BETA
SIMULATION SOLUTIONS

physics on screen

Selected cases

From the automotive industry

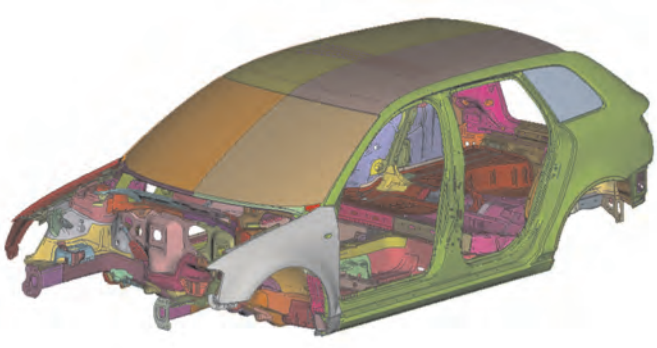
AUDI: Body-in-White FE Modelling Process

Challenge

- Find an efficient way for FEM models build-up.
- Optimize the process: more flexible and easy to follow, with distinct and recognizable steps.

Approach

- Deployment of ANSA DM.
- Generation and handling of alternative representations for each model part.
- Allow the user to interact at any point during the process.
- Give the option to retrieve a previous stage of the process in order to modify it.



Results

- Time reduction by 60%.
- Better feedback and information exchange between the departments.
- Increase of process and product reliability
- Integration of the same process in more projects.
- Easier comparison of results from different projects.
- Better flow overview and control of the project.

"The deployment of ANSA for the Body-in-White Modelling Process, created a significant competitive advantage to our company. The robustness and Ingenuity of ANSA are superior to any other available software"

Richard Lindner, AUDI AG,
Functional Design Body

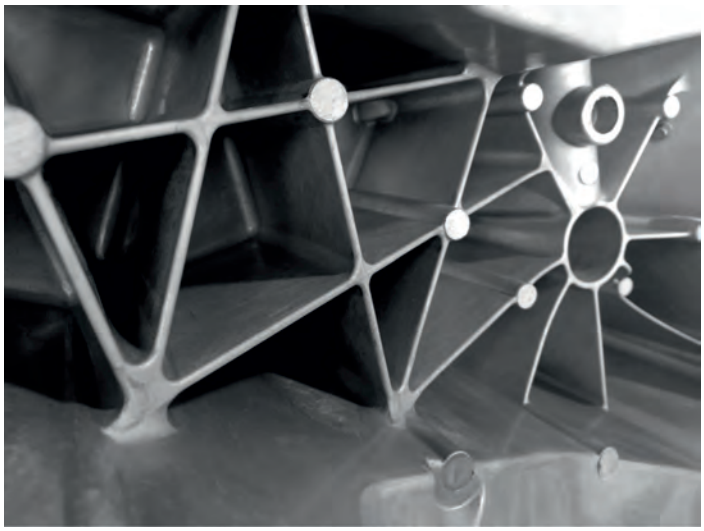
BMW Group: Modelling of casting structures
A comprehensive investigation

Challenge

- Find the best modelling approach for complex casting geometries.
- Evaluation of accuracy, computational time, handling full-scale models and, modelling effort.

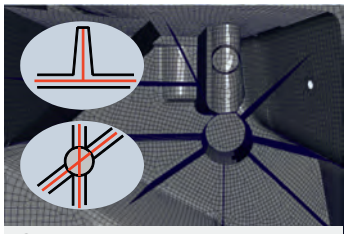
Approach

- Develop and generate various modelling approaches with different levels of discretization.
- A solid mesh made of hexa and tetra elements, respectively, was set as the benchmark.
- Application of an explicit finite element solver to account for non-linearities, large deformations and failure.
- Investigation of three component test set-ups: Global bending, local bending and axial crushing.
- Investigation of selected variants in a full-scale crash test.

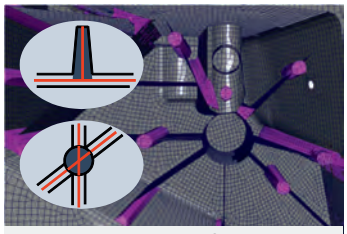


Original geometry

Solid modelling (benchmark)



Shell modelling exact



Hybrid modelling*

Results - Benefits

- Shell modelling exact: Exact modelling based on shell elements with T-junctions is still the best compromise between overall performance and modelling effort. Here, ANSA's casting functions significantly reduce the modelling effort.
- Hybrid modelling*: A shell mesh obtained from the exact modelling approach is reinforced by solid elements as needed. This approach shows a great benefit in accuracy without sacrificing computational time and handling. However, further development in ANSA's casting functions is required.

*Octavian Knoll: A Probabilistic Approach in Failure Modelling of Aluminium High Pressure Die-Castings, PhD Thesis, NTNU Trondheim, Norway, 2015.

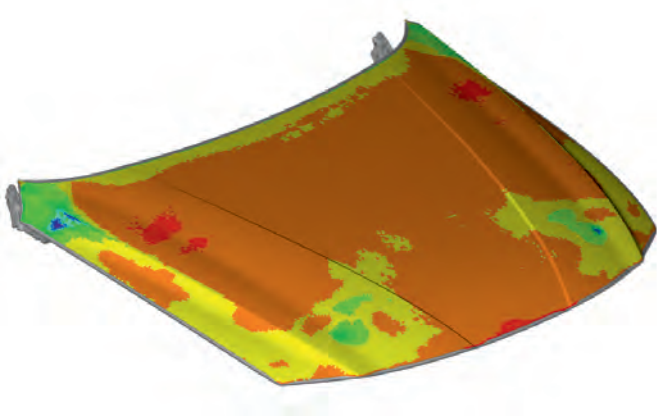
"The exact shell modelling approach is our standard for casting structures. Here, ANSA's meshing functions – especially the casting functions – significantly reduce the modelling effort. The accuracy can be easy increased by reinforcing solid elements. This hybrid modelling approach should be taken into account for future work."

Dr.-Ing. Octavian Knoll
BMW Group

Hyundai Motor Company: Paint dipping pressure fields mapping for structural simulation on a hood component

Challenge

- Mapping of the initial conditions of pressure loads for a large number of analysis steps from CFD simulation result files to a ready-to-run dynamic analysis structural model.
- Handling of large datasets: 100 to 300 steps, source data with pressures at ~100k discrete locations, target mesh with ~100k shell elements.
- Handling of rotating gravity vector.
- Reducing the needed manual work and CPU time for the mapping process.



Approach

- Utilization of the Results Mapper with script additions.
- Additional automation scripts to aid the preparation of the model for mapping and direct output with INCLUDES structure.
- Validation of mapping process by comparing pressure fringe plots, mapped pressure values at specific elements, as well as simulation results.

Results - Benefits

The new approach that utilizes the Results Mapper and the scripting API functionality in ANSA resulted in a manual work time reduction of -37% and an overall time reduction of -70%.

"ANSA is a tool that enables the adaptation of CAE information among diverse file formats. Sametime it works great with really big datasets. The combination of the Results Mapper and the Python script API provided us an effective process that greatly reduces both manual work and computational time."

Yumin Heo, Manager / Advanced Manufacturing CAE Team, HYUNDAI Motor Group
Hyundai Motor Group, South Korea

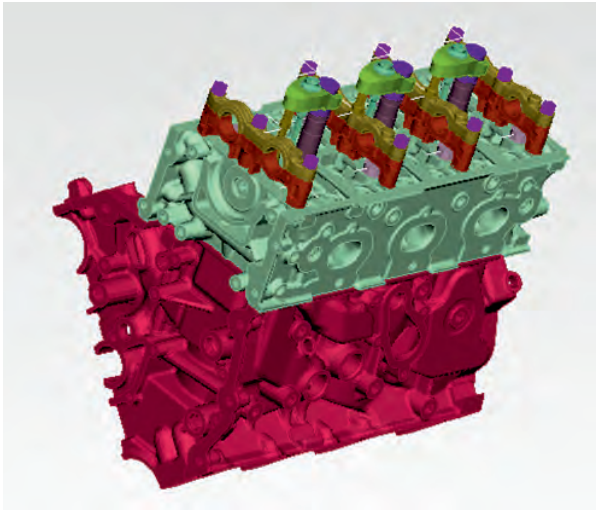
AUDI: Engine modelling using ANSA & META

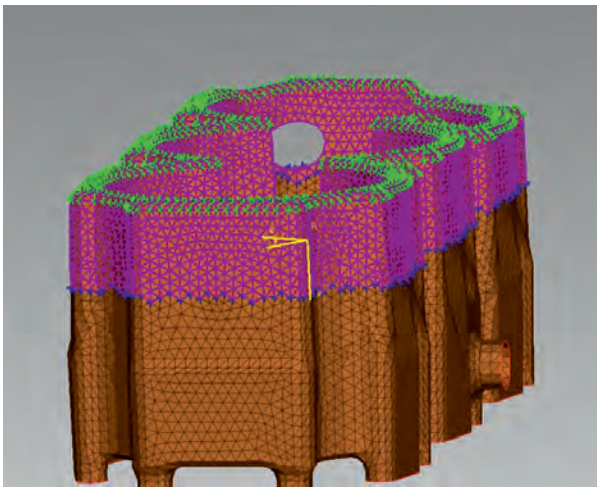
Challenge

- The preparation of an Engine Model for a Static Analysis with ABAQUS using ANSA & META.

