Advances in simulation enable optimal use of composites by chaining molecular dynamics to full-scale damage prediction

LUXEMBOURG – June 9, 2020 – e-Xstream engineering, part of Hexagon's Manufacturing Intelligence division, has today launched the latest version of its Digimat multi-scale material modelling software, extending its advanced composite design capabilities across all scales as part of the Hexagon [10X Integrated Computational Materials Engineering (ICME) solution](#).

Reducing the cost of developing new composites is a priority for materials suppliers and the manufacturers specifying composites, but material development remains highly complex because every aspect of a material system from the chemical composition of the resin to the manufacturing process affects final performance. To manage this complexity, Digimat's integration with molecular dynamics software has been enhanced to extend its micro-level capabilities to predict a material's properties based on its chemical structure. On the meso-level, the direct engineering workflow for unidirectional composites has also been enhanced, enabling ply properties prediction based on their physical and virtual constituents.

"To use composites effectively and meet business needs every aspect matters – from the part's actual shape to the stacking sequence, from the selected constituents to the manufacturing process history. Engineers need to account for these inextricable realities in their composite design process, and these simulation advances will help designers to exploit the full potential of advanced materials by accounting for all these complexities and making the information actionable through an ICME approach."

The effect of defects, such as porosity or gaps from Automatic Fiber Placement can now be characterised at the full-scale coupon level using the state-of-the-art progressive failure analysis (PFA) models developed in collaboration with Pr. Camanho. As a result, the margins-of-safety engineers use to optimise material use and lightweight parts may be optimized with greater confidence.

Furthermore, Digimat 2020 makes this advanced PFA modelling available within Marc, MSC Nastran as well as other structural analysis software via user subroutine, so that engineers can make detailed and accurate damage predictions of structures under load, reducing over engineering.

Design for manufacturing is also improved. New capabilities help manufacturers avoid costly tooling rework by embedding a digital twin of the composite manufacturing process from Digimat within thermo-mechanical finite element analyses tools such as Marc, Abaqus or LS Dyna. This open integration enables the designer to account for distortions introduced by processing and modify their mould design to achieve the required geometry.

For more information please visit www.e-xstream.com/whats-new-digimat-2020.0

About Hexagon | e-Xstream engineering

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

e-Xstream engineering, part of Hexagon's Manufacturing Intelligence division, provides Integrated Computational Materials Engineering (ICME) solutions to innovate and optimise product performance using the right materials and manufacturing process for the right application. Learn more at e-Xstream.com. Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 21,000 employees in 50 countries and net sales of approximately 3.9bn EUR. Learn more at hexagon.com and follow us @HexagonAB.

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