

Optimization
Discover the optimum design

Unleash the benefits of optimization minimizing set-up time in a common approach for any optimizer

ANSA pre-processor and META post-processor in combination with all popular optimization codes, provide a complete tool for optimization applications.

From concept design to final testing, ANSA & META package brings enormous performance and versatility to the optimization problem set-up.

The ability to control the model shape using the ANSA Morphing Tool, ANSA model values and even complicated tasks such as batch meshing and model checking, makes the tool unique.

Morphing features

- Shaping of FE model through the use of 3D, 2D, 1D, and Cylindrical boxes.
- Morphing on CAD geometry.
- Morphing Parameters to control model shaping in a parametric way.
- Parameterizing any manual morphing operation by the DEFORMATION parameter.
- Accurate morphing of model feature lines by fitting on target curves.
- Recording of morphing states for easy recovering of any previous shape.
- Automatic reconstruction to improve mesh quality after morphing.
- Special entities, called Nested Elements, to retain the shape of specific features of the model such as holes and beads.

Direct Morphing

- A powerful new morphing algorithm performs direct morphing on geometry or FE model without the need of morphing boxes. This process minimizes the set-up time especially in large models.
- Direct morphing can be applied by means of edge fitting or Control Points movement.
- Spotweld density consideration during morphing.
- Parametric control of holes diameter.
- Cross section morphing.
- Definition of contact restrictions between morphed regions.
- Automatic adaptation of flanges on underlying parts.
- Interactive bending, twisting, extension or elongation of regions and parts retaining steady cross sections.
- Feature copies in patterns.
- Local tube depenetration from neighboring parts.

Designer Tools

- Depressions definition.
- Creation of beads, stamps, flanged openings and holes of various shapes.
- Patch and bulkhead reinforcement creation.

- Creation of extruded and swept cross members of predefined or user-defined cross sections.
- Cross member attachment on neighboring parts with auto flanges generation.

Process automation

The Optimization Tool facilitates the set-up of the optimization sequence. Design variables are defined and connected to any Morphing Parameter, thus controlling the shape modifications of the model. In a similar manner, Design variables control any parameter of ANSA entities (shell thickness, material density etc.). Furthermore, complicated actions, such as features creation and treatment, parts replacement, connections realization and mesh quality improvement are added to the process and driven by design variables.

Coupling with optimizers

- Direct access to the optimizer integrated in ANSA. An optimization study can be performed with various optimization algorithms either directly or based on response surface models created by machine learning or other algorithms.
- Direct coupling with LS-OPT, modeFRONTIER, OPTIMUS, Isight, HEEDS, OptiSLang and DAKOTA without the need of any scripting.
- Simulate and animate the model shape for different combinations of design variable values and check the model before running the optimization study.
- Video recording of the animated model.
- Enhanced Design Of Experiments that allows the exploration of the design space. Automatic generation of designs via numerous algorithms.
- Definition of full model reports during the optimization process, checking model validity.
- Automatic model fixing during the optimization loops.
- Integrated TOSCA Structure interface facilitating the definition of Topology, Shape and Bead optimization scenarios. Automatic mesh quality improvement of the optimum model and definition of the validation model after TOSCA Run.

Features

- FE & geometry morphing parametric morphing
- Surface & Edge fitting
- Direct morphing
- Process automation
- Scripting

Set up for:

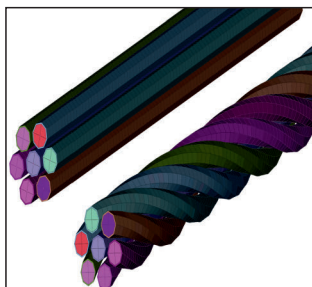
- Shape and Parametric optimization
- Composite material optimization
- Spotweld optimization
- Multidisciplinary optimization
- ANSA & META nodes in ModeFrontier, LS-OPT and OPTIMUS interface
- TOSCA Structure integrated interface
- EPILYSIS & NASTRAN SOL 200 interface

Benefits

- Integrated optimization algorithms in ANSA
- Minimizes the set-up time in morphing using the Direct Morphing functionality
- Powerful morphing in CAD geometry
- Common approach in coupling with any optimizer
- Fast and flexible optimization sequence set up using the massive definition of design variables
- Fast investigation of stiffness improvement with the designer tools

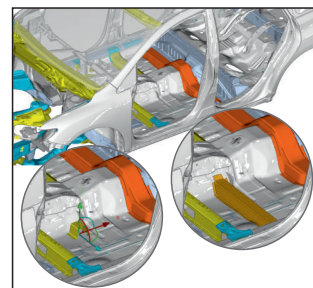
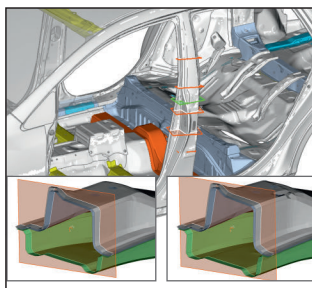
Spotweld optimization

- Parametrization of weldings and easy handling from the Optimization Tool.
- Control parameters such as spotweld density, number of spotwelds, spotwelds' diameter, connections' properties or materials, and alternative connections representation types.



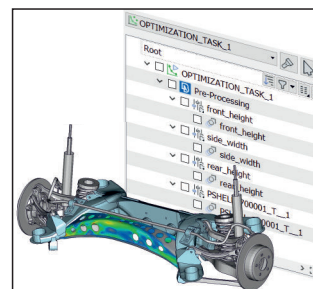
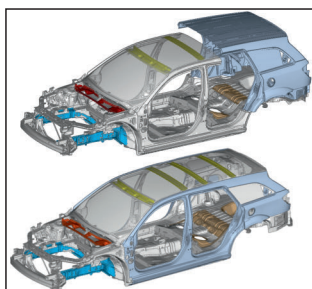
Multidisciplinary optimization

- A defined optimization sequence can be applied on different representations of the same model and prepared for different solvers and analysis scenarios for the set-up of multidisciplinary optimization problems.
- The use of common Optimization Task and Morph Boxes in different analyses ensures the identical shaping.



Post-processing

- A special tool in META offers a flexible way for the responses and histories extraction, from the solvers result files.
- Responses extraction from the 3D model and the 2D Plot.
- The automatic definition of post-processing sessions to participate in the optimization loop, and the calculations upon solvers results, are only a few of META's powerful capabilities.



EPILYSIS SOL 200

- Support of the required keywords for the definition of EPILYSIS or NASTRAN SOL 200 cases for property, and material optimization.
- Use of the Morphing tool for the massive definition of the DVGRIDS for shape optimization according to the Manual Grid Variation method.
- Support of the keywords for topology, topometry and topography optimization.

