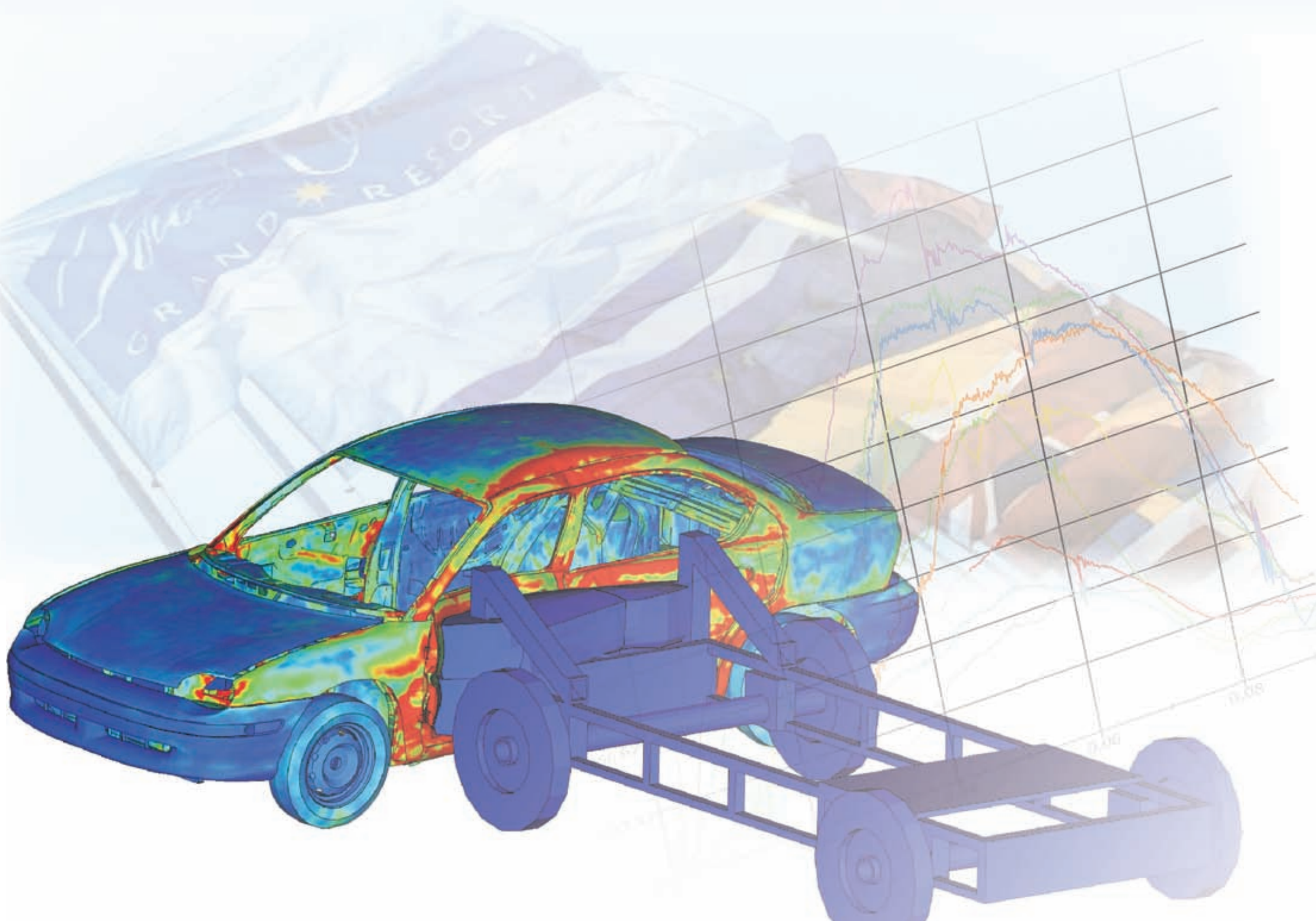
3rd ANSA & μETA INTERNATIONAL CONFERENCE

