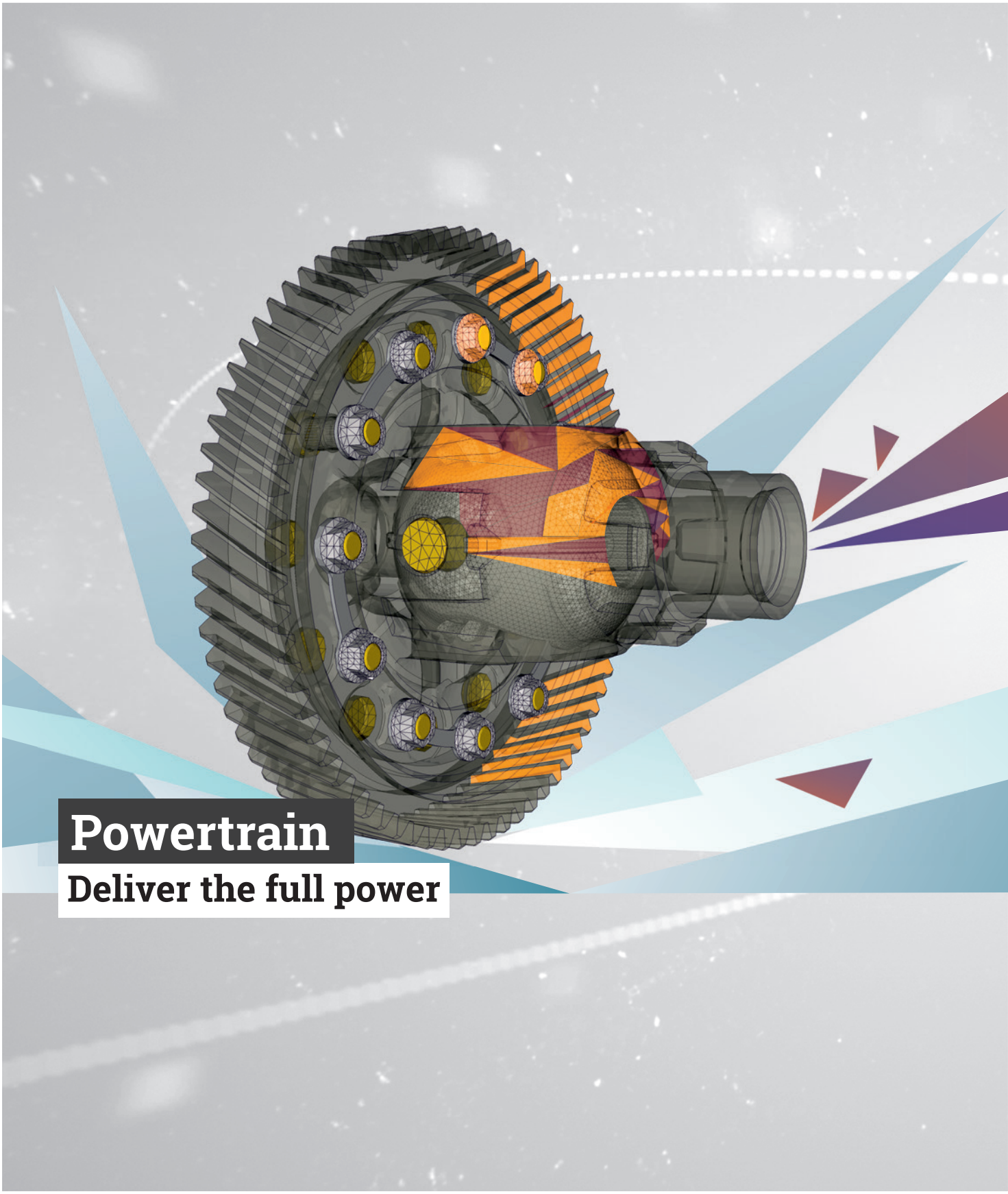
BETA
SIMULATION SOLUTIONS

physics on screen



Powertrain

Deliver the full power

ANSA
PRE PROCESSOR

Streamline your powertrain analyses with the complete tools portfolio of the ANSA pre- processor

With its complete solutions for meshing, assembly, contacts definition, and boundary conditions set-up, ANSA becomes the most efficient and effective solution for powertrain pre-processing.

An easy to set-up, fast and robust, meshing algorithm (Solid structural mesh) that ensures very accurate capturing of geometrical features, and a powerful and versatile assembly center for the generation and handling of bolt models have been specifically developed to satisfy the most demanding powertrain CAE teams.

