



1 Setup with two
RAYLASE AS-Fiber 30 scanners.
2 Welding a bipolar plate.

Double-beam welding of metallic bipolar plates

Hydrogen is regarded as the energy source of the future. The core of the so-called PEM (polymer electrolyte membrane) fuel cell is the bipolar plate, responsible for important tasks such as media distribution and supply, including hydrogen as the reaction medium. The metallic bipolar plate is suitable for mobile applications due to its lower weight. It consists of two formed metallic foils that have to be joined together, which means both quality and cycle times have to fulfill stringent requirements. Laser welding is suitable for this application as its process speed is so high. However, from a welding speed of 500 mm/s (30 m/min), the first signs of humping appear. Humping is a seam defect that manifests itself in the form of periodic melt accumulations on the seam surface, which impair the seam quality and severely limit the process speed.

Two laser beams on one workpiece

With a single-mode fiber laser emitting in the NIR (1070 nm) range, high-quality seams can be produced at a process speed of 30 m/min. One approach to reducing the production cycle time while maintaining this seam quality is to link two processing heads. Two AxialScanFiber30 scanners from RAYLASE are used for this setup. Two lasers, each with a maximum output power of 1000 W, are also used. Both laser beams can be switched on simultaneously.

Reduction of the cycle time

The processing time for a typical welding contour for a bipolar plate is approx. 4.6 seconds when only one processing beam is used. In contrast, the processing time with double-beam welding is only approx. 2.4 seconds, a reduction of approx. 48 percent. A further advantage – the two beams can be used on one spot in the overlapping area of the two scan fields, which helps researchers investigate methods to prevent humping.

Author: Elie Haddad M. Sc., elie.haddad@ilt.fraunhofer.de



Contact

Dr. André Häusler
Group Manager Joining of Metals
Phone +49 241 8906-640
andre.haeusler@ilt.fraunhofer.de