



Hybrid Moulding

Advanced Technologies and Materials



AEROSPACE



Market-Led Innovation

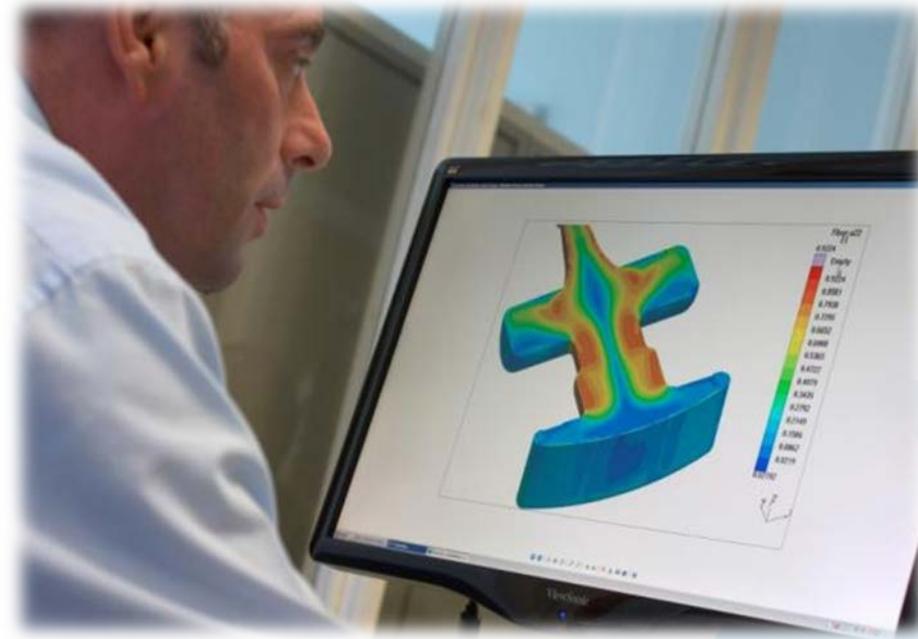
Hybrid Moulding

• Drivers

- Manufacture of complex shape parts
- Reduction in recurring costs
- Geometrical optimisation
- Functional integration
- Improved mechanical performance
- Improved damage tolerance
- Ease of processing

• Approach

- Investigate hybrid technology opportunities for complex-shaped structural parts



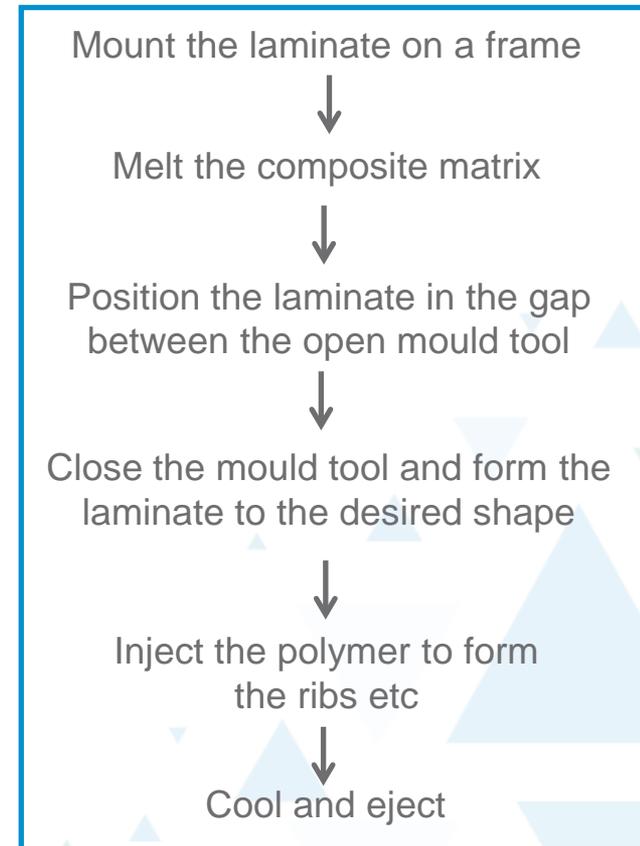


• Overmoulding Basics

- Overmoulding metals is an old technology
- Overmoulding composites
 - Pre-consolidated laminate – ‘organo-sheet’
 - Melt the matrix
 - Thermoform the laminate
 - Injection mould structures onto the surface

