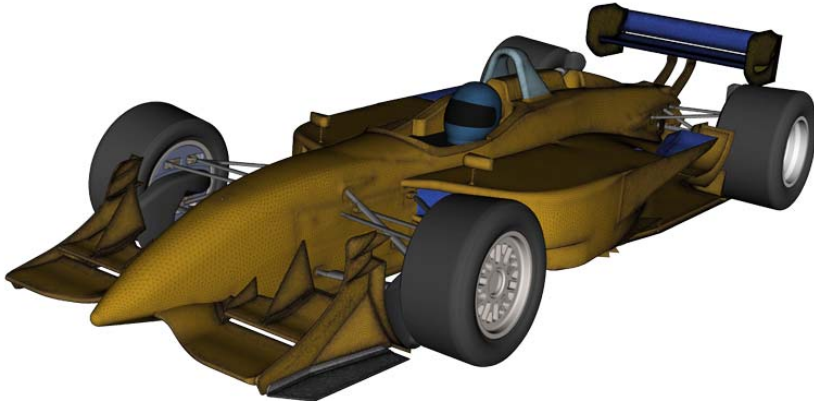# WR Digital adopts ANSA
for Complete and Successful Motor Racing CFD Modeling

In a highly challenging and competitive engineering environment, the use of computational methods in aerodynamics design gives a lead, while the choice of the proper Computational Fluid Dynamics (CFD) software is of paramount importance. WR Digital Ltd. adopted ANSA of BETA CAE Systems S.A. as the standard pre-processing tool for CFD in order to excel and offer to its clients and partners a leading position.

WR Digital Ltd. is a Wirth Research group company, focused on providing innovative answers to complex problems through the application of CFD. Specialized in research, development and design for the motor racing industry and other high technology sectors, it is one of those who face first the challenges of innovation.

"The choice of the best-in-class software is of strategic importance and ANSA is certainly the CFD pre-processing solution that meets our demanding requirements for efficient and competitive modeling" says Rob Rowsell, Head of CFD for WR Digital. "Based on our years of experience in research and design, BETA CAE systems S.A. provides the most effective and complete solution in CFD model preparation".

ANSA, with a fully customized CFD interface that meets the requirements of current CFD trends, offers accuracy, flexibility and automation to engineers. In numerous domains, such as the CAD and teselated data handling, the surface meshing, the generation of volume mesh with boundary layers and the morphing capabilities coupled into optimisation cycles, ANSA has been proven the most reliable CFD pre-processing package in an all-in-one integrated environment.

Some of the challenges faced by WR Digital and the solutions offered by ANSA are revealed in brief in this document.

Demanding Geometry Preparation For Complex Aerodynamics Simulation.

Having to work with various CAD formats, the versatility of the CAD data to ANSA files, translators allows the import of models prepared by different customers, across a wide range of disciplines. Handling of the geometry and its clean-up is the first in a series of steps that analysts benefit from the use of ANSA. The automated and semi-automated tools that allow the fixing, modification and de-featuring of geometry are some of the major advantages we found while preparing watertight models in ANSA.
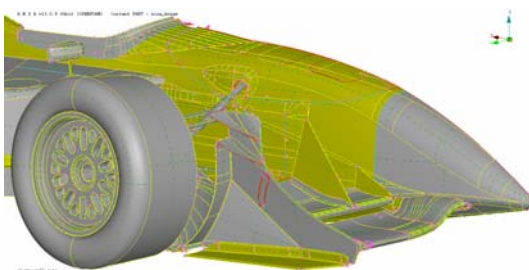

Original geometry
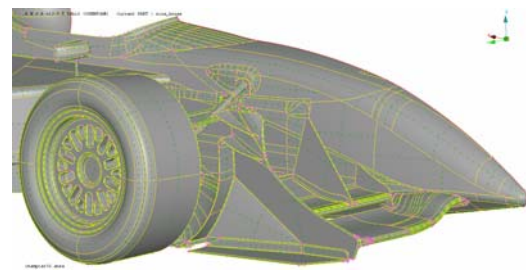
Watertight geometry

Advanced Surface Meshing For High-Precision External Aerodynamics.

