ALGOR®

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

Multiphysics

Real-world mechanical behavior is often the result of several physical factors acting simultaneously and multiphysics software allows engineers to simulate a product's behavior when those multiple physical factors interact. User-friendly tools and wizards automate the application of results from one type of analysis to another. These analysis capabilities are all available within FEMPRO, an 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 with 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
- automatic, hex-dominant hybrid solid meshing to produce higher quality elements on the first pass and more accurate results

ANALYSIS

Multiphysics analysis capabilities include static stress and Mechanical Event Simulation (MES) with linear and nonlinear material models, linear dynamics, steady-state and transient heat transfer, steady and unsteady fluid flow and electrostatics.

In addition, FEMPRO features automated tools to:

- transfer temperature results to a static stress analysis, MES or electrostatic analysis
- transfer electrostatic results to a static stress analysis, MES or heat transfer analysis
- transfer fluid flow results to a static stress analysis or MES
- couple heat transfer and fluid flow analysis to accurately simulate natural, forced or mixed convection

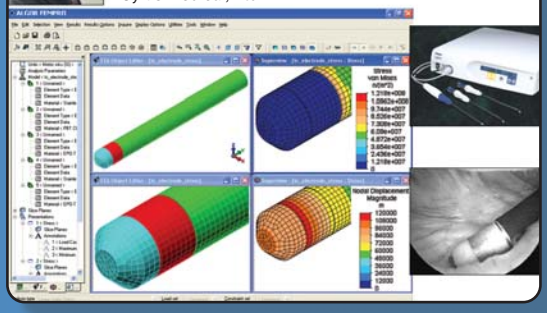
RESULTS EVALUATION AND PRESENTATION

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

"We used ALGOR multiphysics analysis software and practical testing for a fast, progressive method of concurrent design."

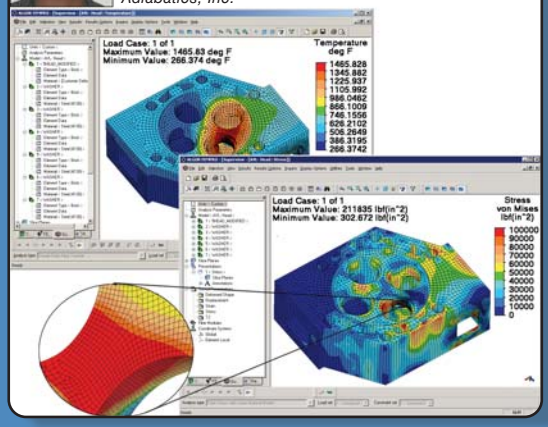
Mike Hagland
Gyrus Medical, Ltd.



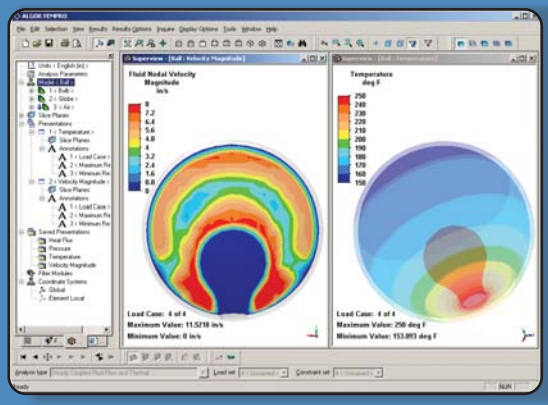
Engineers at Gyrus Medical, Ltd. used multiphysics software to determine the temperature and thermal stress distribution for this temperature control electrode, which heats soft tissue during arthroscopic surgical procedures.

"The highest thermal stresses coincided with the part of the cylinder head that had been leaking in the preliminary prototypes."

Vishwas Bantanahal
Adiabatics, Inc.



Engineers at Adiabatics, Inc. used multiphysics software to study the thermal and structural behavior of a cylinder head for a military vehicle diesel engine that was developing leaks during prototype testing.



ALGOR provides coupled heat transfer and fluid flow analysis to accurately simulate natural, forced or mixed convection. This capability was used to simulate natural convection in the air contained within the globe around a light bulb. The fluid flow velocity (left) and heat transfer temperature (right) results, produced by a single analysis process, can be viewed simultaneously in the Superview IV Results environment.

