

Accepted Manuscript

Size effect of depth of cut on chip formation mechanism in machining of CFRP

Youliang Su, Zhenyuan Jia, Bin Niu, Guangjian Bi

PII: S0263-8223(16)31187-4

DOI: <http://dx.doi.org/10.1016/j.compstruct.2016.11.044>

Reference: COST 8004

To appear in: *Composite Structures*

Received Date: 13 July 2016

Revised Date: 1 November 2016

Accepted Date: 12 November 2016



Please cite this article as: Su, Y., Jia, Z., Niu, B., Bi, G., Size effect of depth of cut on chip formation mechanism in machining of CFRP, *Composite Structures* (2016), doi: <http://dx.doi.org/10.1016/j.compstruct.2016.11.044>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Title: Size effect of depth of cut on chip formation mechanism in machining of CFRP

Author: Youliang Su, Zhenyuan Jia, Bin Niu, Guangjian Bi

Affiliations: Key Laboratory for Precision and Non-traditional Machining Technology of Ministry of Education, School of Mechanical Engineering, Dalian University of Technology, 116024, Dalian, People's Republic of China

Corresponding author: Bin Niu

Email: niubin@dlut.edu.cn,

Tel/Fax: 0086-411-84708550

Abstract:

This paper investigates the effect of depth of cut on chip formation mechanism in machining of CFRP by the orthogonal cutting method. Characteristics of the cutting forces and the specific energy for material's removal under different depths of cut for different cutting angles are studied. Meanwhile, tool-material interactions are discussed for the effect on the failure mechanism combined with the on-line micro observation of the chipping process. Chip formation is the debonding-bending for 0° , and is the cutting-shearing for 45° . It is the buckling-dominant when the depth of cut is close to the cutting edge radius. Once the depth of cut is much larger than the cutting edge radius, the kinkband-shearing occurs for 90° , and the bending-dominant for 120° . Especially, the effect of the contact between the fiber and the cutting edge is analyzed based on the contact theory. It reveals fibers with strong constraint fracture at local contact area like 45° . However, it becomes a combination of the bending and the local contact due to the large bending deformation with the decrease of the off-axis modulus along the cutting direction like 90° . Furthermore, the bending-dominant chip formation easily results into the severe subsurface damage due to the large bending deformation.

Keywords:

Machining of carbon fiber reinforced plastic, chip formation mechanism, depth of cut, analysis of the contact

Download English Version:

<https://daneshyari.com/en/article/4912213>

Download Persian Version:

<https://daneshyari.com/article/4912213>

[Daneshyari.com](https://daneshyari.com)