Approach

- Based on pure geometric data, a procedure has been established in which the geometrical data are translated into ANSA files. Possible geometrical errors are fixed. A Surface Mesh using automate and semi-automate functionality has been generated, fullfilling the special treatment on certain areas. The Volumes have been meshed using 2nd order Tetra Elements. Then a full Model has been set up for a static analysis using ABAQUS. A toolbar has been created in META to automate the Evaluation of the results. Quick modifications of the model shape, in order to examine how these will affect the results, can be done easily using the ANSA Morphing tool.





Results

- The established procedure using ANSA & META eliminates the bottlenecks and reduces the needed time for preparing an ABAQUS model.

"Using ANSA & META we succeed to improve our procedure for an Engine Model Static Analysis"

Norbert Zenker, Berechnung Struktur / Dynamik Otto / Diesel, AUDI AG

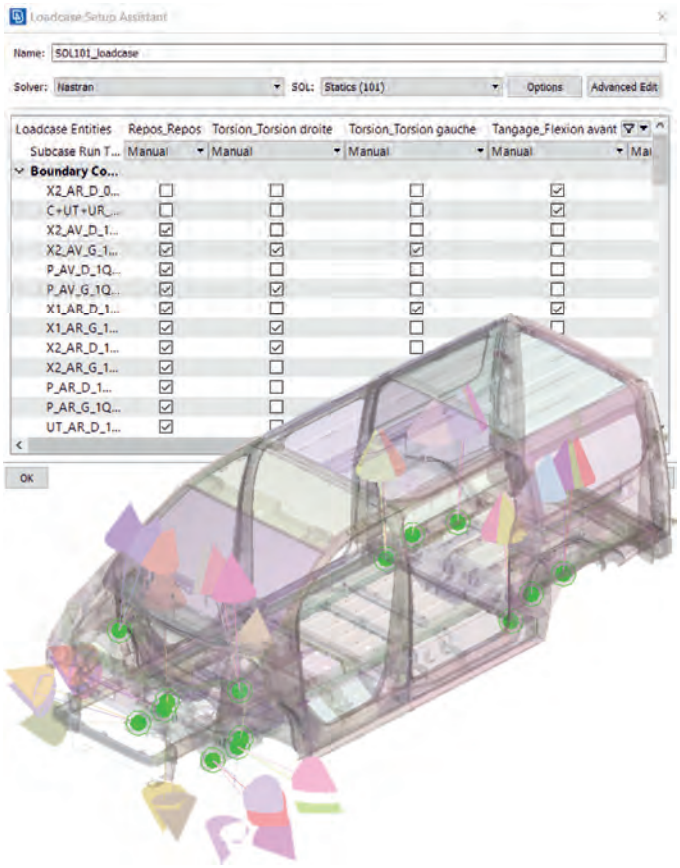
Groupe PSA : ANSA Toolkit for Body-In-White Durability Load Cases set-up

Challenge

- Interpret Nastran SOL101 load cases and masses from excel files into ANSA
- Facilitate the positioning of the load application points.

Approach

- Develop tools in ANSA with the aid of python scripting language which:
- Read load cases/masses through excel file
- Configure Nastran Lodcase Assistant through a user defined scenario (using new ANSA functionalities for Loadcase Manager & Reference Library for templates)
- Generate and position LC points to mark load application points.



Results

- Automated interpretation of load cases/masses
- Speed-up user defined scenarios for the load cases
- Ensure the integrity of the model by preventing user errors
- Store load cases/masses templates for reuse

"ANSA is a wonderful tool, deployed this year in Groupe PSA, for pre-processing calculation on structure/durability discipline. With new native functionalities and python developments (for PSA specifications), ANSA contributes to the significant reduction of the overall CAE turnaround time."

Aurélien PAVIN de LAFARGE, DQI/DAPF/MTSV/VDE/CMES

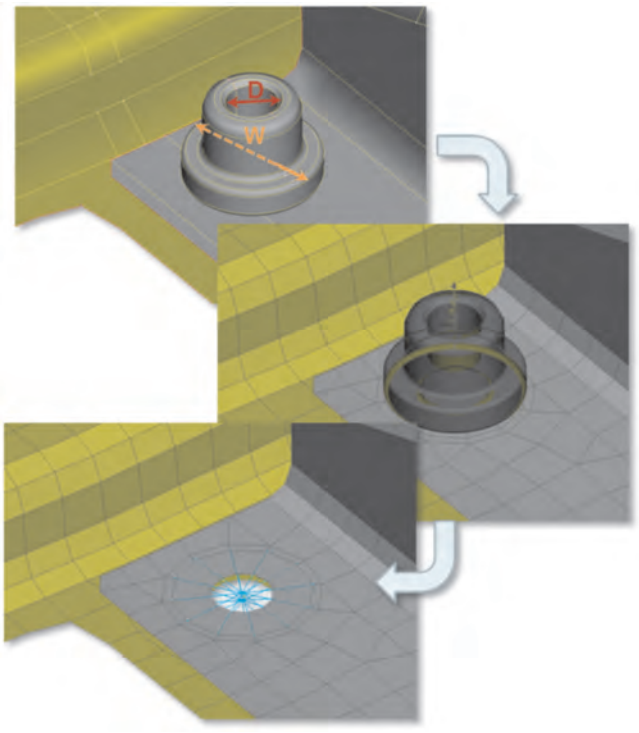
Volvo Car Corporation: Weld nuts modelling for vehicle durability

Challenge

- The exploitation of the weld nut 3D-representation for the extraction of bolt joint data .
- The use of them in the model build process at the early stage of meshing.

Approach

- A script was developed, that extracts geometric information of the weld nuts (i.e. weld nut width, bolt diameter) and stores it in bolt connections.
- For each bolt connection its connectivity is also detected, based on parts with openings in its vicinity.
- The Batch Meshing tool recognizes and treats bolt holes based on the bolt connections' - and subsequently weld nuts'- information. Finally, the bolt connections are realized through the Connections Manager, with suitable FE-representation.



Results

- The weld nuts modelling bottleneck for the body assembly is resolved.
- The process is automated.
- 20% modelling time reduction.
- considerable increase of the process reliability.

"With the automation of the weld nut modelling, significant time has been reduced in the modelling phase allowing the engineers to focus on the more qualified analysis phase improving the product."

