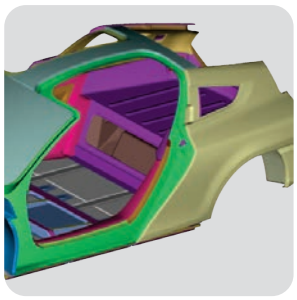
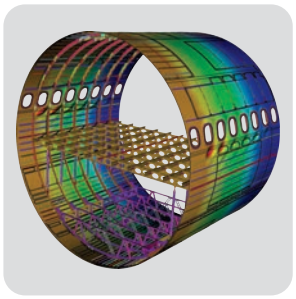
ANSA
PRE PROCESSOR

META
POST PROCESSOR

CAE tools for products made of composite materials




BETA
SIMULATION SOLUTIONS

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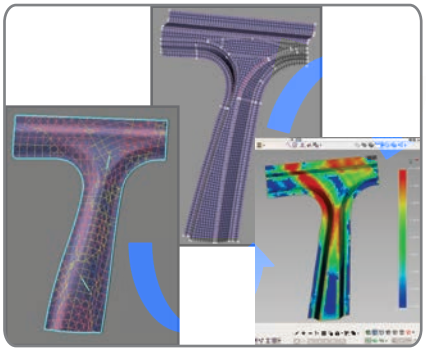
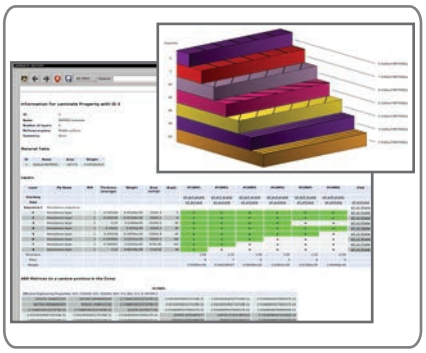
Composite materials demonstrate significant advantages such as weight saving potential, increased strength and greater design flexibility. However, these are combined with design restrictions. In order to fully exploit the composite materials potential, cost and time effective design, analysis and manufacturing processes are required.
New software tools are offered by BETA CAE Systems for the modeling, simulation and analysis of the behavior of products made of fiber reinforced laminated composites. These tools, combined with the rest of the high performance functionality of the complete pre- and post-processing environments of ANSA and META software suite, offer a unique solution for the simulation of products that include parts made of composite materials.



ANSA Laminates Tool

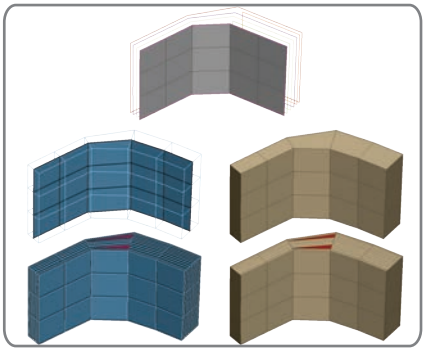
Using the **Laminates Tool**, in combination with a collection of software features of ANSA, the analyst can master the laminates model to be submitted to the solver. ANSA enables the analyst to perform automatically, or through a graphics user interface and with the assistance of comprehensive interaction, several distinct tasks, such as:



- Building, handling, and modifying all Layers and Sequences (Groups of Layers), without any concern for the solver induced constraints, exploiting a special Laminate Property generated in ANSA.
- Visualization, check and modification of the material orientation of shell, thick shell and solid elements.
- Check of the material definition.
- Synchronization of material definition with available material database.
- Review of the orientation and thickness values, per layer, through a comprehensive report.
- Check of the laminates property, by acquiring report on nominal thickness and orientation of fabrics.
- Generation of summaries and reports of the laminates model.

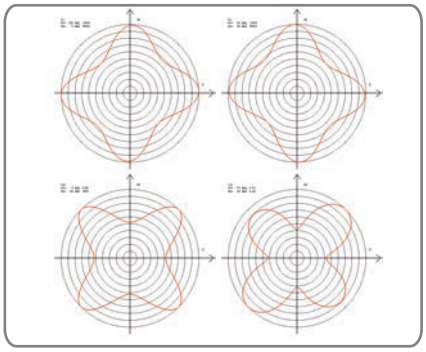
- Visualize variation of effective engineering properties by orientation angle with the aid of polar plots.
- Preview of how the laminate property is outputted to each solver.
- The final laminates definitions, based on the FEA model as is prepared to be submitted to the solver, can be outputted and fed back to the CAD-based composites design software.

