# Title

MODELLING THE FLUID-POROUS INTERFACE IN LIQUID COMPOSITE MOULDING PROCESSES

# Abstract text

For the modelling of liquid composite moulding processes, the fluid-porous interface boundary conditions within the preform unit cell is of concern to many researchers. In general, two boundary conditions are currently used in permeability predictions of a unit cell: no-slip and partial-slip wall boundaries.

No slip wall boundary conditions are applied by some researchers to simplify the modelling process [1]. Partial slip wall boundary conditions proposed by Beavers and Joseph [2, 3] have attracted more attention recently as it describes the flow characteristic more precisely. The determination of the slip coefficients becomes then, however, the key concern of this method. The aim of this study is to obtain the partial slip coefficients by modelling the fluid-porous interface in Ansys CFX.

Two kinds of models are constructed: The first model is composed of a homogeneous porous sub-domain and an open fluid sub-domain, while for the other, the porous sub-domain is replaced by a uniform or random fibre arrangement. The preliminary results indicate that there exists a 7.5% underestimation of the mass flow rate through the open fluid sub-domain when using the homogeneous porous sub-domain and no-slip wall conditions with uniformly distributed fibres (yarn fibre volume fraction is 60%) in Ansys CFX. This result agrees with the conclusions of Beavers and Joseph, that the flow rate is enhanced due to the effect of a fluid-porous interface.

For real fabrics, the fibre distribution within the fibre bundles is random. In this study, the random fibre distributions are generated with a nearest neighbour method in Matlab [4]. For the flow simulations, partial slip coefficients can be obtained for different fibre volume fractions of the unit cell by adjusting the height of the open fluid sub-domain.

The obtained slip coefficient can be applied in permeability predictions of preforms using 3D unit cells generated by TexGen [5] . Finally, the predicted permeability results will be validated by experimentally determined permeability values.

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