Background & Motivation

Tailored Universal Feedstock for Forming (TuFF) sheets can be made with recycled fibers. However, full translation of properties depend on:
• Fiber length distribution
• Degree of Fiber strength degradation
• Alignment accuracy
• Interface quality
• Fiber volume fractions

TuFF parts were produced using discontinuous fibers with three aspect ratios to experimentally validate the challenges associated with fiber lengths.

Experimental Approach

• Model system with E glass fibers in both continuous and discontinuous form was chosen with epoxy from Axiom
• Continuous fabric and TuFF preforms were pre-pregged using resin film infusion
• Used manufacturer recommended cure cycle

Results & Discussion

• Orientation results proved higher alignment accuracy in TuFF due to tight packing of fibers in contrast with continuous composite
• Several interpretations such as stitching, resin rich locations can affect the fiber orientation within the proximity of continuous part

• Models over predict the properties as they do not account for interface failure nor other failures that occur in the composite due to fiber strength variability

Conclusions & Future work

• Experimental demonstration of strength degradation as a function of decreasing aspect ratio in short fiber composites
• Models overpredict due to fiber aspect ratio and strength variability
• Future work will focus on measuring properties with specimens with wider aspect ratios
• Specimens with multiple aspect ratios will be fabricated to demonstrate the effect on degradation and concentration effects during processing

Acknowledgements

This material is based upon work supported by the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy (EERE) under the Advanced Manufacturing Office Award Number DE-EE0009053. The views expressed herein do not necessarily represent the views of the U.S. Department of Energy or the United States Government.

Special thanks to Chris Blackwell from Composites Automation LLC for TuFF preform processing, Nicholas Shevchenko for C Scans and Lake Edward for support during autoclave processing.