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Heater power control for multi-material, variable speed Automated Fibre Placement

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Abstract

Automated Fibre Placement requires accurate control of the heater power to deposit the material at appropriate temperatures throughout the process. This paper presents a simple semi-empirical thermal model of the process which correlates the heater power and the layup speed with the substrate surface temperature. The deposition temperature was measured over a range of heater powers and layup speeds. The experimental data is used to define and validate a semi-empirical thermal model for two classes of materials used in conjunction with a diode laser: carbon fibre reinforced thermoplastics and bindered dry fibres. This enables open-loop, speed dependent heater power control, based on defining and programming the speed dependent heater power function in the machine controls.

Keywords

A. Polymer-matrix composites (PMCs), B. Thermal properties, C. Process Modelling,

D. Automated fibre placement (AFP)