

Topic Definition for a MASTER THESIS

for

Topic: Process Competence Evaluation of Powder Bed Fusion and Directed Energy Deposition Based on Dimensional Accuracy and Mechanical Properties

Additive Manufacturing (AM) has evolved from a rapid prototyping tool into a viable manufacturing route for end-use components. Its key advantage is the cost-effectiveness production of geometrically complex and customised parts. However, AM processes differ significantly in capability. Powder Bed Fusion - Laser Beam/Metal (PBF-LB/M) offers high geometric complexity, fine feature resolution, and good dimensional accuracy, but is limited by relatively low build rates, low build volume, and the high cost of raw materials. In contrast, the Directed Energy Deposition - Arc (DED-Arc) process enables high deposition rates, large build sizes, and relatively low raw-material costs, but typically exhibits lower as-built surface quality and reduced dimensional precision.

The proposed objective is to compare the components manufactured by both processes with respect to their geometrical and selected mechanical properties. Further proposes a hybrid manufacturing approach combining PBF-LB/M and DED-Arc for SS316L, aiming to exploit PBF for applications requiring high complexity and precision, and DED-Arc for rapid deposition of bulk material. The work aims to develop a controllable hybrid interface strategy and quantify the productivity of the individual and hybrid routes.

The following tasks should be completed:

- Conduct a baseline comparison of DED-Arc and PBF-LB/M samples for dimensional tests.
- To conduct and compare mechanical properties, including tensile strength, hardness, etc., with individual and hybrid approaches.
- Develop a workflow for hybrid manufacturing using a combination of DED-Arc and PBF-LB/M.
- Demonstrate a case study with a hybrid approach.

For the defense of the thesis, a poster and a video must be submitted according to the specifications of the professorship.

Issue: Klicken oder tippen Sie, um ein Datum einzugeben.
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