

Industrial Member Report Summary – Key Findings for Industry

Microwave Curing of Composites

TWI Core Research Programme

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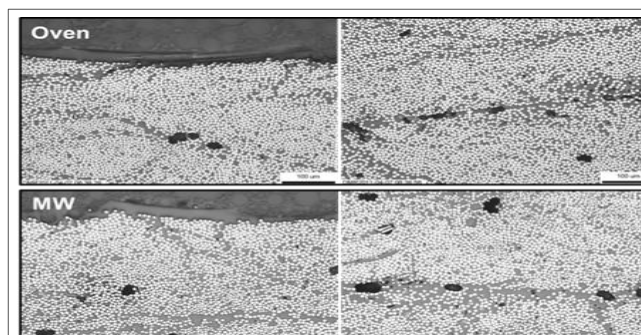
Industrial need

Composite parts are being used in a wide spectrum of applications, covering markets such as aerospace, automotive, power and medical. Their increased use has given rise to challenges with respect to production rates. New, faster manufacturing processes are needed in order to satisfy the current demand of composite structures.

Thermoset cure is inherently a slow process. Microwave (MW) heating could speed up the cure cycles (typically lasting several hours) with no loss of quality due to the instantaneous heating capability and the energy absorbent nature of carbon fibres at the MW frequency.

Key Findings

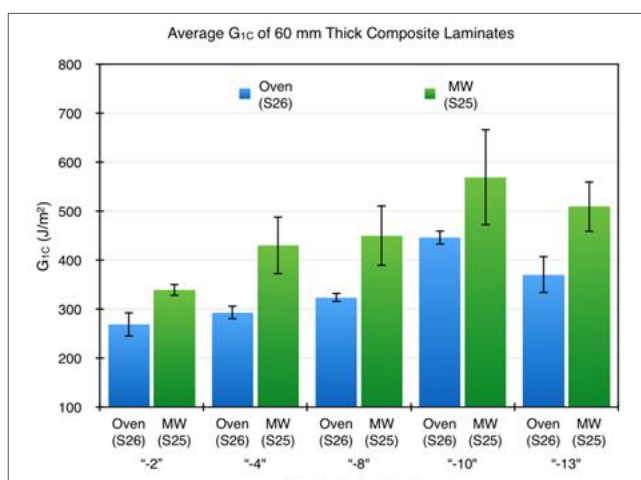
- The axial tensile properties showed little difference between MW and oven cured samples
- The transverse tensile and in-plane shear (IPS) modulus were lower for the MW cured samples
- The consistency in test results observed in MW cured composites is an indication of even heating through and across the laminates
- There is very little difference in the matrix modulus between the MW cured and oven cured samples
- The selective heating nature of MWs created local variations in matrix ductility, essentially transforming the matrix into a two-phase system with a hard brittle region close to the fibre, and a more ductile and tougher region away from the fibre.



Representative micrographs of oven cured (top) and MW cured laminates

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Average interlaminar fracture toughness for laminates cured in convection oven (blue) and MW oven (green). ('-2' is the sub-laminate closest to the mould, and '-13' is the farthest one)