

# AFEA

## The power of Marc and Patran in an integrated environment

### Overview

MSC AFEA is a package of two industry leading products from MSC Software, namely the nonlinear solver Marc and the CAE modeler Patran. By providing these two advanced products in an integrated environment, MSC Software offers high-end modeling and nonlinear analysis capabilities at an affordable price, enabling user to perform a wide variety of structural, thermal, thermo-mechanically coupled and other multi-physics analyses.

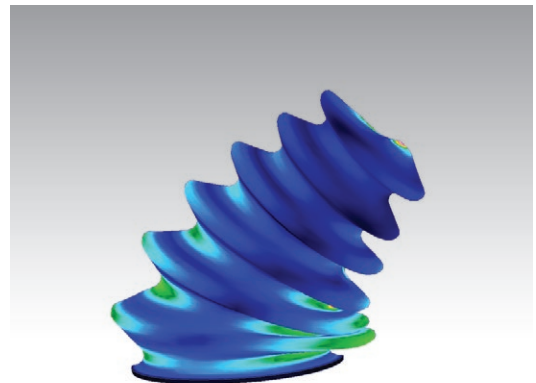
MSC AFEA can be applied to solve engineering models with complex behavior, involving multi-body contact, material and geometric nonlinearities across a variety of industries including aerospace, automotive, biomedical and electronics. Nonlinear material models supported include plasticity, hyperelasticity, viscoelasticity, creep, composite materials, shape memory and more.

Using MSC AFEA, manufacturing processes like metal forming and extrusion can be virtually simulated to predict final shape and residual stresses helping reduce risk and manufacturing cost. The adaptive remeshing capability allows engineers to efficiently solve complex multi-body contact problems more efficiently, with minimal user intervention improving your productivity.

### Preprocessing using Patran

MSC AFEA gives you access to all the powerful preprocessing capabilities of Patran including optional access to data from several CAD systems. Key Patran features include:

- Standard Geometry Access from
  - Parasolid
  - STEP 203 and 209
  - IGES
  - VDA
  - I-DEAS
- Parametric Modeling Capabilities
- Wireframe and Solid Geometry Creation and Modification
- 2D and 3D Finite Element Mesh Generation and Editing
- Advanced Surface Meshing
- Comprehensive Element Library
- Element Property Creation and Edit
- Material Property Creation and Edit



- Load and Boundary Creation and Edit
- Easy Contact Definitions
- Model Visualization and Verification

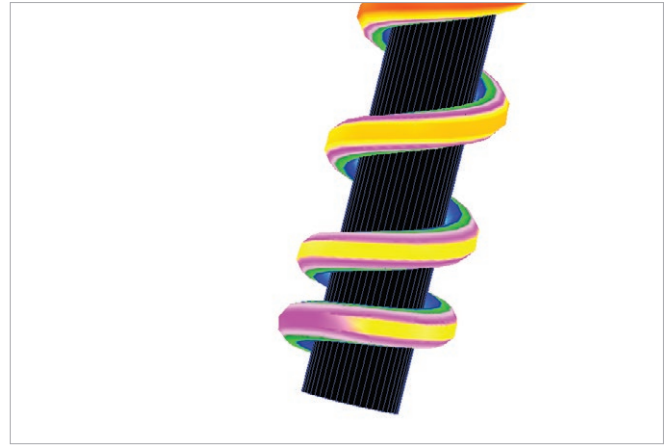
These capabilities are available in addition to the Linear Structures package:

- All or MSC Nastran Linear Structures Package capabilities
- Implicit Nonlinear (via Marc Translator)
- Design Optimization
- Multi-Model Optimization
- Automated Component Mode Synthesis (ACMS)

## Analysis capabilities

MSC AFEA provides a full range of engineering analysis capabilities using the imbedded Marc solver including:

- Structural Analysis
- Static Stress / Normal Modes
- Linear Buckling / Post-Buckling
- Transient Dynamics
- Frequency Response
- Harmonic Response
- Creep and Relaxation
- Thermal Analysis
- Steady State Heat Transfer
- Transient Heat Transfer
- Coupled Thermo-Mechanical Analysis
- Transient Dynamics
- Creep
- Joule heating
- Electrostatics and Electrodynamics
- Automatic Remeshing
- Parallel Processing



