ALGOR

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

Electrostatic

Electrostatic analysis capabilities allow engineers to simulate components exposed to electric current and fields. 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 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
- an automatic, hex-dominant hybrid solid meshing tool to produce higher quality elements on the first pass and more accurate results

ANALYSIS

Electrostatic analysis capabilities include:

- current and voltage analysis for predicting the outcome when an electric potential is applied to a conductive material, which results in a voltage and current distribution over the surface or throughout the volume of an object and its surroundings
- field strength and voltage analysis for studying electric fields around objects and analyzing dielectrics
- automatic transfer of electrostatic results to another analysis type (steady-state or transient heat transfer, static stress or Mechanical Event Simulation) for consideration of multiphysics effects including Joule heating, piezoelectric material response or electro-mechanical simulation

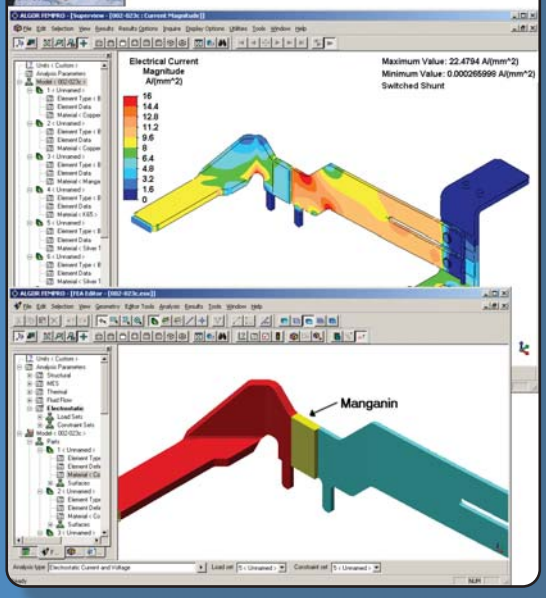
RESULTS EVALUATION AND PRESENTATION

A built-in graphics environment provides extensive results evaluation and presentation capabilities and features 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:

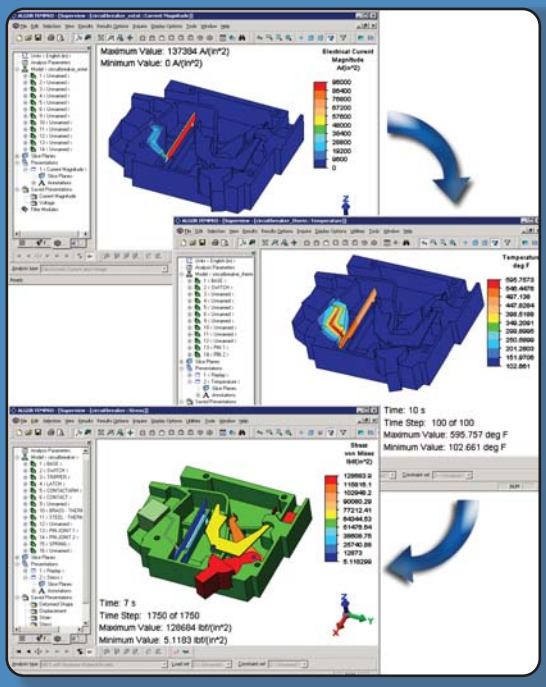
- displayed graphically as contours
- output in the BMP, JPG, TIF, PNG, PCX and TGA formats
- animated with AVI creation and display tools
- presented in text, HTML or PDF reports

"ALGOR's 3-D current flow capabilities are a great improvement over methods used in the past such as hand calculations and 2-D current flow programs. Now, we are able to use more complex 3-D shapes and achieve an accurate design with the first prototype."

Neil Rothwell
Consultant



As a consultant for Samuel Taylor, Ltd., Rothwell used electrostatic analysis to predict voltage and current density in this switched shunt for a Siemens Metering electrical meter. Based on the results, Rothwell changed the geometry to optimize the design's resistance.



This multiphysics simulation of a common single-pole residential circuit breaker combines electrostatic, transient heat transfer and Mechanical Event Simulation analyses to determine the trip time and behavior. When subjected to an overload condition, the bimetallic strip in the breaker deforms due to Joule heating and trips the mechanism to break the circuit.