• Challenges

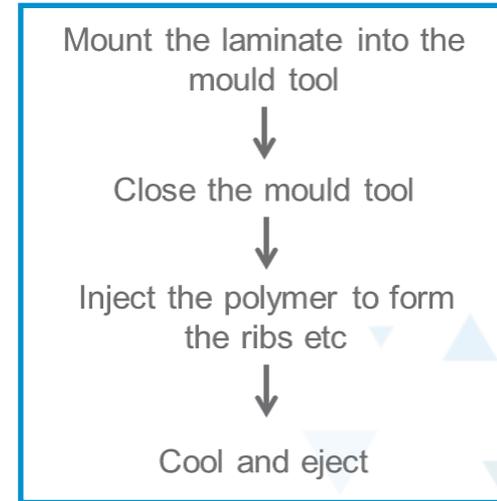
- Control of fibre orientation during forming
- Another heat cycle for the laminate matrix
- Post-moulding operation to remove the excess laminate
- Uniform laminate thickness





• Ideal Process

- Pre-form the composite laminate to the net shape
- Design the laminate to maximise the performance
- Necessitates being able to vary the thickness of the laminate
- Mount the net shape into a mould tool
- Inject the polymer onto the surface
- Cool and eject



• Benefits

- Laminate fibre structure does not change
- No post moulding operations
- Lower energy requirements = lower costs

• Challenges

- Potential for variations in laminate thickness



Initiating the Bond

Overview

- **Bonding**

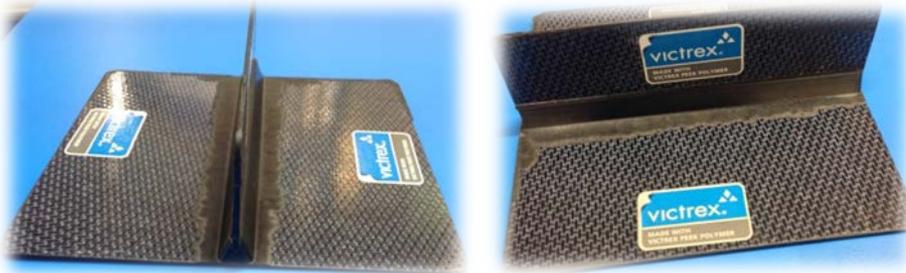
- Molecular scale bonding requirements
 - Compatibility of the resins/same resin
 - Similar mechanical properties
 - Similar levels of crystallinity
- Resin combinations
 - Moulding PEEK onto a solid PEEK laminate does not work
 - Energy available from the melt is not sufficient to melt the solid surface



New Material Solutions

Victrex Developments

- **New VICTREX® PAEK-Based Polymer**
 - Lower processing temperature than PEEK
 - Crystallises quickly
 - Mechanical properties similar to PEEK
- **Laminate**
 - Continuously-reinforced thermoplastic composite
 - Based on a 280g m⁻² 5-Harness satin carbon fabric with 50% fibre volume
- **Overmoulded with VICTREX PEEK Polymer**

