

Final Report

Project acronym: *MatLaMeD*

Project number: *Project5109*

M-ERA.NET Call 2017

Period covered: 01/08/2018 to 31/07/2020

Project website:

<https://www.ipt.fraunhofer.de/de/kompetenzen/Prozesstechnologie/Projekte/matlamed.html>

2. Publishable project summary

Laser additive manufacturing has been proved to be a technique for the fabrication of metallic components within several industries and applications like die & mold, forging and cutting tools. Hot-work tool steel (X38CrMoV5-1) is largely used for the production of hot forging tools due to its high level of hardness, temper resistance and toughness. Hot-work tool steel is exposed to high thermo-mechanical loads, which can lead to failure due to the reduction of its hardness and toughness. In order to mitigate such kind of failure a wire- and powder based laser metal deposition (LMD-W+P) process, which combines a special hot working tool steel and Titanium Carbide (TiC), was established to modify the local mechanical properties of the steel.

A CAD/CAM module for the hybrid Process was developed. The module was also extended by the option to store any information about the workpiece surface. Thus, a correlation between tool path, technology parameters and workpiece surface can be established during a simulation run by storing a reference to the simulated NC block or the currently simulated path segment on the currently machined workpiece surface. The system components and the technological knowledge of the partners were continuously integrated into a database environment as examples and tested with the defined demonstrator component. At the end of the project, a complete run-through from design, process planning and generation of the processing program to the planning of quality tests and data feedback could be performed. The LMD-W+P process was employed to fabricate three point bending samples. Furthermore the micro hardness was investigated as well as the resulting microstructure. The new CAM planning environment allows designing the new hybrid laser metal deposition in a process chain with subtractive process steps and provides a fully integrated LMD-W+P process.