

A Study Of The Effects Of Convergent Flow Fronts On The Properties Of Fibre Reinforced Composites Produced By RTM

NRL Pearce^{*}, FJ Guild[†] and J Summerscales^{*}

[†] Department of Materials Science and Engineering
University of Surrey, Guildford, Surrey GU2 5XH

^{*} School of Manufacturing, Materials and Mechanical Engineering,
University of Plymouth, Plymouth, Devon PL4 8AA

Abstract of a proposed paper for the
4th International Conference on Flow Processes in Composite Materials FPCM '96
University of Wales, Aberystwyth, 9-11 September 1996.

Resin transfer moulding involves the long range flow of resin through a fibre preform within a closed mould. The fibre volume fraction of the preform dictates both the rate at which the resin can fill the mould and also the mechanical performance of the resulting composite material. At higher fibre volume fractions, as is the case with high performance composites, there is a significant decrease in the permeability of the preform and hence reduced flow rates. In order to improve production times multi-port moulds can be used where resin is injected at a number of locations. This decreases the processing time but out of necessity results in the convergence of resin flow fronts.

The objective of this work was to study the effect that the convergence of two flow fronts have on the microstructure of the composite material and its subsequent mechanical properties. Carbon/epoxy plates were manufactured by RTM in a transparent mould with porting arrangements designed to cause resin flows to converge.

The resin injection was monitored by a Minitron video camera and logged at discrete intervals by a Synapse frame grabber using C-Images software in a data logging computer. These images were then compared to ultrasound images of the cured plates showing their quality and thus indicating the distribution of voidage. The plates were then sectioned for quantitative image analysis and interlaminar shear strength testing to CRAG standards. It has been shown that there is a marked increase in voidage in the area where flow fronts meet and this is correlated to a deterioration of mechanical properties.