

3D MEASUREMENT OF SHIELDING GAS FLOWS IN SLM SYSTEMS

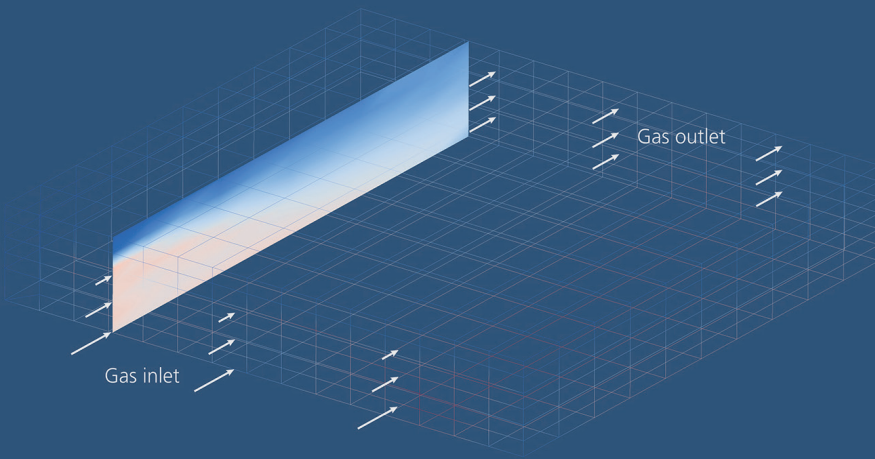
Task

In addition to process parameters such as laser power, scanning speed and the build-up strategy, the shielding gas flow in SLM systems particularly influences the quality of the components it manufactures. Here, a general characterization of the flow via the volume flow is not sufficient; much more, the local flow profile above the construction platform is decisive. For a basic understanding of the correlation of the shielding gas flow with the resulting component quality, the flow in SLM systems shall, therefore, be visualized and quantified. On the basis of these results, an optimized design of the shielding gas flow can subsequently be developed.

Method

A thermal anemometry system is used for the measurement. This allows a time-resolved measurement with up to 50 kHz of flow velocity and direction at one point. By means of a flexibly adaptable portal system, the flow field in the SLM system can be measured sequentially point by point.

1 Flow velocity in a measurement plane.



1

Results

For the first time, the design developed for the 3D visualization of the shielding gas flow makes it possible to directly measure the shielding gas flow in SLM systems without structural changes. The result is a position-resolved measurement of the velocity distribution in a grid of approximately 1 mm edge length. Since the thermal anemometer has a frequency response of around 50 kHz, the turbulence degree of the flow can also be inferred. With this information, a correlation between the flow profile and the component quality can be determined, which is necessary to better design the shielding gas flow of current and future machine generations.

Applications

The results contribute to improving process robustness and reproducibility during the SLM and are, therefore, relevant to manufacturers of SLM systems as well as to their users.

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