Markus Fritzell, CAE analyst, VCC

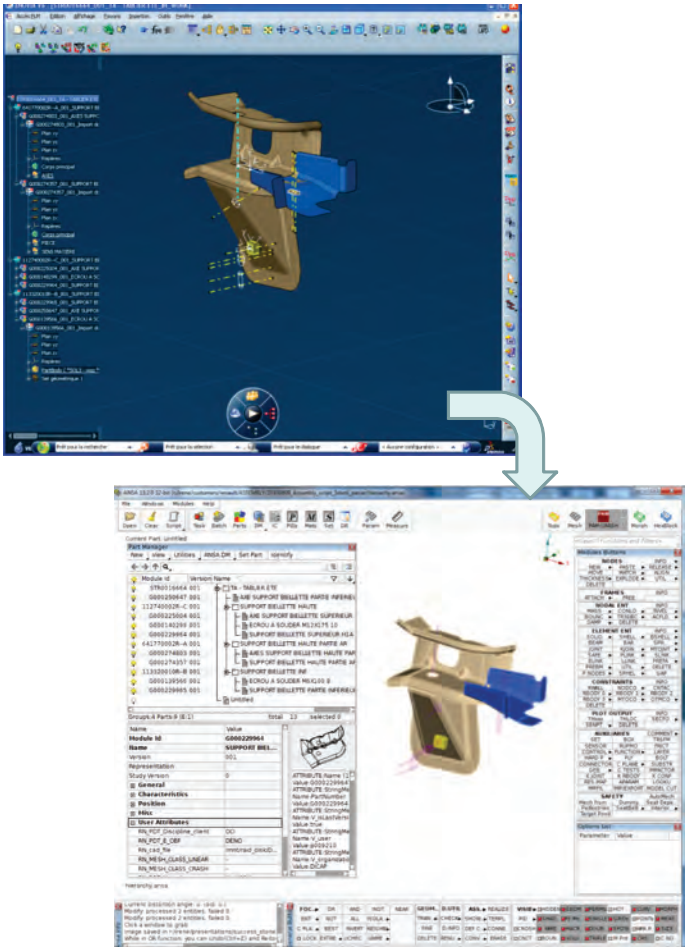
RENAULT: CAE model generation from CAD and PDM info

Challenge

- The generation of a CAE assembly model that maintains the PDM structure and meta-data and integrates CAE-specific information.
- This process must be reliable and consistent since it is the first step of the pre-processing phase.
- The quality of this model will be reflected to all FE-models that will be based upon it.

Approach

- ANSA scripts were developed in order to read the model description file exported from the PDM system.
- The model hierarchy together with part meta-data are imported in the Parts Manager, while all related CAD files are translated into ANSA files with appropriate attributes.
- CAE-specific information, including thickness and material attributes as well as mesh density guidelines, can be optionally mapped to the CAD files.



Results

- An ANSA assembly that integrates PDM and CAE-specific information is generated in a very short time.
- This model has all those attributes that will assist the CAE-engineer in the upcoming pre-processing steps (e.g Batch Meshing and connections realization), as well as enable the version tracking of the assembly components.

"For us, this script development is an excellent example of efficiency of ANSA Customers Team: Skilled and adapted engineers, guided by reactivity and Support principles, dealing to Features matching to complex and specific in-house Digital processes … "

Jeremie Gomez, RENAULT SAS
Specialiste Simulation Numerique

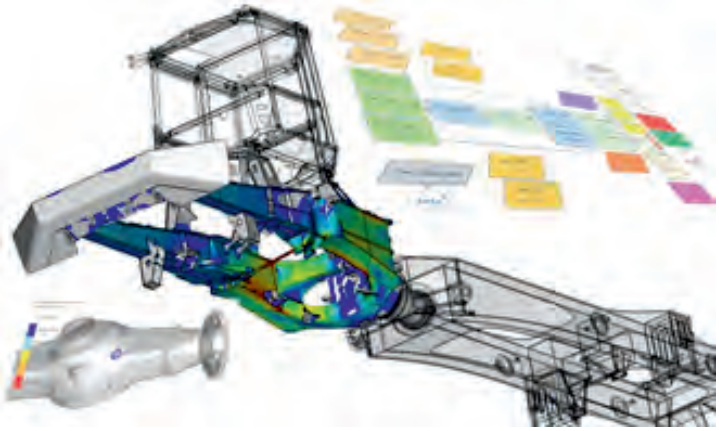
VOLVO: Analysis process automation within VPD Braås

Challenge

- Reduce lead time.
- Improve quality of results.
- Secure conformity between engineers.
- Minimize repetitive tasks.

Approach

Firstly, the processes with several consecutive analyses, long solution times and input had been identified. Tasks within processes, implying heavy administrative work, were also included. While, processes build up of several consecutive tasks were also considered suitable.



Results - Benefits

Using ANSA and META:

- Allows easy access to intermediate data e.g. for manipulation of bulk data.
- Facilitates model build and update in a way that systematicity can be exploited i.e. re-use of hard points etc.
- Allows for tailor made post-processing of method dependent results i.e. in house derived results leading to up to 90% time-saving.
- Can easily be executed in batch e.g. of post-processing tasks.

"Features of ANSA and META facilitates analysis process automation. It is considered to be a great advantage that the same pre- and post tool can be used independently of FE-solver. ANSA allows for several engineers to work with the same models in an organised manner. A project with high pressure was finalised one week ahead of schedule!"

Pierre Orvegren MSc.
CAE-engineer, Durability

Volvo Construction Equipment, Sweden

UNISO Technologies: Backhoe loader stability

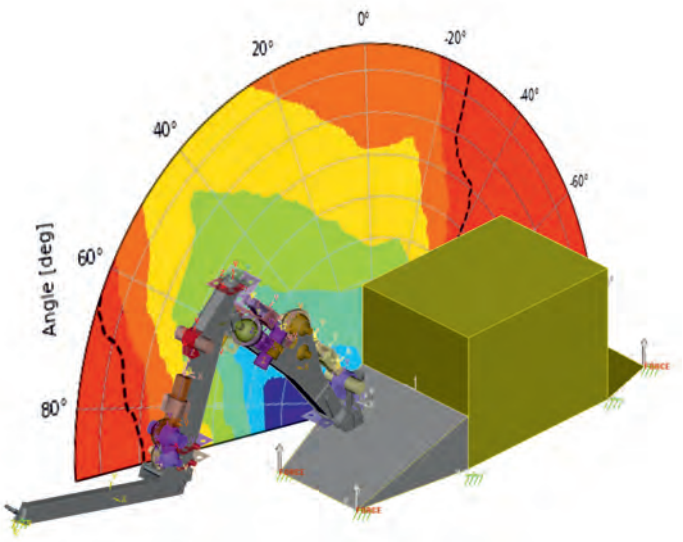
Challenge

- Investigation of potential instability of the backhoe loader when the excavator unit and lift is operated within working range.

Approach

This project was performed by Uniso Technologies AB together with Huddig AB.

- With the aid of the ANSA Kinetics the mechanism and movement of the excavator was setup and reaction forces at supports within operating range calculated.
- A Design of Experiment was performed to cover the possible combinations of positions for the excavator.
- SFORCE was used to identify the contact between wheels and ground and calculate the reaction force.



Results

- Custom post processing scripts for detection of instability.
- Pareto plots for individual cases.
- Automized Stability plots with safe working area.

" To be able to run ANSA Kinetics with a DOE made it possible to investigate a large number of combinations of positions and cases in a time effective way. With ANSA Kinetics, ANSA has evolved from a general purpose pre-processor to a powerful simulation tool for us to deliver results".

Malin Fredriksson, CAE-engineer,
Uniso Technologies

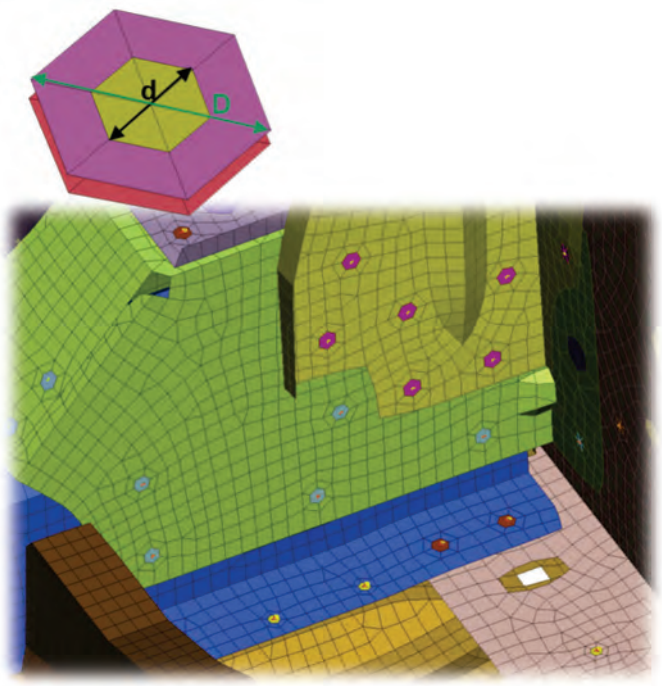
RENAULT: Spot weld modelling for vehicle durability

Challenge

- The use of a spot weld model that gives a good representation of the real spot weld area and correlates well with tests.
- Such a complex spot weld model could not be adopted in production models in the past, due to the very high pre-processing time requirements.