MULTIPHYSICS FEATURES

Analysis Capabilities
- Static stress with linear and nonlinear material models
- Rigid- and flexible-body motion with linear and nonlinear material models
- Natural frequency (modal)
- Natural frequency (modal) with load stiffening
- Response spectrum
- Random vibration
- Frequency response
- Transient stress (direct integration)
- Transient stress (modal superposition)
- Critical buckling load
- Steady-state heat transfer
- Transient heat transfer
- Steady fluid flow
- Unsteady fluid flow
- Steady fluid flow with turbulence
- Unsteady fluid flow with turbulence
- Flow through porous media
- Electrostatic current and voltage
- Electrostatic field strength and voltage
- Weight, center of gravity and mass moment of inertia
- See www.ALGOR.com for the complete list of analysis capabilities

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
- See www.ALGOR.com for the complete list of structural, thermal, fluid and electrostatic elements

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
- Thermal isotropic
- Thermal orthotropic
- Temperature-dependent thermal isotropic
- Temperature-dependent thermal orthotropic
- Fluid isotropic
- Fluid orthotropic
- Fluid isotropic power-law
- Fluid orthotropic power-law
- Fluid/thermal isotropic
- Temperature-dependent fluid/thermal
- Fluid/thermal ideal gas law
- Electrostatic isotropic
- Electrostatic orthotropic
- Electrostatic temperature-dependent isotropic
- Electrostatic temperature-dependent orthotropic
- Temperature-dependent composite
- Composite laminate

Loading and Constraints
- Initial velocities and rotations
- Impact planes
- Point-to-surface and surface-to-surface contact
- Static and dynamic friction
- Forces (nodal, follower, surface, edge, gravitational and centrifugal)
- Moments
- Temperatures (nodal, surface, initial and applied)
- Voltages (nodal and surface)
- Prescribed displacements (nodal, surface and edge)
- Prescribed rotations (nodal, surface and edge)
- Pressures (surface, follower 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
- Displacement vs. period, acceleration vs. period and G vs. period spectrum
- Acceleration and G power spectrum density
- Ground or base motion
- Acceleration and force excitation frequencies
- Convection (steady and temperature-dependent)
- Radiation (isolated and body-to-body)
- Heat flux
- Internal heat generation (steady and temperature-dependent)
- Rotating reference frames
- Automatic constraints of walls
- Prescribed velocities (nodal, surface and edge)
- Fan effects
- Applied voltages
- Current and charge density
- Curing and mean temperature difference

Solver Options
- See www.ALGOR.com for the complete list of solver options

Results Evaluation
- Result displays of:
  - Displacement, stress, strain, plastic strain, strain energy density, reaction force and factor of safety
  - Vector plots of principal stress directions
  - Static and time-dependent temperature distribution, heat flow and heat flux
  - Fluid flow velocity, pressure, vorticity and streamlines
  - Reaction force, stress tensor and maximum and minimum principal stress resulting from the flow of fluids
  - Vector plots of fluid flow velocity
  - Particle tracking of fluid flow
  - Voltage distribution
  - Steady-state flow of electric current
  - Current flow lines and vector plots
  - Force flow lines
- AISC (ASD 1989) code checking
- Shear and bending moment diagrams
- Stress linearization utility for use with a linear static stress analysis on 2- or 3-D thin-walled structures
- Fast Fourier Transform (FFT) display
- Automated tools for multiphysics simulation to:
  - Transfer temperature results to a static stress analysis, MES or electrostatic analysis
  - Transfer electrostatic results to a static stress analysis, MES or heat transfer analysis
  - Transfer fluid flow results to a static stress analysis or MES
  - Couple heat transfer and fluid flow analysis to accurately simulate natural, forced or mixed convection
- 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
- Automatic view factor calculator for determining the amount of radiation to be passed between bodies in a steady-state heat transfer analysis based on user-specified input
- Film/Convection Coefficient Calculator for open (external), closed (internal) and buoyant flows uses classical correlations to estimate the heat transfer coefficient between a solid and adjoining fluid
- See the FEMPRO product data sheet (Part No. 3201.326) for additional user interface features

Note: For complete details on our multiphysics 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.

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