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Complete Simulation Process Chain for the Manufacturing of Braided Composite Parts

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1. Abstract

A complete simulation process chain has been used to predict the production and subsequent injection of over-braided textile preforms. A range of mandrel geometries and braiding configurations were used to illustrate how these factors affect the resin injection of the part. Braiding simulations were first completed, predicting the geometry of the braided textile throughout the mandrel. Following this, a range of multi-layered unit-cells were modelled, capturing the variations in geometry. These virtual stacks were produced with both no and maximum in-plane ply shift so as to capture the range of stacking configurations possible. Following a compaction simulation of these stacks, their in-plane permeability tensor was predicted and used to identify the permeability of the braided preform at different regions. This was used to predict the propagation of the resin flow front, highlighting the effects that the mandrel geometry, braiding process parameters and stacking method have on the resulting resin injection.

2. Introduction

The use of fibre reinforced polymer composite parts has been rapidly increasing, taking advantage of their high weight specific mechanical properties. Highly automated