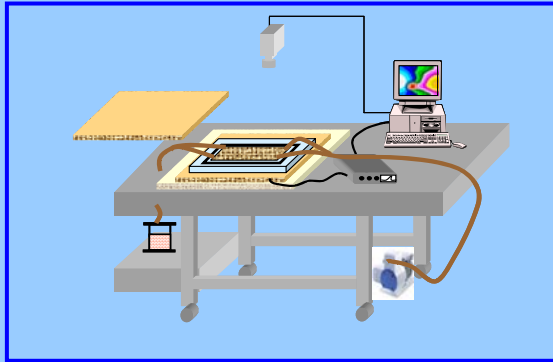
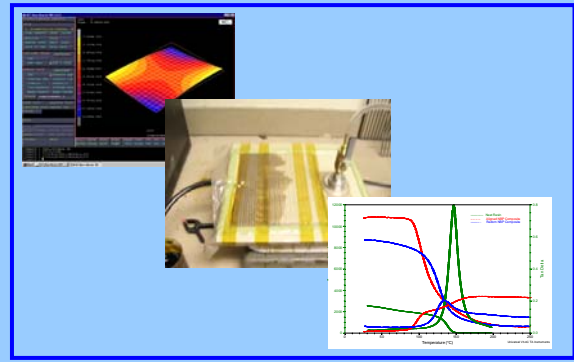


Synopsis:

High-Temperature Vacuum Assisted Resin Transfer Molding



HT-VARTM testbed



Modeling, processing, and characterization

Background

Manufacturing high-quality, large composite parts for high-temperature applications using the VARTM process will significantly reduce costs due to low cost tooling, flexible part integration, and larger part dimension. However, high-temperature (HT)-VARTM presents technical challenges including low processing pressures, high resin viscosity, large dimension variations, and the need to maintain low volatile content in the resin during processing to minimize voids. HPMI is systematically investigating HT-VARTM processing techniques through characterization of resin systems, non-isothermal flow modeling, and process simulation/optimization, as well as testing and characterizing final parts.

Goals

- Develop a HT-VARTM testbed to demonstrate the capabilities and potential of HT-VARTM, incorporating flow simulation and in-situ optical thickness monitoring, as well as closed-loop control of vacuum level
- Develop a simulation-guided HT-VARTM processing technique for aerospace composite structures
- Demonstrate dimensionally stable HT-VARTM processing techniques

Projects/Research Highlights

- Development of an integrated approach and testbed for HT-VARTM
- Systematic investigation of the effects of fiber preform spring-back on part dimension variations with a 3D optical scanner
- Development of an innovative technique to reduce part dimension variations by matching resin and fiber CTEs through adding nanotubes in the resin and pressure distribution control during part curing

Benefits to Industry

- Affordable and repeatable HT-VARTM for aerospace grade applications
- Low cost and effective techniques for dimension control of composites structures and assemblies