

## Experimental Analysis of Advanced Multi-Axial Preforms Conformability to Complex Contours

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**Abstract :** A degree of research has been undertaken in the determination of 3D textile preforms behaviour to compression with direct comparison to 2D counterparts. Multiscale simulations have been developed to try and accurately analyse the behaviour of varying architectures post-consolidation. However, further understanding is required to experimentally identify the mechanisms and deformations that exist upon conforming to a complex contour. Due to the complexity of 3D textile preforms, determination of yarn behaviour to a complex contour is assessed through consolidation by means of vacuum assisted resin transfer moulding (VARTM), and the resulting mechanisms are investigated by micrograph analysis. Varying architectures; with known areal densities, pic density and thicknesses are assessed for a cohesive study. The resulting performance of each is assessed qualitatively as well as quantitatively from the perspective of material in terms of the change in representative unit cell (RVE) across the curved beam contour, in crimp percentage, tow angle, resin rich areas and binder distortion. A novel textile is developed from the resulting analysis to overcome the observed deformations.

**Keywords :** conformability, compression, binder architecture, 3D weaving, textile preform

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