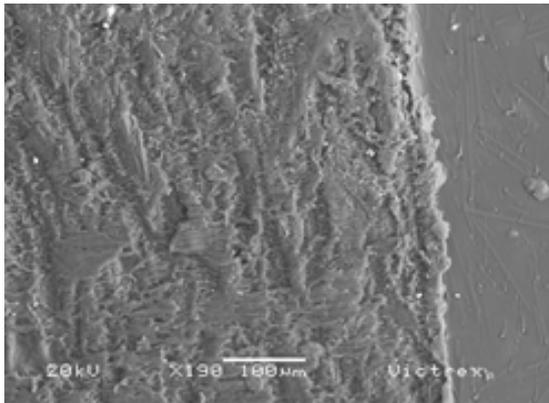
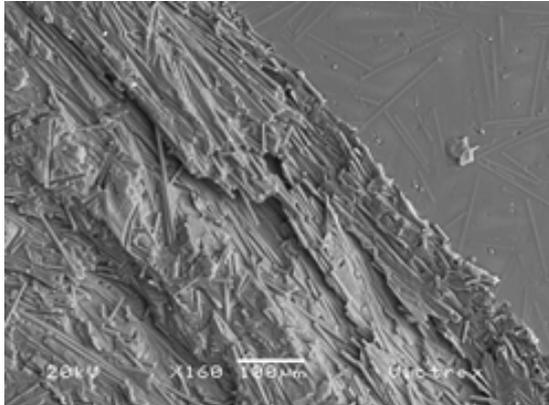


*Composite laminate furnished by TenCate



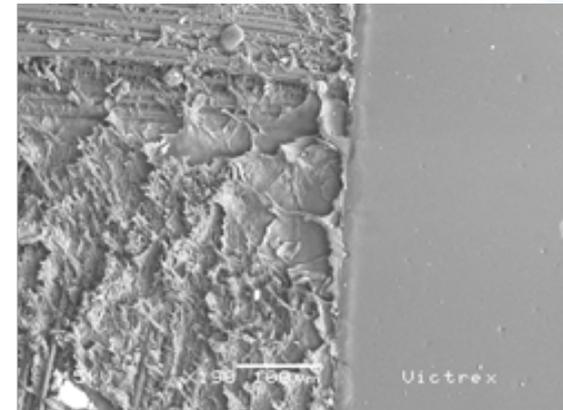
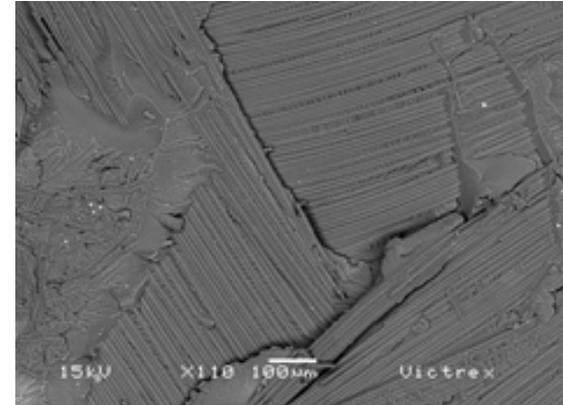
New Hybrid Technology

