
Topic Definition for a MASTER THESIS

for

Topic: Computational Analysis of dual-side deposition on minimizing the substrate deformation

Directed Energy Deposition - Arc (DED-Arc) using metal wire is a process that involves the precise deposition of molten material to create complex structures. One significant challenge in DED-Arc is the excessive heat input required to melt the metal, which often leads to substantial deformation of the substrate plate. This deformation can compromise the dimensional accuracy and mechanical properties of the manufactured parts.

Previous research explored a dual-side deposition technique to mitigate this deformation. In this method, metal was deposited completely on one side of the substrate plate and then on the opposite side. While this approach showed some improvement, it did not entirely eliminate the deformation issue. This project aims to extend and refine the dual-side deposition method by alternating the deposition of each layer on both sides of the substrate plate. This new approach is hypothesized to more effectively balance the thermal stresses and reduce the overall deformation of the substrate.

The following tasks should be completed:

- Computational analysis of deformation behaviour due to one-side deposition.
- Analyse and compare the results for one side's complete deposition followed by the other side with the alternate layer deposition on each side, computationally.
- Experimental validation of results on a robotic wire-arc additive manufacturing setup.
- Optimization of dual-side layer deposition with intermittent layering strategy.
- To investigate the study on aspect ratio and its effect on deformation.

Note: All computational work will be performed on SIMUFACT software, and basic training will be provided.

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

Issue:

Submission:

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