

Announcement of a Master's Thesis, 19.06.2020

Topology optimization and additive manufacturing of metallic connectors for Ultrasonic Joining

Description

Laser powder bed fusion (LPBF) is a type of additive manufacturing (AM) technique, during which metallic parts are fabricated from a 3D computer-aided drawing (CAD) file by selective laser melting of successive layers of powder. U-Joining is a new friction-based joining technique capable of producing metal-composite hybrid joints. In this process, joining is accomplished by means of applying ultrasonic energy to a metallic connector with integrated pins to increase mechanical interlocking, thereby optimizing damage tolerance of hybrid joints. LPBF has been successfully used to manufacture metallic connectors with different geometries for the Ultrasonic Joining (U-Joining) process. However, further development is required regarding the pin geometry of the metallic connector used. The main objective of the present thesis is to optimize the pin geometry of the U-Joining metallic connectors to improve the shear and tensile strength of metal-composite hybrid structures. Finite Element Method (FEM) simulation applying ABAQUS, LPBF of stainless steel 316L, quasi-static mechanical testing, and microstructural characterization (Light Optical and Scanning Electron Microscopy) will be used for this purpose. The results of this work will subsequently support the U-Joining development and production of metal-composite hybrid structures for aviation and aerospace applications.



Organization

Supervisors: Research supervisor: Eng. Willian Carvalho, willian.carvalho@tugraz.at

Academic supervisor: Univ.-Prof. Dr.-Ing. Sergio Amancio

Duration: as of now for min. 6 months

Location: Endowed Professorship for Aviation, Kopernikusgasse 24/I, 8010 Graz

Reward: A € 2000 MSc scholarship is available, as well as an additional bonus of € 500 for theses graded with "very good".

Further information

For further information, please contact the secretariat of the institute or the supervisor.

Tel: +43 316 873 7181, office.imat@tugraz.at, <http://imat.tugraz.at>