DESIGN AND ANALYSIS OF CURVED BEAMS MADE OF COMPOSITE MATERIALS

Leite, A.; Travassos, J.

Instituto Superior de Engenharia de Lisboa (ISEL), Departamento de Engenharia Mecânica, Lisboa, Portugal

Publicado em:
Artigo apresentado na 12th European Conference on Composite Materials (ECCM 12), publicado no CD-ROM de actas do encontro, 29 de Agosto a 01 de Setembro de 2006, Biarritz, França.

The main purpose of this work is to predict the peak interlaminar stress, responsible for the initiation of delamination, on a composite curved beam, subjected to end forces and end moments. The stacking sequence is symmetric, non-balanced, with 14 layers and it was fabricated using pre-impregnated unidirectional glass fiber in epoxy resin, stacked over a fabricated male tool, and the assembly was then vacuum-bagged and cured in a laboratorial autoclave. A sample of curved elements was tested to failure using static loads. Other sample was instrumented with strain gages in the outer and inner layers, in the apex region, and circumferential strains were measured. Two different finite element models were constructed in two commercial FEM applications: 1) 3D model with solid layered elements; 2) 2D model using plane elements. Interlaminar tensile and circumferential stresses obtained by FEM were compared. For the circumferential strains in the outer and inner layers, the results are validated with experimental data. The radial location and intensity of the interlaminar tensile stress were calculated by the Multilayer Theory of Ko and Jackson and were compared with the FEM results.

03