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Siemens PLM Software

Top ten reasons to buy Femap with NX Nastran

White Paper

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Top ten reasons to buy Femap with NX Nastran

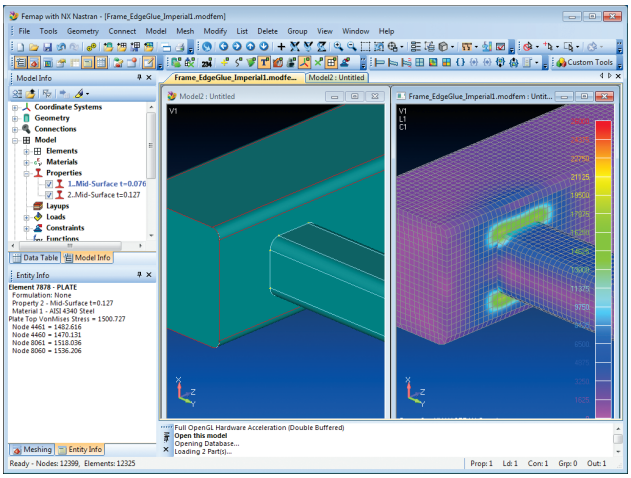
This white paper presents just a sample of the many technical and commercial reasons for investing in Femap™ with NX™ Nastran® software that clearly show why Femap with NX Nastran is the leader for FEA pre- and post-processing and solution in many markets including aerospace, defense, heavy industry, shipbuilding and general mechanical engineering.

For more information on Femap with NX Nastran, go to: www.siemens.com/plm/femap

This document is intended to help you understand the strengths of Femap with NX Nastran. The following section lists the top ten differentiators that distinguish Femap with NX Nastran and its capabilities.

1. Usability

Designed specifically as a native Windows application, Femap offers comprehensive analysis functionality that is easy to use and quick to learn. Key features promote usability and efficiency, including dynamic viewing, color and screen management, multiple model access and multiple undo steps – all within an intuitive user-friendly interface based on an up-to-date Windows look and feel. User interface panes include Model Info and Entity Editor that allow direct access to analysis modeling data without having to navigate a menu system. Similarly, the Data Table pane allows direct access to post-analysis results data. Also available is the comprehensive help menu and online help resources.



An efficient on-screen working environment reduces training overhead and allows engineers to maintain maximum productivity even when Femap is being used on an occasional basis. The learning curve for Femap is very short. Typically, FEA knowledge engineers can become productive in the use of the software after only two days of training.

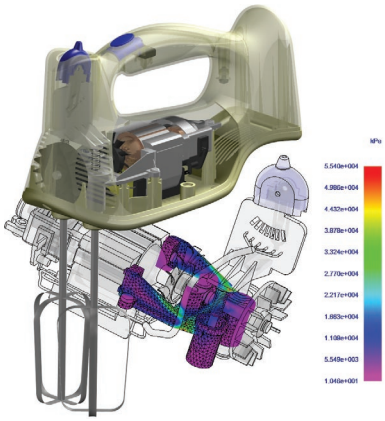
Competitive advantages

- User friendly, Windows-native, command and menu system that includes up-to-date Windows style user interface that is easily customizable
- Superior color, model entity and group display control
- Fast learning curve that reduces the necessary time investment before productivity returns can be gained
- The quick-to-learn user interface allows maximum productivity to be maintained, even with occasional use
- Unique and specialized display panes – such as the Model Info tree and Data Table – allow direct access to analysis modeling and results data enabling rapid creation and editing of models and fast comprehension of results

> "It's the small things that make Femap with NX Nastran more user-friendly, and the ease of working with it makes you want to do more analysis."
>
> *Joe Brotherton*
> *Director of Product Development*
> *KIC Holdings*

2. CAD access

You can leverage the design model in your 3D CAD system by importing the CAD model directly into Femap and using it as the basis for the simulation model. Femap offers neutral CAD support that enables analysts and engineers to import CAD data reliably from a wide variety of sources. Femap leverages the Parasolid modeling kernel that allows direct access to Parasolid data for surface and solid modeling, and provides robust advanced geometric tools necessary to access non-Parasolid geometry. In addition, Femap is associative with Solid Edge.