September 9-11, 2009

Porto Carras Olympic Hall

Porto Carras Grand Resort Hotel, Halkidiki, Greece

PROGRAMME & ABSTRACTS



10 years

BETA CAE Systems SA

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PROGRAMME & ABSTRACTS

BETA CAE Systems SA

Contents

Welcome

Dear Attendees

We have the pleasure and the honour to welcome you to the "3rd ANSA & μETA International Conference", to celebrate with us the 10 years since the establishment of BETA CAE Systems S.A..
This year we formed an extensive programme that includes a day of free technical workshops and two days of contributed papers.
The free workshops, focused on numerous disciplines, have a balanced content of presentations, demos and discussions and promote the knowledge on the latest software features, techniques and methodologies. These workshops add value to the participation experience and along with the one-to-one technical discussions, demonstrations and meetings that follow each day's presentations they give a unique opportunity to the participants to interact with our engineers from the development and services departments, to promote their requests and to share their problems.
This year's event holds one more premiership: we are honoured to host as Keynote Speakers two distinguished guests: Mr. Hiroo Yamaoka of Toyota Motor Corporation, and Mr. Toshihiro Araki of Nissan Motor Company. Mr. Yamaoka and Mr. Araki have distinguished careers, they hold prominent positions at their organizations and they have outstanding achievements in CAE. We are specially honoured by their acceptance to attend to the 3rd ANSA & μETA International Conference as Keynote Speakers and by the unique opportunity that they offer to the participants to benefit from their speeches.
More than 45 contributed presentations compose the main body of the event, in plenary or parallel sessions. Grouped according to subject relevance, they are expected to keep the attention of the audience unabated.
The Technical Round-table with Q&A session with our product managers and chief engineers, just before the event's closing, will give to the participants the opportunity to have their questions posed openly and answered by the most appropriate people.
As happened in our previous two events, the interaction among the participants is expected to remain intense during the offered meals and especially during the social event themed as "Greek night".
BETA CAE Systems S.A. would like to thank you for coming. We would also like to express our gratitude to all those who contributed their papers and presentations for the success of the conference.
Please, feel free to contact us for any issue regarding your stay and we will do all we can to assist you. Enjoy your participation to our event and your stay in Halkidiki.

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Programme

Tuesday, September 8

16:30 - 18:30	**Pre-Registration, Meliton Hotel lobby**
20:00 -	**Dinner,** *please, collect your ticket during Pre-Registration*

Wednesday, September 9

8:30 -	**Registration, Olympic Convention Hall lobby**	
	Session 1.1.1	
9:30 - 10:00 10:00 - 10:30	**ANSA & μETA for NVH** K. Skolarikis▲, A. Sarridis▲, V. Pavlidis▲ BETA CAE Systems S.A., Greece	
10:30 - 11:00	**Coffee Break**	
	Session 1.1.2	**Session 1.2.2**
11:00 - 11:30 11:30 - 12:00	**ANSA & μETA for Crash & Safety** L. Rorris▲, S. Chatziangelidis▲ BETA CAE Systems S.A., Greece	**ANSA for CFD** E. Skaperdas BETA CAE Systems S.A., Greece
12:00 - 12:30 12:30 - 13:00	**ANSA & μETA for Durability** M. Giannakidis▲, S. Kleidarias▲ BETA CAE Systems S.A., Greece	
13:00 - 14:30	**Lunch**	
	Session 1.1.3	
14:30 - 15:00 15:00 - 15:30 15:30 - 16:00	**ANSA & μETA: automating pre- & post-processing, from data input to final reporting output** I. Charalampidis▲, A. Perifanis▲ BETA CAE Systems S.A., Greece	
16:00 - 16:30	**Coffee Break**	
	Session 1.1.4	
16:30 - 17:00 17:00 - 17:30	**Solutions for Morphing & Optimization** G. Korbetis▲, N. Tzolas▲ BETA CAE Systems S.A., Greece	
	Session 1.L.5, Olympic Convention Hall lobby	
17:30 - 18:30	Technical discussions, demonstrations and meetings	
20:00 -	**Dinner**	

