

Laser beam welding for the construction of rail vehicles

Within research and development orders, SLV Halle GmbH investigated the opportunities of producing sub-assemblies for the construction of rail vehicles using laser welding equipment. To this end, different lateral wall segments consisting of a carrier frame and the outer sheet metal lining were prepared using different laser beam sources.

Laser beam welded sub-assemblies



Lateral wall segment with stitch welds

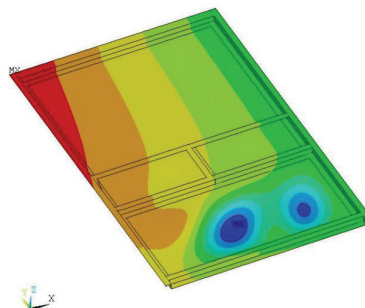


Segment with weaving and circumferential welds

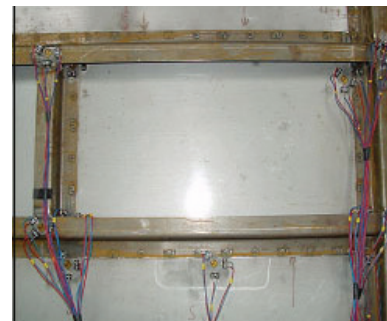
Welded production of lateral wall segments

- Materials tested: X5CrNi1810
X2CrNi12
S355N-Cu
- Weld types tested: stitch weld in overlapping joint
weaving weld in overlapping joint
circumferential weld in overlapping joint
- Laser types used: CO₂-laser
Lamp pumped Nd:YAG laser
Diode pumped Nd:YAG laser
- Laser outputs: 5.000 W, 2.000 W, 4.400 W

Simulation and inspection of welded structure



Results of FEM analyses



Strain gauge measurement at component

Schweißtechnische Lehr- und Versuchsanstalt Halle GmbH

Prof. Dr.-Ing. S. Keitel

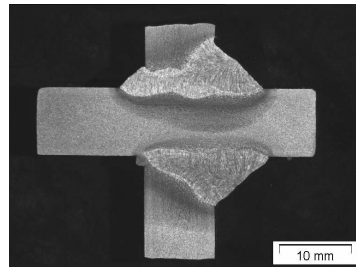
Phone: +49 345 5246-415 Fax: + 49 345 5246-412; Email: gf@slv-halle.de

Bombardier Transportation, (Bahntechnologie) Germany GmbH & Co. KG

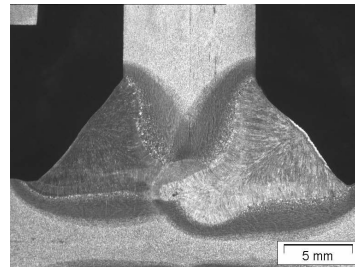
Phone: +49 3581 33-1424 Fax: +49 3581 33-1442

Production of carrier subassemblies using MSG laser beam hybrid welding

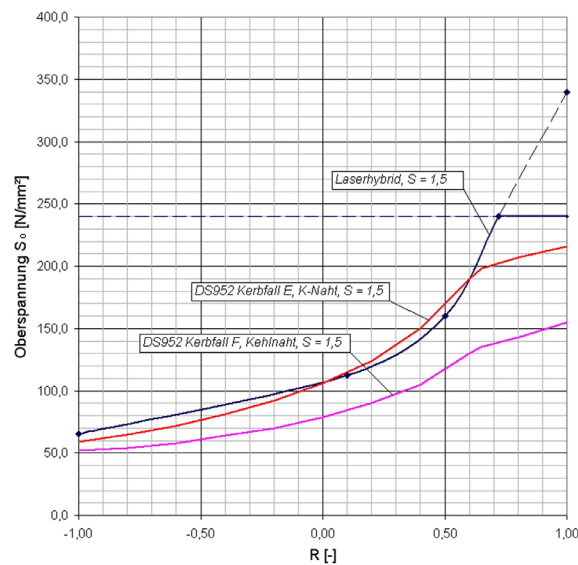
The influences of both energy sources during MSG laser beam hybrid welding allow synergetic effects which eliminate the disadvantages of individual processes for a high number of joining tasks. The object of the tests carried out so far covered the representation of the technological, and, above all, the economical potentials in particular at T joints with the target to produce a full single-pass connection.



One-side welding at T joint

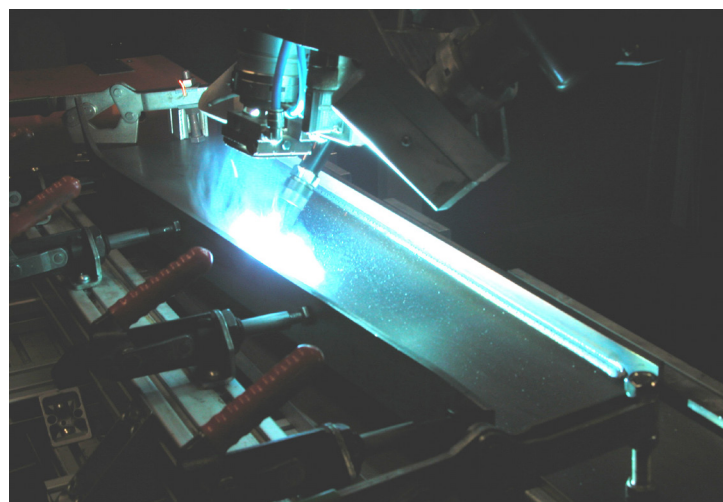


Two-side welding at T joint



MKJ graph of two-side welding with 50 % probability of survival

After the demonstration of the strength characteristics in the endurance test, another focal point was defined together with Bombardier Transportation Görlitz, i.e., sample fabrication for the evaluation of the process stability and reproducibility of parameters. A lot size of 40 double channel beams with double fillet welds was produced with dully connected joint over a weld length of 800 mm. Continuous welding without faults was observed during the subsequent US test. Thus one can consider that the whole process of fabrication has proven its worth.



Carrying out the production weld