Competitive advantages

- Robust CAD import capabilities
- Supports all major CAD programs and data formats
- CAD-independent solution with most types CAD data access available in the base module

> "Femap's ability to import geometry enhances the quality of the analysis. This feature of Femap lets us add more detail to the models so we get more accurate results."
>
> *Jan-Erik Larsson*
> *Head of Engineering*
> *RUAG Aerospace Sweden Mechanical Products Division*

3. Geometry preparation tools

CAD models often contain problematic geometry such as sliver surfaces which, while are not important for the CAD modeling considerations can hinder simulation model creation with potential generation of bad elements and discontinuities. Preparation of geometry in readiness for finite element model creation and meshing is a task that can typically be laborious and time consuming. Femap works well with imported CAD data and offers interactive geometry clean up, removal and modification tools to identify and heal potentially problematic geometry efficiently and easily. Femap also has the ability to automatically clean up geometry and remove or suppress unwanted small features not required for analysis. In addition, Femap offers additional capabilities in the interactive toolboxes that can modify and prepare the geometry for meshing, such as surface splitters, and combination curves and surfaces.

Competitive advantages

- Robust import editing and modification of complex 3D geometry
- Easy identification and clean up of potentially problematic geometry
- Interactive geometry modification toolbox to prepare geometry for meshing
- Automatic geometry cleanup capability

> "We were able to import the geometry into Femap and very quickly produce different finite element models. Then we ran a number of analyses that gave the customer the answers they needed in time for the design review. With Femap and NX Nastran, we can provide that kind of turnaround."
>
> *Mike Pagnotta*
> *President*
> *Pagnotta Engineering*

4. Preprocessing, modeling and visualization

With complete exposure to all finite entities and data, the need to effectively control entity display and graphics visualization is paramount. Femap includes an impressive array of versatile modeling, display and visualization tools to aid finite element model creation and verification prior to analysis. Visualization options include model transparency, clipping plane, dynamic graphics viewing and the ability to interactively display and manage view options, groups and model entities.

The depth of the model setup functionality allows for intuitive load and boundary condition creation, including support for demanding loading definitions required by more advanced types of analyses such as heat transfer and dynamics. Data surfaces and data mapping functionality is also available in Femap and can be used to set up complex loading conditions including the transfer of results efficiently from one analysis into loading functions for a subsequent analysis. Femap also provides more advanced equation-based and function-based methods for defining loads.

Femap modeling capabilities support the creation of contiguous weldment models, and include powerful mid-plane extraction functionality that can easily turn thin-walled solid structures into plate type finite element meshes for accurate and efficient solutions. For assembly models automatic contact detection is available that can quickly and easily determine all contact areas which may then be defined to simply in contact or glued together.

Femap also supports powerful beam modeling capabilities, including a beam cross-section tool.

Competitive advantages

- Complete exposure to all finite element entities and data
- Easy to use visualization management and viewing tools
- Ability to apply loads and boundary conditions both directly to the geometry model, or to the FE entities created after meshing
- Advanced load definition methods that can be equation or function based
- Efficient data surfaces and data mapping capabilities
- Efficient mid-plane extraction of solid thin-walled structures for plate model creation
- Beam modeling and cross-section tool

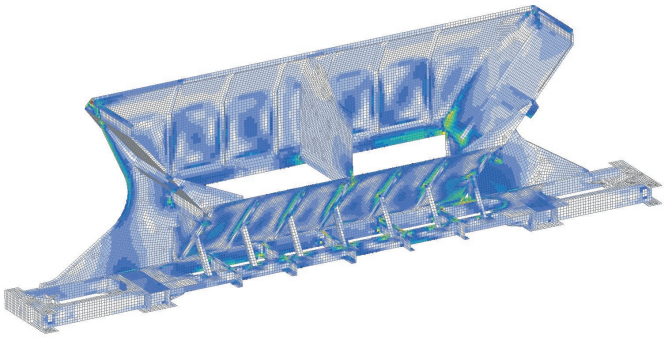
> "Our design team is taking advantage of and realizing great value with advanced modeling and analysis functionality."
>
> *Gary Davidson*
> *Director and Principal Structural Design Engineer*
> *Revolution Design*

5. Meshing

Femap incorporates powerful 3D solid and surface meshers capable of producing top quality meshes automatically. Femap also provides full control of geometry meshing through a comprehensive set of meshing toolboxes that enable meshes to be modified and edited interactively, while simultaneously providing element quality feedback. Use of these tools allows efficient and accurate meshes to be created quickly and easily. Also available are unique modeling tools that facilitate 3D hex meshing and multi- and mid-surface modeling and meshing.

Competitive advantages

- Robust automatic finite element meshers
- Easy high quality mesh creation that ensures accurate results
- Full control over mesh creation and editing
- Interactive mesh editing toolboxes with live element quality feedback
- Unique 3D hex mesh creation tools



Courtesy of Cideon Engineering GmbH.