Translation

With ANSA, the information ported from CAD is not limited to the geometric descriptions of the components but extends to the product structure together with several metadata such as the name, the number and version of each component, its position matrix, and its material information.

Set-up of meshing

The mesh result is dominated by 4 parameters:
a. Target element length.
b. Distortion angle and distance (chordal deviation).
c. Maximum aspect ratio.
d. Minimum element length.
Feeding these parameters to the Batch Meshing Wizard automatically generates the appropriate mesh parameter and quality criteria files.

Feature recognition

Geometrical features are automatically detected and the feature treatment is easily defined. Fillets are automatically identified by their shape and continuity, requiring no radius and width specifications. Tubes are also recognized likewise, with no need for additional input. Also, flange areas are detected based on parts proximity and shape.

Geometry simplification

Geometrical errors, due to bad CAD definition or erroneous translation, are automatically identified and fixed. Irregularly shaped faces are joined to produce unified macros significantly improving the mesh flow, respecting at the same time the important features of the part.
Imprinted and protruded logos can be totally removed. In case of narrow ribs sharp edges, they are automatically recognized and maintained.

Fillets treatment

Number of elements in the fillets' width is controlled by the designate distortion and minimum element length, ensuring precise geometry representation with the minimum input requirements, avoiding the creation of numerous, length dependent, rules.
The element length along the fillet is controlled by the global prescribed quality criteria of aspect ratio and skewness, or by setting a local target length. Furthermore, the user is able to select different treatment for internal and external fillets and for the mesh generation, among orthogonal and equilateral trias arrangement.

Features

- Include-files handling
- Batch mesh dominated by target element length, distortion angle and distance, maximum aspect ratio and minimum element length
- Geometry simplification
- Fillets, Tubes, and Flanges treatment
- Second order mesh for more accurate representation
- Mesh quality improvement
- Bolts modeling through reduced representations consisting of any combination of elements
- Automated bolt connections generation from bolt geometries
- Multiple bolt connection realization into FE-representation in a single step
- Automatic contact definition
- ANSA can be easily coupled with any parametric optimizer
- FE & geometry morphing 2D & 3D parametric morphing

Benefits

- Time-efficient pre-processing that minimizes cost and time to market
- High end solutions for meshing, model assembly and boundary conditions set-up
- Configuration files and templates allow for the standardization of the pre-processing steps ensuring repeatability and enforcing robustness

Tubes treatment

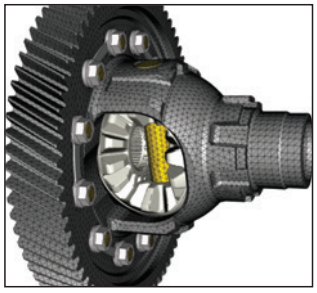
The number of elements along the tubes' perimeter is controlled by the designated distortion and minimum element length and is maintained along the tubes' length with the use of orthogonal trias. Zones, meshed with orthogonal or equilateral trias, can be generated around the top and bottom rings of the tubes. The width of each zone can also be associated to the tubes' characteristics (diameter, target length etc.). Small tubes can be filled.

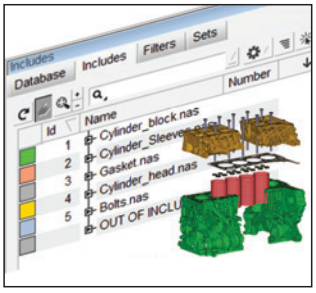
Flanges treatment

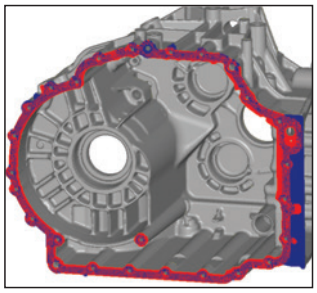
The mesh density on solid flanges can be increased to assure a contact of better quality. At the same time, the meshing algorithm ensures that no flange node is moved away from the surface during automatic quality improvement.

