

## **Finite element modeling of a cylinder of composite materials under impact and thermal conditions**

S. M. Ion<sup>1</sup>, D. Nitoi\*<sup>2</sup>, O. Chivu<sup>2</sup>, T. Opran<sup>3</sup>,

*1 Rom Turingia SRS, Calea Brasovului no.30, Campulung Muscel, sorin.ion@romturingia.ro*

*2 University Politehnica of Bucharest, Department of Quality engineering and industrial Engineering, Splaiul Independentei no. 313, Bucharest, Romania, nitoidan@yahoo.com*

*3 University Politehnica of Bucharest, Department of Manufacturing Engineering, Splaiul Independentei no. 313, Bucharest, Romania, constantin.opran@upb.ro*

**Keywords.** composite, product, FEM, structural, thermal

### **Abstract.**

Composite materials have now reached very important production volumes in many avant-garde industries or always innovative industries such as automotive or aerospace. Composite materials allow engineers to adjust the formulation to meet specific strength or temperature requirements of any application. In short by combining specific materials and adjusting them, composite materials can be tailored to any vehicle. As mentioned by BBC's Bitesize, "The materials for a composite material are chosen because they have different properties that combine to make a more useful material". Polymer composite products for car bodies made of polymer composites have component areas in the form of semi-cylindrical surfaces. The good behavior of these types of surfaces on impact or high temperatures is a requirement of traffic safety conditions for participants. Paper presents the results of research on modeling and impact simulation of these types of products besides a transient temperature analyze using the finite element method.

Thus, the state of stress and deformations resulting from a structural analysis are highlighted, as well as the variation of temperatures from the transient thermal analysis. This results in suggestive images from which conclusions can be drawn regarding the possibility of using such composite structures in the automotive industry. As a results of the research carried out, results in solutions for optimizing the body profile, the constructive typology of the polymer composite product and the manufacturing technology, respectively, leading to the increase of the safety of the traffic participants in optimal vehicle manufacturing conditions.