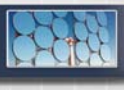
ALGOR®







INTERNATIONALIZED FEA SOFTWARE
简体中文
Deutsch
English
Español
Français
Italiano
SIX LANGUAGES

Structural

Structural analysis capabilities allow engineers to perform static stress analyses with linear and nonlinear material models. These analysis capabilities are all available within FEMPRO, ALGOR's easy-to-use, single user interface for finite element modeling, results evaluation and presentation.

MODELING

A suite of modeling capabilities includes:

- InCAD technology for direct CAD/CAE data exchange with Alibre Design, Autodesk Inventor, Inovate, IronCAD, KeyCreator, Mechanical Desktop, Pro/ENGINEER, Rhinoceros, Solid Edge and SolidWorks
- full associativity for each design change for most CAD solid modelers
- CAD support for 2- and 3-D CAD universal files
- Superdraw 2- and 3-D sketching tools
- 2- and 3-D parametric structured meshing
- automatic, unstructured 2- and 3-D meshing
- automatic, intelligent, feature-based mesh refinement and point-and-click definition of areas where a finer mesh is desired
- a midplane mesh engine for reducing thin, solid features in a CAD model to plate/shell elements with automatic handling of parts, assemblies, multi-thickness regions and mixed element type models
- an automatic, hex-dominant hybrid solid meshing tool to produce higher quality elements on the first pass and more accurate results

ANALYSIS

Structural analysis capabilities include:

- static stress analysis with linear and nonlinear material models
- multiple-body contact and interaction
- consideration of hydrodynamic, voltage-induced, load stiffening and geometric nonlinear effects as well as Hertzian contact, elastic and permanent deformation, local buckling, pre-stess, residual stress, thermal stress, creep and sub-modeling

RESULTS EVALUATION AND PRESENTATION

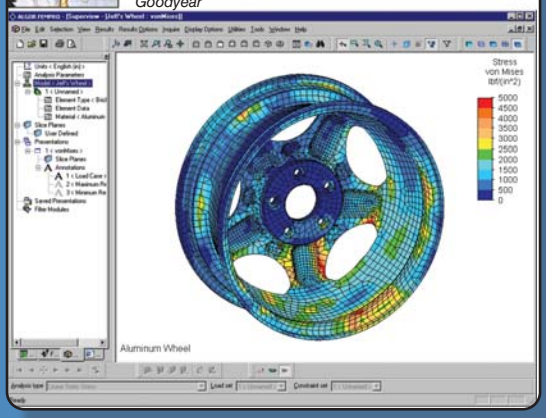
Extensive results evaluation and presentation capabilities include transparent display options, multiple-window displays, fast dynamic viewing controls and customization options including user-defined color palettes and annotations. All analysis results can be:

- displayed graphically as contours
- output in the BMP, JPG, TIF, PNG, PCX and TGA formats
- animated with AVI creation and display tools
- presented in text or HTML reports

Additionally, a stress linearization utility can be used to calculate the stress distribution through the thickness of 2- or 3-D thin-walled parts, such as pressure vessels, and compare the results to relevant ASME code requirements.

"One of the reasons I chose ALGOR for this project was its flexible meshing capabilities, which were needed for the complex geometry of the wheel."

John Stearns, Ph.D.
Goodyear



Goodyear engineers performed a linear static stress analysis on this aluminum automobile wheel, modeled in Pro/ENGINEER, in order to verify that safe stress levels were maintained in the wheel at zero inflation pressure for a new "run-flat" tire design.

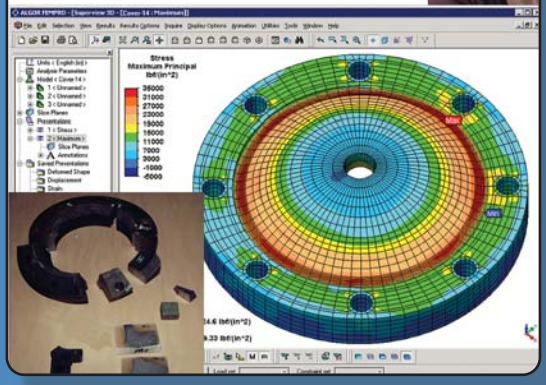
"Our skilled craftsmanship partnered with ALGOR's advanced technology resulted in a superior new yacht design."

Michael McClain
Hodgdon Yachts

Hodgdon Yachts used linear static stress analysis to improve a new, custom yacht design.

"We've found that ALGOR is an affordable solution for accurately proving the causes of product failures and then explaining those causes to our clients."

Anselmo Najera
Herrera, Stafford and Associates, LLC



Herrera, Stafford and Associates, LLC studied a compressor head cover using linear static stress analysis and laboratory tests to discover the root cause of its failure.