Approach

- The ANSA Connections Manager was used, that combines the efficient handling of few thousands of connection points with the powerful local re-meshing capabilities of ANSA.
- The different areas of the spot weld are automatically assigned custom property and material attributes with the aid of a post-realization user-script.



Results

- The time for the generation of more accurate spot weld models has been drastically reduced, together with the possibility for monitoring errors during the assembly process.
- The implementation of such spot welds in the production durability models was made possible, increasing the overall model quality while keeping the pre-processing cost low.

The spot modeling was very time consuming in the loop of BiW durability study. We win a precious time with this script. The resulting mesh around spots can be checked with powerful scripts“

Jean-Francois Vittori, RENAULT SAS
Body in White & Structure Design

PSA PEUGEOT CITROËN: Effective post-processing of Electric Spot-Welds with META

Challenge

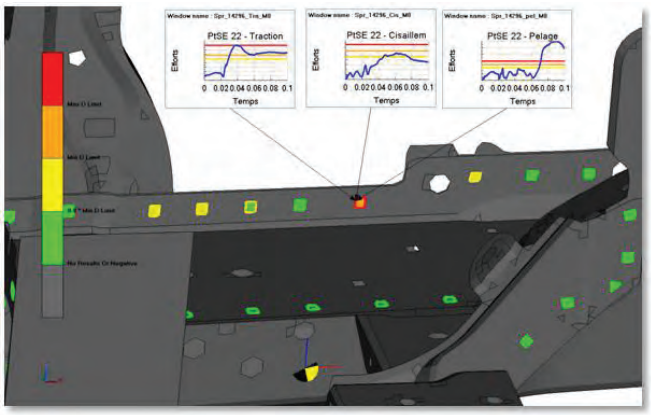
- The effective inspection of Electric Spot-Welds (ESW) failure and forces.

Approach

- Capturing of PSA PEUGEOT CITROËN procedures through custom developments in META to facilitate and automate these processes.
- Deployment of META native functionality and scripting capabilities.

Results

- Post-processing time for the forces in ESW has been reduced by almost 65% compared to the old PSA way.
- ESW failure check at a specific timestep or throughout the simulation.
- Ability to check all forces in the ESW during the simulation (tension, shear, bending) without changing the view via annotations.



"META is a wonderful tool, applied here in PSA Peugeot Citroen, for crash post-processing. Both its native functionalities and the scripting possibilities provide a great assistance in the reduction of post-processing time"

Nicolas Vallino,
PSA - DAPF/MTSV/NSIV/SIMU/SICA

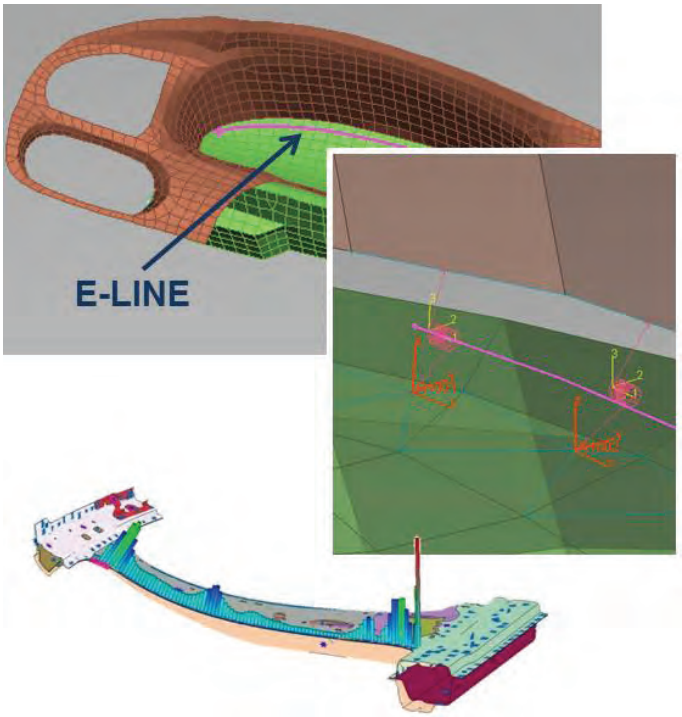
Volvo Car Corporation: Squeak and Rattle analysis

Challenge

- The investigation of squeak and rattle issues by simulating the relative displacement between two parts of the model due to a random signal.

Approach

- Based on pure geometric data, an advanced ANSA script has been developed to produce RBE3-CBUSH-RBE3 elements between a master and a slave part. A coordinate system, used to orient the CBUSH element, is created on each “master” node. The respective coordinate system is oriented according to four different configurations, each corresponding to the phenomenon that the user needs to examine (squeak or rattle). In META, a toolbar has been utilized to visualize the results on the CBUSH elements through circular annotations and through colored cylinders aligned to the local direction.



Results

- E-LINE analysis has lead to quick and accurate results in squeak and rattle investigation. The evaluation of results is done through innovative functionality that leads to safe conclusions.

“The E-LINE creation script in ANSA is a key enabler for efficient use of the E-LINE approach and greatly facilitates the connection of simulation results to both tolerance data and physical stick-slip tests, needed for squeak and rattle assessment”

Jens Weber,
CAE Development Engineer, AF

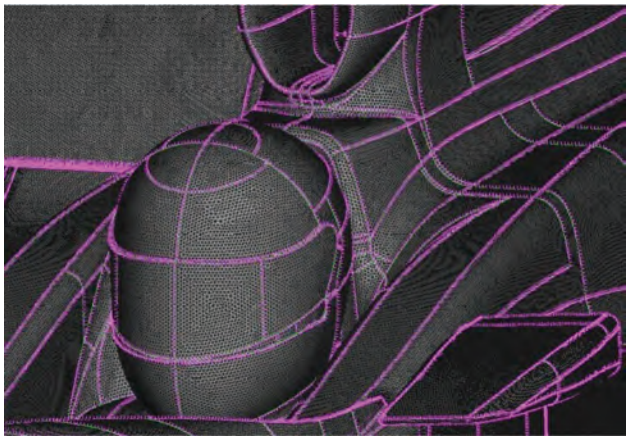
WR Digital: CFD for external aerodynamics in Racing

Challenge

- In modern racing, CFD preprocessing for external aerodynamics is becoming more demanding due to high model complexity, increased size handling and reduced processing time.

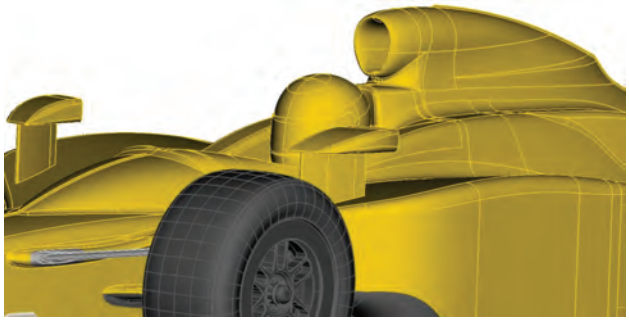
Approach

- CAD import in ANSA, geometry clean up and defeaturing with semi-automatic tools for watertight generation.
- One step meshing process with batch mesh tool.
- Generation of variable size CFD surface mesh.



Results

- Improved aerodynamics performance of racing car through high quality CFD modeling in less time, with reduced resources.



"CFD preprocessing for performance racing technology means high quality complex modelling in limited time. ANSA has proved to be robust and efficient in both."

Rob Rowsell, WR Digital,
Senior CFD Engineer

Ford Motor Company: NVH Console deployment in Ford Motor Company for Full Vehicle NVH development

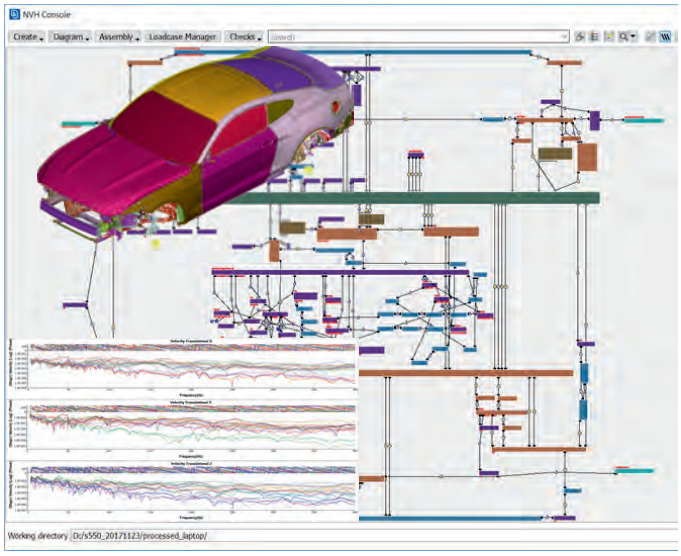
Challenge

- Replace an existing in-house tool used for the full vehicle NVH CAE assessments.
- Use names instead of IDs for the whole process.
- Accelerate NVH CAE assessment work.

