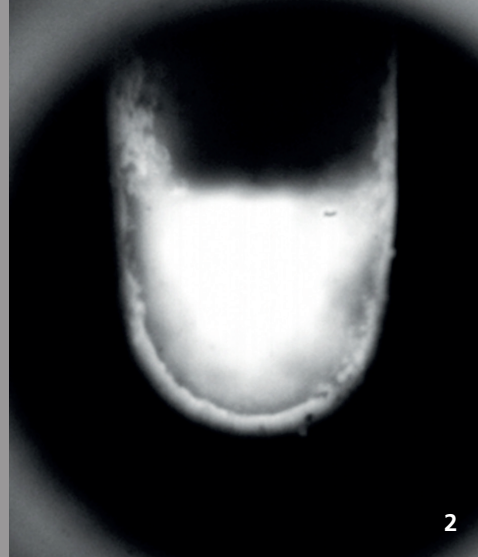




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INTELLIGENT PROCESS MONITORING FOR LASER MATERIAL DEPOSITION

Task

Laser material deposition has established itself as a method for functionalizing surfaces, repairing and modifying components and manufacturing new parts. To produce high-quality components or parts with long processing times, however, the industry requires complete documentation of the processes used. Owing to wide variety of applications and the large number of process parameters, there is a great need for application-specific monitoring strategies to ensure product quality.

Method

Fraunhofer ILT uses machine learning methods to adapt process monitoring systems to specific applications. In a training phase, process videos of the thermal emissions of the machining process are correlated with quality features of the process result. On the basis of this data, a large number of image features can be analyzed regarding their relevance to the respective process. The classification is carried out with different algorithms from the field of machine learning and allows the component quality to be evaluated reliably. As this selection is implemented in production, not only can the quality

be documented, but the defect class can also be assigned, in order to specifically prevent defects from occurring. The system can be further trained during production in order to optimize the quality or to adapt to changing boundary conditions.

Results

With this approach, Fraunhofer ILT has effectively adapted camera-based process monitoring to different applications and implemented its functionality in a plant-integrated system. This system also supports the process setup and enables a user to calibrate the »powder gas jet«. Moreover, it provides extensive functions for quality assurance in laser material deposition.

Applications

Applications include all areas of laser material deposition where monitoring of the process control is required. The most important areas of application include machine and tool construction as well as engine and power train construction.

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1 Sensor module of the process monitoring system.

2 Thermal emissions of the melt pool.