

Press release XV / 2015:

New perspectives for laser beam welding of die-cast aluminum components

Scientists of the Fraunhofer IWS Dresden in cooperation with an industrial partner have developed a new technique for the welding of die-cast aluminum components and have managed to transfer it into series production. For the very first time, a weld joint, which is characterized by extremely low porosity and strongly reduced distortion, is generated with the help of brilliant laser radiation and high-frequency oscillation. Furthermore the component's distortion is extremely low because of the concentrated, locally limited heat input. Traditional laser beam welding procedures cannot assure this high quality.

Thanks to the excellent castability and the complex shape, die-cast aluminum material is frequently used in automotive applications, especially for thin-walled cross sections. Frequently die-cast components are connected to profile or semi-finished tube products, which have to be joined in a pressure-tight manner. As the joining technique is required to be most efficient and cost-saving, beam welding procedures are highly predestinated for these ambitious joints, in particular laser beam welding techniques.

Due to the manufacturing process die-cast components are difficult if not almost impossible to weld. The reasons are entrapped gases within the pores or cavities, which are exposed to high pressure as well as mold release agents from the die-cast process. These factors prevent a homogeneous weld seam. In general, a high amount of pores in the weld seam and melt pool blow out occur and prohibit the use of the component. IWS scientists succeeded in improving the quality of weld seams by applying beam sources of the highest quality and high-frequency beam oscillation within the melt pool. Thanks to high reproducibility an excellent joining procedure with high component production is available for industrial series.

Laser beam welding techniques have found their way into diversified industrial serial applications. Procedures with integrated short-time heating, with material-adopted fillers and recently with high-frequency beam oscillation, enable the generation of crack-free joints made of hardenable and high strength steels, cast iron, aluminum, special alloys, and hot-crack-prone alloys with high stiffness.

Research results will be presented at the Automotive Engineering Expo AEE in Nurnberg from June 9 to 10, 2015. You are cordially invited to visit our booth in hall 7A, booth 516 and to attend the presentation at the Automotive Engineering Congress, June 9, 2015 (talk 1.6). Furthermore our experts are looking forward to welcoming you at the LASER World of PHOTONICS, hall A3, booth 121 (Fraunhofer joint booth), Munich, June 22 – 25, 2015 or at the Fraunhofer IWS Dresden.

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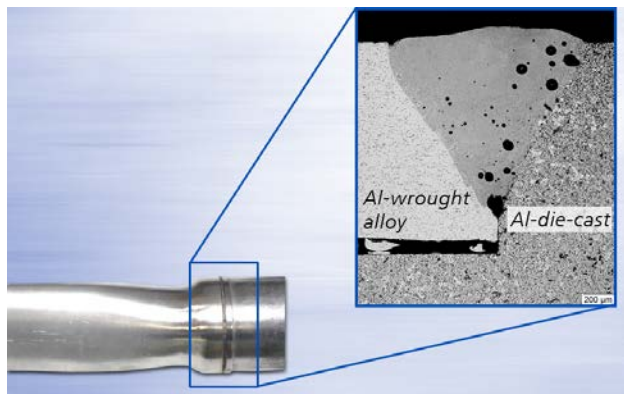


Fig. 1: Section from a customer's component with pressure-tight weld seam;
material mix: Al-tube + Al-die-cast
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Fig. 2: Welding process
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