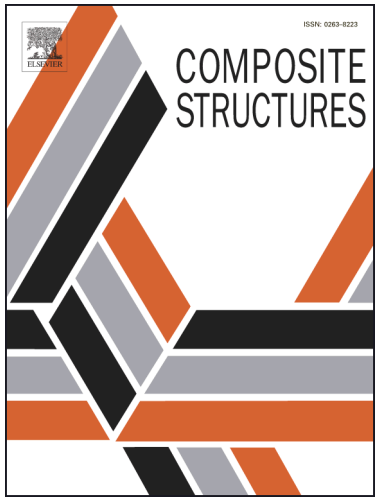

Experimental and theoretical investigations on lateral crushing of aluminum foam-filled circular tubes

Zhifang Liu, Zhichao Huang, Qinghua Qin

PII: S0263-8223(17)30202-7
DOI: http://dx.doi.org/10.1016/j.compstruct.2017.05.004
Reference: COST 8513

To appear in: *Composite Structures*

Received Date: 20 January 2017
Revised Date: 5 April 2017
Accepted Date: 2 May 2017

Please cite this article as: Liu, Z., Huang, Z., Qin, Q., Experimental and theoretical investigations on lateral crushing of aluminum foam-filled circular tubes, *Composite Structures* (2017), doi: http://dx.doi.org/10.1016/j.compstruct.2017.05.004

Submitted to Composite Structures R1

Experimental and theoretical investigations on lateral crushing of aluminum foam-filled circular tubes

Zhifang Liu[a,b*], Zhichao Huang[a], Qinghua Qin[b*]

[a] Institute of Applied Mechanics and Biomedical Engineering, Taiyuan University of Technology, Taiyuan 030024, China

[b] State Key Laboratory for Strength and Vibration of Mechanical Structures, Shaanxi Engineering Laboratory for Vibration Control of Aerospace Structures, Xi'an Jiaotong University, Xi'an, 710049, China

Abstract. Mechanical response and energy absorption of aluminum foam-filled and empty circular tubes with different geometries were investigated experimentally and theoretically. All specimens including foam-filled circular and empty circular tubes were compressed laterally by two rigid plates. Effects of the geometrical characteristics of specimens and densities of aluminum foam on deformation and energy absorption of the foam-filled and empty circular tubes were considered. Experimental results show that the presence of aluminum foam filled in the circular tubes changes the deformation modes and increases the energy absorption of the foam-filled circular tubes. An analytical model for the plastic deformation of the foam-filled circular tubes under the lateral loading was proposed. The relations of lateral loading and energy absorption of the foam-filled circular tubes were obtained. Comparisons between the analytical predictions and the experimental results were performed and good agreement was achieved.

Keywords: Thin-walled circular tube; Aluminum foam; Analytical model; Plastic deformation; Energy absorption.

*Corresponding authors. liuzhifang@tyut.edu.cn; qhqin@mail.xjtu.edu.cn. Tel: +86-351-6010560