

# Pro/ENGINEER® Advanced Mechanics

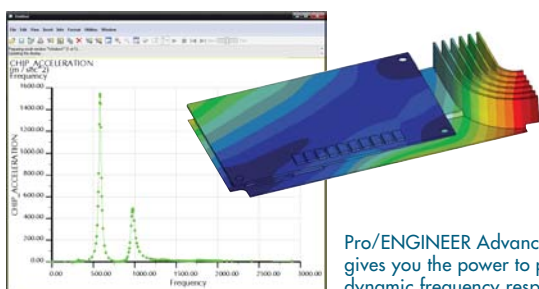
THE OPTIMAL TOOL FOR SIMULATING REAL-WORLD PERFORMANCE

Few companies today – if any – can afford the time and cost of building a new physical prototype with every new design iteration. Instead, today's top development teams are relying on Pro/ENGINEER Advanced Mechanics to perform comprehensive structural and thermal simulation – on the desktop – long before committing significant time and money to physical prototypes. There's simply no better tool on the market for early insight into product performance.

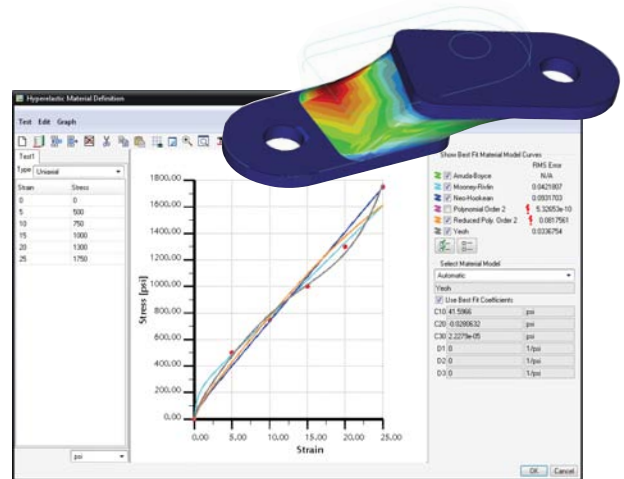
Facing the pressure to deliver higher quality products on ever-tightening schedules, companies are adopting computer-aided engineering (CAE) tools as an intrinsic part of their design processes.

Pro/ENGINEER Advanced Mechanics expands the power of Pro/ENGINEER Mechanical, providing an even broader set of analysis capabilities such as nonlinear deformation, transient thermal, vibration and failure analysis. You'll also have more options to model advanced, real-world conditions such as rigid or weighted links, orthotropic and transversely orthotropic materials, advanced springs and preloaded bolt fasteners.

By giving engineers early insight into design performance, Pro/ENGINEER Advanced Mechanics enables product development organizations to easily meet exacting requirements. With this knowledge, engineers have the freedom to explore new ideas and design variants, while optimizing their designs. Better yet, it saves time by reducing the number of changes during physical prototyping. It saves even more time by offering greater options to simplify the model in preparation for analysis. For example, in Pro/ENGINEER Advanced Mechanics, users can idealize components in an assembly down to point masses whose properties are associative back to the original components.



Pro/ENGINEER Advanced Mechanics gives you the power to perform dynamic frequency response analyses.



Pro/ENGINEER Advanced Mechanics simulates nonlinear, hyper-elastic behavior and allows you to define material properties with your own test data.

For any simulation tool to be adopted as an integral component of the product design process, it must be fast and easy to use, plus it must provide accurate results while satisfying functional needs. As a Pro/ENGINEER simulation add-on, Pro/ENGINEER Advanced Mechanics delivers all these capabilities because it employs the same user interface, workflow and productivity tools that are prevalent throughout Pro/ENGINEER. Thus, designers can leverage their familiarity with the proven power of Pro/ENGINEER for model creation and collaboration. Also, since the model files store simulation-modeling data, engineers can streamline data management issues.

