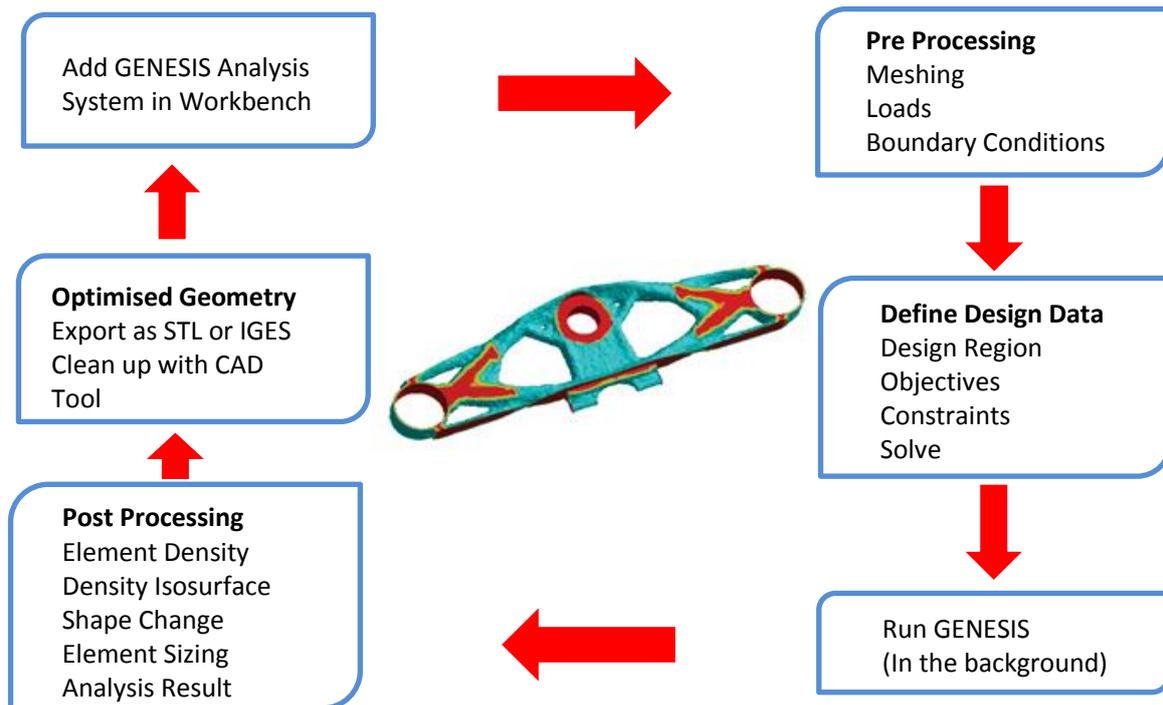


GSAM

GENESIS Structural Optimisation for ANSYS Mechanical

GENESIS Structural Optimisation for ANSYS Mechanical (GSAM) is an integrated extension that adds topology, topography, freeform, sizing and topometry optimisation to the ANSYS environment. Designers benefit by being able to automatically generate innovative designs in a reliable, robust and easy-to-use interface.



Benefits and Highlights

- Generate Innovative Designs.
- Reduce Cost and Improve Performance
- Reduce Engineering Time
- Easily add structural optimisation to existing ANSYS workbench workflow.
- Fast and reliable structural optimisation
- Easy and convenient to post-process optimisation results

Structural Optimisation Capabilities

- Topology
- Topography
- Freeform
- Shape Optimisation with Domains (access through Design Studio)
- Sizing
- Topometry
- Mix of any of the above



Support ANSYS and Analysis Systems

- Static Structural (Linear and Non Linear)
- Modal
- Linear Buckling
- Harmonic
- Random
- Transient Structural
- Multiple analysis systems simultaneously.

