StressCheck®

COMPOSITES ANALYSIS

Setting a new standard in composite structures and bonded joints analysis

The unique hierarchical element formulation and modeling framework of StressCheck® makes reliable and accurate composite analysis a proven reality.

StressCheck® technology delivers state of the art finite element analysis (FEA) of laminated composite materials and adhesively bonded joints. Whether you are an analyst or designer, StressCheck® delivers reliable results – guaranteed.

Years of focus and attention to the needs of the aerospace industry have made StressCheck® the premier FEA tool on the market today for simulating the behavior of composite structures and bonded joints. A composite research team from the aeronautics industry, the Composites Affordability Initiative (CAI), conducted an extensive study of existing capabilities in the area of failure analysis tools for composite bonded joints. The study led the CAI team to unanimously select StressCheck® as the software tool to "replace as well as radically improve existing industry standard software currently used to size bonded joints." Combining these capabilities with other state of the art StressCheck® technologies, like large aspect ratio elements and seamless transition from linear to nonlinear analyses, you can now analyze composite and bonded structures for various failure modes with guaranteed reliability.

"Aerospace scientists and engineers now have a new state-of-the-art software product called StressCheck, which provides efficient and reliable analysis tools for composite bonded aircraft structures. A [study by a] composites research team … known as the Composites Affordability Initiative … led the team to unanimously choose StressCheck as the software tool to replace as well as radically improve existing industry standard software currently used to size bonded joints."

Air Force Research Laboratory
CAI Team: Bell Helicopter, Boeing, General Electric, Lockheed Martin, Northrup Grumman, US Air Force, US Navy

"StressCheck's quality control features have given us the tool we need to perform detailed composite bonded joint analysis with confidence that the results are accurate."

The Boeing Company

"This software tool will play an important role in making composites more affordable … [and] provides a … tool that will replace the FEM tools and failure criteria the experts currently employ for analyzing bonded joints. The software includes an FEM-based handbook format which allows non-experts to utilize models prepared by specialists …"

Lockheed Martin

Altair

Alliance Partner

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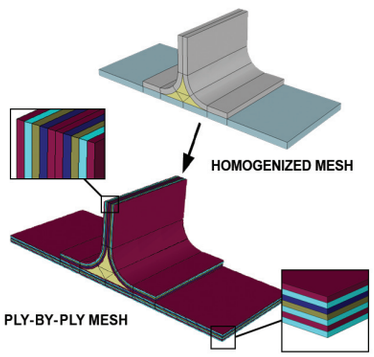
StressCheck®

A powerful, reliable tool for detailed stress analysis of composite structures and bonded joints – from unique modeling capabilities, to advanced analysis technology, to powerful post-processing functions. Only StressCheck® brings this power to you in an easy to use framework with unmatched flexibility to allow control degrees of freedom without re-meshing.

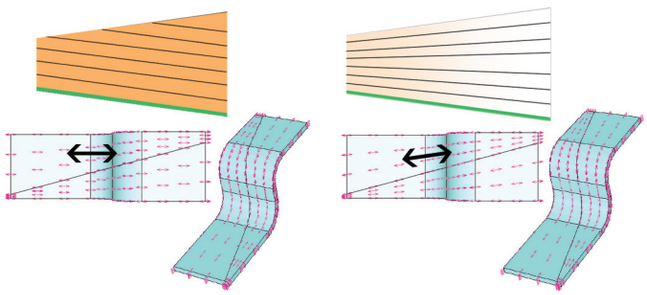
Modeling and Analysis

The unique features of StressCheck® facilitate modeling of composite materials and bonded structures. The Automatic Laminate Builder greatly reduces the time to define the composite layup. You can enter the homogenized material properties or the ply-by-ply information and select homogenized (or lumped) material properties, similar to other FEA programs. But with the unique hierarchical element formulation of StressCheck®, you can now automatically model elements on a ply-by-ply basis enabling highly detailed stress analysis. The color coded display provided by StressCheck® lets you graphically verify the ply angles in the laminate stack.



Material directions can reference Cartesian or cylindrical coordinate systems. However, for many practical problems, a general curvature approach is needed. StressCheck® has two unique capabilities allowing you to align the material properties with the curvature of an element with the Lam-MapEdge and Lam-MapVolume options.

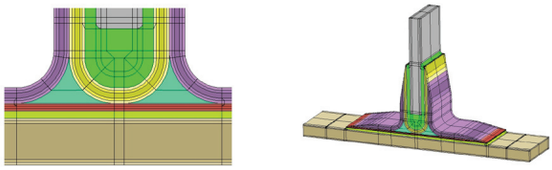
LAM-MAP EDGE ***LAM-MAP VOLUME***



These options allow modeling injection molded parts that include cut fibers which orient themselves with the mold. StressCheck® allows you to display arrows representing the principal direction for laminates, which is particularly useful when visualizing the ply angle orientations.

Thin solid elements in StressCheck® allow substantial savings in computational time, without compromising the quality and accuracy of the solution. This is exceptionally valuable when analyzing composites where ply-by-ply element modeling is used.

The advanced FEA formulation in StressCheck® allows high aspect ratio elements, for example 200:1 or larger, enabling ply-by-ply element modeling while reducing model size. StressCheck® also allows vanishing angle elements necessary to mesh the noodle or filler areas, with no degradation of results.



Post Processing

StressCheck® offers the ability to test for failure at multiple locations simultaneously. This unique feature is available in the nonlinear Margin Check analysis module. Margin Check evaluates the solution with respect to specific failure criteria, defined as parametric formulae, for each load step and continues to increment the load until a failure condition is detected. Upon completion of the analysis, margin of safety data are presented in tabular form for each load step. The analyst can specify any number of failure criteria to be evaluated.

StressCheck® also allows you to extract results for a laminate as well as an individual ply within a laminate. Stress or strain results are available in the material direction of each ply, in addition to the global or other coordinate system directions. Primary quantities used to assess failure of composites, such as the first strain invariant J1 and volumetric strain can be calculated through the failure criteria interface. You can also combine the mechanical and thermal strain effects to determine the onset of failure in composite structures. The powerful fracture mechanics capabilities already available in StressCheck®, such as the J-integral, have been extended to composite materials. And of course, all StressCheck® post-processing features, such as convergence checks, are available as you analyze your structure for potential failure.

StressCheck® Handbook

Using the unique StressCheck® Handbook framework, advanced technology such as laminated composite analysis can be packaged for use by both analysts and non-specialists. Parameterized models of complex laminated structure can be developed by a qualified analyst and delivered in a very convenient and highly reliable handbook environment for use by designers and analysts.

StressCheck® Handbook models can include virtually all relevant design variables necessary to define a laminated composite configuration. The handbook framework enables users to store all relevant solution and extraction procedures with the model for subsequent recall and modification. A report is generated automatically that includes an assessment of the solution quality, based on convergence estimates and specified failure criteria.

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