Some important features that highlight the benefit of the use of ANSA in the process are the ease of use of surface meshing tools with automatic optimal meshing area idealization and the parallel-processing CFD meshing with refinement based on local curvature and sharp edge features. The automatic functions of quality mesh improvement have reduced the total man-hours required to generate mesh of high quality or fix grids imported from other sources. Size boxes that have been implemented in the model provide further local mesh refinement.
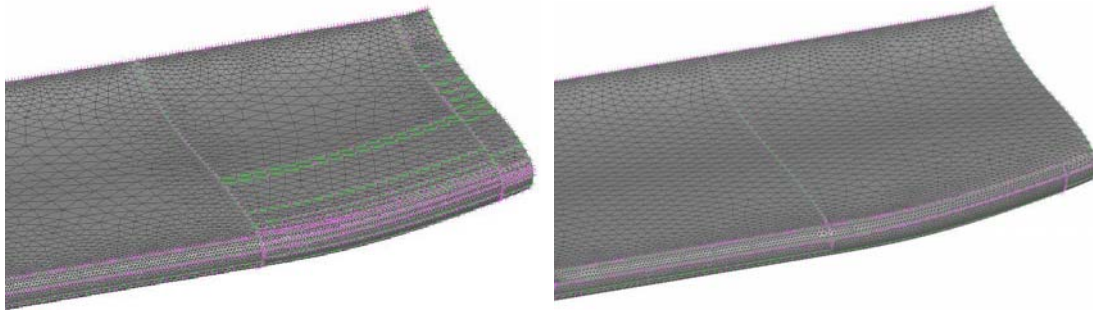
*Automatic surface meshing areas idealization*
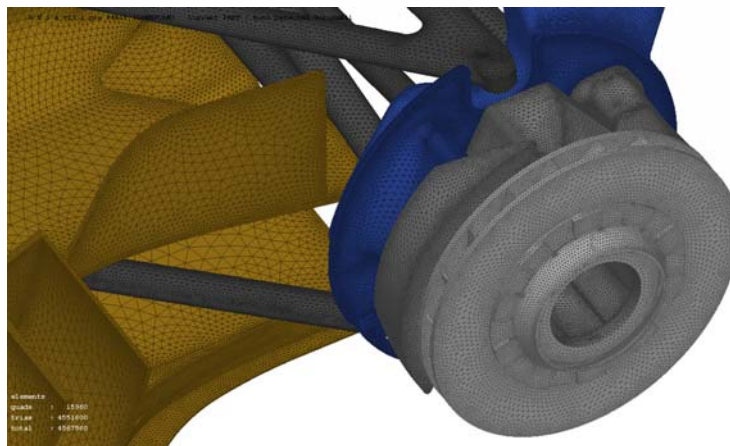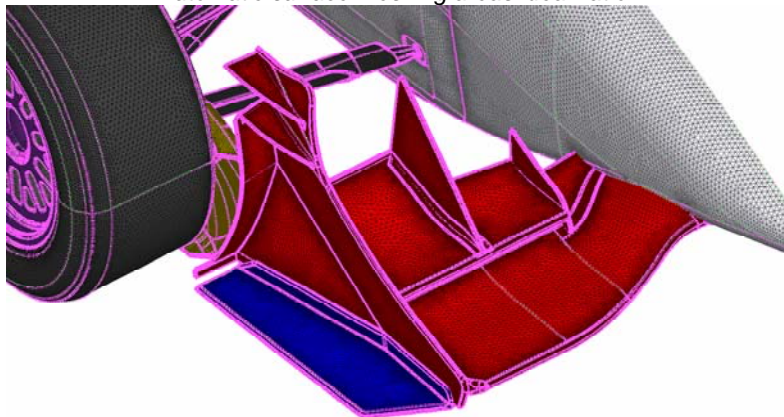
*Automatically generated curvature dependent grid*

The latest version of ANSA has been enhanced with a new Wrapping algorithm that allows the effective handling of "dirty" CAD data and FE mesh, creating a watertight surface mesh while reducing the processing time from weeks to hours. Within this context, complicated or simply parts that are not in place and thus have penetrations, intersections overlaps or cracks, can be automatically combined in a common assembly of high-quality standards. This provides WR Digital with an initial mesh at the early stages of the design process.

State-Of-The-Art Structured And Unstructured Mesh With Layers.

The newly developed advanced boundary layers and volume mesh algorithms allow the generation of grids with variable per area parameters and with user-defined controls for elements "squeezing" and "collapsing" to avoid intersections and proximity issues. Having to mesh models of extensive size, the use of fast meshing algorithms is of great importance. The recent additions of Tetra Rapid and Polyhedral are fulfilling these requirements.
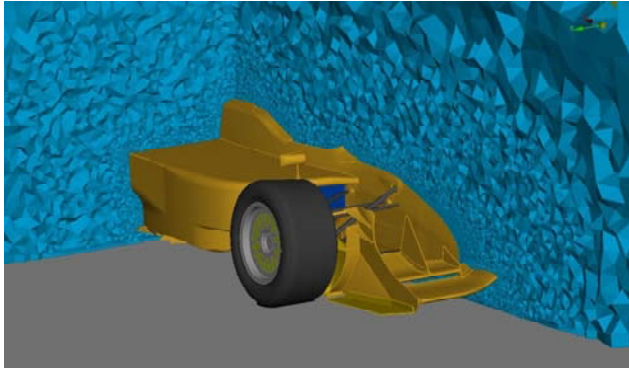

