THESIS PROPOSAL

Reference: S. Cacace, Professor Q. Semeraro

Subject: Experimental validation of analytical models for the selection of the optimal process parameters in L-PBF processes

Date: September 2021

In Laser Powder Bed Fusion (L-PBF) processes the selection of the process parameters is a crucial aspect. Usually, process parameters are provided by machine or powder manufacturer; the most important parameters are power P, speed v and hatch distance d_h . However, the suggested operational condition might not be optimal. Other times, the material selected for the application is not well-know or already tested in L-PBF applications and therefore no (or little) knowledge is available regarding the operational conditions.
Analytical models can be used to determine if a combination of parameter (P, v, d_h) produce defects (lack of fusion or keyhole). These analytical models provide a feasibility window for processing new materials based on few properties (thermal diffusivity, thermal conductivity, enthalpy at melting and absorptivity).
The objective of the thesis is to validate experimentally a procedure for the selection of a feasibility region in L-PBF processes based on analytical models. The lab activity consists in the validation of the thermal model by examining the actual melt pool size and compare it with the predicted one from the analytical models. A study on the variability of the melt pool width and depth should be carried out to understand the relationship between these two quantities. Once the thermal model is validated, the procedure is used to determine optimal processing conditions that should be validated by printing samples.

Starting date: State of the art can start at any moment.

Required Knowledge: Basics of Matlab coding, Design and Analysis of the experiments course, Advanced manufacturing processes class

Bibliography

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