ELECTROSTATIC FEATURES

Analysis Capabilities
- Electrostatic current and voltage
- Electrostatic field strength and voltage

Modeling
- See the FEMPRO (Part No. 3201.326) and CAD Support (Part No. 3201.331) product data sheets for the complete list of modeling features

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

Element Library
- Electrostatic 2-D element
- Electrostatic 3-D tetrahedral element
- Electrostatic 3-D brick element

Material Models
- Electrostatic isotropic
- Electrostatic orthotropic
- Electrostatic temperature-dependent isotropic
- Electrostatic temperature-dependent orthotropic

Loading and Constraints
- Voltages (nodal, surface and applied)
- Current and charge density

Solver Options
- Symmetric sparse
- Skyline
- Algebraic multigrid (AMG) iterative
- Banded
- Parallel processing for multiple processors

Results Evaluation
- Result displays of:
  - Voltage distribution
  - Steady-state flow of electric current
  - Current flow lines and vector plots
  - Force flow lines
  - Electrostatic reaction force
  - Electrostatic charge
  - User-supplied functions operating on calculated results, user-supplied constraints and material properties
- Automated tools for multiphysics simulation to:
  - Transfer electrostatic results to a static stress analysis, MES or heat transfer analysis
- See the FEMPRO product data sheet (Part No. 3201.326) for additional results evaluation features

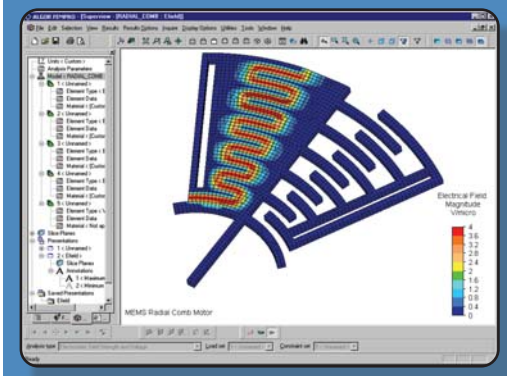
Results Presentation
- See the FEMPRO product data sheet (Part No. 3201.326) for the complete list of results presentation features

User Interface
- See the FEMPRO product data sheet (Part No. 3201.326) for the complete list of user interface features

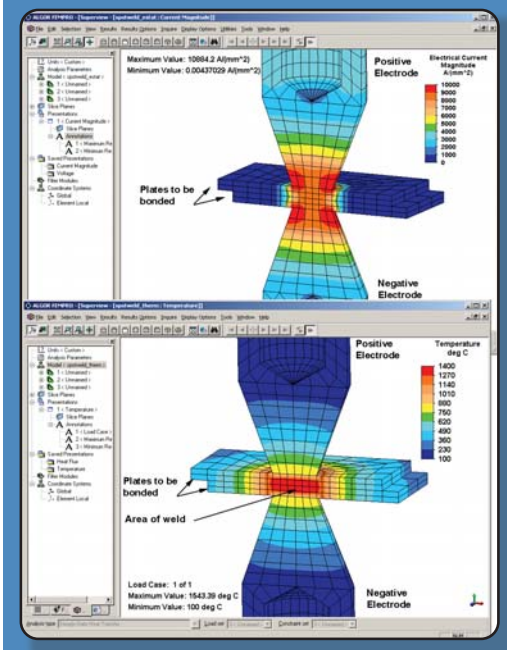
Note: For complete details on our electrostatic features, see the "Products" section of www.ALGOR.com. ALGOR's web site contains additional information about our wide range of simulation capabilities including static stress and Mechanical Event Simulation (MES) with linear and nonlinear material models,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

TYPICAL APPLICATIONS

- Circuit breaker design
- Comb drive design
- Corrosion simulation
- Electronic device design
- Electroplating study
- Fuse design
- Inkjet printhead design (piezoelectric and thermal)
- Insulator design
- MEMS (Micro Electro Mechanical Systems) design
- Micro-gripper design
- Micro-mirror technology
- Piezoelectric actuators
- Power transmission cable design
- Printed Circuit Board (PCB) simulation
- Spark plug analysis
- Study of Electron Discharge Machining (EDM) processes
- Thermoelectric actuators



Micro electro mechanical systems (MEMS) like this radial comb motor require electrostatic analysis to determine mechanical forces due to surface charges, which can then be directly used in a stress analysis for calculating the mechanical response.



In this spot welding system involving Joule heating, two relatively thin metal plates were permanently bonded together by passing an electric current through them. An electrostatic current and voltage analysis was performed to determine the current distribution. The electrostatic results were then directly used in a steady-state heat transfer analysis to determine the temperature distribution.

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