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Dynamic beam shaping increases the attractiveness of laser beam fusion cutting

The decisive argument for purchasing a laser cutting machine is the optimal combination of good quality, maximum feed rate, low investment and operating costs. During the last years, fiber and disc lasers have achieved a leading position as a laser source for cutting of thin metal sheets due to their distinctly higher cutting rates. The need for optimization emerges for sheet thicknesses exceeding 5 mm. Compared to CO₂-lasers, the solid state lasers cause an increase in surface roughness and burr formation.

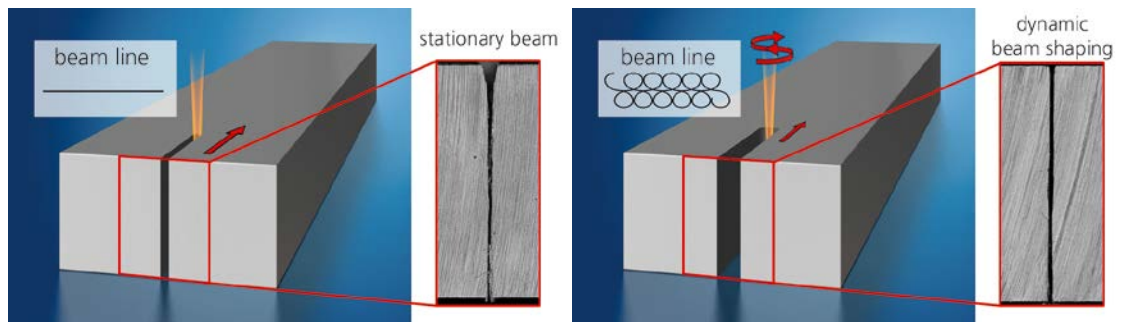
Fraunhofer IWS Dresden works on innovative solutions for the optimization of laser beam fusion cutting processes which result in an improved cutting quality. Thus, the leading position of the solid state laser as universal laser beam source for the cutting market can be extended.

The qualification of innovative cutting methods such as remote laser cutting for the industrial production as well as the development of laser beam fusion cutting methods belong to the emphasis of Fraunhofer IWS in the field of laser beam cutting. All this is supported by fundamental investigations for process understandings. The scientists in Dresden fall back on all established laser types with different wave lengths, power and beam quality in combination with highly dynamic 2D and 3D cutting machines. Alongside commercially available optical equipment for the focusing and the shaping of the beam, special-purpose solutions and equipment developed in-house are used as well. Additionally, there are numerous possibilities for the characterization of the process results, from roughness measurement at the cutting edge to detection of magnetic properties at laser cut electrical steel sheets.

At the EuroBLECH trade fair in Hannover the scientists at of Fraunhofer IWS Dresden present a new approach to cutting of thick metal sheets by the means of dynamic beam shaping. The basic idea is to modify the spatial and temporal energy deposition so that the advantages of high focal intensities remain while the absorption increases. For this purpose, a standard cutting head is combined with a high performance scanner system. A special control solution allows for the programming of freely definable functions of the scanner system in the kilohertz range. Numerous degrees of freedom modulate the oscillation of the laser beam and add possibilities to the conventional cutting parameters such as laser power, feed rate, focal plane, and gas pressures.

Without physical adaptation of the focal length as it is done with standard cutting machines, very good cutting performances for thin and thick metal sheets are achieved with the same focal length. The process integrated sensor systems allow efficient customer-specific optimization of the cutting process.

We are looking forward to your visit at the EuroBLECH trade fair from October 25 to 29, 2016 in Hannover at the Fraunhofer stand in hall 11 / B135.



Manipulation of the cut kerf geometry depending on the oscillation function;
 on the left: conventional cutting process
 on the right: improved parallelism of the cut kerf by dynamic beam oscillation functions
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