Bidirectional CAD communication



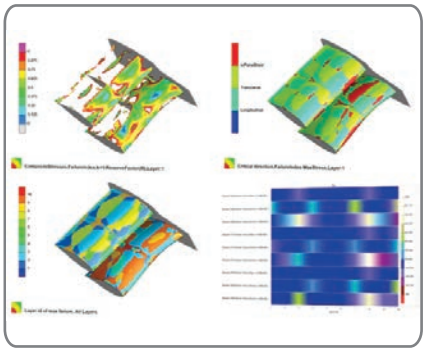
- Mapping of the laminate information, derived from CAD-based software, to the discipline specific finite element mesh model within ANSA, using the ANSA Results Mapping tool. The mapping procedure leads to the lossless assignment of material orientation, material definition, element thickness per layer and element orientation per layer attributes to the CAE meshed parts.
- Generate and output to CAD updated layer boundaries and layer attributes.
- Create 3D-curves or STL surfaces of plies to propagate the geometry back to the design.

Integrated Draping tool



- Integrated draping algorithm capable of simulating fabric orientation for single and woven layer.
- Material and layer orientation as well as woven layer thickening are calculated.
- Fiber shearing and thickness variation is previewed with comprehensive fringe plots of the structure.

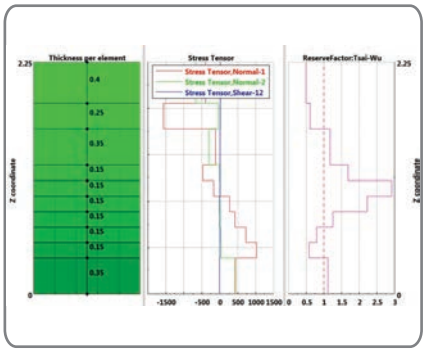
Thick shell and solid laminates



- Thick shell and solid laminates supported for all solvers.
- Conversion of shell to single or per-ply, thick shell or solid laminates.

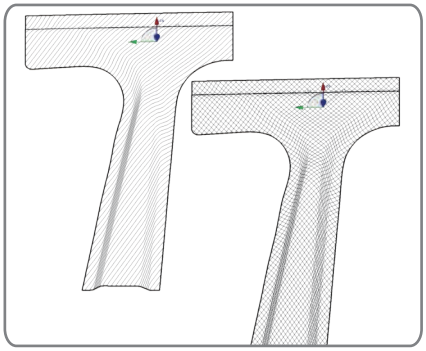
META CompositePost Toolbar

Analysts demand to evaluate results of intricate products and complex simulation models in a high-performance manner, with direct references to the initial materials of the design process. Therefore, special consideration is given to the provision of automated tools for the post-processing of results deriving from the analysis of products from laminated composites.



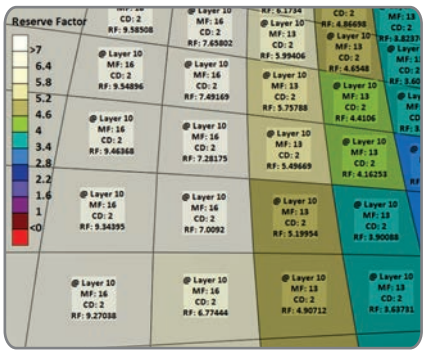
The solver results from the analysis of products made of composite materials can be processed for evaluation, report generation and decision making towards the design improvement. In order to accommodate the requirements of the analysis of these results, META offers the **CompositePost Toolbar**, a set of integrated specialized functionalities, collected into a single user interface.

This collection of functions offers:



- Visualization and inspection of layers as they were defined in pre-processing.
- Set up of material limits.
- Calculation, within META, of Failure criteria (Tsai-Wu, Puck, etc.), VDI 2014 Part III
- Identification of the layer with the max failure.
- Identification of critical directions.
- Identification and isolation of failed elements.
- Plot of stress tensor results across each element thickness.
- Re-evaluation of failure criteria after modifying material limits.

