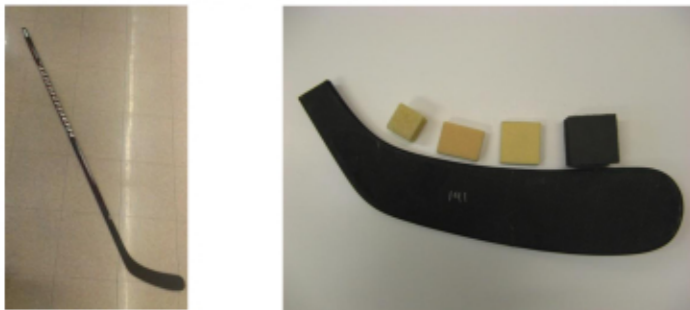


Stress Relaxation in Hockey Stick Foam Core

S. Durbano, N. Shevchenko, P. Schulze, Y. Tsuchida

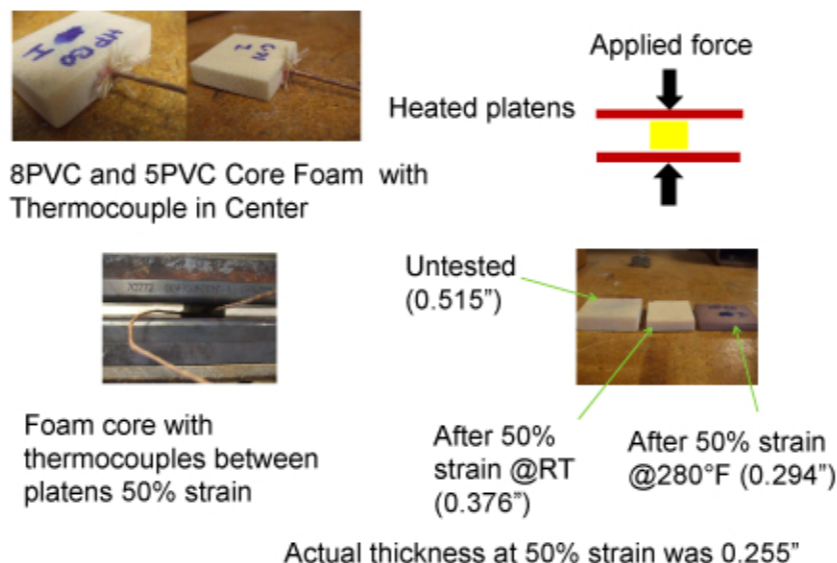
University of Delaware . Center for Composite Materials

INTRODUCTION



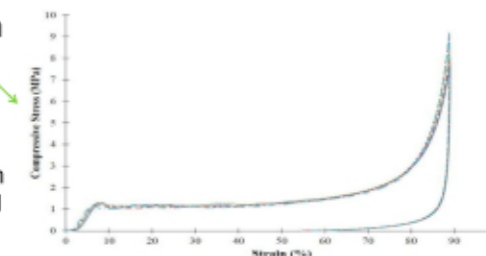
- Foam core is a critical component in most hockey sticks
 - Contributes to strength and stiffness of carbon sandwich
- Oversized/overweight foam traded off for processing
- Foam and process are influenced by each other
 - Does oversized foam core help in laminate compaction?
 - Does compaction and heat affect foam properties?
- How does foam behave under processing pressure and temperature
 - Does foam lose strength under Pressure?

Foam Strain and Heating Experimental Setup



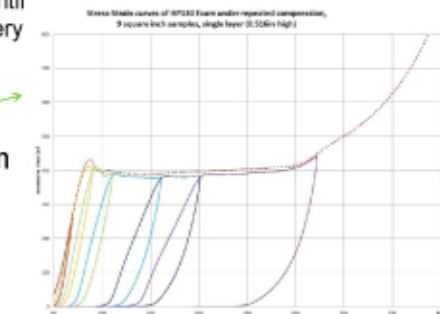
8PVC and 5PVC Foam Stress Strain Relaxation

5 pound PVC foam

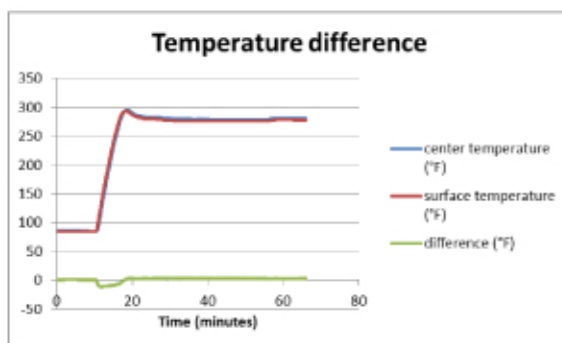


The foam is observed to deform somewhat linearly up to several percent strain. After which a plateau is reached. A nearly constant stress is maintained until the foam begins to densify at very high strain levels

8 pound PVC foam

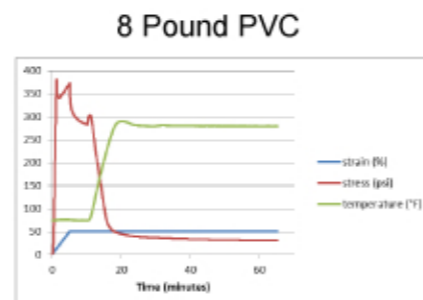


Foam Heating



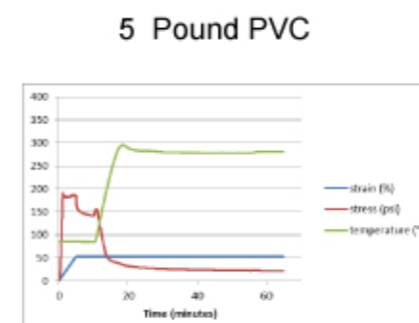
There was about a 10 F degree temperature difference between the center of the compressed foam and its surface while heating. Otherwise the temperature was uniform throughout.

8 Pound PVC foam stress during strain and temperature cycle



After the initial compaction to 50% strain, the foam relaxed to a lesser stress level as expected. Immediately upon heating the foam further relaxed to a fraction of the initial stress level.

5 Pound PVC foam stress during strain and temperature cycle



Conclusion

- Foam relaxes (loses strength)
- oversized core not helping
- Compaction and heat severely weakens foam
- Reduced sized core would yields same compression with less weight

ACKNOWLEDGEMENTS

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