

Process Simulation and Development for Laser Beam Welding with Rotating Bifocal Optics

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Laser welding has been an established technology in industrial production. Nevertheless, there are many unsolved problems with cracks and pores when welding certain materials such as high-strength aluminum alloys or so-called tailored blanks. New process or exposure strategies are therefore being developed to enable a controlled temperature field within the welding zone and thus deliver better welding results.

The aim of this study is to investigate a new type of processing optic that uses bifocal optics to split the laser beam into two partial beams and a fast rotation of these two partial beams. Optimum welding parameters for different materials were determined while varying the rotational speed, laser power and welding speed. The results show that porosity formation and cracks are observed less than with conventional laser welding. At the same time, simulations were created with the FLOW 3D software, which agree very well with the experimental results.

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