## Capabilities

- Model Preprocessing
- Comprehensive CAD integration allowing model import from all of the major CAD packages
- Comprehensive meshing algorithms for automatic creation of quality meshes
- Variety of methods for applying element properties, constraints, loads, and more
- Engineering Analysis
- Advanced linear and nonlinear analysis capabilities to solve complex problems
- involving nonlinear materials, geometric behavior, contact and multi-physics
- Easy multi-body contact definition without concern for contact pairing
- Adaptive re-meshing to solve high deformation and plastic-flow problems
- Multi-step load scenarios to simulate complex loading
- Scalable domain decomposition to significantly reduce processing time through parallel processor capabilities
- Results Postprocessing
- Advanced visualization techniques to gain complete insight of product performance.
- Open Architecture
- Customization of the graphical user interface and analysis process

## Postprocessing using Patran

MSC AFEA provides a full range of capabilities for visualization and interpretation of analysis results available in Patran including:

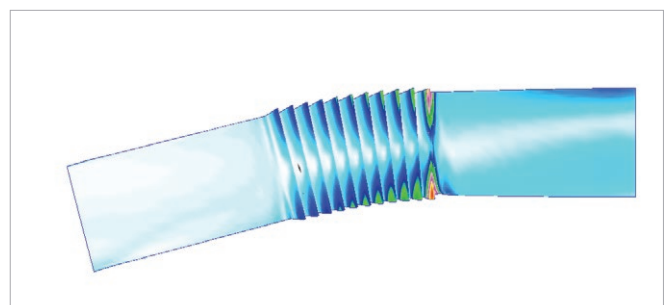
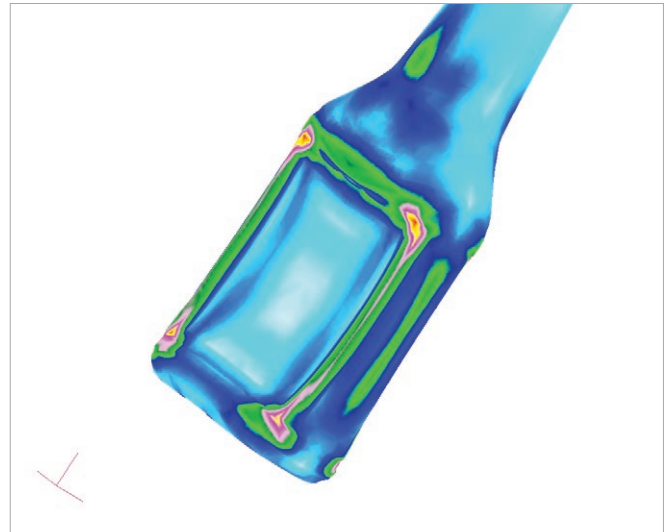
- Results Access
- Marc POST File Import
- Marc POST File Direct Results Access
- Results Visualization
- Deformation / Contour
- Vector / Tensor
- Data History / Animation
- Results Templates

## MSC AFEA package options

- CAD Access
- ACIS
- Pro/ENGINEER
- Unigraphics NX
- CATDirect\_V4
- CATDirect\_V5
- Productivity Tools
- CAE Solid Modeling
- Multi-processor capability
- Laminate Modeler

## Benefits

- Reduce time required to develop high-quality models, increase productivity, and reduce risk with proven simulation tools
- Comprehensive CAD system data integration allowing model import from all of the major CAD packages
- Improve designs by understanding how they respond in operating environments.
- Gain access to the power of integrated computer-aided engineering at an affordable bundle price





Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

MSC Software, part of Hexagon's Manufacturing Intelligence division, is one of the ten original software companies and a global leader in helping product manufacturers to advance their engineering methods with simulation software and services. Learn more at [mscsoftware.com](https://www.mscsoftware.com). Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter.

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