MEMBRANE BASED VARTM - AEROSPACE APPLICATIONS

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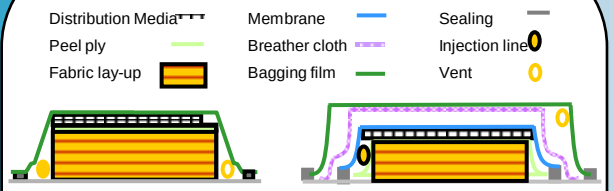
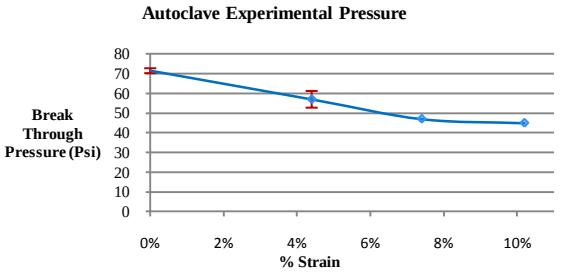
VARTM v. VAP



- Vacuum Assisted Resin Transfer Molding (VARTM) is a prolific composites manufacturing process.
  - Vacuum is applied to the vent line. It compacts the fibers and draws resin into the pre-form through the injection line.
- The Vacuum Assisted Process (VAP) incorporates an air permeable membrane into the setup.
  - The setup is identical to traditional VARTM except for the addition of the membrane and the bleeder cloth.

RESEARCH OBJECTIVES

- Measure the pressure capabilities of the membrane under uniaxial and biaxial stretch up to the failure/tearing limits of the membrane.



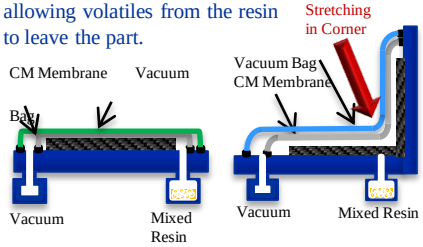
Breakthrough pressure v. Uniaxial Stretching

PRESSURE V. STRAIN TEST FIXTURE

- With known fluid properties, the input pressure and flow rate can be used to calculate the pore size distrubution.
  - The stretching fixture will allow the membrane to be tested in situ.

IMPLEMENTATION

- The Composite Manufacturing Membrane acts as a resin barrier allowing volatiles from the resin to leave the part.

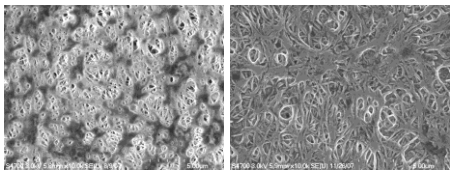


- Complex geometries introduce a stretching phenomena that has caused resin breakthrough and process failure.

Stretching Issues

- Membrane stretching causes leaks in the membrane which need to be mitigated before the membrane can be implemented in aerospace applications.
  - Simple fixes are not desired, fundamental understanding of the membrane stretch and failure phenomena are desired at this time.

Breakthrough Pressure v. Stretch



Unstretched Stretched 23%

- The breakthrough pressure of uniaxially stretched samples has been established and future work will develop the break through pressure of biaxially stretched samples.

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