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Can it Be Made? Predicting the Formability of Textile Composite Components

Mike J. Clifford, P. Harrison, A.C. Long

School of Mechanical, Materials, Manufacturing Engineering and Management, The University of Nottingham, Nottingham, UK

There are many ways of forming components from composite materials. These include injection moulding, hand lay-up, diaphragm forming, stamping, pultrusion, resin transfer moulding, filament winding, and vacuum forming. In recent years, attention has been focused on optimising the structural properties of composite components by using continuous fibres. Producing materials that can be formed with minimum force to produce high quality components is a challenging task. In this study, a constitutive model is developed which predicts the force required to form various composite components from continuous fibre reinforced composites. The model is based on easily measurable physical quantities such as the tow spacing, fibre volume fraction and matrix rheology. The constitutive model is implemented in an energy based drape model to predict the formability of various demonstrator components. Finally, forming limit diagrams and design guidelines for producing components from textile composites are discussed.

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