Light RTM (LRTM) Moulding

"Mould build technology"

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Master Model

- Orientation
- Flange
- Surface
- Draft angle
- Release agent

Master Model Orientation





Lounger pattern Flange



Flange/seal rules



Primary and secondary seals may follow different paths



Corner radii restriction must be observed



Seals placed on pattern to simulate paths

Other Flange examples

130 mm +/- 5mm
Flange direction change



Master Model -Pinch off detail



Inserts in the first mould flange

Flange vacuum

- Injection port
- Alternatives
- Autosprue
- 10mm pipe







Location of inserts on master pattern



Injection port on Face tool



Inserts illustrated



13

General mould cross section



Typical VM mould production set up



Location - Dowelling

• X and y location



Peripheral Fill

- Resin mould flow designed to find initial easy path around cavity.
- Ideal path fills before cavity starts to fill.
- Theory to practise example......

Flow path built into Mould flange





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4m² small craft VM mould - filling









More Flow shots

Face tool Lay up

- Release agent
- Tooling gel coat VE
- Tissue + VE
- First layer 450 g/m² CSM + VE
- Second 3 x 450 g/m² CSM + LP
- Frame wood or light steel

Calibration of first mould



Seals and flow channel profiles







Seals and profiles





Resin Runner Profile





In face mould

or contra mould

Resin runner position



Two vacuum levels

- Vacuum 1 to clamp mould flange.
- At least 85% providing 1 tonne/linear m.
- Vacuum 2 to clamp cavity and assist fill.
- 55% provides 0.55kg/cm² clamping.

Air driven vacuum control





Accuracy is the Key – Vacuum lock during LRTM Mould build





Total Cost of moulds

- Mould material costs £340 / m²
- Labour costs average 30 hrs / m²
- Comparison, LRTM tooling is less than 50% the cost of conventional RTM tooling

High Volume VM up to 800/ day!



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VM will mould Small to Large Parts



LRTM can go big and complicated



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Wind Turbine housing – approx. 100 m2 surface area




Difference between RTM and LRTM Moulding Speed Moulding accuracy Equipment requirements

"RTM" and complimentary "LRTM" closed moulding for composites

Difference between RTM and LRTM Moulding Speed





Moulding Speed

- LRTM injects the fibre pack at approximately 1/3 the speed of RTM
- LRTM cannot be speeded up by using higher injection pressure
- RTM is able to inject 2 to 4 times faster
- Optimised RTM 6 times faster

"RTM" and complimentary "LRTM" closed moulding for composites

Difference between RTM and LRTM

Moulding Speed
Moulding accuracy



Moulding Accuracy

LRTM moulds within +/- 0.025" at best
RTM moulds within +/- 0.002" at best
LRTM mould accuracy governed by fibre pack and vacuum level- unpredictable
RTM mould set accuracy controlled by design - predictable

"RTM" and complimentary "LRTM" closed moulding for composites

Difference between RTM and LRTM

Moulding Speed
Moulding accuracy
Equipment requirements



Equipment requirements

- RTM needs a low pressure meter mix machine and tool manipulator.
- LRTM needs a VERY low pressure meter mix machine and two vacuum sources

Low pressure LRTM Machine

Mould Pressure Guard Regulates speed of pump to achieve safe low pressure



More Application examples

Sunlounger





Pacific Composites -Australia



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Invalid Bath



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10mm thick 80kg VE resin









VM can go big and complicated







Other VM applications



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Conclusions

- LRTM is a viable lower cost system complimentary to RTM.
- Tooling manufacture must be accurate
- Material selection, resin, fibre critical.
- Operating procedures must be consistent for success.

Heating /Temperature control



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