Assignment 3

Question 3

High fiber alignment is critical for compressive strength. Lower fiber volume fraction may have benefits for highly flexible composite structures. Shear stress should be minimized in design for optimal compressive strength properties. Cross sectional shape has minimal effect on compression strength. Greater gains in compression strength come from optimizing the in-plane shear modulus of the composite, this is done through improving matrix and fiber matrix interfacial properties.

Filament-wound fiber bundles can be used in unidirectional epoxy composites and the compressive strength will increase by 15% and exerting tension during the filament winding process could increase the compressive modulus by about 45%. With filament-winding spacing increased, the compressive strength of the specimen will decrease due to the buckling of the longer compressive critical wavelength.

The fibers that are oriented perpendicular to the tensile stress trajectories need three-dimensional stress analysis to determine these trajectories and matrix manipulations. Incorporation of SiO2 nanoparticles into the epoxy matrix has reinforcing effects of nanoparticles under the compression into modified elastic plastic microbreaking model, which will lead to greater compressive strength.

High fiber alignment

Lower Fiber volume fraction

Shear stress should be minimized in design

Optimizing In plane shear modulus

Filament wound fiber bundles

Focusing on forces oriented perpendicular to tensile stress