

Master's Thesis (1 year): Post-processing for Metal Additive Manufacturing - surface modification and support structure removal of 3D printed parts

Background

Additive manufacturing (AM) is growing as an alternative manufacturing process for a broad range of materials. Today, the technology enables manufacturing of parts with complex geometries including internal conformal cooling channels or for example lattice structures to reduce a part's weight. A broader adoption of the technology depends on the ability to control the entire eco-system, involving pre-printing, printing, and post-printing. Almost 30% of the total cost is linked to the post-treatment processes involving machining, surface modification, powder removal, support structure removal, etc. For this reason, it is of great interest to examine the existing and emerging technologies that can remove the support structure in a controlled and automated manner and possibly also contribute to improved surface roughness / topography.

This thesis work focuses specifically on how the Hirtization® Process affects the surface integrity of the additively manufactured surfaces as well as that the technology enables automatic support structure removal after laser powder bed fusion (L-PBF).

Objective and Research Questions

The objective of the Master's thesis is to investigate the surface integrity (*residual stresses, dimensional accuracy, powder removal capacity, and surface topography*) of additively manufactured 316L/In718 materials after being treated by the Hirtization® process. Based on the gained knowledge, the student should propose input to how a part should be designed to meet a certain design requirement.

Questions to be answered:

- How does the Hirtization® process affect the surface integrity of the additively manufactured part?
- How should the support structures be designed to be optimized for the Hirtization® process?
- How should a feature (edge, channel, etc.) be designed to meet a tolerance when being exposed to the Hirtization® process?

Work Description

The student will be placed at the Department of Industrial and Materials Science at Chalmers. The focus will be:

- Literature study
- Design of Experiments (various features to be evaluated and tested)
- Surface integrity analyses and design proposals
- Evaluation of the results and report writing

Qualification

We are looking for you who is studying towards a Master of Science degree in the field of Material Science. The thesis work is suitable for someone who is interested in materials science, materials characterization, and additive manufacturing. It is a merit to have experience in using design tools.

Start of the thesis work: August/September 2021

Time frame: The thesis covers 60 credits / 40 weeks

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