Multiple Material Properties

- Isotropic
- Orthotropic
- General Anisotropic

Use ANSYS Solver for Nonlinearity

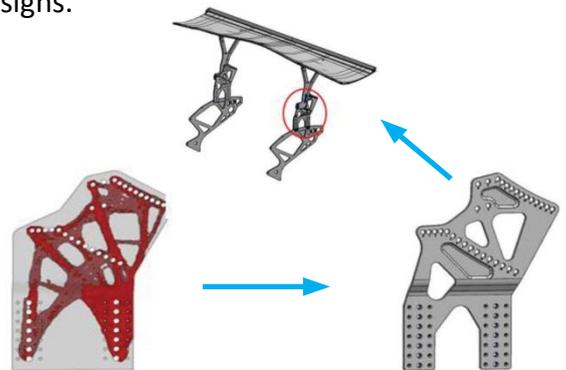
- Nonlinear Large Deformation
- Nonlinear Material
- Nonlinear Contact
- Transient

Wide Range of Design Responses

- Strain energy
- Displacement
- Relative Displacement
- Frequency
- Buckling load factors
- Modal/ direct/ random displacement, velocities and accelerations
- Moment of Inertia
- Mass/ volume and topology mass fraction
- Stresses
- Contact Pressure
- Contact Clearance
- Equivalent Radiated Power

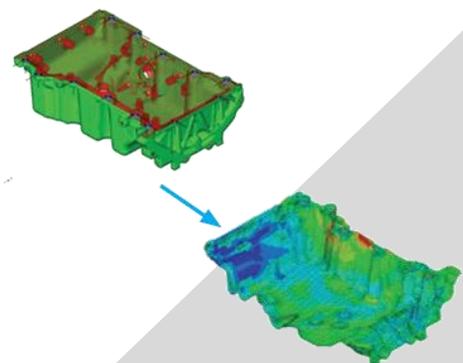
Topology Optimisation

Topology design is to find the optimal distribution of material in a given package space while improving the product performance. Typically topology optimisation is used by engineers in the early design stages to generate innovative design proposals. GENESIS provides an extensive family of fabrication constraints such as casting, extrusion, symmetries, etc. that helps to user to obtain easy to build designs.



Topography Optimisation

Topography design is a special type of shape optimisation where the grids are moved along the normal direction of selected surfaces. Typically topography optimisation is used by the designer to generate bead patterns on a plate to improve the design performance. Fabrication requirements such as symmetries, extrusion and bead fraction can be imposed if necessary.

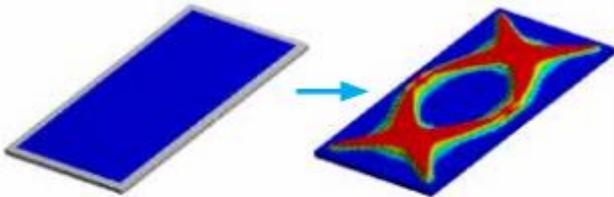


Topography Optimization for Oil Pan

GSAM

Freeform Optimisation

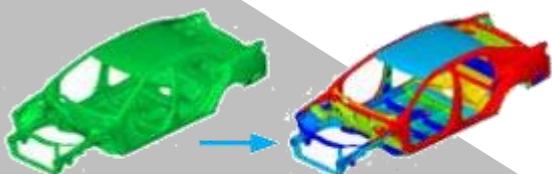
Freeform design is also a special type of shape optimisation. The intention is to increase the design freedom with little effort from the user. GSAM will automatically create perturbations for grids on selected surfaces. During the optimisation process the grid locations are changed to achieve a better design. Optionally the user can apply fabrication requirements such as symmetries, extrusion or grid fraction. Freeform optimisation can also be used by automatically linking adjacent grids to reduce computational cost.



Freeform Optimization for a Solid Plate – Ribs Design

Sizing Optimisation

Sizing optimisation is to design the dimension of the elements. In current GSAM implementation, the thickness of shells can be designed. GSAM will automatically create design variables associated with the thickness of the shell. Sizing optimisation is typically used at detailed design stage to gain more material savings and improve design performance.

