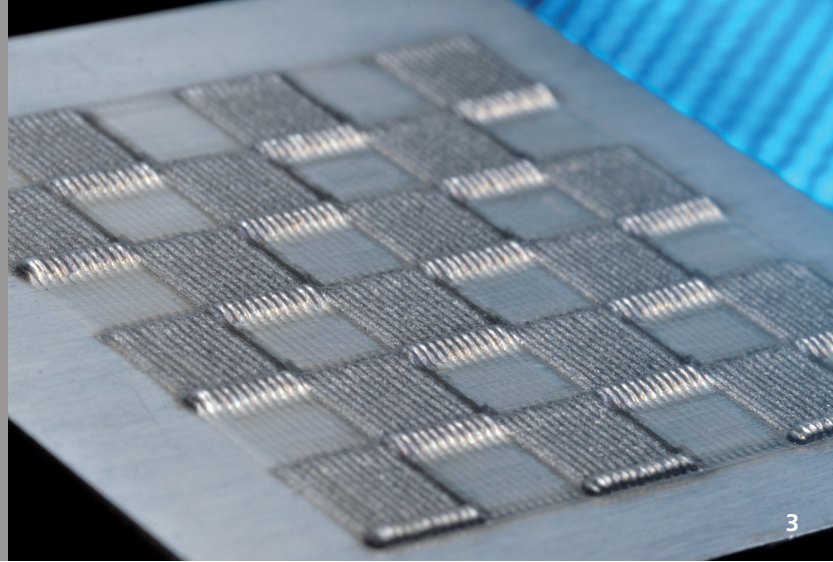




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HIGH-SPEED POWDER SWITCH – SYSTEM TECHNOLOGY FOR LASER MATERIAL DEPOSITION

Task

Laser material deposition often requires the coating process to be interrupted so that the component can cool down or the coating head can be repositioned. During these interruptions the powder feed system must either be switched off, which substantially increases processing time, or the powder gas stream allowed to continue during the interruption. The powder supplied during these downtimes can be reused only to a limited extent owing to contamination; it also soils the laser system and the components being processed. Depending on the application, up to 30 percent of the filler material can be wasted. For these reasons a high-speed powder switch that can switch the powder gas stream on and off in fractions of a second provides a compelling solution. The powder not used for the process can be collected in a separate container and reused.

Method

In collaboration with HD, a company based at Fraunhofer ILT, a high-speed powder switch (Fig. 2) was developed that enables the powder gas stream to be switched on and off and can toggle between two powder gas streams. This enables a coating process lasting several hours to be completed with no interruptions.

Result

Initial tests using the high-speed powder switch demonstrate switch-on and switch-off times for the powder gas stream of approx. 300 ms. The powder switch has been designed to ensure that no powder trickles out once it has been switched off. The developed design also allows two powder storage vessels to be linked so the system can seamlessly toggle between the powder storage vessels. The powder switch has been fitted with a pneumatic switch for automated processing; this switch drives the powder switch via the plant control system. Fig. 3 shows a chessboard pattern where the powder gas stream was switched on and off during the process without switching off the laser beam. Consequently, the processing time for this kind of geometry was reduced by a factor of 10. Apart from reducing processing time, the high-speed powder switch also saves substantial amounts of filler material.

Applications

Laser material deposition and thermal spraying are potential applications for the high-speed powder switch.

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2 High-speed powder switch.

3 Chessboard pattern, manufactured by high-speed switching of the powder gas stream.