MODELING AND VALIDATION OF COMPRESSION RTM PROCESS USING P4 FABRIC

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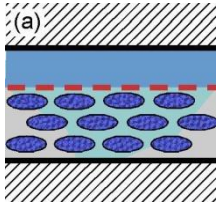
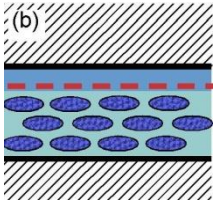
CRTM Phases

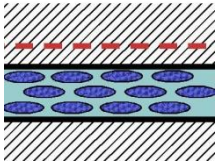
Phase 1: Injection



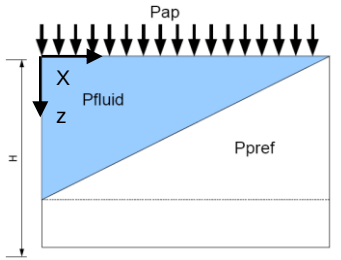
Phase 2: Gap closing



Phase 3: Compaction



Phase 2 Study



Boundary conditions:

$\hat{z} = 0 \Rightarrow \hat{p} = 1$

$\hat{z} = 1 \Rightarrow \hat{p} = 0$

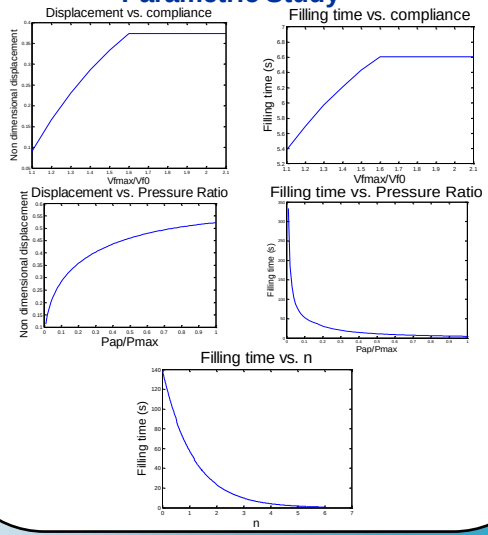
$\hat{t} = 0 \Rightarrow \hat{p} = 1 - \hat{z}$

Non dimensional behavior equations:

Pressure distribution: $$\frac{\partial \hat{p}_{fluid}}{\partial \hat{t}} = \alpha \frac{v_f^{2-n}}{v_{f0} \cdot v_f'} \frac{\partial^2 \hat{p}_{fluid}}{\partial \hat{z}^2}$$

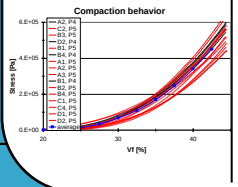
Flow front progression: $$\frac{\partial \hat{L}}{\partial \hat{t}} = \gamma \frac{\partial \hat{p}_{fluid}}{\partial \hat{z}_{z=L}}$$

Parametric Study

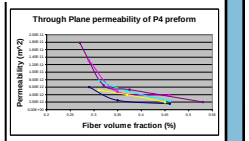


Material Characterization

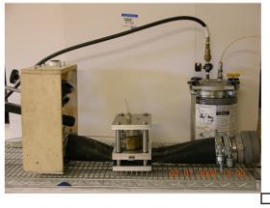
Compaction

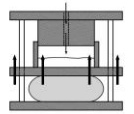


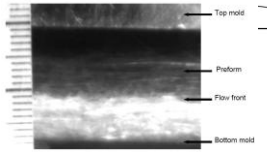
Permeability

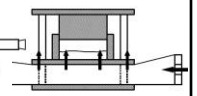


Experimental setup



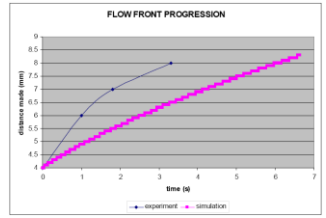






Experiment / Simulation

	Experiment	Simulation
Initial thickness (mm)	12	12
Final Thickness (mm)	8	8.3
Filling time (s)	3.3	6.6



Future Work

Include the phase two behavior in the CRTM code.

Verify the results:
- **on a larger scale experiment**
- **on more complex parts**

Conduct a study on injection nodes to increase process speed.

Acknowledgements

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