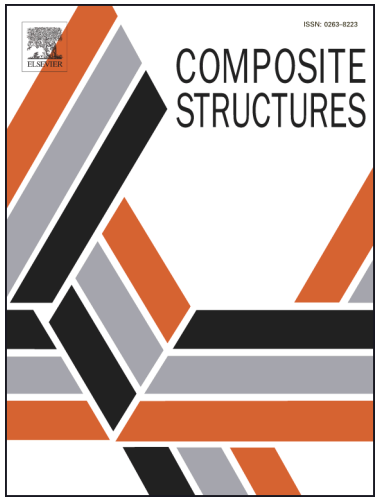

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PII: S0263-8223(18)30664-0
DOI: https://doi.org/10.1016/j.compstruct.2018.02.046
Reference: COST 9396

To appear in: *Composite Structures*

Received Date: 14 February 2018
Accepted Date: 19 February 2018

Please cite this article as: Loja, M.A.R., Alves, M.S.F., Bragança, I.M.F., Rosa, R.S.B., Barbosa, I.C.J., Barbosa, J.I., An Assessment Of Thermally Influenced And Delamination-Induced Regions By Composites Drilling, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.02.046

AN ASSESSMENT OF THERMALLY INFLUENCED AND DELAMINATION-INDUCED REGIONS BY COMPOSITES DRILLING

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Abstract

The connection among different structural components may be promoted by several means. Among these, if one considers mechanical connections, it becomes often necessary to drill the components. When these structures are total or partially made of composite materials, this drilling operation imposes a particular care, due to its heterogeneous character highly prone to delamination or fibre pulling-out. Under these circumstances, not only will the stiffness and strength of the material be reduced in the drilled region neighbourhood, but ultimately a more worrying situation may arise if specific conditions exist to enable propagation and subsequent failure. It is therefore important to improve the drilling processes efficiency from the damage minimization perspective. To this purpose, the characterization of the drilling parameters influence in a cross-relation to measurable resulting effects may be a relevant contribution.

With the present work, one intends to characterize how different drilling parameters may affect the surrounding region, either from an induced damage quantification perspective as well as from a thermally affected area characterization. The information acquisition of the affected areas was carried out both through scans and thermographic digital videos and images. A set of illustrative cases is presented to support the conclusions.

Keywords: Fibre Reinforced Composites, Damage, Thermography, Drilling; Digital Image Processing.

1. Introduction

The continuous growing trend on the use of laminated composite materials in the most diverse engineering areas often require manufacturing operations such as drilling. This type of intervention is known to produce local stiffness and strength losses, which in a