Characterisation and Modelling of Supporting Materials for the Vacuum Assisted Resin Infusion of Wind Turbine Blades

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The Vacuum-Assisted Resin Infusion (VARI) of large composite structures, such as wind turbine blades, relies not only on the properties of the reinforcing fabrics, but critically on a range of supporting materials such as flow media, perforated release films, peel plies, and light-weight core materials. While the permeability and flow characteristics of reinforcing fabrics have been widely studied, the supporting materials remain relatively overlooked, even though they frequently dominate the flow behaviour and speed of large-scale VARI processes. Hence, current modelling approaches often rely on assumed or highly idealised property values for these layers, or infer them inversely from infusion experiments, leading to significant uncertainty in the simulation results or a dependency on experimental calibration.

In this work, we identify key challenges associated with the characterisation of supporting materials, including their anisotropy, compressibility, and complex flow behaviour. We present a selection of experimental and numerical results that illustrate methods for quantifying these properties and demonstrate how they can be incorporated into large-scale infusion models. These observations and recommendations provide guidance for the systematic measurement, parameterisation, and implementation of supporting materials in VARI simulations, reducing reliance on calibration and improving predictive accuracy.

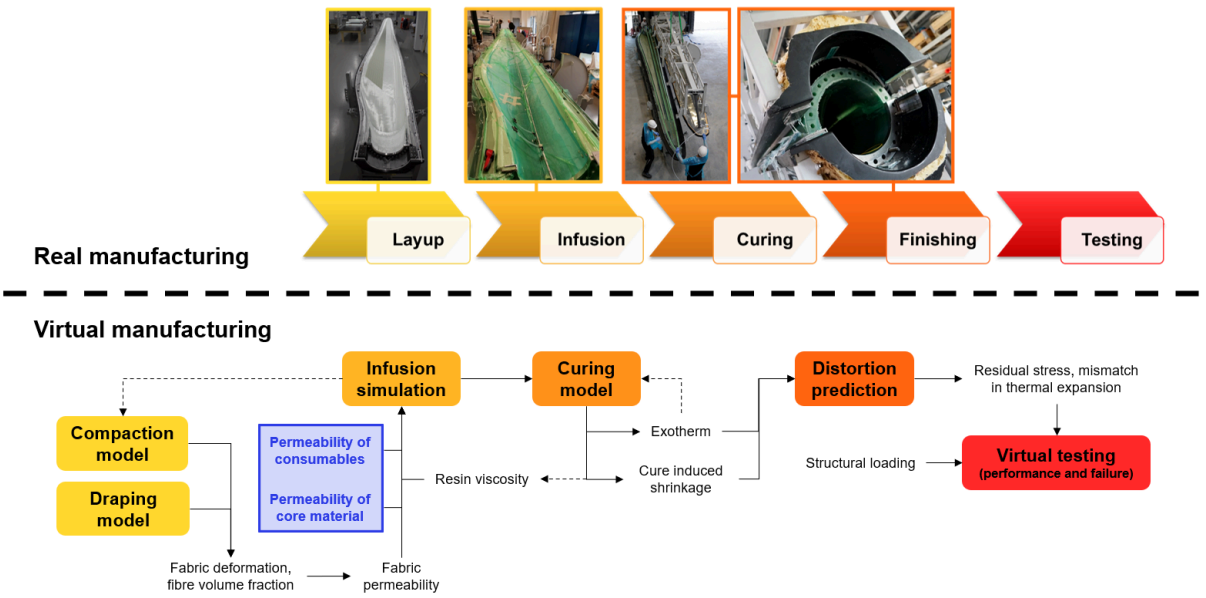

Figure 1. Significance of supporting materials (consumables and core materials) in process modelling for blade manufacturing.