Approach

Development of NVH Console embedded in ANSA, featuring:

- A simplified diagram view offering a concise overview of the full vehicle assembly and being fully synchronised with the 3D display.
- Loadcase Manager: an interface for the easy and fast creation/handling of components hierarchy, connectors and subcases.
- Options for customisation.
- Numerous checks.
- Seamless driving of any Nastran-based solver or META FRF Assembly.
  META FRF Assembly performance was optimised and its capabilities were extended.



Results - Benefits

- Full vehicle models or sub-assemblies are built in a fast and robust way, completely independent from IDs, avoiding errors.
- Model build/update and users collaboration is further augmented by storing the assembly in modular XML files which can also be used as templates.
- NVH CAE assessments are calculated fast and accurate even on local workstations along with multiple root-cause analysis results extracted from a single run.
- Complicated standard loadcases can be created easily with minimum input.

"NVH Console enables us to efficiently build, update, and manage vehicle NVH models and custom dynamic loadcases for the timely support of our new vehicle NVH development. It has also provided a very efficient and accurate solver, the FRF Assembly of META, which allows us to conduct most of our full vehicle NVH CAE assessments on the engineers' local workstations."

Dr. Kun-Tien Shu
Driving Dynamics Engineering

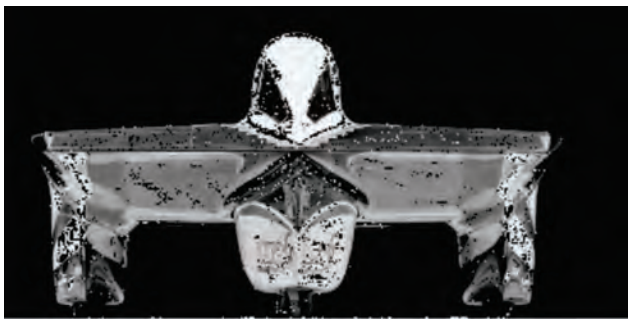
Actiflow BV: Nuna6 solar car aerodynamics

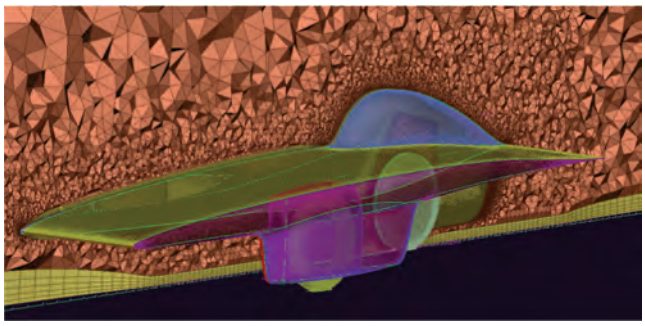
Challenge

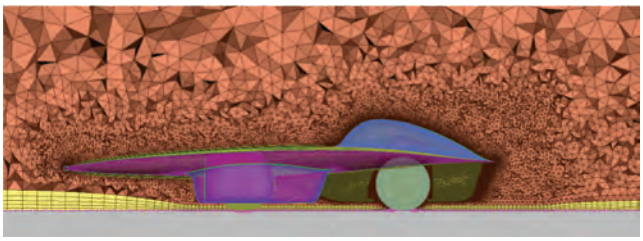
- Reduce the aerodynamic drag while keeping maximal solar cell area and minimal lift.

Approach

- Read in a Rhino generated IGES file in ANSA.
- Perform geometry clean up and watertight model preparation.
- Generate high quality surface and volume mesh with boundary layers all around the vehicle, moving wheels and road.
- Output in OpenFOAM for CFD simulations.







Results

- Nuna 6 took the 2nd position in the World Solar Challenge that took place in Australia in October 2011.

"The use of ANSA throughout the whole process of CFD model preparation allows the fast generation of high quality meshes that are necessary for reliable and accurate CFD simulations."

Tom Fahner, Actiflow BV,
Aerodynamics Engineer

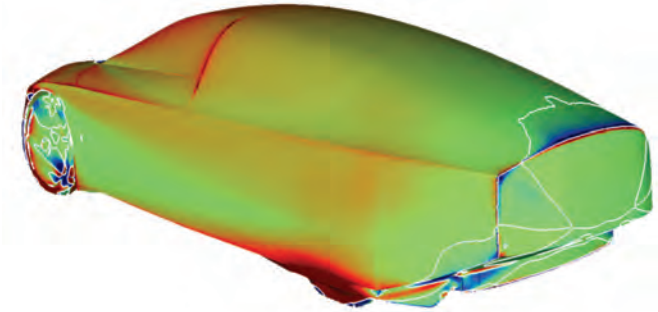
Volkswagen: Sensitivity-based morphing and optimization with ANSA

Challenge

- Efficient translation of element- or node-based CFD adjoint sensitivities into a new, smooth shape for geometries of industrial complexity.

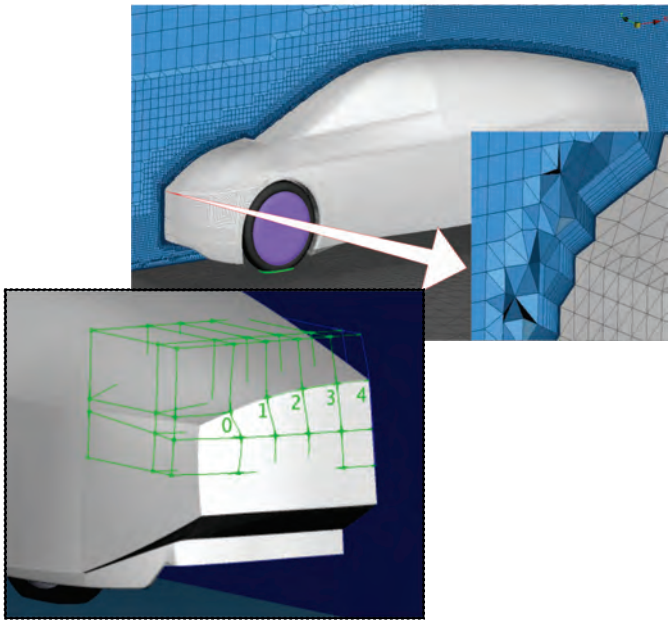
Approach

- The sensitivities as computed by an adjoint CFD solver are mapped from the model surface to adequate morphing control points and drive the subsequent morphing of the model.



Results

- The sensitivity-based shape morphing method developed in cooperation with BETA CAE Systems closes an important gap towards an automatic adjoint-based shape optimization process.
- One-shot optimization of entire vehicle aerodynamics at a cost of 4-6 flow solutions is now possible as demonstrated by the application to the external aerodynamics of the Volkswagen L1.



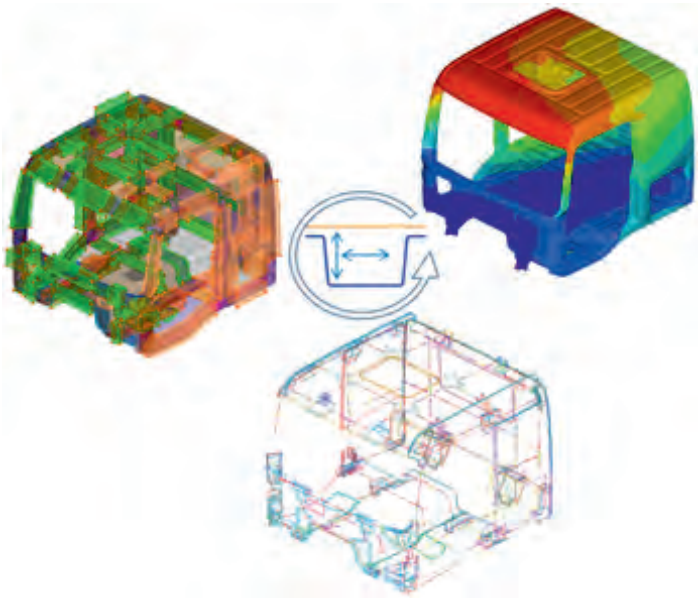
"The extension of ANSA's morphing capabilities towards sensitivity-based morphing opens up the way for an efficient adjoint-based shape optimization."

