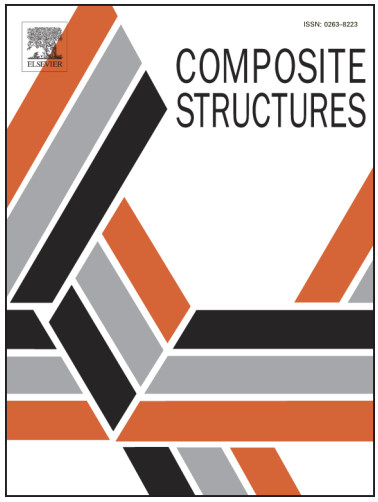

Stacking sequence optimization in composite tubes under internal pressure based on genetic algorithm accounting for progressive damage

José Humberto S. Almeida Jr., Marcelo L. Ribeiro, Volnei Tita, Sandro C. Amico

PII: S0263-8223(17)32031-7
DOI: http://dx.doi.org/10.1016/j.compstruct.2017.07.054
Reference: COST 8709

To appear in: *Composite Structures*

Received Date: 20 June 2017
Accepted Date: 18 July 2017

Please cite this article as: Almeida, J.H.S. Jr., Ribeiro, M.L., Tita, V., Amico, S.C., Stacking sequence optimization in composite tubes under internal pressure based on genetic algorithm accounting for progressive damage, *Composite Structures* (2017), doi: http://dx.doi.org/10.1016/j.compstruct.2017.07.054

STACKING SEQUENCE OPTIMIZATION IN COMPOSITE TUBES UNDER INTERNAL PRESSURE BASED ON GENETIC ALGORITHM ACCOUNTING FOR PROGRESSIVE DAMAGE

José Humberto S. Almeida Jr.[a*], Marcelo L. Ribeiro[b], Volnei Tita[b], Sandro C. Amico[c]

[a]Leibniz-Institut für Polymerforschung Dresden e.V., Department of Composite Materials, Hohestraße 6, 01067 Dresden, Germany

[b]Department of Aeronautical Engineering, São Carlos School of Engineering, University of São Paulo, São Carlos/SP, Brazil

[c]PPGE3M, Federal University of Rio Grande do Sul, Av. Bento Gonçalves, 9500. 91501-970 Porto Alegre/RS, Brazil

---

Abstract

Due to the large number of design variables for laminate composite structures, the use of an optimum stacking sequence is a key step in the design of a structure with the most suitable mechanical properties. This work presents a genetic algorithm (GA) for the optimization of the stacking sequence to improve strength of a cylindrical shell under internal pressure. The GA, which is associated to a meso-scale damage model, was written in Fortran and later linked to a Finite Element (FE) package to simulate composite damage and failure. Two scenarios were considered: i) without restriction, where an ideal situation is simulated; and ii) with manufacturing restrictions, accounting for limitations on feasible winding angles. The results show that progressive failure analysis generates asymmetric and unbalanced laminates

[*]*Corresponding author*: humberto@ipfdd.de; jhsajunior@globomail.com.
Phone: +49 351 4658 1423; Fax: +49 351 4658 362