

Distortion Minimization in Remote Welding of Steel

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Abstract. In conventional robot-guided laser beam welding of sheet metal, e.g. for automotive applications, one of the key aspects determining the welding sequence is the positioning distance between the welds. Generally, it is intended to minimize this positioning length, due to the pure positioning velocity significantly influence the cycle time. However, to minimize cycle time by minimizing positioning distances might result in a welding sequence less than optimal in view of distortion. In view of this conflict, remote welding may be a potential solution. It has been demonstrated that, by moving the laser spot over the work piece by the help of a fast beam deflection unit, it is possible to reduce the relative proportion of positioning time to less than 10% of the cycle time. In special, the importance of positioning distance is drastically reduced, thus allowing to base the selection of the welding sequence on technological aspects such as distortion rather than on economic necessities. However, basic studies on distortion and distortion minimization exploiting the specific advantages of remote welding are still lacking. Thus, various investigations on this topic have been conducted at the BIAS Bremer Institut für angewandte Strahltechnik by the help of a Trumpf CO₂-Laser remote welding system. The results presented here are focussed on the effects of heat input and welding sequence on distortion during stitch welding of one- and two dimensional steel sheet structures.