Thursday, September 10

	Session 2.2.1 – Hall 2 *chair: S. Saltiel*		
8:30 - 9:00	**Opening Speech** D. Angelis, President, BETA CAE Systems S.A., Greece		
9:00 - 09:30	**Keynote Speech: Future innovative CAE for next-generation vehicle development** Hiroo Yamaoka, TOYOTA Motor Corporation, Japan		
9:30 - 10:00	**FEM Body In White modelling process** R. Lindner[1]▲, A. Fassas[2] [1]AUDI AG, Germany [2]BETA CAE Systems S.A., Greece		
10:00 - 10:30	**ANSA & μETA: Future Developments** D. Angelis BETA CAE Systems S.A., Greece		
10:30 - 11:00	**Coffee Break**		
	Session 2.1.2 – Hall 1 *chair: J. Skarakis*	**Session 2.2.2 – Hall 2** *chair: Y. Kolokythas*	**Session 2.3.2 – Hall 3** *chair: E. Skaperdas*
11:00 - 11:30	**Analysis of S&R phenomena through simulation in Abaqus** I. Lama, J. Viñas▲, Y. Blecon, X. Montané IDIADA Automotive Technology, Spain	**Modular build-up of vehicle crash models using ANSA Data Management** H. Klamser[1], A. Kaloudis[2]▲ [1]Dr. Ing. h.c. F. Porsche AG, Germany [2]BETA CAE Systems S.A., Greece	**Using OpenFOAM and ANSA for road and race car CFD** R. Lewis▲, A. Mosedale, I. Annetts TotalSim Ltd., UK
11:30 - 12:00	**Establishment of simulation of sound-proof package for a vehicle using ANSA script** H. Okamura[1]▲, F. Ide[2] [1]TOP CAE Corporation, Japan [2]Honda R&D Co., Ltd., Japan	**Optimisation of occupant safety with coupling of kinematic and optimisation tools** C. Giesen▲, M. Schallmo Volke Entwicklungsring GmbH, Germany	**Meshing and Accuracy in CFD** M. Lanfrit▲, W. Seibert ANSYS Germany GmbH, Germany
12:00 - 12:30	**ANSA - A perfect tool for structural optimization** B. Lauber FE-DESIGN GmbH, Germany	**Simulation of pedestrian safety for AMG C63 using ANSA and μETA** H. Friese LASSO Ingenieurgesellschaft mbH, Germany	**CAE frame work for aerodynamic design development of automotive vehicles** P. Peddiraju[1]▲, A. Papadopoulos[1], R. Singh[2] [1]BETA CAE Systems USA Inc., USA [2]General Motors Corporation, USA
12:30 - 13:00	**Non-linear multi-scale analysis of aerospace structures** O. Mintchev▲, R. Diez LASSO Ingenieurgesellschaft mbH, Germany	**Calculating FORCES on user defined cross sections in META prevents from re-solving crash models and facilitates substructuring for durability models** S. Kleidarias▲, G. Kalaitzidis BETA CAE Systems S.A., Greece	**High level geometry restoration for CFD purposes in ANSA** P. Gullberg▲, L. Löfdahl Chalmers University of Technology, Sweden
13:00 - 14:30	**Group Photo - Lunch**		
	Session 2.1.3 – Hall 1 *chair: M. Giannakidis*	**Session 2.2.3 – Hall 2** *chair: K. Kiouptsidis*	**Session 2.3.3 – Hall 3** *chair: S. Seitanis*
14:30 - 15:00	**Advanced capabilities of μETA for NVH post-processing and submodeling** V. Pavlidis▲, D. Siskos BETA CAE Systems S.A., Greece	**Latest developments and advancements in ANSA and μETA for crash and occupant safety simulation and model creation** L. Rorris▲, Y. Kolokythas, M. Tryfonidis, D. Siskos BETA CAE Systems S.A., Greece	**An efficient approach for CFD Topology Optimization of interior flows** I. Nitsopoulos▲, M. Stefan, M. Böhm FE-DESIGN GmbH, Germany
