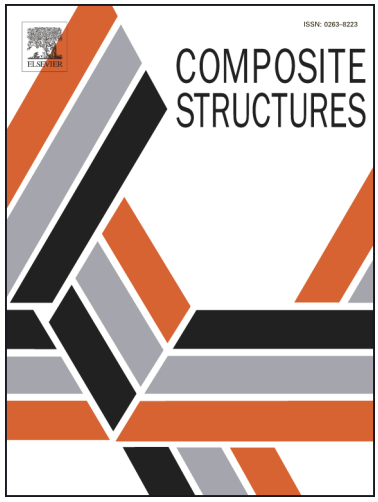

Experimental study on drilling mechanisms and strategies of hybrid CFRP/Ti stacks

Jinyang Xu, Mohamed El Mansori

PII: S0263-8223(16)31248-X
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.07.025
Reference: COST 7625

To appear in: *Composite Structures*

Received Date: 25 February 2016
Revised Date: 9 June 2016
Accepted Date: 19 July 2016

Please cite this article as: Xu, J., El Mansori, M., Experimental study on drilling mechanisms and strategies of hybrid CFRP/Ti stacks, *Composite Structures* (2016), doi: http://dx.doi.org/10.1016/j.compstruct.2016.07.025

Experimental study on drilling mechanisms and strategies of hybrid CFRP/Ti stacks

Jinyang Xu [1, 2]*, Mohamed El Mansori[1]

[1] *MSMP – EA 7350 Laboratoire, Arts et Métiers ParisTech, Rue Saint Dominique BP508, Châlons-en-Champagne 51006, France*

[2] *School of Mechanical Engineering, Shanghai Jiao Tong University, Shanghai 200240, PR China*

[*] *E-mail address: jinyang.xu@ensam.eu*

Abstract: Mechanical drilling is a frequently-used operation for high-quality finishing of hybrid CFRP/Ti stacks prior to the final fastening assembly. Owing to their inhomogeneous behaviors and poor machinability, drilling CFRP/Ti stacks in one-shot time has brought great challenges to the modern manufacturing community. Compared to previous studies on drilling CFRP/Ti, this paper aims to highlight the following aspects: (*i*) the feature of tool-work interaction and machinability classification dominating the bi-material drilling; (*ii*) the influences of different cutting sequences ($^{\text{CFRP} \rightarrow \text{Ti}}_{\text{Ti} \rightarrow \text{CFRP}}$) on CFRP/Ti drilling responses; and (*iii*) the effects of different tool geometries/materials on CFRP/Ti drilling performance. Experimental results show that the drill geometrical features, which ensure the cutting contacts of the stack combination, have a more significant effect on CFRP/Ti drilling output than tool material composition. The Ti → CFRP drilling strategy promotes higher quality of machined hole surface (*e.g.,* consistent hole diameter and good surface finish) with lower Ti burr formation, while the CFRP → Ti drilling strategy reduces however the induced delamination extent. The experiments discussed in this paper allow besides several recommendations for the cutting sequence selection when drilling hybrid CFRP/Ti stacks.

Keywords: Hybrid CFRP/Ti stack; Drilling; Cutting-sequence strategy; Drill geometrical feature; Hole quality; Tool performance.