ANSYS®

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ANSYS® Composite PrepPost

ANSYS® Composite PrepPost Product Features

Unique material definition functionality, tailored for modeling layered composite structures
- Basic materials with engineering constants
- Uniaxial fabrics with vendor-specific data
- Multiaxial fabrics with vendor-specific data
- Standard laminate templates

Coordinate systems
- Cartesian, cylindrical, spherical

Oriented element-set concept
- Definition of material application direction independent of shell normal
- Definition of material 0° direction
- Overlapping multiple oriented element sets
- Unique possibility of easy asymmetric laminate definition
- No need of ply subdivision

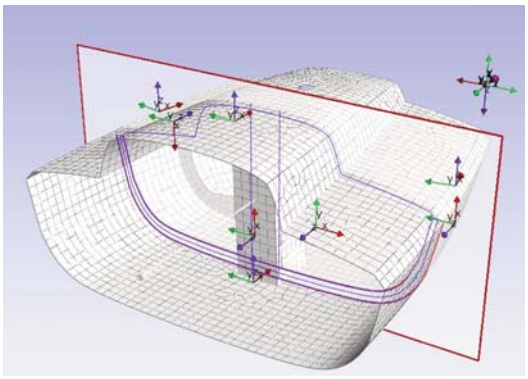
Surface and 3-D modeling
- Generation of layered solid composite models from layered shell models
- Layer-wise post-processing of layered solid and layered shell models

Draping and flat-wrap functionality
- Analysis of draping, write and load draping data
- Analysis of fiber-angle correction
- Flat-wrap analysis and export of plies with distortion

Efficient Engineering of Layered Composite Structures

Composite materials are formed from the combination of two or more layered materials, each having very different properties. Composite materials have become a standard for manufacturing products that are both light and strong. Additionally, composites provide enough flexibility so that products with complex shapes, such as boat hulls or surfboards, can be manufactured.

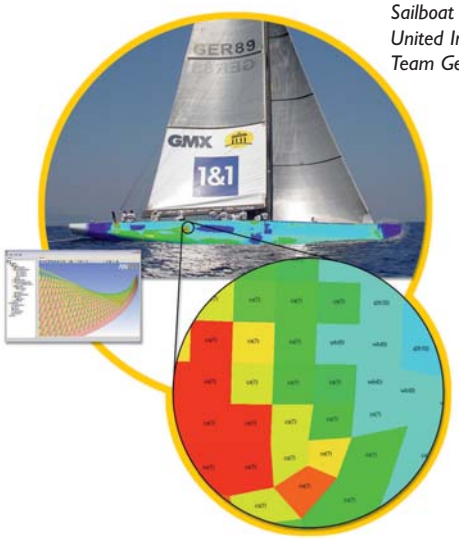
Among the many challenges of designing products from composites is defining the specifications of each of the layers that are a part of the composite material. To engineer layered composites, a designer must find the best combination of lamina, from the number of layers involved to the thickness and relative orientation of each layer. As with homogeneous materials, stresses, deformations and other performance indicators will help determine a product's performance under actual working conditions. In addition to this, a range of failure criteria, from simple to more advanced formulations, is usually also used to study how the layer material and their orientations affect the design of the product.



Thickness visualization on the global structure

ANSYS Composite PrepPost software provides all the necessary functionality for the analysis of layered composite structures. An intuitive interface efficiently defines materials, plies and stacking sequences, and also offers a wide choice of state-of-the-art failure criteria. ANSYS solvers provide the foundation for accurate results, while additional computations for the failure criteria are performed within the ANSYS Composite PrepPost application.

Sailboat courtesy United Internet Team Germany



Layer orientation and layer-wise failure criteria analysis on a complex hull shape

ANSYS Composite PrepPost Product Features

Comprehensive composite failure analysis capabilities

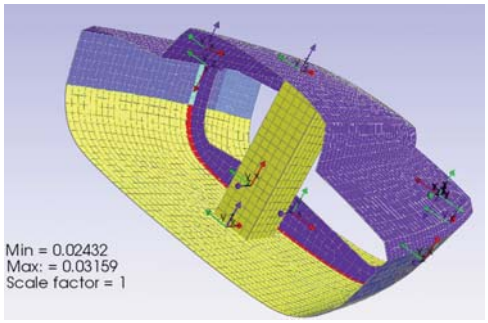
- Inverse reserve factors (IRF), reserve factors (RF) and margin of safety (MOS) for composite failure criteria at all integration points of all layers
- Arbitrary combinations of failure criteria
  - Max. strain, max. stress, Tsai-Wu, Tsai-Hill, Hashin, LaRC, Cuntze
  - Puck 2-D and 3-D for UD and weave materials
  - Core failure and face sheet wrinkling for sandwich structures
- Multiple load case consideration
  - 4 result values per in-plane data point
  - Maximum IRF of all criteria of all layers
  - Active failure mode
  - Layer index with highest IRF
  - Critical load case
- Simple definition, configuration and combination of desired composite failure criteria
- Unique method to evaluate interlaminar normal 3-D stress in curved laminates based on shell elements
- Element sampling enables ply-based strain, stress and IRF visualization
- Result visualization for each ply of the laminate
- Text plot highlights critical failure mode, layers and load case
- Sensors for the evaluation of material quantity and cost
- Python® scripting interface (e.g., for user-specific failure criteria)

Ply-book generation

- Generation of individually formatted ply books in restructured text-format
- Ply books can be exported in various formats (*.html, *.pdf, *.odt, etc.)

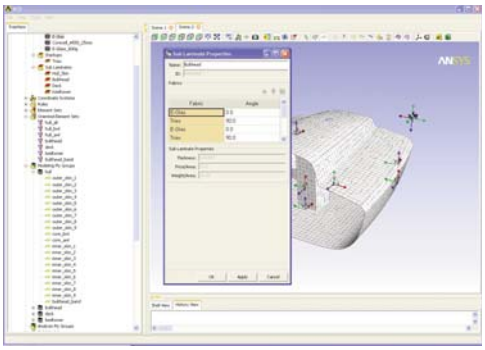
Scripting and automation

- Python scripting interface to automate model definition



Results visualization on the global structure

The post-processing capabilities of ANSYS Composite PrepPost software allow an in-depth investigation of a product's behavior. The results for the structure can be looked at globally or viewed in detail down to the layer level, which enables users to accurately identify reasons a structure could potentially fail. Design iterations can easily be performed to take into account geometric changes or material variations.



Overview of the user interface and material definitions

Useful for the analysis of an end product, the draping capabilities of ANSYS Composite PrepPost software allow users to correctly identify the exact orientation of every layer of the composite. A flat-wrap capability and the ability to create ply books help in product manufacturing.

The product works with the ANSYS® Mechanical™ interface in the ANSYS® Workbench™ environment and composite structure designs can be automated through its integration with the ANSYS Mechanical APDL interface for advanced scripting.

The ANSYS Advantage

With the unequalled depth and unparalleled breadth of engineering simulation solutions from ANSYS, companies are transforming their leading edge design concepts into innovative products and processes that work. Today, 97 of the top 100 industrial companies on the "*FORTUNE* Global 500" invest in engineering simulation as a key strategy to win in a globally competitive environment. They choose ANSYS as their simulation partner, deploying the world's most comprehensive multiphysics solutions to solve their complex engineering challenges. The engineered scalability of our solutions delivers the flexibility customers need within an architecture that is adaptable to the processes and design systems of their choice. No wonder the world's most successful companies turn to ANSYS — with a track record of almost 40 years as the industry leader — for the best in engineering simulation.

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