

# Femap Topology Optimization

## Benefits

Acceleration of the product development process

- Reduce number of design cycles
- Reduce number of prototypes and physical tests
- Facilitate weight and material savings
- Improve product durability
- Shorten time-to-market

High quality designs

- Produce designs that are stiffer, have lower mass and reduced stress
- Develop reliable and competitive products
- Reduce costly recalls

Seamless integration

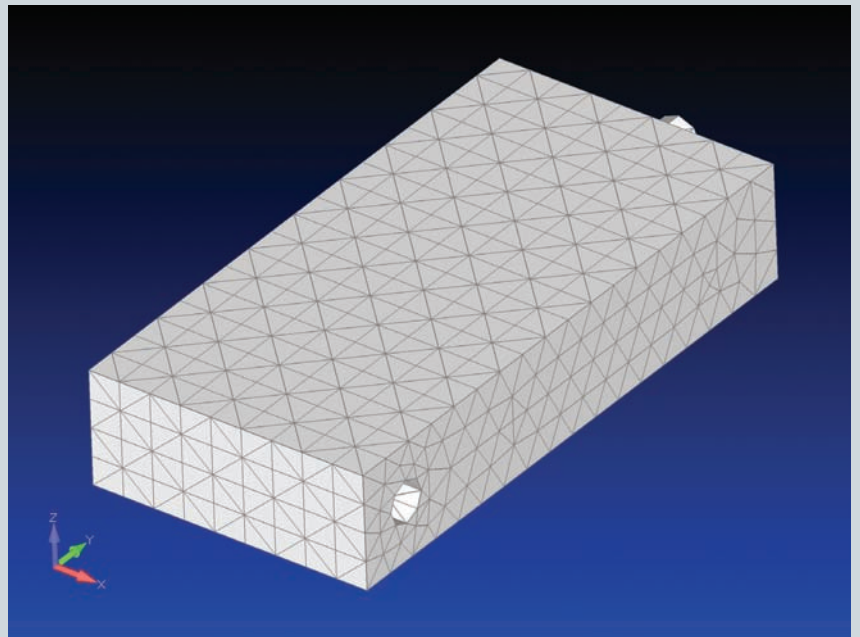
- Leverage your existing CAE knowledge and IT environment
- Take advantage of high-quality calculated results
- Extend usage of previous CAE software investments

## Summary

Femap® Topology Optimization is a module for non-parametric structural topology optimization analysis that functions in combination with the NX™ Nastran® solver. Topology optimization determines an optimum design proposal starting with a given maximum design domain. All loads and boundary conditions from the NX Nastran finite element model are taken into consideration during the automatic optimization process.

## Complete optimization workflow

Model setup is very simple using Femap, and existing NX Nastran input data can be used for the optimization process. Femap Topology Optimization supports the complete optimization workflow including smoothing for results transfer back to the CAD system. A complete optimization process can be adopted using Femap Topology Optimization, from the first design concept to the optimized geometry for return back to the CAD system.

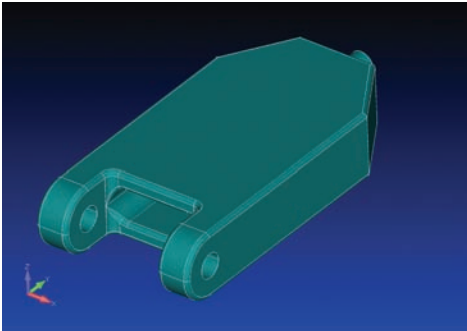
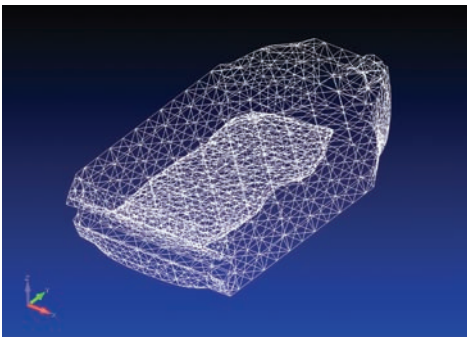
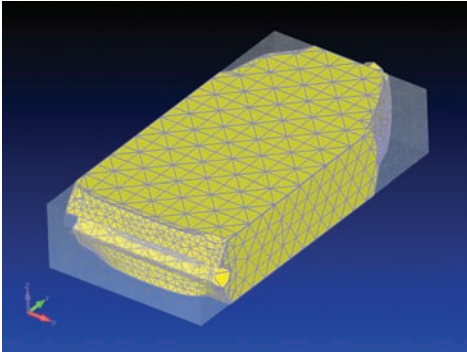


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# Femap Topology Optimization



## General capabilities

- Topology optimization with NX Nastran for linear statics and normal modes analyses
- Pre- and postprocessing with Femap
- Based on best-in-class optimization system TOSCA Structure, by FE DESIGN GmbH
- 2D and 3D finite element meshes
- Linear and parabolic elements
- Areas easily defined by Femap groups
- Contact definitions within the FE model
- Consideration of multiple load cases
- No model parameterization necessary
- Stable and fast optimization algorithms
- Efficient handling of very large models

## Optimization targets

- Maximize stiffness with volume constraint
- Maximize the lowest eigenfrequency with volume constraint
- Minimize volume with displacement constraint

## Manufacturing constraints

Demolding constraints for casting and forging components including consideration of stamping conditions and tightness

- Definition of one area for demolding constraint
- Parting plane definition: Midplane = none, auto, stamp, autotight
- Check Group all elements or design elements

## Symmetry constraints

- Definition of one symmetry constraint
- Plane or cyclic rotational symmetry

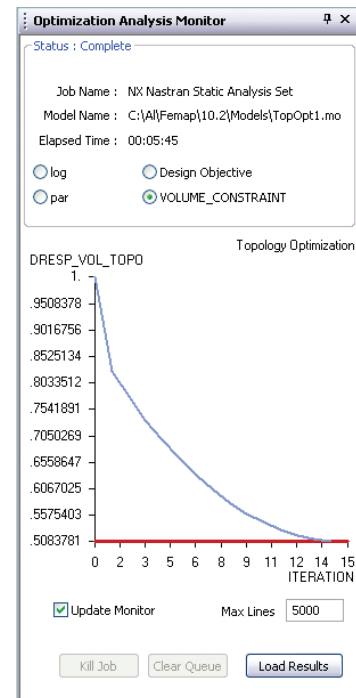
Maximum wall thickness constraint

Minimum wall thickness constraint

Arbitrary number of frozen areas

## Design smoothing

- Automatic generation of smoothed isosurfaces of the material distribution following topology optimization
- Specification of the target volume for the isosurface calculation
- Export of isosurface as triangulated surface mesh
- STL data reduction for CAD transfer



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