UPDATED GOODMAN DIAGRAMS FOR FIBERGLASS

COMPOSITE MATERIALS

USING THE DOE/MSU FATIGUE DATABASE

by

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Abstract

Recent expansions of the DOE/MSU Composite Fatigue Database permit the construction of a high resolution Goodman Diagram with detailed information at thirteen R-values (minimum stress / maximum stress). This Goodman diagram is the most detailed to date, including several loading conditions which have been poorly represented in earlier studies. The data for a single E-glass/polyester material system are extracted from the MSU/DOE Fatigue Database to construct the Goodman diagrams. Diagrams are constructed using both mean fits to the data and 95/95 fits. These formulations allow the effects of mean stress on damage calculations to be evaluated. Two sets of load spectra are analyzed. The first set is experimentally-determined load spectra obtained from operating wind turbines, and the second is the WISPERX load spectrum.   The analysis of the turbine load spectra illustrates a significant overestimation of the equivalent fatigue loads when the mean stress is not considered in the calculation. The analysis of coupon data using the WISPERX spectrum illustrates that the Miner's rule does not predict failure very well.