Master Thesis - “Increased Crack-Progation Threshold.” (30 credits/20 weeks – 1 or 2 students)

Project Background

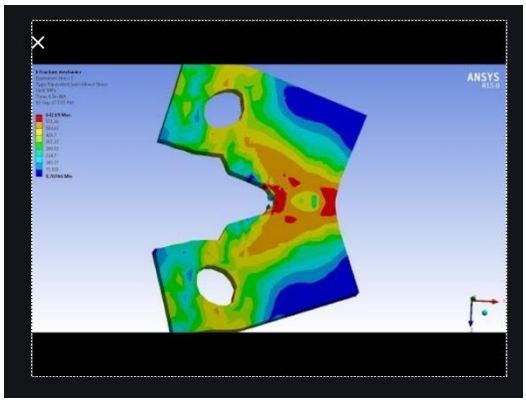
The interest to increase the lifing performance of components in loading conditions are constantly increasing in many industries. In the aerospace industry, high crack-proagation threshold is one of the key properties to get a damage tolerant component with good lifing response. The key to the success of is to understand the underlaying mechanisms and related properties for the materials and production technologies. By doing that it is possible to also produce components with good lifing properties. Laser additive manufacturing, consisting of laser metal deposition, selective laser sintering and selective laser melting (also refer to as Laser beam Powder-Bed-Fusion (LB-PBF)), is one of the most important AM process for metallic materials. In LB-PBF, the parts are built by spreading powder layers and melting selective regions, layer by layer within a chamber filled by inert gas.

Crack-propagation properties are important criteria for the performance of load-bearing Ti alloys in aerospace application. The major factors causing failure of produced parts are surface quality, defects and microstructure. AM fabricated Ti-6Al-4V has been found to get a low damage tolerance in fatigue testing, because of low threshold stress value. For this reason it is a great interest to find a process strategy to raise the threshold value of the material (ΔK_{th}) and understand the correlation to the microstructure.

Assignment Description

The thesis work will focus on

- Literature review
- Understand the testing procedure
- Perform crack-propagation threshold testing on LB-PBF produced specimen
- Review and analyze performed crack propagation threshold tests
- Examination of the microstructure and chemistry at the location of crack initiation by a variety of technology including SEM, energy dispersive spectroscopy (EDX), OM etc.
- Analyze the correlation to microstructure
- Make suggestions of how testing and analyzing can be improved



The thesis work will be supported by both GKN and Chalmers.

Qualifications

- Master in mechanical engineering, material engineering or similar
- Interest in Material Science/Solid Mechanics/Fracture Mechanics
- The students should be capable of taking initiatives on their own, especially while gathering data from departments
- The work will take both at GKN site in Trollhättan and at Chalmers University of Technology, Göteborg.

Apply by

Mats Delin, mats.delin@gknaerospace.com; supervisor
Prof. Emmy Yu Cao, yu.cao@chalmers.se; supervisor and examiner

Last date for application: 2022-12-20. Interviews will be held continuously and the position could be filled prior to the last application date.