STRUCTURAL FEATURES

Analysis Capabilities
- Static stress with linear and nonlinear material models
- Multiple-body contact and interaction
- Hertzian contact
- Elastic deformation
- Permanent deformation
- Local buckling
- Pre-stress
- Residual stress analysis
- Thermal stress
- Creep analysis
- Sub-modeling
- Hydrodynamic effects
- Voltage-induced effects
- Load stiffening
- Geometric nonlinearity
- Weight, center of gravity and mass moment of inertia

Modeling
- KinePak mechanism wizard to define links and then dynamically examine the motion of various types of basic mechanisms
- See the FEMPRO (Part No. 3201.326) and CAD Support (Part No. 3201.331) product data sheets for additional modeling features

Meshing
- See the CAD Support product data sheet (Part No. 3201.331) for the complete list of meshing features

Element Library
- 2- and 3-D hydrodynamic element
- General contact element
- Contact element
- Coupling element
- Slider element
- Pipe element
- Spring element
- Pulley element
- 2-D element (planar, axisymmetric)
- 3-D truss element
- 3-D beam element
- 3-D membrane element
- 3-D membrane plane stress element
- 3-D plate element
- 3-D shell element
- Thin composite element
- Sandwich (thick) composite element
- Motion-enabled composite element
- 3-D brick element
- 3-D tetrahedral element
- Gap element
- Cable element
- Rigid element

Material Models
- Elastic
- Plastic
- Variable tangent
- Curve description
- Curve description with cutoff tension
- Drucker-Prager
- von Mises with isotropic hardening
- von Mises with kinematic hardening
- von Mises curve with isotropic hardening
- von Mises curve with kinematic hardening
- Temperature-dependent orthotropic
- Thermoelastic
- Thermoplastic
- Viscoelastic (thermal-creep)
- Viscoplastic (thermal-creep)
- Mooney-Rivlin (2, 5 and 9 constants)
- Ogden (1st - 6th order)
- Arruda-Boyce (thermal and finite-strain viscoelastic)
- Blatz-Ko (thermal and finite-strain viscoelastic)
- Hyperfoam (1st - 6th order)
- Linear elastic isotropic
- Linear elastic orthotropic
- Linear temperature-dependent isotropic
- Linear temperature-dependent orthotropic
- Piezoelectric
- General piezoelectric
- Anisotropic
- Temperature-dependent composite
- Composite laminate

Loading and Constraints
- Impact planes
- Point-to-surface and surface-to-surface contact
- Static friction
- Forces (nodal, surface, edge, gravitational and centrifugal)
- Moments
- Temperatures (nodal and surface)
- Voltages (nodal and surface)
- Prescribed displacements (nodal, surface and edge)
- Prescribed rotations (nodal, surface and edge)
- Pressures (surface and hydrostatic)
- Tractions
- Variable surface and distributed loads
- Global and off-axis constraints (nodal, surface and edge)
- Variable-stiffness off-axis constraints (nodal, surface and edge)
- End releases
- Local coordinate system support
- Lumped masses
- Mass moments of inertia
- Curing and mean temperature difference

Solver Options
- Symmetric sparse
- Skyline
- Algebraic multigrid (AMG) iterative
- Banded
- Riks method
- Restart capability
- Automatic time-stepping
- Parallel processing for multiple processors

Results Evaluation
- Result displays of:
  - Displacement
  - Stress
  - Strain
  - Plastic strain
  - Strain energy density
  - Reaction force
  - Factor of safety
  - Vector plots of principal stress directions
  - Plate/shell thickness
  - Isosurfaces
- AISC (ASD 1989) code checking
- Shear and bending moment diagrams
- Support for Tsai-Wu, Maximum Stress or Maximum Strain failure criteria for composites
- Stress linearization utility for use with a linear static stress analysis on 2- or 3-D thin-walled structures
- Fast Fourier Transform (FFT) display
- See the FEMPRO product data sheet (Part No. 3201.326) for additional results evaluation features

Results Presentation
- See the FEMPRO product data sheet (Part No. 3201.326) for the complete list of results presentation features

User Interface
- Timeline editor/viewer for viewing and editing the multiplier data associated with a time-dependent loading event
- See the FEMPRO product data sheet (Part No. 3201.326) for additional user interface features

Note: For complete details on our structural features, see the "Products" section of www.ALGOR.com. ALGOR's web site contains additional information about our wide range of simulation capabilities including static stress and Mechanical Event Simulation (MES) with linear and nonlinear material models, linear dynamics, fatigue, steady-state and transient heat transfer, steady and unsteady fluid flow, electrostatics, full multiphysics and piping.

TYPICAL APPLICATIONS

- Annealing
- Design optimization
- Impact analysis
- Infrastructure design
- Interference analysis
- Material transport and storage
- MEMS design
- Piezoelectric component design
- Press-fit
- Pressure vessel design
- Pre-stress concrete
- Product life cycle simulation (failure)
- Quenching
- Rotating machinery design
- Snap-fit
- Snap-through buckling
- Tolerance testing
- Tower design
- Underwater design optimization
- Wear analysis
- Wind load simulation

ALGOR, Inc.
150 Beta Drive
Pittsburgh, PA 15238-2932 USA

Phone 1.412.967.2700
USA/Canada 1.800.48.ALGOR
Fax 1.412.967.2781

info@algor.com
www.ALGOR.com