Dr. C. Othmer, Volkswagen AG, Group Research

Hyundai Motor Company: Beam Section Optimization

Challenge

- Concept Shell mesh model to beam model.
- Shape optimization set up for Beam section.
- Apply optimization results of Beam section on Shell mesh Concept model.
- Minimize repetitive tasks by Automation.



Approach

- Initially the process of converting shell mesh concept models to beam models was defined manually. However manual actions were labor intensive and time consuming. And it's impossible to make the interactive function between Beam section & Shell mesh. Also the set up for the optimization was complicated and the reflecting of the results on the concept model was not possible.

Results

Using ANSA and a Tool created with Python script:

- Allows easy selection and creation of beam elements.
- Facilitates the selection of different types of Cross Sections, Junctions representation, model types (just frame or frame with panels).
- Automatically Creates Optimization set up with shape and thickness design variables and removes invalid cross section changes.
- Can easily use the Optimization results and reflect the new cross section shapes on the shell concept model.

" We made the interactive function tool between beam section and shell model, and the optimization result was imported in shell model automatically. In front loading stage, we could provide a well defined BIW model for design team using this process. This is a simple, easy and powerful tool for CAE engineers"

Moon Jihoon / Chang Hongsuk
Senior research engineer / Commercial Vehicle CAE Research LAB.
Hyundai Motor Group, South Korea

SEAT: Correlation studies using videos & images

Challenge

- Simplify and accelerate the procedure for correlation studies between simulation results and physical test data.

Approach

Use of META and its embedded Visual tools, to exploit its capability to:

- match FE models on images or video frames,
- synchronize the simulation with the video of the physical test and
- trace features on videos.

Results

- The new procedure, based on META post-processor is simple, fast, straightforward and is completed within a single tool.

"The choice of META for the correlation of simulation results with physical test videos was the optimum because META simplified our work and reduced the effort, time and cost required for our procedures."

Angel Segura Santillana
CENTRO TÉCNICO DE SEAT, SEAT S.A.

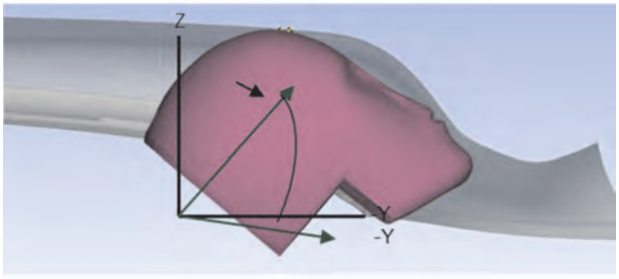
Volvo Car Corporation: ANSA and META for interior Head impact analysis

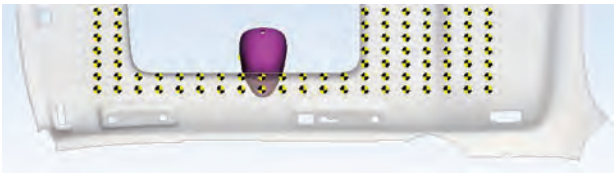
Challenge

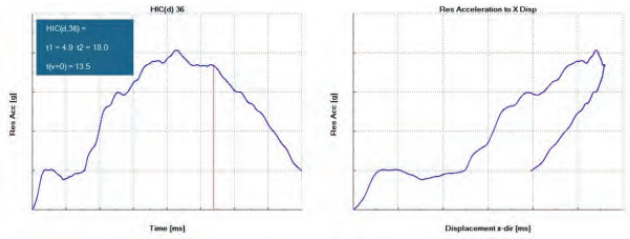
- The development of an automatic procedure that can speed up a Head Impact test for the Upper Roof area of a vehicle in accordance with FMVSS201U protocol.

Approach

- A script, which calculates possible Target Points on the Upper Roof area and produces Robustness Analysis for each Target, has been developed.
  A difficult task was the identification of the areas of the upper Roof where the maximum vertical angle can be achieved. For this reason, an advanced algorithm, which positions the Impactor with the desired vertical angle and simultaneously acquires the minimum contact distance, has been developed. The positioning is applied simultaneously to all the identified Target Points and the corresponding keyword files are created.
  The results are presented, according to the federal regulations and robustness studies, as overviews as well as for a single Target Point in META.







Results

- The innumerous Target Points which created uncertainty in the study of Upper Roof area are now identified in an automatic way. This, in combination with having the ability to position the Headform massively for all the Targets, in really difficult places of the Upper Roof, have reduced the time of an Interior Head Impact Analysis up to 100 times.

"FMVSS201U tool in ANSA and META were developed in close cooperation with OEMs in order to be efficient and easy to use. The algorithm in ANSA works in consistency with the regulations. The new functions with automatic targeting and multi positioning offer conservative strategies and enable robustness studies to detect worst-case scenarios. As well, the use of FMVSS201U tool in META speed up the analysis of the CAE results."

Dr Anneli Högberg, Crash Safety CAE analyst, Volvo Car Corporation

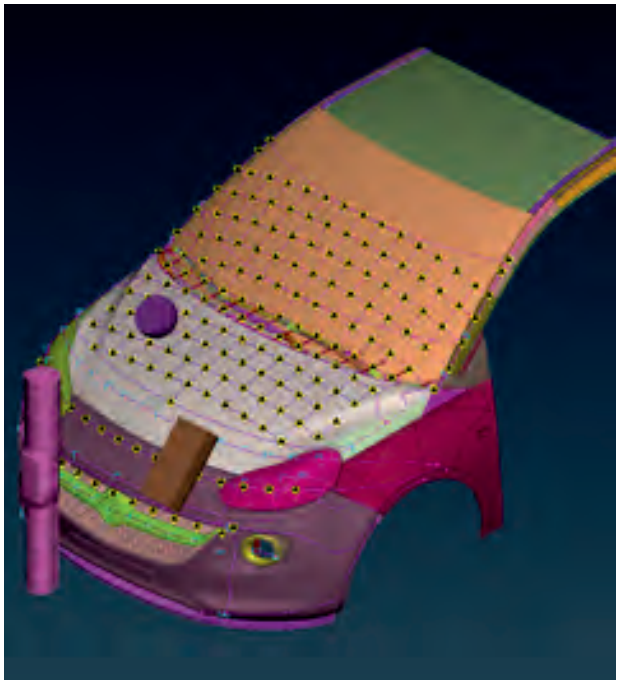
Adam Opel AG: Using ANSA in Pedestrian Safety Analysis

Challenge:

- Passing from EuroNCAP v5.0 to v8.0 the number of Target locations has had an approximate increase from 60 to 210. This creates the need for an automated tool that produces the target locations, positions the Impactor, and offers simultaneously high precision and time effectiveness.

Approach:

- An enhanced Pedestrian tool has been developed, using the ANSA script and the ANSA Pedestrian functionality.
- The tool allows the analyst to mark the outer trim of the vehicle by creating all the desired Target Points.
- Moreover, it offers the ability to position all the Impactors (Headform, Lower and Upper Legform) according to the protocol on all the created Target Points simultaneously.
- Finally, there is a bulk creation of ready for solving keyword files for all the positioned Targets.



Results:

- Using the ANSA Pedestrian functionality and its scripting capabilities, a simulation engineer can perform a full Pedestrian Safety analysis, from the outer surface math data(unmarked) to a simulation in the solver, in less than 25 minutes.

"ANSA provides a powerful programming language that enables the automation of repetitive tasks improving the quality and speed of our work."

