Powerful tools for composite nonlinear analysis
Improve accuracy, efficiency, and convergence for the simulation of composite materials

Composite simulation tools within your FEA code help you make better design decisions earlier in the development process. Using advanced capabilities such as progressive failure to provide insight into failure loads and modes to help you reduce redesigns.

Autodesk® Helius PFA software is an add-on for commercial finite element analysis (FEA) programs that is designed to improve accuracy, efficiency, and convergence in composite material simulations. Simulating failure of composite structures earlier in the design process makes it possible to validate designs before experimental testing, which helps to reduce testing time, cost and helps you make great products.

Developed specifically for composite materials, Helius PFA replaces traditional generalized analysis with advanced technologies for structural analysis and simulation. It delivers many powerful capabilities, including an efficient multiscale approach for the analysis of material nonlinearity, progressive failure and composite delamination as well as methods to reduce mesh sensitivity.

Helius PFA addresses a range of composite analysis types, such as fatigue, nonlinear static, and explicit simulation scenarios. It supports multiple material types including chopped and continuous; unidirectional, plain, 4, 5, and 8 harness weaves. These and other diverse capabilities combine to help you address the unique challenges in the structural simulation of composite materials.

Improved accuracy

Traditional methods treat composite lamina as homogeneous materials with uniform properties throughout. In contrast, Helius PFA is based on the multicontinuum theory which computes stresses and strains for all composite constituents. The result: better damage initiation and more accurate prediction of damage propagation at the fiber and matrix level.

Features and benefits

- Seamless integration into Abaqus/CAE, ANSYS, and MSC SOL 400 platforms for easy adoption
- Transfer as-manufactured information from Autodesk® Moldflow® to an Abaqus structural model
- Support for a wide variety of 2D and 3D elements
- Easy-to-interpret results
- Smooth integration of widely used material data
- Robust convergence through IDS method
- Quick and easy conversion of legacy models

Built for efficiency

Helius PFA includes built-in convergence enhancements formulated specifically for composite materials. These enhancements work with the FEA solver to strengthen the solution process and significantly reduce simulation run-time without the use of viscosity.

Easy adoption

Integrate Helius PFA seamlessly with leading FEA packages, even those already in use within your organization, helping you to produce better results. There’s no need for expensive, difficult-to-obtain material characterizations; instead, quickly get started with the extensive database of commonly used materials, or use standard test data to easily characterize new materials and add the results to the database.
Fatigue analysis

Composite materials have many advantages, one being their resistance to fatigue. Helius PFA works with conventional FEA software to simulate the progressive fatigue response of composite structures. Even after multiple applied cycles, information about both the damaged state and the ultimate fatigue life of the structure is provided—allowing you to make more in-depth decisions earlier in the design process.

Multiscale analysis

Using a multiscale approach, Helius PFA gives you the ability to initiate and view damage effects at the constituent fiber and matrix level, supporting identification of multiple modes of damage and the resulting composite responses. Together, these capabilities support physically realistic damage initiation and propagation in your finite element analysis.

Delamination

Delamination creates separation between plies, stopping all load transfer between those plies, which can significantly affect the failure mode of a structure. Helius PFA helps predict intra-ply and inter-ply failure simultaneously by simulating the effect of delamination, giving you a more accurate understanding of both the load path and the best options for its modification.

As-manufactured simulation

Understand the structural analysis of your fiber-filled parts and identify material nonlinearity and failure early in the design cycle. Transfer manufacturing simulations to structural simulations and map material data and fiber orientations from Autodesk Moldflow simulation software to your Abaqus structural model. Use the information to conduct a more accurate simulation of the fiber-filled material, including predicting material nonlinearity from plastic deformation and simulating matrix cracking during the structural analysis.

Mesh sensitivity

Take advantage of the energy-based material degradation evolution model to help control the rate of material degradation for your composite structure. Adjust your effective strain measure to eliminate much of the mesh dependency and support understanding of global failure prediction.
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