



CLEAN REMOTE PROCESSES FOR RELIABLE JOINING

When using lasers to clean and ablate components, the resulting emissions must be intentionally removed from the workspace. The researchers at Fraunhofer IWS have also addressed this task for remote processes. They substantially minimized particles and smoke by means of a model environment that represents particle movement and air flows.

The local laser-assisted ablation of surface contaminations prior to adhesive bonding or thermal joining is not only intended to clean the parts. Ablation can also modify the surface topology so that adhesives or plastics bond better with the piece to be joined. The problem is that engineers must remove the particles emerging in the procedure from the processing area to avoid recontamination of the components to be joined and to protect the operator against hazardous substances. The challenge: Remote processing allows an area of up to one square meter to be machined simultaneously. The IWS team, working with researchers from TU Dresden, analyzed particle and gaseous emissions during laser processing of metal and carbon fiber-reinforced plastics. The measurements outlined clear differences both in relation to particle size distribution and the resulting gaseous species. Using the »Fluent« simulation environment, the researchers reproduced a simplified laser ablation process and visualized process-typical emission flows. They

simulated empirically developed approaches that combine a transverse jet and exhaust module in the model environment and were able to optimize the configuration and flow conditions. Once the project has been completed, the laser process user will be provided with a tool that improves emission removal and thus guarantees that the processed components are sufficiently clean.

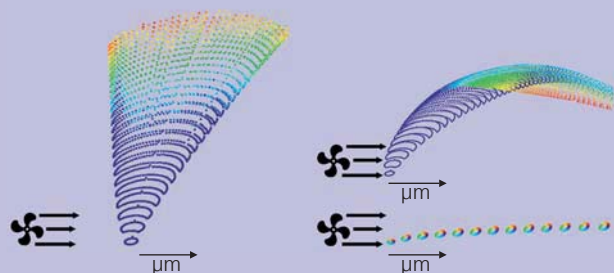
- 1 To ensure that the injected plastic sufficiently bonds to the coated steel sheet, the laser beam locally ablates parts of the zinc coating.

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"Fluent" calculates the trajectory of various particle sizes



The emissions emerging in the laser remote process consist of various particle sizes. Therefore, the particle trajectory is determined size-selectively at given flow conditions.

CONTACT

Dipl.-Ing. Annett Klotzbach
Bonding and Composite Technology

+49 351 83391-3235

annett.klotzbach@iws.fraunhofer.de

