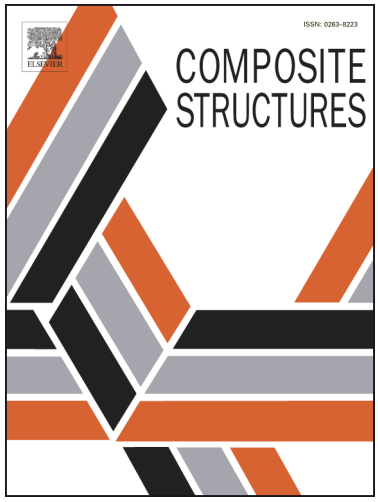

Experimental and numerical investigation on the impact behavior of dual-core composite sandwich panels designed for hydraulic turbine applications

R. Ouadday, A. Marouene, G. Morada, A. Kaabi, R. Boukhili, A. Vadean

PII: S0263-8223(16)32899-9
DOI: https://doi.org/10.1016/j.compstruct.2017.11.007
Reference: COST 9073

To appear in: *Composite Structures*

Received Date: 20 December 2016
Revised Date: 11 September 2017
Accepted Date: 6 November 2017

Please cite this article as: Ouadday, R., Marouene, A., Morada, G., Kaabi, A., Boukhili, R., Vadean, A., Experimental and numerical investigation on the impact behavior of dual-core composite sandwich panels designed for hydraulic turbine applications, *Composite Structures* (2017), doi: https://doi.org/10.1016/j.compstruct.2017.11.007

Experimental and numerical investigation on the impact behavior of dual-core composite sandwich panels designed for hydraulic turbine applications

R. Ouadday[1], A. Marouene, G. Morada, A. Kaabi, R. Boukhili, A. Vadean

Department of Mechanical engineering, Polytechnic Montreal, Montreal, Quebec, H3C 3A7, Canada

Abstract:

This paper focuses on the experimental characterization and modeling of the impact behavior of a multi-functional dual core sandwich panel designed for the rehabilitation of hydroelectric turbines. The studied sandwich panel consists of glass fiber reinforced epoxy (GFRE) facesheets and a dual core composed both of alumina trihydrate-filled epoxy (ATH/epoxy) and extruded polystyrene foam (XPS). Low-velocity impact tests are conducted at different impact energies to take into account the presence of debris in the water flow. A 3D numerical model is developed to simulate the impact tests and particularly the energy distribution within the sandwich constituents. A good correlation is achieved between the experimental data and numerical predictions. The dual core sandwich construction placed on a rigid foundation undergoes both local and global deformation under impact loading. The experimental results show that for the tested impact energy range, the sandwich panel absorbs approximately 50% of the impact energy. Although the top facesheet and the ATH/epoxy core govern the initial impact behavior, the recoverable compression deformation of the XPS foam core is the major energy absorption mechanism. This statement is well supported by the numerical simulation.

Keywords: Alumina trihydrate; dual core sandwich panel; extruded polystyrene foam; low-velocity impact; LS-dyna; resin casting technique.

[1] Corresponding author.
E-mail : rim.ouadday@polymtl.ca