

PhD. title:

Analysis of the influence of vibration assisted drilling process on the integrity of the Ti6Al4V machined surface

Description:

In the aeronautical industry, for the assembly process, drilling is often one of the last operations performed on parts with high added value. Furthermore, industry demands constant improvements in reliability and productivity for the Ti6Al4V drilling process. However, due to the geometry of the drill tip, its movement and the operation's confinement, ensuring good control over drilling is not an easy matter. Efficient chip breakage and their subsequent evacuation during cutting are major issues for process reliability. Vibration Assisted Drilling relies on the introduction of an additional axial oscillation to the conventional axial displacement of the drill. The cutting process is then periodically interrupted. The resulting chips are consequently fragmented and more easily evacuated than conventional chips. This new cutting process modifies the thermomechanical conditions of the cutting zone. This can affect the microstructure of the Ti6Al4V drilled material.

The subject of the proposed thesis is to establish correlations between the manufacturing process (cutting parameters, vibratory parameters, tool wear, lubrication) and the modification in terms of microstructure of the Ti6Al4V for drilling assisted application. An analysis of the close surface micro structural properties will allow to characterize the tool/material interaction in the cutting zone. A new methodology will be developed to gather the numerous cutting process indicators (cutting forces, temperature near the cutting zone) to identify an analytical model of the cutting process. In addition of this experimental study, a numerical modeling of the 3D cutting process will be made to characterize the thermomechanical cutting conditions.

Key words: Machining process, multiphysics modeling, surface properties, surface integrity, microstructure, Ti6Al4V

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Funding: ~ 1750€ (gross income)/month

Institution awarding doctoral degree: Ecole Doctorale Sciences des Métiers de l'Ingénieur (EDSMI), ENSAM

Candidate's profile

Applications are welcomed from prospective students with a good Masters Level degree or equivalent in any of Mechanical Science, Materials Science, Manufacturing and Processes. Good oral and written communication skills in English are required.

Application deadline: 15th April 2018 but the application evaluation will start immediately, so you are encouraged to apply before this date.

Starting PhD. Thesis: 1st of October 2018

Send your CV and a cover letter to : Mehdi.Cherif@ensam.eu