"Creating meshes with multiple element types is much easier in Femap than anything else I've dealt with."

Ron Heberlein
Senior Mechanical Engineer
Columbia Helicopters

6. Analysis functionality and scalability

Femap offers a very high level of integration with NX Nastran, and supports NX Nastran high-level analysis functionality with an intuitive user interface. This provides both occasional users and full-time analysts with a complete simulation system that can solve complex engineering problems in a straightforward manner. Femap with NX Nastran supports advanced dynamics and nonlinear solutions, including random response, response spectrum, material and geometric nonlinearity with time dependent loading, and rigid and deformable body contact. Other advanced analysis options include implicit integration nonlinearity, rotor dynamics, aeroelas-ticity, advanced thermal analysis solutions, and 3D computational fluid dynamics. Femap with NX Nastran provides the tools necessary to get the job done, no matter what your engineering problem demands.

Competitive advantages

- A very high level of integration with the industry standard NX Nastran solver
- User interface support for advanced NX Nastran capabilities including dynamics, design optimization, advanced nonlinear, rotor dynamics, aeroelasticity
- User interface support of the TMG solvers advanced thermal and fluid flow analysis capabilities
- Base Femap with NX Nastran module that provides a wealth of analysis functionality including heat transfer and nonlinear capabilities, as well a linear and glued contact functionality

"We have we set ourselves up with an advanced solution that lets us perform a complete range of structural and thermal analyses. With the Siemens PLM Software (solutions), we can handle any analysis application related to space."

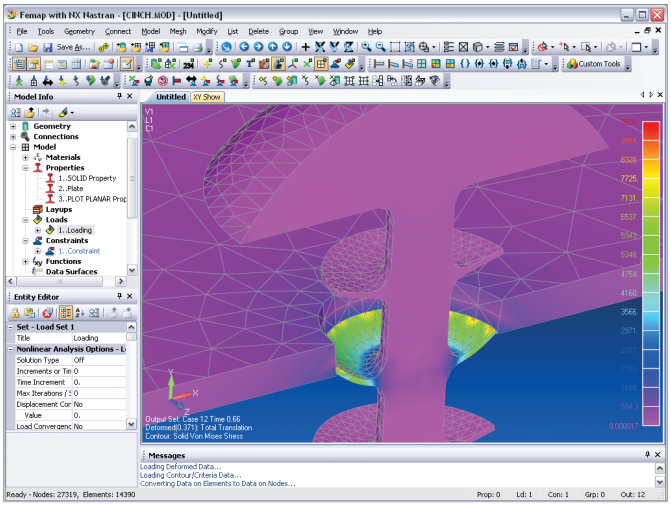
Nicolas Étienne
Mechanical Group Leader
ABB Bomem

7. Solver support

A major strength of Femap is solver neutrality. Femap offers access to all the main commercial analysis solvers with the ability to handle data peculiarities of the individual solver types easily and efficiently within its database, and without having to manually change solver preferences. Full access to all supported solver types is available within the base Femap module precluding the need to purchase any additional add-on modules.

Competitive advantages

- Base Femap module supports access to all main commercial solver preferences – no add-on modules are required to be purchased
- Femap support for all solvers is inherent in the program – no solver preference switching is necessary



"What makes Femap unique is that it is independent. It doesn't have a particular solver preference and it isn't aligned with a particular CAD program. It supports them all."

George Laird
President
Predictive Engineering

8. Postprocessing

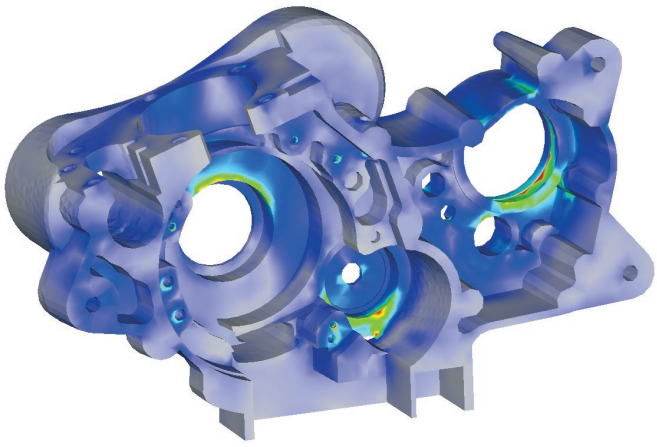
Post solution, Femap offers more results processing tools to enable quick and efficient understanding of the behavior of the system under analysis. Postprocessing tools include time animations, streamlines, cutting planes, free-body diagrams, grid point force balance, bar and beam visualization with results display on the beam cross section, shear and bending moment diagrams, and user-defined reports. Furthermore the Femap Data Table offers versatile results data processing functionality after the analysis has been completed.

