

# **Variability in liquid composite moulding techniques: process analysis and control**

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## **Abstract**

The present work aims at understanding the poor flow repeatability which is observed in LCM processes such as resin transfer moulding (RTM) and vacuum infusion (VI a.k.a VARTM). Two of the causes of this poor flow repeatability, the natural variations in permeability and in surface density, are studied by implementing the Monte-Carlo method in the LIMS FE/CV flow package. Reliability improvements are proposed by using this 'real-life' virtual flow environment to design the appropriate active control strategies.

Flow repeatability is discussed as a function of component shape, gating arrangement and control strategy. In addition, the reliability differences between VI, where the flexible tooling induces transient thickness and permeability, and standard RTM, are explored. It is shown that specific models are required to analyse the impact of variability in different LCM techniques and how different control techniques affect the probable outcome of an injection.