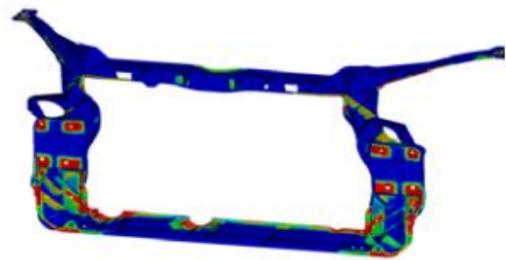


Normalized original thickness Normalized optimized thickness

Sizing Optimization for Car Body

Topometry Optimisation

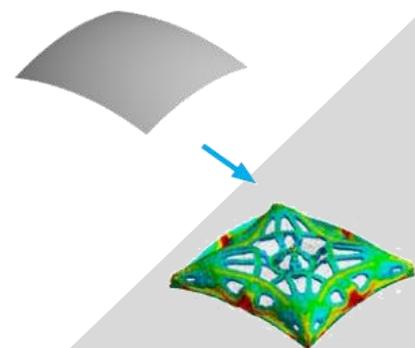
Topometry is an element by element sizing optimisation capability. This capability is to increase the design freedom for problems where the user has flexibility for design changes. Typically topometry design can be used to find the thickness distribution of plates. It can also be used to find the best elements to keep from a pool of elements. Fabrication constraints such as symmetries and extrusion can be imposed on topometry designed regions. Coarse topometry option is available to reduce computational cost.



Topometry Design for Automobile Support Frame

Mixed Optimisation

Topology optimisation can be combined with sizing, topometry, topography, and/or freeform design. Optimisation problems may have both topology designable regions and parametric designed entities at the same time. All response types may be used in any optimisation setup (ie. Topology-only, parametric-only or mixed).



Combined Topology and Freeform Optimization for a Curved Shell



Other VR&D Products

GENESIS – Structural Analysis & Optimisation

GENESIS is a fully integrated finite element analysis and design optimisation software package. Analyses include static, normal modes, direct and modal frequency analysis, heat transfer and system buckling. Design optimisation is based on the advanced approximation concepts approach to find an optimum design efficiently and reliably. Actual optimisation is performed by the well-established DOT and BIGDOT optimisers, also from VR&D. Design capabilities include: topology, shape, sizing, topography, topometry and freeform optimisation. Typically the optimisation requires less than ten detailed finite element

Design Studio for GENESIS

Design Studio for GENESIS is a design oriented pre and post-processor graphical interface for the GENESIS program. It features built-in and easy to use trails for setting up the optimisation problem and running GENESIS from the interface. It also supports post-processing of the optimisation results with contour plots, deformed plots, animations etc.

VisualDOC–Multidiscipline Design Optimisation

VisualDOC is a software system that simplifies adding optimisation to almost any design task. It uses a powerful intuitive graphical interface, along with gradient based and non-gradient based optimisation, response surface (RS) approximate optimisation, and design of experiments (DOE) methods. VisualDOC interfaces easily to your own code or third-party analysis program. For example, VisualDOC can be easily coupled with ANSYS Workbench.

DOT – Design Optimisation Tools

DOT is a general purpose numerical optimisation software library which can be used to solve a wide variety of non-linear optimisation problems. If you require only an optimisation engine to incorporate into your design software, DOT will serve that purpose.

BIGDOT

BIGDOT is intended to solve very large, nonlinear, constrained problems where gradient information is available, and function and gradient evaluation is efficient. BIGDOT is capable of solving continuous, discrete/ integer or mixed variable problems. Problems in excess of three million variables have been solved by BIGDOT.

SMS Fast Eigensolver

The SMS eigensolver may be added to existing NASTRAN installations to offer significant performance advantages over the default method when a large number of eigenmodes are required for a system with many degrees of freedom. Benchmark studies and user experience show 2-10 times speedup. SMS may also be embedded into your product/ software.

ESLDYNA – Optimisation Software for LS-DYNA

ESLDYNA is based on the Equivalent Static Loads (ESL) method to perform optimisation based on a non-linear finite element analysis with GENESIS as the structural optimisation program, to solve large scale optimisation problems based on the responses from a non-linear finite element analysis. It also helps to significantly reduce the design time by identifying high performance designs with five to ten nonlinear analyses.