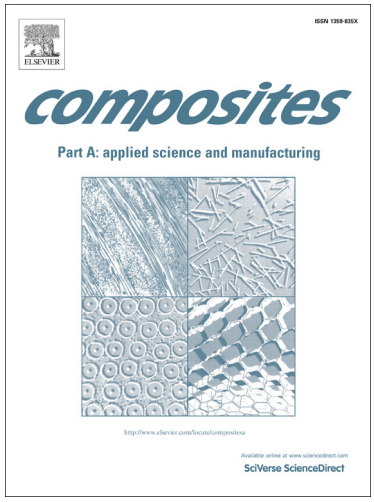

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A yarn interaction model for circular braiding

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Abstract

Machine control data for the automation of the circular braiding process has been generated using previously published mathematical models that neglect yarn interaction. This resulted in a significant deviation from the required braid angle at mandrel cross-sectional changes, likely caused by an incorrect convergence zone length, in turn caused by this neglect. Therefore the objective is to use a new model that includes the yarn interaction, assuming an axisymmetrical biaxial process with a cylindrical mandrel and Coulomb friction. Experimental validation with carbon yarns and a 144 carrier machine confirms a convergence zone length decrease of 25% with respect to a model without yarn interaction for the case analysed, matching the model prediction using a coefficient of friction of around 0.3.

Keywords: C. Analytical modeling, A. Automation, E. Braiding, E. Preform

1. Introduction

Overbraiding is a manufacturing process for the production of bi- and triaxial tubular preforms of composite material. A mandrel is used to define the inner surface shape of the preform. After braiding, the preform is usually impregnated and cured using resin transfer moulding. Optionally, the mandrel is removed afterwards. Hundreds of yarns can be deposited simultaneously, providing a fast fiber deposition. The interlaced structure of braids can reduce the tendency of the

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