

Master Thesis – Compression of nickel based alloys for additive manufacturing (30 credits/20 weeks x2 – 2 student)

Project Background

Laser Metal wire Deposition (LMD-w) is an additive manufacturing method which utilizes a high power laser to melt metal wire and an industrial robot to deposit beads to build up 3D geometries layer by layer. The process is sensitive to changes in both geometry and process parameters. Nickel based alloys are commonly used in the aerospace industry for high temperature applications, but are difficult to deposit due to their crack sensitive behavior. The process can be controlled by measuring the resistance in the wire during the deposition and then change laser power, laser spot size, electrical power, wire feed rate or robot position to minimize variations in the process. The goal of the thesis work will be to perform a comparative study of different nickel based alloys to investigate how different materials behave with changes in key process variables from a material perspective and from a process control perspective.

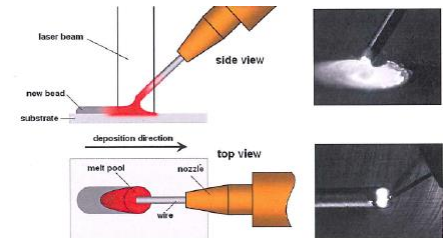
Assignment Description

The task will be to perform a comparative study on the different alloys to identify a suitable process window through DoE and testing and investigate if a significant difference can be identified with regards to microstructure formation, cracking tendency and material flow behavior. The process part of the assignment will focus on mapping the resistance signal in the wire for the different materials to see if significant changes can be observed in the resistance signal and to determine how this signal can be used as a precursor to avoid unstable regions in the process window.



Workflow:

- Literature review
- DoE
- Experimental work
- Material/Process data evaluation
- Thesis report



Qualifications

Student in the final year of their M.Sc. in material science

Student in the final year of their M.Sc. in automation, mechatronics, mechanical engineering, or similar

Preferably you apply for this thesis work as a couple but individuals are also welcome to apply for one of the parts.

Apply by

Send your resume and cover letter to Jonatan.Palmquist@gknaerospace.com.

Preliminary start: January 2021