This set of functions is integrated to the complete post-processing environment of META, therefore, the analyst can end up with an automatically generated report to be used as a decision making tool towards the improvement of the product design.

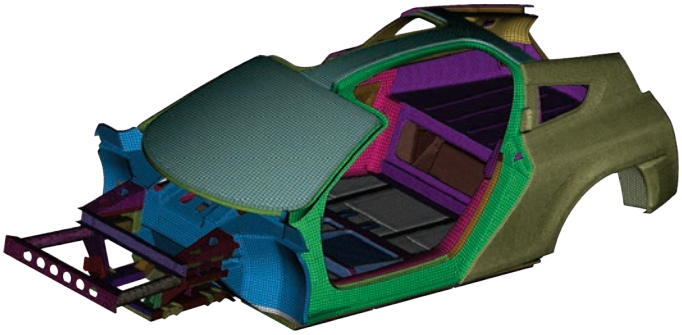


Supported solvers

- Nastran (MSC, NX), Abaqus, LS-DYNA, ANSYS, PAM-CRASH, PERMAS, RADIOSS

Full-product simulation

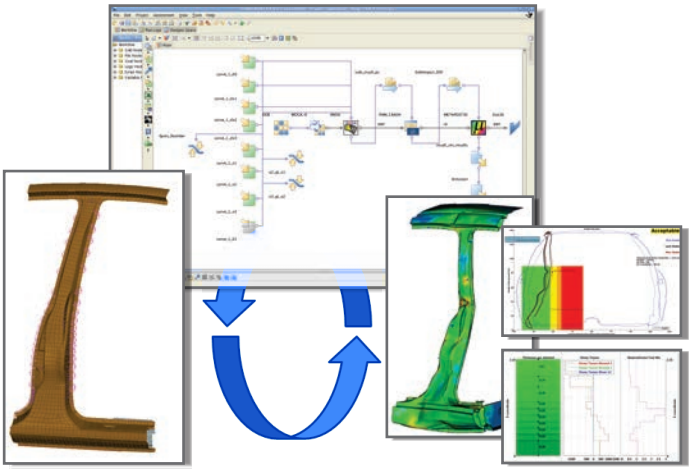
ANSA pre-processor and META post-processor software suite has a proven record of complete CAE model buildup and analysis results handling. The software meets the Industry's requirements and exceeds legacy procedures expectations, due to the level of automation and customization they offer. The implementation of laminates modeling and analysis functionality into ANSA and META, with full product model handling capabilities, enables analysts to:



- build and handle model variants,
- handle efficiently the model updates,
- assemble models using a large number of standard and customizable connection types, and
- perform multidisciplinary modeling and processing of analysis results for numerous FEA solvers and analysis types.

Optimization

The capability of ANSA and META to be coupled with numerous optimizers and the ability to return the design and properties changes to the CAD-based composites design tools, allow the design of products, which include parts made of composite materials, to be easily optimized.



Benefits

- Tight interfacing with CAD-based composites design tools, so analysts access the same CAD master model of a composite part in its to-be-manufactured state.
- Two-way interaction between designers and analysts, allows the multiple iteration of design changes.
- Solver & discipline neutral modeling removes all solver induced restrictions.
- Parallelized modeling for numerous solvers.
- Deal with composite parts properties and detailed composite lay-up descriptions, with the level of abstraction required by each analysis type.
- Handle full-model built-up of models comprised of a large number of parts, of a variety of materials and properties, and joined by numerous connections of different type.
- Building and handling of model variants.
- Monitoring of model updates.
- On the fly handling of Zone and Ply definitions.
- Propagation of design changes and updated ply boundaries back to the CAD-based design tools.
- Automated calculations, graphs and report generation based on analysis results
- Comprehensive identification of layers and propagation of the identification information throughout the process.
- Results evaluation with direct references to the initial materials of the design process.
- High level of automation and customization.
- Incorporation of laminates design into optimization cycle.
- Designers and analysts still focus on their domain of expertise, using their own software tools.

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