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ABSTRACT
PRESENTATION
PAPER

Abderezak Aouali is an associate professor at the Thermal and Energy Laboratory (LTEN) of the University of Nantes in Nantes, France.

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INFRARED THERMOGRAPHY FOR AUTOMATED FIBER PLACEMENT MEASUREMENT

This work is part of the experimental thermal analysis applied to the shaping of carbon/PAEK composite in the Automated Fiber Placement (AFP) shaping process. In fact, the study of heat transfer (measurement of the temperature field) during the heating stage of the AFP process is an essential requirement for manufacturers.

Temperature fields during this process are generally measured by thermography using infrared (IR) cameras. The latter measure a lighting flux proportional to the temperature and emissivity (the capacity of a body to emit radiation) of a sample. However, the configuration of the dispensing head in the AFP process does not allow for measurements in the recommended conditions, i.e. by placing the IR camera perpendicular to the surface of interest, which must be free of any obstacles. However, because of its size, the camera is generally offset and/or at a considerable angle to the surface being analysed. Under these conditions, the temperature measured is strongly affected by the solid angle formed between the camera and the surface, as well as the multiple interactions of the heat fluxes emitted by the surfaces of the deposited fold and the substrate.

In order to quantify the measurement errors made, two measurement benches named CalCam 1 and CalCam 2 were developed. CalCam 1 was used to highlight and quantify the measurement errors made using the IR camera in this type of process as a function of the viewing angle of the IR camera in relation to the carbon fibres. CalCam 2 is a system with two orientable heated elements that allows to get closer to the process conditions and to analyse the effects of interactions between two heating surfaces that will be perceived by the IR camera. By understanding and modelling these fluctuations, we will be able to propose methods for correcting them in order to achieve perfect thermal control in the industrial process.