HOOP TENSILE STRENGTH IN SPLIT-DISK TEST OF FILAMENT WOUND COMPOSITE TUBES BY FINITE ELEMENT ANALYSIS

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Summary: Filament wound composites are widely used in industry as pipelines and pressure vessels. In such situations materials are often subjected to complex loads involving tension, compression, hydrostatic pressures and bending. Hence, helical fiber layers are used to improve structures load bearing resistance. The aim of this study was to investigate the hoop tensile strength at split-disk tests of composite tubes for different fiber winding angles in configurations with helical layers and both helical and hoop layers. For this purpose, finite element models were built in order to evaluate the mechanical behavior of different lay-up configurations under hoop stress at split-disk test, according to ASTM D2290. Experimental results were used to validate the finite element models and the maximum discrepancy between numeric and experimental values was 8.4%. An increase of hoop tensile strength with the winding angle was found for both configurations and for angles larger than 75° the difference between configurations was quite small, tending to zero up to 88°. It was also found that for smaller winding angles hoop layers increase hoop tensile strength substantially.