

Machining Challenges and Solutions to Aerospace Grade Composite - Titanium Stacks

Jinyang Xu^{1,*}, Ming Chen¹, Mohamed El Mansori^{2,3}, J. Paulo Davim⁴

¹School of Mechanical Engineering, Shanghai Jiao Tong University, Shanghai 200240, China

²MSMP – EA 7350, Arts et Métiers ParisTech, Châlons-en-Champagne 51006, France

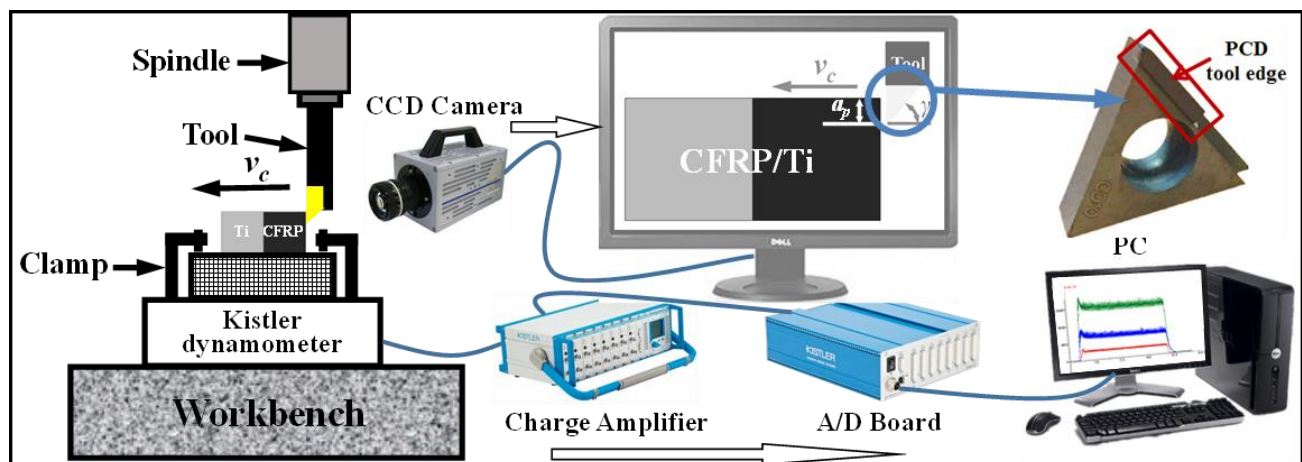
³Department of Mechanical Engineering, Texas A&M University, College Station, TX 77840, USA

⁴Department of Mechanical Engineering, University of Aveiro, Aveiro 3810-193, Portugal

*Corresponding and Presenting Author: E-mail: xujinyang@sjtu.edu.cn

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Graphical Abstract



Abstract

Multilayer composite/metal stacks constituted by carbon fiber reinforced polymers (CFRPs) and titanium alloys are advanced high-performance materials being widely used in the modern aerospace industry due to their improved mechanical/physical properties and enhanced structural functionalities. Due to the different properties of each stacked material, machining of these hybrid composite stacks has posed significant challenges to the manufacturing community. The invited talk reports the existing challenges faced by the current machining industries and then presents the

potential solutions by lecturing the innovative works carried out by the speaker's research group. The fundamental mechanisms of the chip removal process and defects formation of CFRP/Ti6Al4V stacks are firstly introduced. Issues of hole quality attributes and tool wear progression during the stack drilling are discussed. Performances of several innovative cutting methods involving the MQL machining and the vibration assisted drilling to improve the stack machinability are illustrated. Eventually, the future developments in the fields of high-quality machining of aerospace grade CFRP/Ti6Al4V stacks are put forward.

Keywords: CFRP/Ti6Al4V stacks; machining; challenges; cutting strategies; drilling quality.

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Biography of Presenting Author



Jinyang Xu is an Associate Professor and a Doctoral Supervisor of Mechanical Engineering at Shanghai Jiao Tong University, China. He was awarded as a talent of the Shanghai Pujiang Program by Shanghai Municipality in 2017. He got his Ph.D. degree in Mechanical Engineering from Arts et Métiers ParisTech, France, in 2016, and received his M.S. degree in Mechanical Manufacturing & Automation from Shanghai Jiao Tong University, China, in 2013. His research interests focus on composites machining, numerical modeling, micro/nano cutting and surface texturing. He has published over fifty peer-reviewed articles and edited four special issues in refereed international journals and conference proceedings. He is currently serving as the Co-Editor-in-Chief of Journal of Coating Science and Technology (JCST) and the Academic Editors/Board Members of International Journal of Aerospace Engineering (indexed by SCI), Advances in Materials Science and Engineering (indexed by SCI) and Current Materials Science (CMS). He is the principal investigator of some national and provincial projects including the NSFC fund projects, Shanghai Pujiang Talents Program, Shanghai Academy of Spaceflight Technology projects, as well as a number of industrial projects. For his research contributions to the machining science of composite/metal stacks, he received the Best Paper

Awards at the CJUMP2017 (November 19-21, 2017, Shanghai, China) and the ISGMA2015 (June 23-27, 2015, Qingdao, China) conferences. He was nominated for the Pierre Bézier Doctoral Dissertation Award in 2016 and was the recipient of the National Government Study Abroad Scholarship of China (2013), the Excellent Master Thesis Award of Shanghai Municipality (2013), the Excellent Graduate Award of Shanghai Municipality (2013), and the National Graduate Scholarship of China (2012).

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