Tetrahedral mesh with boundary layers
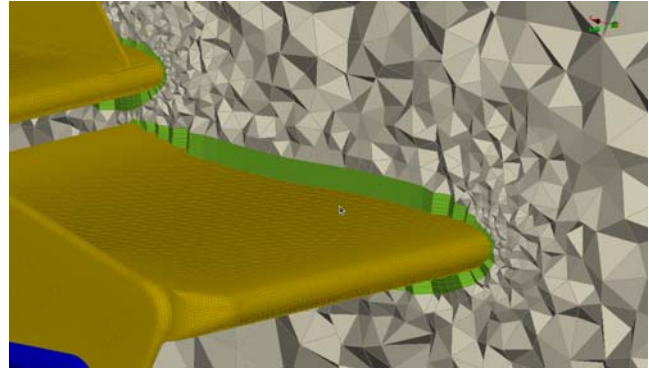
*Boundary layers* mesh

One-Step CFD Model Generation.

Using the functionality provided by the batch meshing tool of ANSA, the generation of surface mesh, boundary layers and volume grid is automated and reproduced on different models using a set of predefined scenarios. In case of non-watertight FE or "dirty" CAD models, the same automated process incorporates also the new wrapping tool, with intelligent leak detection, and thus produces a watertight domain. Therefore, with one setup of rules and settings the batch meshing tool produces high quality mesh with minimum user interference in short time. With these enhancements, the development of grids on large domains for external aerodynamics analysis is becoming a streamlined process.

## Flexible Aerodynamics Optimization

External aerodynamics shape optimization is a key aspect in the design and development of motorsports models. Minor modifications on the surface shape may have a huge positive or negative impact on the product's performance characteristics, therefore, accuracy and data integrity is at the top of the agenda. Having to simultaneously manage multiple morphing-shape optimisation tasks within the same model, the morphing tool of ANSA has been proven to be both powerful and accurate. ANSA morphing operations are applicable on either FE model data or original geometry data so that those can be sent back to CAD department to update the original design. With extensive control over the morphing actions through parameters and automatic coupling with major optimization codes it could be a standalone tool. Yet still incorporated in the same package with meshing and geometry handling allows cross-interaction and consequently increased user-flexibility.
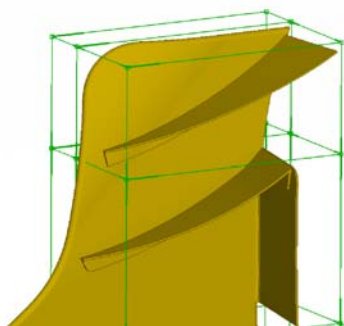
Original geometry
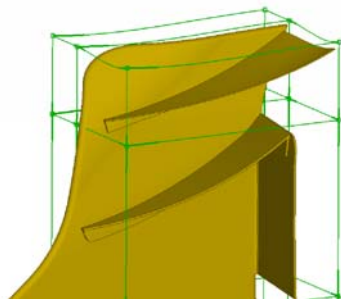
Morphed geometry
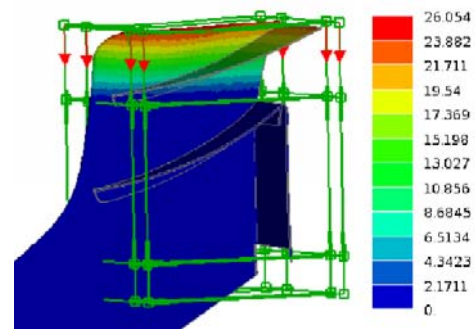
Morphed geometry with modification values graph

BETA CAE systems S.A. products have been an invaluable partner to the automotive and motorsports industry for years, providing CAE engineers with robust software solutions that fulfill the requirements of accurate and fast CFD preprocessing. ANSA has empowered WR Digital Ltd.'s ability to create complex aerodynamics models of high quality and accuracy.

Using ANSA, WR Digital Ltd. is now able to significantly reduce the time required to create a watertight surface mesh, from weeks to a couple of days. The automation tools of ANSA have contributed to the reduction of the total development and simulation cost. Furthermore, the common multi-tasking environment of ANSA proved capable to deal with all the organization's CFD preprocessing requirements, thus eliminating the exchange of data between different software.

BETA CAE Systems S.A. engineers, offering software solutions and customers services to WR Digital team with the same dedication and quality throughout the years of co-operation, strengthen the organization to be a step ahead.

For more information on WR Digital Ltd.
visit: http://www.wirthresearch.com

For more information on ANSA and BETA CAE Systems S.A.:
visit: www.beta-cae.gr/