Yogesh Upreti, Development Engineer in Pedestrian Safety, Adam Opel AG

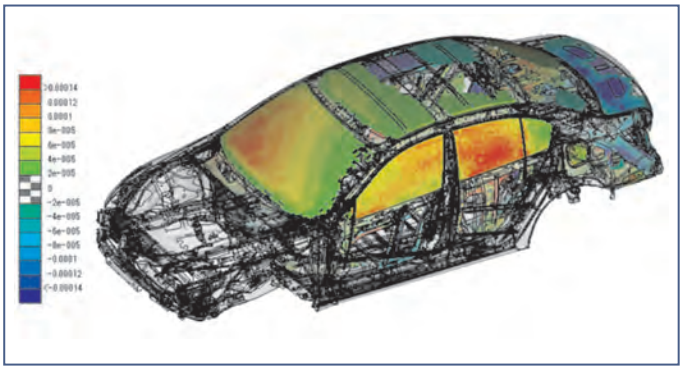
Honda R&D Co., Ltd. Automobile R&D Center: Addressing post-processing for Body NVH

Challenge

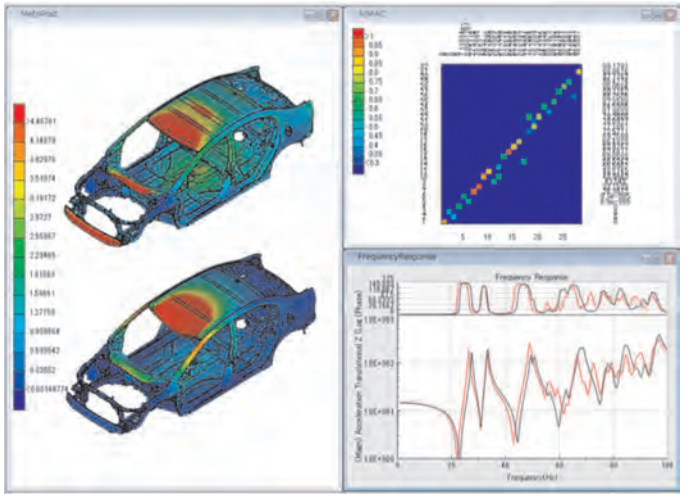
- To streamline and automate the NVH post-processing of a car body using one tool.

Approach

- Exploitation of the extensive suite of NVH tools of META.
- Use of customization & automation capabilities of META.



Grid participation



Modal analysis

Results

- All required NVH post-processing were easily achieved.
- Significant time saving and minimisation of errors by streamlining the processes.
- Ability to further decrease process duration by setting up repeatable processes and by automating tasks reducing human interaction.
- The wide usage of META, along with the similarity of its interface with that of ANSA, resulted in reduced training time and steeper learning curve.

"META constitutes a complete NVH suite which along with its customization capabilities, the high responsiveness of BETA CAE Systems to our development requests, and the superb support we receive from TOPCAE, proved to be the right choice for NVH post-processing."

Yasuhiko Kagiyama,
Assistant Chief Engineer
Honda R&D Co.,Ltd. Automobile R&D Center

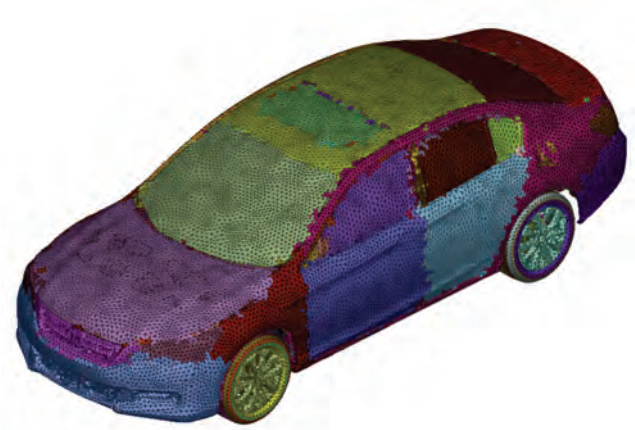
Honda R&D Co., Ltd. Automobile R&D Center: Exterior Acoustics full vehicle model generation

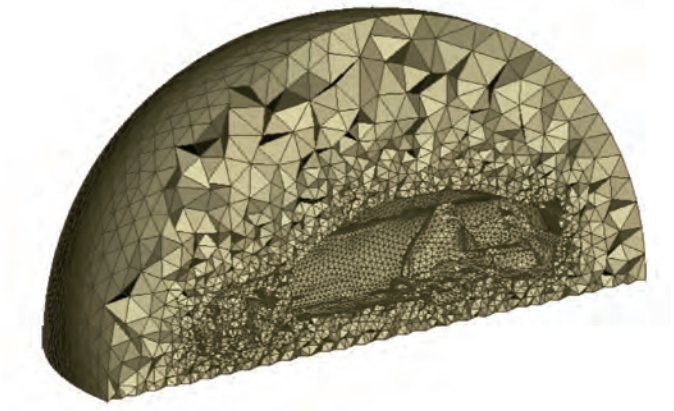
Challenge

- The generation of a full vehicle model for Exterior Acoustics, including tires and bumper faces.
- This process must be reliable and consistent, so that it can be applicable to both a trimmed body model, and a full vehicle model in the pre-processing phase.
- The quality of the final model should be reflected and certified during all steps of the process.

Approach

- A model preparation, consisting of making groups for wrap, ribs and unnecessary parts removal, holes and gap fill, and leak check is essential.
- The main model procedure consists of wrap, coarsen, intersections fix and solids creation.





Results

- Time reduction by 85%
- Increase of process automation and product reliability:
- Integration of the same process in more projects.

"The proposed procedure was very effective to reduce model creating time. Thank you so much for your co-operation!"

Yasuhiko Kagiyama,
Assistant Chief Engineer
Honda R&D Co.,Ltd. Automobile R&D Center

Volkswagen: Process for preparing engine parts for acoustic calculations

Challenge

- Create a procedure to use standardized numbering for engine parts.
- Prepare a segmented engine-block-structure for an automated superelement-procedure.
- Prepare the engine parts for minimized storage and output by increased quality.

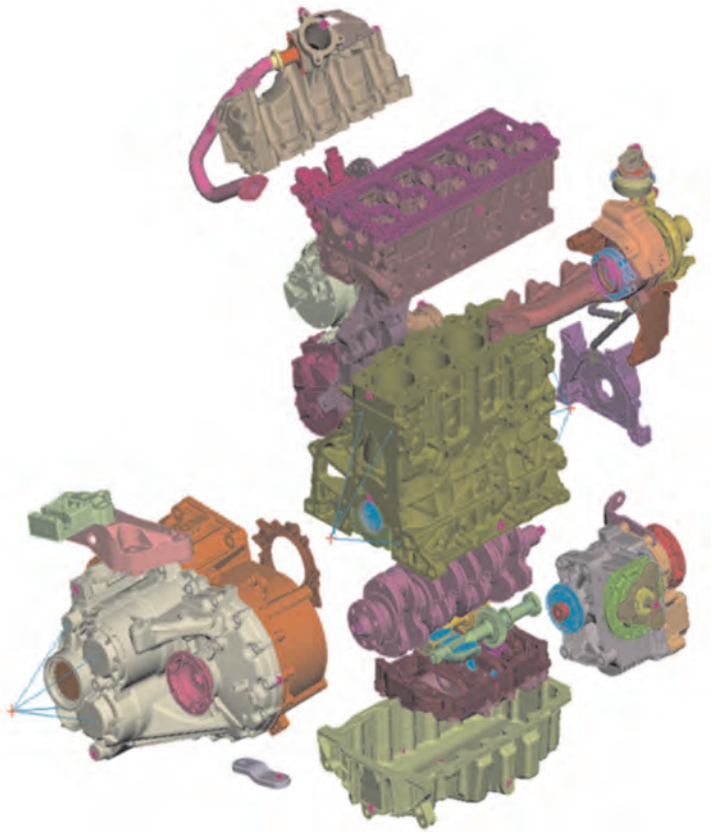
Approach

ANSA scripts were deployed that:

- renumber the engine parts by use of predefined rules according to part position in the assembly structure and connectivity to other parts / entities.
- create bushing-elements to connect different parts including the search for combining nodes.

Results

- The ANSA -script creates a custom set of windows that allows to change the position of parts, review / correct the masses and delete / replace any parts.
- All parts are output in the desired format, providing a ready to run file structure (includes, headers, etc.).
- Fully automated and optimized preparation-process that minimizes user errors.
- The time for the preparation of the calculation models has been drastically reduced.



"The procedure in ANSA helps us - alongside a script to run the calculation and a special calculation program for acoustics - to reduce the time for acoustic calculation from weeks to hours. We are now able to run multiple versions of engines and engine-parts in order to design engines with low noise in a minimum of time."