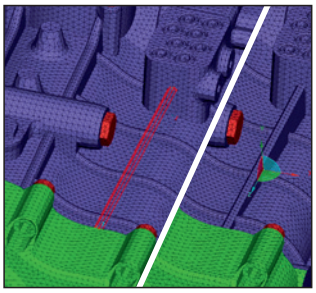
Second order mesh

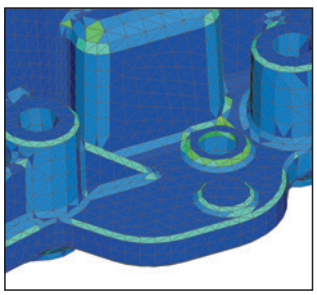
Created mesh can be of either 1st or 2nd order. The 2nd order nodes are always located on the geometry and not on a straight edge. This way, the component's shape is most accurately represented and the deviation of the CAE model mass from the actual mass is minimized. The elements' quality is efficiently controlled with a number of quality criteria.

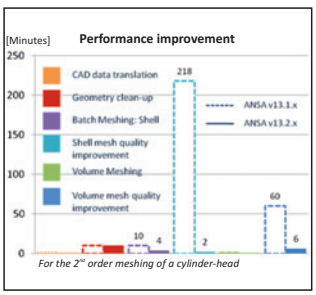












ANSA
PRE PROCESSOR

Mesh quality improvement

Several tools are available for the check and verification of the mesh quality, from the on-screen visualization of quality violations, to the automatic generation of quality reports. Distortion and distance from geometry graphs are offered to assure the precise capturing of geometrical features. For all those cases when quality improvement is necessary, very powerful automatic tools are offered to handle both shells and solids, either by slightly moving nodes, or by local reconstruction of the mesh topology.

Bolts modeling

Reduced representations of bolts, consisting of any combination of elements, are generated with the aid of bolt connections. A bolt connection “carries” all the necessary information to successfully create the bolt; where is the bolt located, what parts are connected by the bolt, bolts characteristics (direction, diameter, bolt/washer radius, length). Bolt connection entities can be transferred from one model to another through connection files and are realized into suitable FE-representations with the aid of the Connection Manager.

Bolt connections generation

Bolt connections can be automatically generated from bolt geometries, inheriting from the latter geometrical attributes like the location, orientation, diameter, head diameter, and length. In case of lack of the bolt geometries, bolt connections can be automatically generated from bolt holes and tubes. In either case, the bolt connectivity is detected by performing a search in the bolt's vicinity, and is expressed either with part numbers or property ids.

Bolt connections realization

With the aid of the Connection Manager, multiple bolt connections can be realized into suitable FE-representations in a single step. A multitude of bolt FE-model options are available for the generation of the bolt body and its attachment to the connected parts. Bolt connections are automatically reapplied after part replacement, allowing the effortless update of the assembly.
Pre-loading of the bolts can be easily defined, either with the set-up of pre-tension keywords -for the solvers that support such- or with the definition of thermal loads, using the thermal expansion properties of the material.

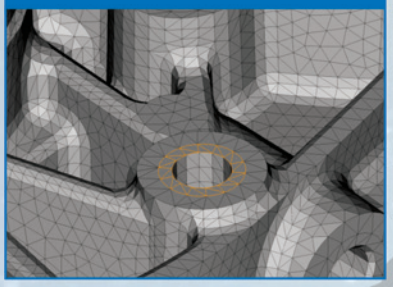
Contacts definition

Contact areas between solid parts are automatically detected based on proximity. Master-slave contact constraints are directly defined either using contact card templates or with the default values, and with the contact clearance being automatically updated.

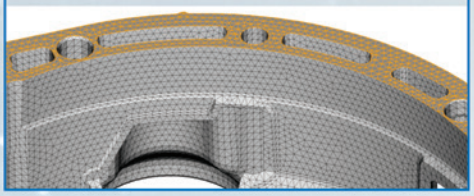
Rib creation

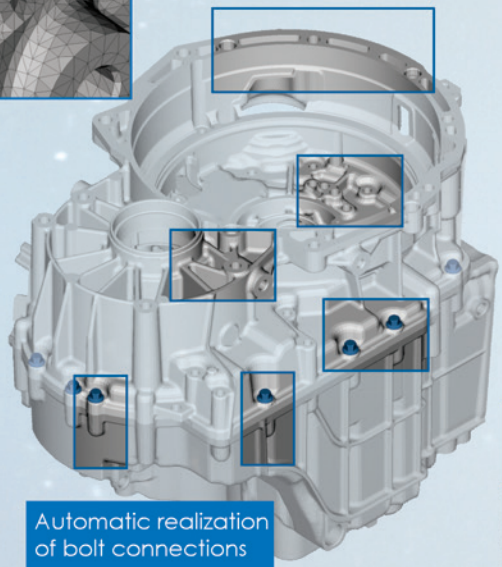
Ribs of any type can be easily created via the rib creator tool. Via a stepwise wizard all of the rib's characteristics, width, top bottom fillet/chamfer, orientation are defined while a preview is created for the user. Existing ribs can easily.

