Master Thesis - Creep Behaviour and Microstructural Evaluation of Nickel-Based Superalloy 718 for Aerospace Applications (30 credits/20 weeks – 1 student)

About us

GKN Aerospace is the world's leading multi-technology tier 1 aerospace supplier. With 33 manufacturing locations in 12 countries, we serve over 90% of the world's aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world's advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

Project Background

The aerospace industry is continuously seeking manufacturing technologies that improve sustainability, reduce material waste, and enable more efficient production of high-performance components. Laser Directed Energy Deposition with blown powder (LDED-p) is an additive manufacturing technology that offers significant benefits through near-net-shape manufacturing, reduced buy-to-fly ratios, and increased design flexibility for nickel-based superalloy components.

Nickel-based alloy 718 is one of the most widely used high-temperature materials in aerospace applications due to its excellent combination of strength, toughness, and elevated-temperature performance. However, to support wider implementation of LDED-p manufactured components in demanding engine environments, a thorough understanding of long-term material behaviour at elevated temperatures is required. Exposure to high temperatures and sustained loading can lead to microstructural evolution, creep deformation, and ultimately degradation of material performance.

Understanding how microstructural characteristics influence creep resistance and failure mechanisms is therefore essential for reliable life assessment and future component design. This thesis project aims to investigate the relationship between creep performance and microstructural characteristics in LDED-p manufactured Alloy 718 through analysis of high-temperature creep test results and post-test material characterization. The results will contribute to improved understanding of damage mechanisms during elevated-temperature exposure and could provide valuable input to future studies of thermo-mechanical fatigue and high-temperature life assessment of additively manufactured aerospace components.

Assignment Description

The following tasks are foreseen:

- Literature review on high-temperature deformation and creep mechanisms.
- Analyse and evaluate creep test data from recently completed experimental campaign.
- Assess creep damage and fracture characteristics following testing.
- Characterise microstructural features using optical and electron microscopy techniques.
- Correlate observed microstructural features with creep performance.
- Compare findings with published literature and industrial expectations.
- Document the work in a thesis report and present the results.

Qualifications

Student in the final year of their M.Sc. studies in the field of Mechanical Engineering, Materials Engineering or similar with an interest in Solid Mechanics and Fatigue. Previous knowledge of fatigue and fracture mechanics is an advantage. An interest in additive manufacturing, fatigue, experimental work or similar is beneficial.

Apply by

Send your resume and cover letter to
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Last date for application: 2025-12-31. Interviews will be held continuously and the position could be filled prior to the last application date.