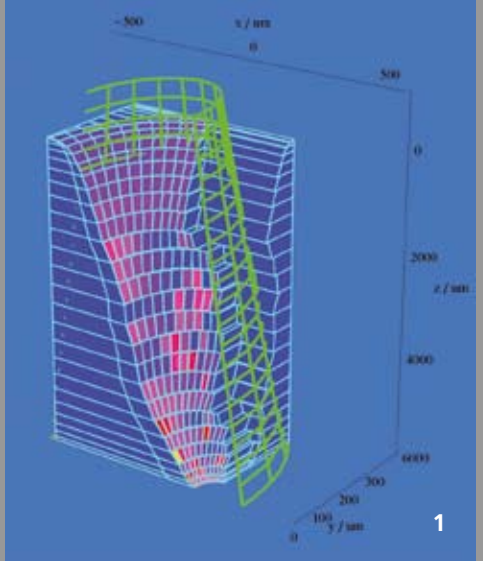

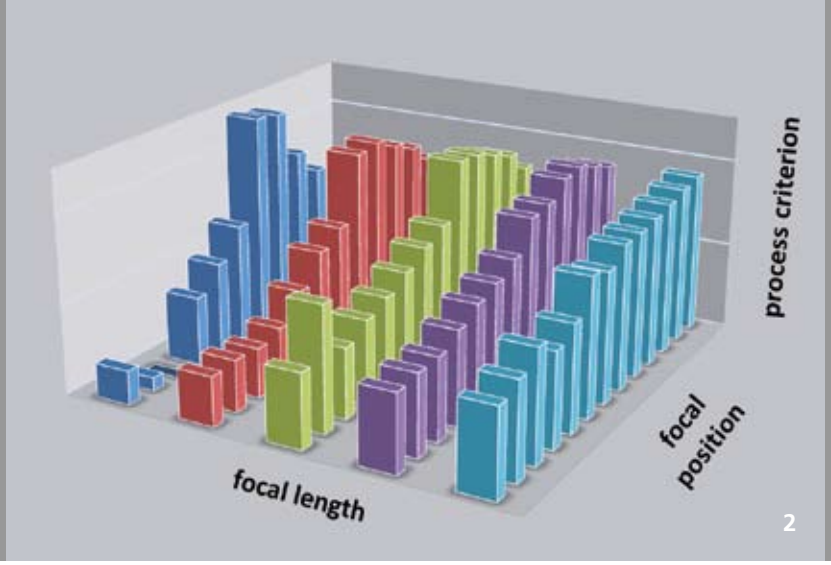

Subject to alterations in specifications and other technical information. 09/2014.

PARAMETER SCREENING AND OPTIMIZING FIBER LASER CUTTING THROUGH PROCESS SIMULATION

Task

Laser system manufacturers and end users in the sheet processing industry are desperately searching for solutions to connect the advantages of fiber-coupled beam sources, as compared to the established CO_2 lasers, in terms of flexibility and productivity along with a higher cutting quality. Above all, questions remain on what the mechanisms of melting stage formation are, on how horizontal and vertical melting strings arise as well as on which melting film surface temperatures occur and how far vaporization as well as multiple reflections contribute to the process.. The experts have hardly come to a consolidated understanding of parameter dependencies important to the user. In addition to experimental investigations, now systematic simulation calculations should support parameter screening.

Method

In the EU project »FILCO« and on behalf of five European high-tech SMEs, Fraunhofer ILT has taken over the task of screening the parameter field »focal length x focal position« with the simulation program CALCut and to develop an optimized laser cutting optic on the basis of the simulation results.

Result

In the first project phase, more than 600 CALCut simulations were calculated for a reference application selected by the project consortium. With the aim of reaching cutting processes that are as efficient as possible and that provide high-quality cutting results, the following simulation values were assessed:

- maximum cutting speed,
- range of the cutting gas stream in the kerf,
- homogeneity of the cutting front geometry,
- homogeneity of the absorbed power density, and
- robustness with incremental changes of parameters.

As a result, an efficient and robust regime was identified in order to select optical parameters and the design of the optics.

Applications

The simulation-supported parameter screening will soon take on a key role in laser process development.

The research results were funded by the EU under the 7th Framework Program via the REA – Research Executive Agency under the grant number FP7-SME-2012-315405-FILCO.

Contact

Dr. Dirk Petring
Telephone +49 241 8906-210
dirk.petring@ilt.fraunhofer.de

1 Cutting front simulated with CALCut (6 mm, stainless steel).

2 Example of screening result.