Master Thesis (1 year): Simulation of the Laser Powder Bed Fusion Process

Background

Uncertainty about the robustness of the Laser Powder Bed Fusion (LPBF) process has been a major obstacle for industrialization of this technology for serial production. The sources of variation in this technology is numerous, and the impact of these sources on the final product quality is yet not fully understood. A full-scale robustness study requires numerous print runs and extensive empirical testing. The objective of this project is to circumvent this issue by developing a new methodology for evaluation of process robustness which is cost effective and less test intensive. This new methodology is based on predictions from LPBF process simulation.

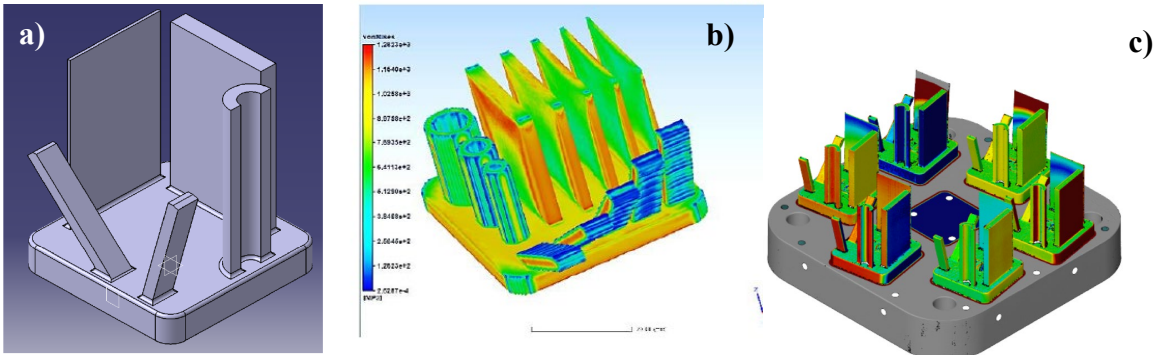

***Figure** shows the different steps of the project: **a)** identification of features to be printed, **b)** process simulation (e.g. for prediction of distortion), **c)** Printing and 3D scanning of the parts for comparison with simulations. (**source:** Master Thesis-Chalmers: The Effect of Scanning Strategies on Geometrical Accuracy & Surface Roughness, by: MA Feizabadi and AK Rajendran)*

Objective and Research Questions

The objective of this master thesis is to understand the capabilities and limitations of the commercial simulation software SIMUFACT. In general, the goal is to understand how this simulation tool can be used to predict the outcome of a real print run. How to use simulation results to predict distortions in the part and compensate for it in the design?

Approach

The applicant should perform a comprehensive literature survey on the topic of process simulation for L-PBF. Next, the applicant should explore the capabilities of the commercial simulation software SIMUFACT. The applicant will be guided and supported by simulation experts and designers at RISE IVF, Etteplan and MSC Software. Experimental print runs will be performed at RISE (or Chalmers) to validate the simulation results.

Work Description

The student will be placed at RISE IVF in Mölndal. The focus will be:

- Literature study
- Calibration procedure for L-PBF process
- Simulation of defined components for the specific material
- Evaluation of the results and report writing

Qualification

We are looking for a candidate with a background in mechanical engineering and knowledge of simulation tools such as MSC SOFTWARE or ANSYS. Knowledge of design and CAD is a merit.

Start of the thesis work: September 2021
Time frame: The thesis covers 60 credits / 40 weeks
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