Zone of elements around tubes

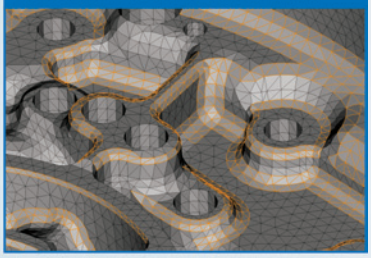


Flanges recognition and treatment

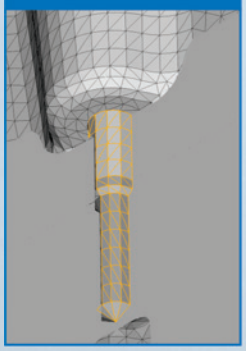




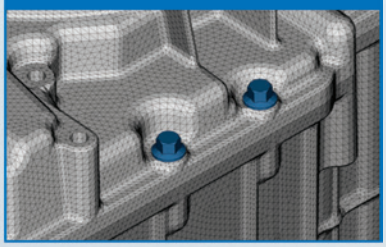
Fillets recognition and distortion-based treatment



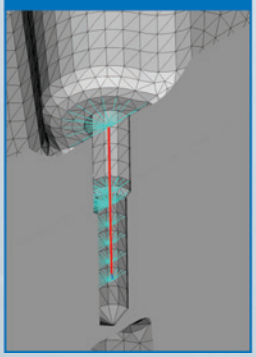
Orthogonal mesh in tubes



Generation of bolt connections from bolt geometry or tubes



Automatic realization of bolt connections



META
POST PROCESSOR

Automate post processing time while focusing on the details that make the difference

META is a complete solution for multi-disciplinary post-processing that stands out due to its model organization capabilities, the variety of tools for the assessment of the results, the available functionalities for the identification of the areas of interest and hot spots, the tools for direct calculations based on solver results, the options for the communication of the results, and for its automation capabilities.

Model navigation

META offers model organization capabilities for complex assemblies. Model structure, connection information are passed via ANSA comments in META. A variety of tools are offered for the assessment of the results. Such tools offer:

- Exploded view providing great assistance in the visualization of the results when contact pairs are involved and needed to be visualized on each of the contact surfaces.
- Cutting planes.
- Fringe bars with transparent colors.
- Iso-contours to highlight the area of interest.
- Measurements for identifying distances between parts, different stages, and points.

Communication of the results

META integrates a very powerful functionality for the identification of areas of interest and hot-spots. The results of filters can be presented by selecting the filtered entities, using the identification tool, by isolating the filtered entities, or by adding annotations. Filters can be saved and then reused. Additionally, filters can be automatically synchronized with states and thus when passing from one stage to another the filters are re-applied.
Results can also be presented in a tabulated manner through the Statistics tool. This list displays nodes, elements, parts, and materials. It can also display user-specified results and statistic values. The user can add custom columns, create mathematical operations between existing columns and transfer data to the embedded spreadsheet editor for further process.

Parametric points

The identification of arbitrary points can be accomplished by either manually selecting them using the mouse or by specifying the coordinates, even if the points lie outside the model boundaries. Additionally, it is possible to identify points and nodes on a linear or circular path. Parametric points are available in various tools such as the Identify and the Statistics tools.

Calculations in META

Numerous tools are available in META to calculate results directly based on the results read.

- The Linear Combination tool allows for the combination of results of unit loads.
- The User Field Function tool allows for the creation of new results sets as a function of existing results. It can generate deformation, scalar and vector results.
- The Modal Correlation tool allows for the calculation of the modal assurance criterion.
- The Modal response tool can calculate responses from the normal modes either with loads imported through a keyword file in META, or directly generated in META.
- The Modal Model Builder enables the generation of a modal, “reduced” representation of an assembly, given the results of the modal analysis.

Section forces

The Section forces tool of META is a valuable tool for the calculation of Forces and Moments on sections. Its accuracy allows for the calculation of new sections within META without having to repeat the task of defining them in the pre-processor. Moreover, the Section Forces tool offer the option to export grid force vectors. These can be used as Boundary conditions to accurately replace areas of the model with little or no interest.

Model comparison

Dedicated tools are available for the comparison of different models or different runs.

