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MODELLING THE HEAT TRANSFER OF INJECTION MOULDING PROCESSES

#thermal #composite materials #advanced characterization #thermal conductivity #experimental bench #aeronautics

A key player in the aeronautics sector, specialized in landing and braking systems, produces thermoplastic composite parts with high added value. This manufacturer called on Capacités's specialists to determine the thermal conductivity properties of a composite material reinforced with short fibers during the injection process. Objective: optimizing the thermal cycle of its moulding during the injection process, especially the cooling phase.

DETERMINING THE THERMAL CONDUCTIVITY OF AN INJECTED COMPOSITE DURING MOULDING

This aeronautics manufacturer required to integrate heat transfer in its numerical modelling of the injection of short-fibre thermoplastic composite parts in order to better apprehend the thermal effects occurring during the process.

Ascertaining the thermal properties of a material under representative conditions is the cornerstone in achieving any accurate thermal modelling. In this case, it meant taking into account the composite anisotropy and the effects of the thermoplastic polymer melting at high temperature.

Since no commercial device is capable of fulfilling these criteria, they entrusted this project to the experts at Capacités who came up with a strategy and a precise means of measurement.

Based on the manufacturer's specifications, the specialists at Capacités designed a tailor-made

experimental test bench able to monitor the evolution of the thermal conductivity of a composite in any direction in both solid and molten state. The development of this new device included a thorough evaluation of its performances from ambient temperature to 400°C with known reference materials.

Owing to the results that they received from Capacités, the manufacturer's teams successfully refined their modelling of the injection process and were, ultimately, able to optimize the cooling phase of their process.

To complete this ambitious project, the Capacités' experts benefited from support and technical equipment from the LTen laboratory (Heat Transfer and Energy Laboratory), joint research unit of Université de Nantes and the CNRS. ■

Expertises:

- Thermal engineering
- Composite materials engineering

CAPACITÉS

Created in 2005, Capacités is the private engineering and research valorisation subsidiary of the University of Nantes. It employs 90 employees, mainly engineers and PhDs, who work directly with scientists in the research laboratories.



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