## Key Benefits

- Greater confidence in your design's ability to satisfy performance requirements
- Understand a product's ability to satisfy structural and thermal performance requirements by testing the design as it develops
- Mitigate the risk of failure and drive first-time build success by leveraging the integrated design and analysis environment, and by starting analysis earlier in the design cycle
- Reduce product cost and design time by identifying and addressing design flaws before committing to costly physical prototypes
- Produce the highest quality designs by modeling complex real-life conditions and using advanced capabilities such as failure analysis
- Save time by having even more advanced tools, along with the flexibility to simplify the model

# Pro/ENGINEER Advanced Mechanica

## Features and Specifications

Pro/ENGINEER Advanced Mechanica has all the capabilities of Pro/ENGINEER Mechanica, plus the following advanced simulation capabilities:

### Simulate a broader range of analysis types

- Advanced nonlinear capabilities:
  - Large deformation
  - Hyper-elastic materials
- Pre-stress static analysis, including stress-stiffening effects
- Pre-stress modal analysis, including spin-softening effects
- Transient thermal analysis
- Dynamic analyses for:
  - Time response
  - Frequency response
  - Random response
  - Shock

### Support for Advanced Connection Definitions

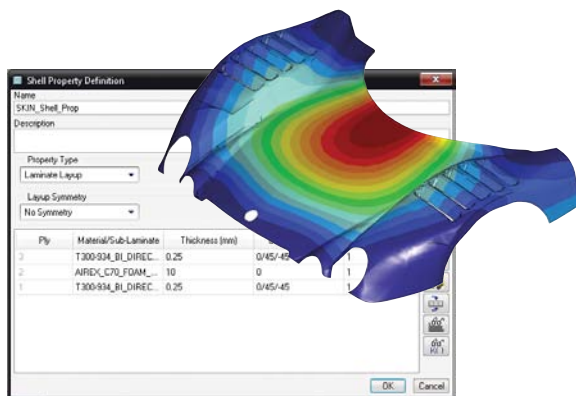
- Use Rigid Links to bond geometry together as a rigid body
- Use Weighted Links to couple a point to the average of the displacements of a set of referenced geometry
- Easily add infinite friction to individual contact regions
- Model thermal resistance between components

### Laminate Modeling Capabilities

- Support for orthotropic and transversely orthotropic materials
- Tsai-Wu, Maximum Strain, and Maximum Stress failure criteria
- Define shell properties with a laminate ply editor
- Flexible options to view results by ply or relative to material orientation

### Access to More Sophisticated Idealization Types

- Mass idealizations defined by component or the full inertia tensor
- Spring idealizations defined by the stiffness matrix including off diagonal terms
- Define advanced conditions for bolt fasteners such as pre-load, stiffness properties and coupling control
- Shell idealizations support for material orientations and non-isotropic material definitions
- Define advanced material properties with your own test data



Quickly and easily define laminate shell properties to realistically simulate product behavior.

### 2D Model Support

- Plane Strain
- Plane Stress
- 2D axis-symmetric

### Advanced FEM Mode Support

- Hierarchical meshing: assemble meshed models from lower-level components into higher-level assemblies
- Rigid- and weighted-link support
- Laminate support to NASTRAN with PCOMP and PSHHELL export options

### Language Support

- English, German, French and Japanese

### Platform Requirements

- Microsoft Windows (Vista and XP)
- UNIX platforms (Solaris and HP-UX)

For specific operating system levels, visit:

[www.ptc.com/partners/hardware/current/support.htm](http://www.ptc.com/partners/hardware/current/support.htm)

### The Pro/ENGINEER Advantage

Pro/ENGINEER is simple to learn and use, and is available in a variety of packages designed to meet your company's specific needs. Whether you need a cost-effective 3D CAD system that contains all the basic design capabilities or a comprehensive Product Development System that seamlessly connects your extended supply chain, you'll find exactly what you need in a single, fully scalable solution. Choose the package that fits your needs today. As your needs change and grow, you can easily upgrade to the package that is right for you tomorrow which leverages the same powerful platform—this means no data translation and a consistent user experience.

With every Pro/ENGINEER add-on module, you gain an advantage over any other CAD/CAM/CAE product, due to the power of associativity. Because all Pro/ENGINEER modules share the same architecture, you don't have to worry about translating model information between applications, which wastes time and often introduces errors in your design. Once you modify your model in the design environment, you can instantly rerun the analysis in Pro/ENGINEER Advanced Mechanica. You don't waste a minute setting up the simulation again and again with each design change. Also, the Materials Library gives you central access to material properties, including structural and thermal properties, throughout all Pro/ENGINEER modules. By giving you full associativity across CAD, CAM, and CAE functions, Pro/ENGINEER offers a level of speed and ease that's second to none.