Digimat Users' Conference 2017

Presentation Title: Assessment of state of the art prediction methodology for mechanical properties of CF-SMC structures	
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About the Speaker: Graduated in Aerospace Engineering at University of Pisa, Luca M. Martulli is a PhD trainee based in Toyota Motor Europe, with the academic supervision of Katholieke Universiteit Leuven (KUL). Within the Marie-Curie ITN "FiBreMod", which aims at the development of new failure prediction methods for composites, his research focuses on the prediction of mechanical performance of CF-SMC.	

Abstract (max 500 words)

In the last years, the automotive sector, has shown great interest in Carbon Fibre-Sheet Moulding Compound materials (CF-SMC). These materials are made of long chopped carbon fibre (~25 mm) dispersed in uncured thermosetting resin in the form of malleable sheets. Those are then compression moulded into the final desired shape, allowing fast and simple manufacturing, excellent formability, high volume production, lightweight capabilities with fair mechanical properties. However, there are many challenges regarding the accurate prediction of the mechanical properties of CF-SMC components, which requires the consideration of process induced effects like the change of the material microstructure by fibre orientation effects.

The present work aims at assessing the methodology for designing complex structural component made from CF-SMC materials, showing the prediction capabilities of mechanical properties, mainly in terms of strength and stiffness. The general work flow of the procedure starts with fibre orientation predictions, SMCs mechanical properties being highly dependent on the local microstructure. Numerical simulations of the compression moulding process are performed with this objective. A reliable method for mechanical behaviour prediction of CF-SMC requires, at this point, a proper material description at different scales; Digimat represents one of the most used state of the art software for this purpose, especially in automotive. Therefore, it will be used as a reference tool for material modelling: homogenization between the constituents' properties will be performed, taking into account local fibre orientation. Finally, a coupled analysis between structural simulation software and Digimat is performed.

The mentioned process will be first applied extensively to very simple components (specimens or coupons); validation with experimental data will be provided. Preliminary work will be also conducted on a more complex bulky component, derived from an actual chassis part. In this way, the methodology will be also used to design a geometry demonstrator that will be later used for failure predictions.

Deadline to submit an abstract: June 14, 2017

Submit abstract and high resolution headshot of speaker to chabha.djouder@e-xstream.com