Competitive advantages

- Comprehensive postprocessing display and reporting tools that facilitate faster comprehension of model behavior and results
- Data manipulation post analysis with the Data Table
- Versatile results combination and post-analysis manipulation
- User-defined report generation
- Beam visualization and results display options

"One of Femap's most important advantages is ease of use. For example, you can easily control how you want to view the data in postprocessing. That is one area in which Femap is extremely strong."

Milan Bure
Structural Engineer
Evektor-Aerotechnik



Courtesy of Predictive Engineering, Inc.

9. Customization

Femap offers a comprehensive set of customization tools including a fully featured application programming interface (API) and a facility to record, edit and play user-defined macros.

The powerful API capability provides full access to all Femap functionality and allows external OLE/COM compliant programs such as Excel and Word to interact with Femap. Also available is a full-featured programming environment inside the Femap user interface that includes an interactive program debugging capability.

With the macro capability, macros can be leveraged to record particular processes or workflows and facilitate the automation of repetitive modeling or analysis tasks.

Competitive advantages

- Ability to extend Femap capabilities and add new applications
- Interface with other external programs such as Word and Excel
- Direct access to all Femap functionality
- Program using standard visual Basic language or industry standard programming languages – no special or proprietary programming knowledge required
- Ability to record, edit, debug and playback user-defined macros directly in the Femap interface

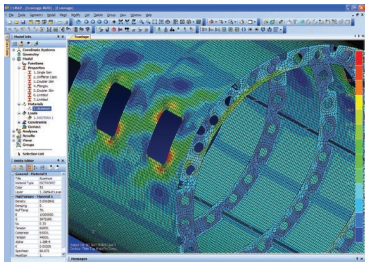
"Individual load results can be easily taken from the model and migrated to Microsoft Excel with the click of a mouse for specific evaluations. The ability to create a multitude of load types using the API facilitates recurring analysis tasks and saves a huge amount of time."

Jyrki Majamaeki
Femap User
Eurocopter

10. Product quality

The Femap development team has remained constant for over 20 years, and the future functionality development is subject to a consistent planning process that follows a well defined roadmap. The Femap product releases regularly every few months and contains powerful new functionality that is guided largely by the user base. Unique functionality added to Femap in the last couple of releases includes the following:

- Updated user interface to reflect the latest Windows look and feel
- Customization with the application programming interface
- Assembly model management which includes automatic assembly detection
- Linear contact
- Glued connection for connecting differently meshed components
- Results data mapping
- Support for the fast sparse solver



- Analysis extensions – DDAM, rotor dynamics, composite laminates, bolt preload support
- 64-bit support
- Meshing enhancements – new automatic 2D and 3D meshers, meshing toolbox with interactive geometry cleanup/meshing/quality visualization
- Model group and entity display
- Support for advanced NX Nastran capabilities including rotor dynamics and aeroelasticity

With a consistent development team committed to high quality product advancement through the provision of robust functionality, Femap is set to have a very strong future.

Competitive advantages

- High value for maintenance fees and consistent, ongoing product functionality improvements
- Commitment to ongoing product development and enhancements
- Commitment to quality assurance
- Development team continuity

"Finite element modeling methods have improved with the new software due to the vast but specific pre-analysis tools available for model definition, as well as post-analysis tools for results review, including the ability to sift through huge amounts of engineering results data with minimal effort and computer resources. These changes have significantly improved productivity."

Ben Teffell
Engineering Manager
Aquila Engineering

Siemens PLM Software

Headquarters
Granite Park One
5800 Granite Parkway
Suite 600
Plano, TX 75024
USA
+1 972 987 3000

Americas
Granite Park One
5800 Granite Parkway
Suite 600
Plano, TX 75024
USA
+1 314 264 8287

Europe
Stephenson House
Sir William Siemens Square
Frimley, Camberley
Surrey, GU16 8QD
+44 (0) 1276 413200

Asia-Pacific
Suites 4301-4302, 43/F
AIA Kowloon Tower, Landmark East
100 How Ming Street
Kwun Tong, Kowloon
Hong Kong
+852 2230 3308

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