- The Multi-model statistics tool, presents in a tabulated manner a comparison of extreme values between loaded models and for the user selected states. User-specified properties, materials, groups, elements or nodes can be added to the table.
- The overlay tool can use the currently generated session file or project file as a template, and, by adding a different set of result files, perform exactly the same post-processing actions on both 3d and 2d-data.

Features

- Ability to handle complex models
- A variety of tools for the assessment of interest areas and hot spots
- Statistics tool
- Ability to transfer data from the statistics table to an embedded spreadsheet editor
- Calculations of solvers' results
- Powerful graph tool
- Correlation and synchronization of simulation and real test results
- Automation of post processing tasks
- Models and Runs Comparison
- Automated Report Composer
- Coupled with any parametric optimizer

Benefits

- Time-efficient post processing that minimizes cost and time to market
- Easy handling of complex models
- A wide collection of tools in an intuitive user-interface
- Flexibility through filters use
- Powerful automation capabilities allow the standardization of post processing sequences and the fast generation of reports in pptx, html or pdf formats

2d plots

2d plots can be generated directly from solver result files or from the 3d-model. Also, test data are supported for the correlation of simulation and real test results. Also, 2d plots can be synchronized with the 3d model.

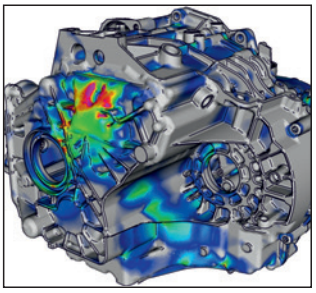
User toolbars

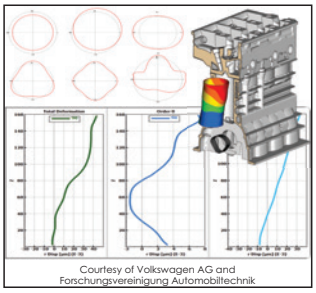
META comes with a collection of user toolbars.

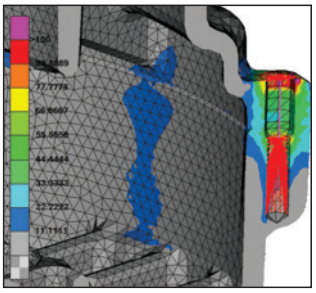
- The Cylindrical Coordinate System toolbar allows for the effortless generation of cylindrical coordinate systems, for transforming results on bores and cylinders.
- The Equivalent Radiated Power (ERP) toolbar performs the calculation of equivalent radiated power results on element, part or model level and these results are visualized as new result labels. ERP results are calculated based on displacement, velocity or acceleration results output by Nastran.
- The Bore distortion analysis toolbar enables the calculation of Fourier orders of deformations on bores. Selected orders can be plotted. Additionally, a new state with the 3d deformations for selected orders is generated.

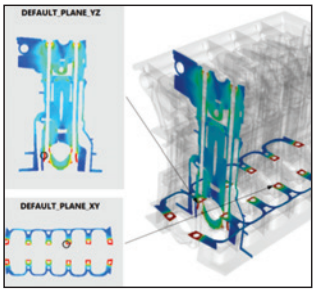
Reporting

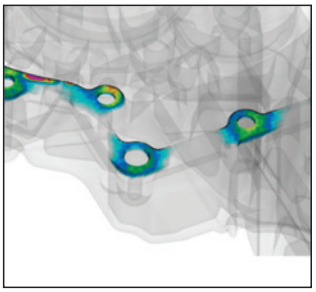
One of the strongest points of meta-post is the very powerful report generation. Reports with custom contents and layout can be generated through the Report Composer and exported in html, pptx or pdf formats. Images and tables can be easily added, by dragging and dropping. Basic shapes can be generated in the common PowerPoint-style. The report generation can be fully automated for a quick, ANSA deck-info like html report.

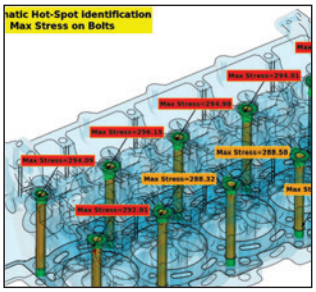


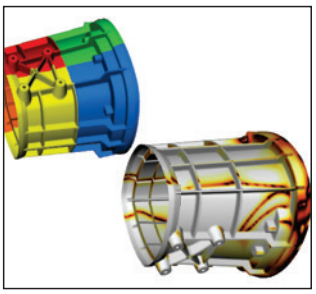












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