Dr. P. Stamerjohanns,
Advanced Diesel Engine Development,
Volkswagen AG

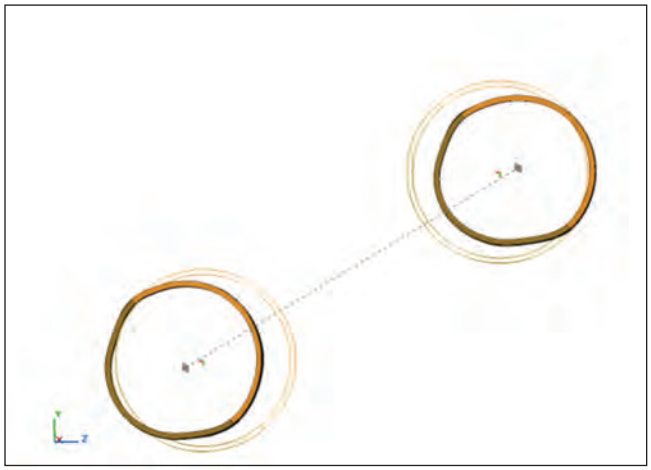
AUDI: Calculation of rod elongation through Bore Distortion Analysis

Challenge

- Organize the calculation of the rod elongation through an easy and repeatable procedure.

Approach

- Deploy META post-processor.
- For each bolt connection its connectivity is also detected, based on parts with openings in its vicinity.
- Use integrated META Bore Distortion Analysis toolbar.
- Exploit its capability of bore distortion polar plots calculation and creation, from single Fourier orders.



Results

- The procedure is simple and realized from a single tool.
- There is visual validation of the input data and the results.
- There is no need any more for special nodes numbering or moving data between different software.

"The deployment of META for Bore Distortion Analysis significantly reduced the time required for our analysis procedures as it offers an automated, simplified and integrated environment."

Reinhard Wersching,
AUDI AG, Neckarsulm

TECOSIM: Reverse engineering of CT-scanned objects

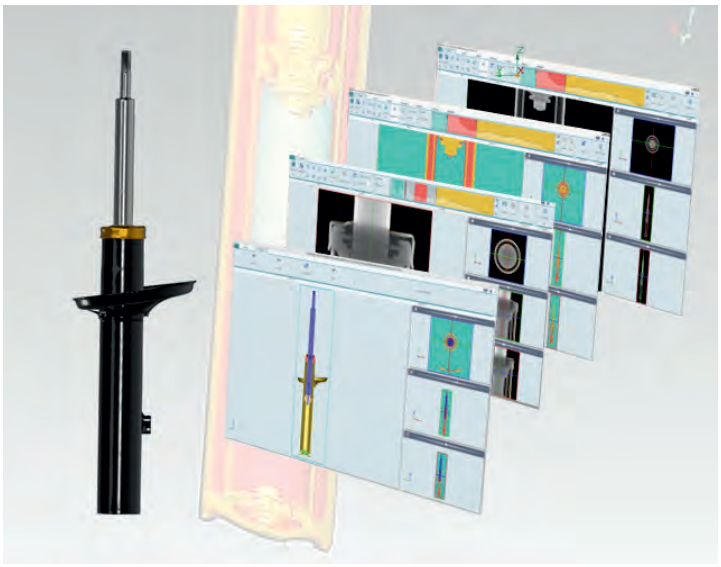
Challenge

- Produce an FE-model from a CT-scan of a shock absorber part, towards further use for CAE-purposes.
- Perform a per part as well as per material segmentation.
- Increased difficulty factor, due to the existence of the hydraulic fluid.

Approach

For this process, RETOMO/ANSA/META have been deployed.

- With the aid of RETOMO we performed the per part/per material segmentation at image level and produced the FE-meshes.
- The ANSA pre-processor has been used to remove artifacts & mesh noise.
- The META post- processor was deployed for reporting the reverse engineered parts, taking advantage of presentation features such as explosion, photorealism, annotation and the animation editor.



Results - Benefits

- RETOMO handles the big datasets in modest computers, generating simplified but accurate meshes for further processing in ANSA.
- With META the user may directly load the RETOMO segmented volume and perform inspection using VR.

"It's the combination of RETOMO/ANSA/META that facilitates a complete reverse engineering process, from handling CT-Data until reporting the redesigned objects."

Dipl.-Ing. S. Baum
Branch Manager
TECOSIM Technische Simulation GmbH

BMW MOTORRAD: Transient Animation of Flexible Bodies with Modal Coordinates from Multibody Simulation

Challenge

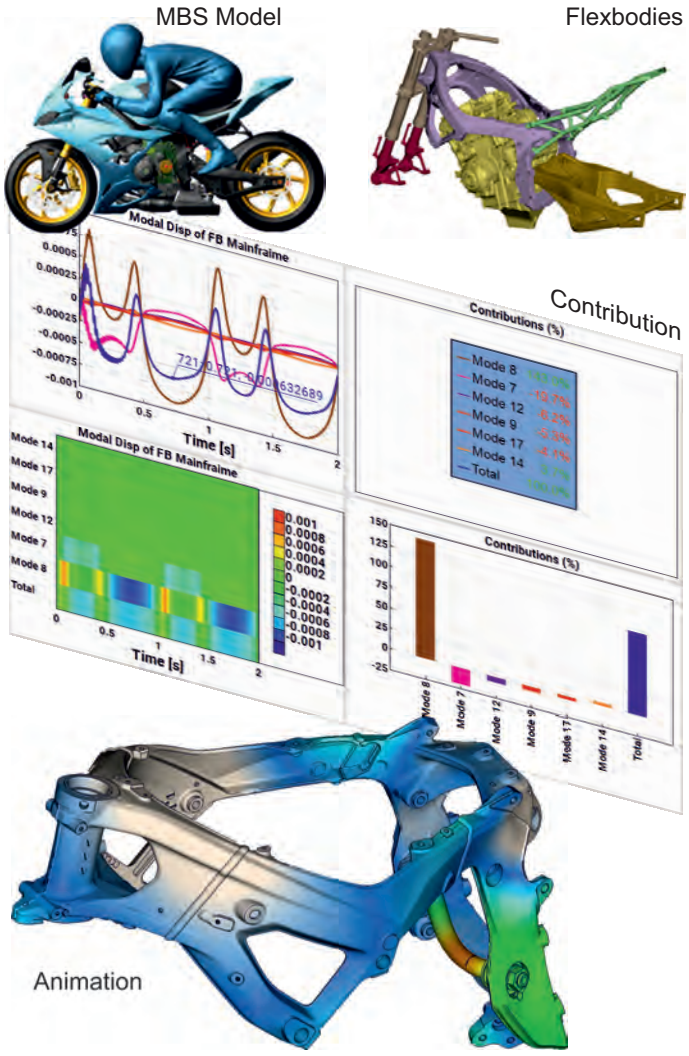
– The influence of structural deformations on the vehicle dynamics is a very important field during the development phase.
– In a full vehicle multibody simulation (MBS) model all relevant structural parts are considered as flexible bodies.
– A detailed visualization and an efficient investigation of the structure's transient behavior is required, but is not facilitated by current MBS post-processors.

Approach

– An additional, detailed modal base, which includes also stress results, is calculated during the creation of each Flex Body.
– The modal coordinates of the Flex Bodies obtained from the MBS result along with the respective additional modal base are input into META.
– The “Transient Analysis of Flex Bodies from MBS” toolbar is used for the investigation of the full elastic behavior, through transient animation of deformations and stresses, as well as contribution plots for modal results.

Results - Benefits

– Detailed study of the transient behavior of a component during maneuvers, by using the original FE-model with all its degrees of freedom, instead of using a flexible body with only a few display nodes.
– Identification of problem areas and result-oriented optimization based on relevant transient full vehicle maneuvers.
– Reduction of hardware prototypes.
– Experience and knowledge gain.



“By reading the modal coordinates of flexible bodies from a multibody simulation and using the new Toolbar in META, it was possible to investigate the structural behavior of components during specific maneuvers in very high detail.

This helped us to optimize components based on transient maneuvers and to reach an optimal design regarding vehicle dynamic behavior.”

Martin Floßmann
R&D Specialist Vehicle Dynamics,
BMW MOTORRAD

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“…… They never promise something they can’t deliver ,… Real professionals.”

“I would like to express my gratitude to the support team for being very helpful and professional. It has been above my expectation and this is the quality that each customer is looking for. Thank you!”

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