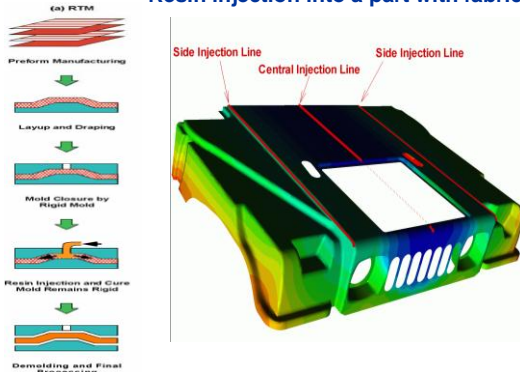


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LIQUID COMPOSITE MOLDING PROCESS

Resin injection into a part with fabric



Resin flow simulations in a mold require knowledge of fabric permeability in all principal directions

OBJECTIVE

- ◆ Develop an algorithm to determine the 3D permeability tensor of fibrous media from a single radial flow experiment

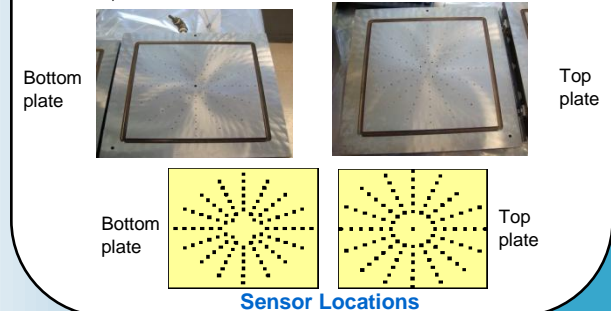
$$u = - \left(\frac{K}{\mu} \right) \nabla P \quad \text{Darcy's Law}$$

$$K = \begin{bmatrix} K_{xx} & K_{xy} & K_{xz} \\ K_{yx} & K_{yy} & K_{yz} \\ K_{zx} & K_{zy} & K_{zz} \end{bmatrix}$$

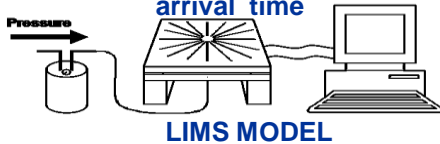
Fabric Permeability Tensor

EXPERIMENTAL SET-UP DESCRIPTION

- ◆ Flow front information is acquired by electronic sensors that trigger when they come in contact with the fluid.
- ◆ Sensors are connected to data acquisition system to acquire experimental flow front arrival times at the sensors
- ◆ Two plates : top and bottom sensor plate with 96 electronic sensors embedded in each plate in a radial fashion, sandwich the fibrous media.

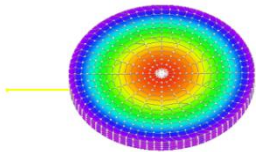


Compare 3D flow simulation arrival times to experimental arrival time

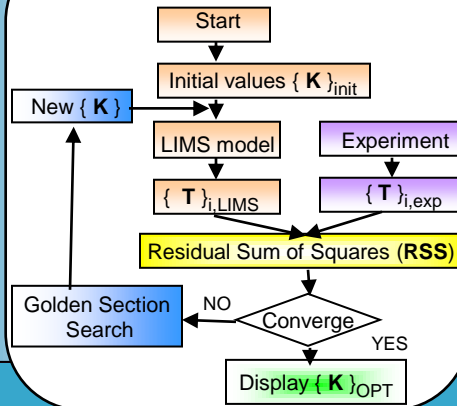


LIMS MODEL

- ◆ 3D mesh for flow simulation in LIMS
- ◆ # Nodes= 2887, # Elements=2321

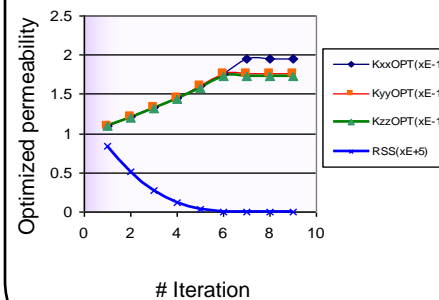


DETERMINATION OF PERMEABILITY USING FLOW SIMULATION



RESULTS

Woven E-glass fibrous media @ 45% vf



FUTURE WORK

- ◆ Experimental work with woven E-glass fibrous media to validate the approach
- ◆ The effect of distribution media on the permeability of fibrous media needs to be investigated

ACKNOWLEDGEMENTS

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