



INFLUENCE OF SHIELDING GAS GUIDANCE ON QUALITY OF COMPONENTS PRODUCED WITH SLM

Task

The shielding gas flow in SLM systems has to convey the smoke and splashes away from the zone where the laser and the material interact. If this does not occur, or only inadequately, the desired component density generally cannot be achieved. So far, however, it is not known which flow conditions are needed to optimize the SLM process. Hence, to better understand how the flow characteristics correlate with the resulting component quality, Fraunhofer ILT has visualized the flow in SLM systems. Based on the results, the flow of shielding gas can then be optimized.

Method

To visualize the flow in SLM systems, the institute has used two methods. Using Particle Image Velocimetry (PIV), it can make spatially resolved images of SLM process chambers, the protective gas flow amount and direction by using replicas. These results can be directly transferred to the plants and, thus, to the process due to the true-to-scale models. Furthermore, how the shielding gas flow influences the discharge of smoke during machining can be determined by the second method, high speed videography.

Result

It was shown that PIV can be used to map the shielding gas flow in SLM systems. In this way, it is now possible to obtain a spatially resolved image of the magnitude and direction of the flow of shielding gas in SLM systems. Moreover, it was demonstrated that high speed videography constitutes an appropriate tool for visualizing the impact of the inert gas flow on the smoke generated in the SLM process.

Applications

The results contribute to enhancing the process robustness and reproducibility in SLM. This can mainly be applied in the production of safety-related components in, for example, the aerospace industry.

The work has been carried out as part of the LuFo project »GenFly« under grant number 20W1305H.

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3 High speed recording of smoke removal from an SLM process chamber.