# ALGOR®

*INTERNATIONALIZED FEA SOFTWARE*

简体中文
Deutsch
English
Español
Français
Italiano

*SIX LANGUAGES*

# Linear Dynamics

Linear dynamic analysis capabilities include natural frequency (modal), natural frequency (modal) with load stiffening, response spectrum, random vibration, frequency response, transient stress (direct integration), transient stress (modal superposition) and critical buckling load. 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

Linear dynamic analysis capabilities include:
- natural frequency (modal) analysis
- natural frequency (modal) analysis with load stiffening
- response spectrum analysis
- random vibration analysis
- frequency response analysis
- transient stress (direct integration) analysis
- transient stress (modal superposition) analysis
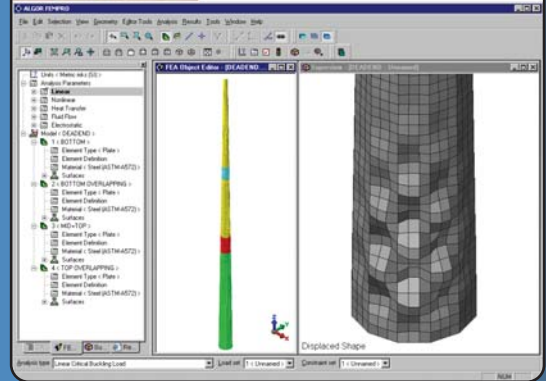- critical buckling load analysis

## 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

*"This project required poles to support transmission lines from the chemical company's co-generator power plant to the nearby electricity grid of a power company. A critical buckling load analysis was done to check the pole shaft for buckling."*
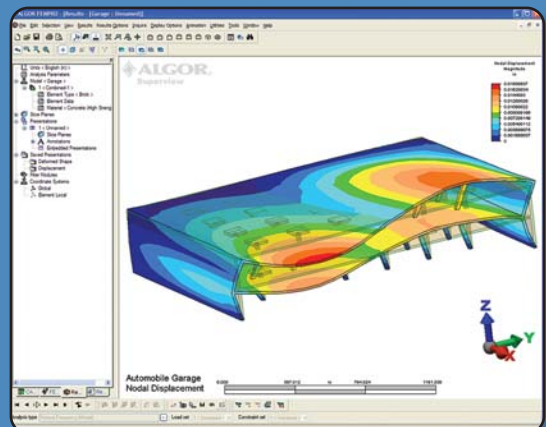
Ted Brockman
West Coast Engineering, Ltd.

**Engineers at West Coast Engineering, Ltd. optimized a transmission pole design using critical buckling load analysis.**
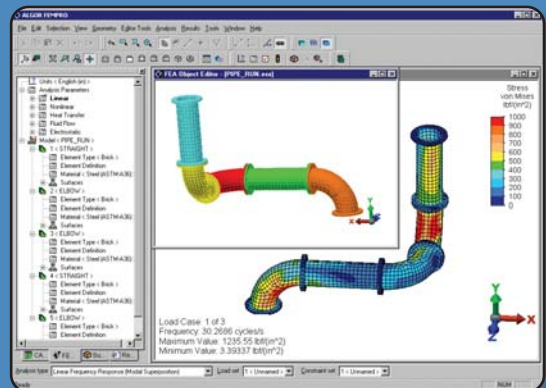
**A frequency response analysis was performed on this section of a piping system to determine its dynamic response to a sinusoidal force generated by a pump in the system.**

**A natural frequency (modal) analysis was performed on this two-story, concrete, automobile parking garage to determine the natural frequencies and mode shapes.**

# LINEAR DYNAMICS FEATURES

## Analysis Capabilities
- 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
- Ground motion excitement
- Earthquake simulation
- Frequency sweep
- Harmonic vibration response

## 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
- Spring element
- 2-D element (planar, axisymmetric)
- 3-D truss element
- 3-D beam element
- 3-D membrane plane stress element
- 3-D plate element
- Thin composite element
- Sandwich (thick) composite element
- 3-D brick element
- 3-D tetrahedral element
- Rigid element

## Material Models
- Linear elastic isotropic
- Linear elastic orthotropic
- Linear temperature-dependent isotropic
- Linear temperature-dependent orthotropic
- Piezoelectric
- General piezoelectric
- Anisotropic
- Composite laminate

## Loading and Constraints
- 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

## Solver Options
- Sparse Lanczos eigensolver
- Parallel processing for multiple processors

## Results Evaluation
- Result displays of:
  - Displacement
  - Stress
  - Strain
  - Mode shape plots
  - Vector plots of principal stress directions
- Shear and bending moment diagrams
- Output power spectrum density at nodes
- Capability to combine the results of linear static stress and linear dynamic analyses
- 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 linear dynamics 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
- Acoustical speaker design
- Aerodynamic phenomena study
- Aerospace structure design
- Aircraft component design
- Airport noise control
- Annealing
- Automotive frame design
- Blast and shock tests
- Bridge and overpass architecture
- Building code analysis
- Bushing optimization
- Chassis analysis
- Column design
- Compressor design
- Construction equipment design
- Conveyor design
- Filtering equipment design
- Generator design
- Ground transportation effects
- Impact analysis
- Infrastructure design
- Jet engine vibration
- Liquid pipeline system design
- Material transport and storage
- MEMS design
- Motor vibration
- Musical instrument study
- Nuclear piping system design
- Nuclear power plant component design
- Payload vibration
- Piezoelectric component design
- Piping system analysis
- Power transmission component design
- Power transmission tower analysis
- Processing system design
- Pump/compressor design
- Quenching
- Railcar design
- Road conditions vibration
- Robotic system analysis
- Rocket engine vibration
- Rotating machinery design
- Rotational imbalance
- Safety factor determination
- Slender member design
- Structural integrity verification
- Traffic analysis
- Transmission tower design
- Turbine design
- Unbalanced load effects
- Uniform Building Code (UBC) validation
- Vehicle skin design
- Vehicle vibration
- Vibrating conveyor optimization
- Wind load simulation
- Wing flutter analysis

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