Welding of Tailored Blanks

Task

Laser welding of flat sheets allows the combination of different materials and material thicknesses into a single component with locally adapted properties. In a single stamping process, this so-called “tailored blank” is formed into the final component reducing both the total cost and weight of the parts as well as the steel consumption and handling costs. At the same time this process often leads to optimized mechanical properties and, in the case of automobile parts, superior crash-test performance.

The customer, ArcelorMittal Tailored Blanks, has more than 15 years experience using CO₂-lasers for tailored blank welding and wanted to replace the older lasers sources by modern and much more efficient diode lasers.

Approach

A range of trials on different, relevant materials in the Laserline applications labs convinced the customer of the weld quality and process stability when using high power diode lasers in the 5 to 6 kW range. The first LDF 5000-40 laser replaced a CO₂ laser in one of the customers’ production lines, was installed end of December 2011 and runs in production since then.

Result

Despite the medium working distance of the LDF 6000-40 and LDF 5000-40 that are now used in several Arcelor production plants throughout Europe and India, weld process stability and weld speed are at least equivalent to other diode pumped laser sources with “better” beam quality. The diode laser proves to have much higher overall equipment effectiveness (OEE) than the previously employed CO₂ lasers and further lasers will be replaced over subsequent years.

- **Material**: Galvanized steel, thickness range 0.5 mm to 2.7 mm
- **Task**: Reliable welding in high-volume production
- **Laser**: LDF 6000-40 and LDF 5000-40
- **Optics**: Laserline welding head. Spot 0.6 to 0.9 mm
- **Parameters**: Weld speed 5 m/min to 15 m/min
- **Result**: In production since January 2012
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