Victrex Developments



PEEK moulded surface

**Good
bonding**



Composite surface

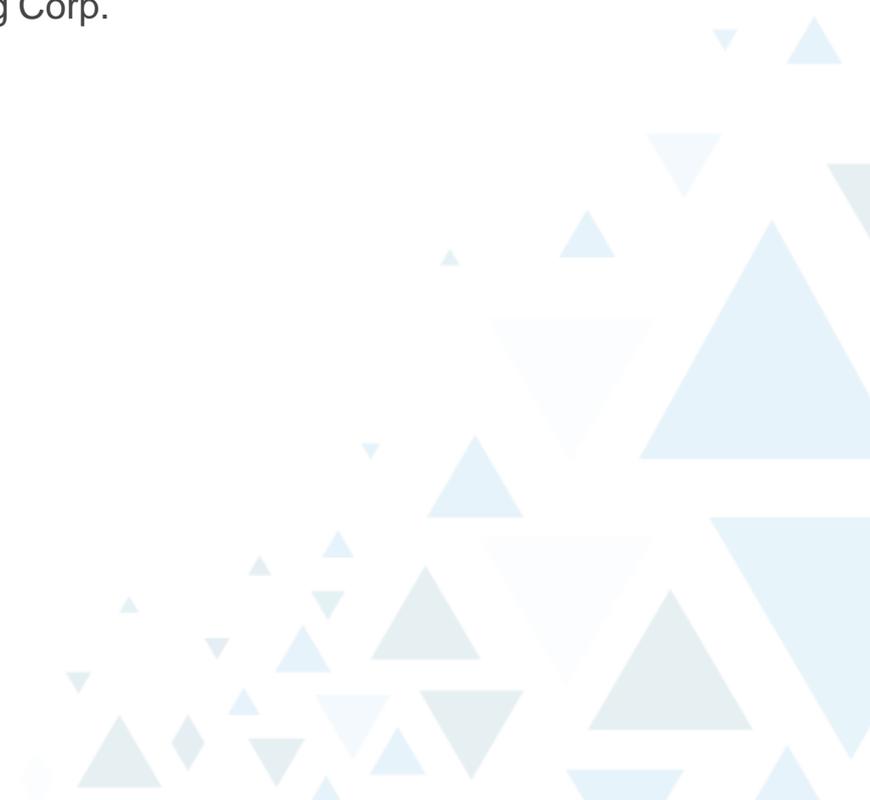


New Hybrid Technology

Victrex Developments

- **Structural Aerospace Bracket**

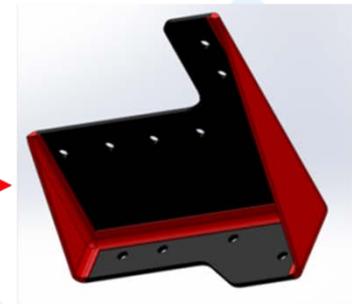
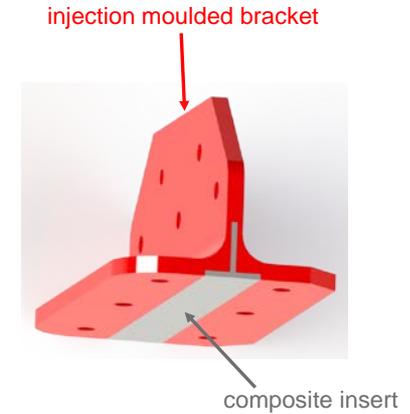
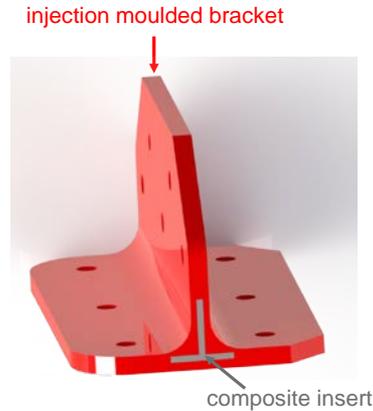
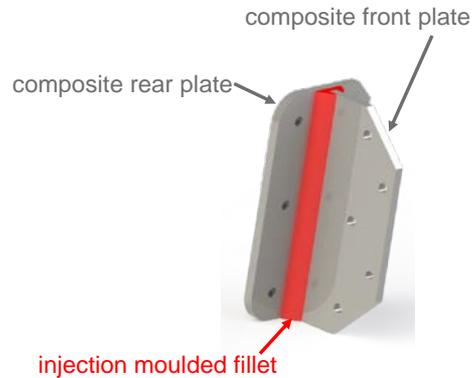
- Composite insert made using new VICTREX® PAEK-based polymer
- Injection moulded component made from VICTREX PEEK polymer
- Manufactured by Tri-Mack Plastics Manufacturing Corp.





Potential Applications

Aerospace Industry



Red – VICTREX® PEEK injection moulding polymer
Grey/black – New VICTREX PAEK-based polymer



Have A Question?

Contact Us!

If you have questions regarding our new polymer and hybrid moulding technology, please contact...

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