Introducing the concept of self-sensing for ultrasonic assisted laser beam welding of 1.4301 stainless steel and 2.4856 nickel alloy

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Abstract

The desired standards for components and production processes are constantly increasing. Regarding product quality, the required material properties and financial considerations are a conflict of interest. The production of hybrid components is a way to overcome this conflict. The CRC Tailored Forming in Hannover is fostering this novel technology. By combining application-optimized materials with cost-optimized materials very early in the process flow, both quality and economic value can be improved.

This contribution provides a very brief insight into the joining of dissimilar steel rods. A nickel alloy for high-temperature applications is joined with a cost-optimized stainless steel utilizing the ultrasonic assisted laser beam welding process. During the process, the molten metal is superimposed with ultrasound. Influencing the dynamics of the molten bath results in better mixing and a grain refinement in the weld seam. The subsequent forming of the semi-finished products results in components with locally adapted properties.

The evaluation of the driving signals of the ultrasonic transducer during the welding process provides characteristic information about the process which provides the basis for process monitoring. Here the concepts are discussed and the first results are presented.

Keywords: ultrasonic assisted welding, grain refinement, process monitoring