15:00 - 15:30	**A step forward in process automation: Results mapping and automated multiple Abaqus/Standard load-cases definition** M. Tryfonidis[1]▲, S. Vasudeva-Rao[2] [1]BETA CAE Systems S.A., Greece [2]Chrysler LLC., USA	**Stamping simulation study on Al-6061 alloy using FEA approach** Trivikram N. L.[1]▲, V. R. Sural[1], Mrityunjaya R. Yeli[1], R. Venkatesan[1], Ramesch C. S.[2] [1]EASi Technologies, India [2]P.E.S. Institute of Technology, India	**Numerical simulation for improving a rotary motor efficiency by Flow Optimization inside the motor's chambers** S. Savvakis▲, Z. Samaras Lab. of Applied Thermodynamics, Aristotle University of Thessaloniki, Greece
15:30 - 16:00	**ANSA as a pre-processor for fluid-solid coupling simulations** Chen H.Y. ▲, Liu Wei, Lv X. M., Zhang L.Z. Beijing FEAonline Engineering Co., Ltd, China	**Integration of morphing and optimization with the CAX-load case composer at AUDI** M. Thiele[1]▲, H. Meissner[2] [1]DYNAmore GmbH, Germany [2]AUDI AG, Germany	**Strategies and techniques for rapid parameterization of vehicle surface mesh** R. Lietz[1], M. Tessmer[1], S. Sun[1], S. Earla[2]▲, R. Nimbalkar[2] [1]Ford Motor Company, USA [2]BETA CAE Systems USA Inc., USA
16:00 - 16:30	**Coffee Break**		
	Session 2.1.4 – Hall 1 *chair: I. Makropoulou*	**Session 2.2.4 – Hall 2** *chair: L. Rorris*	**Session 2.3.4 – Hall 3** *chair: G. Galaitsis*
16:30 - 17:00	**Identification of anisotropic elastic material properties from micro-FEM simulations for natural materials** R. Schneider[1]▲, U. Hindenlang[2], M. Resch[1] [1]High Performance Computing Center Stuttgart (HLRS), Germany [2]LASSO Ingenieurgesellschaft mbH, Germany	**LS-DYNA® durability loadcases: Automated template driven process using the ANSA Task Manager** D. Fels[1], M. Weinert[1], Y. Kolokythas[2]▲ [1]Ford-Werke GmbH, Germany [2]BETA CAE Systems S.A., Greece	**Minimizing fuel consumption with CFD and automated morphing** S. Michalowski[1]▲, A. Pieck[1], M. Goedecke[1], M. Teller[2] [1]Wilhelm Karmann GmbH, Germany [2]University of Applied Sciences Trier, Germany
17:00 - 17:30	**An approach to the effective notch stress concept to complex geometry welds focusing on the FE modeling of weld ends** M. Malikoutsakis▲, G. Savaidis Aristotle University of Thessaloniki, Greece	**Simulation of explosions in train and bridge applications** Mrityunjaya R. Yeli▲, Trivikram N. L., V. R. Sural, R. Venkateshan EASi Technologies, India	**Optimization of air flow through a heat exchanger in an automotive HVAC** V. A. Jairazbhoy[1], LeeAnn Wang[1], M. Shahabi[1], R. Nimbalkar[2], S. Earla[2]▲ [1]Automotive Components Holdings, USA [2]BETA CAE Systems USA Inc., USA
	Session 2.L.5, Olympic Convention Hall lobby		
17:30 - 18:30	Technical discussions, demonstrations and meetings		
20:00 -	**Dinner - Social Event: "Greek Night"**		

Friday, September 11

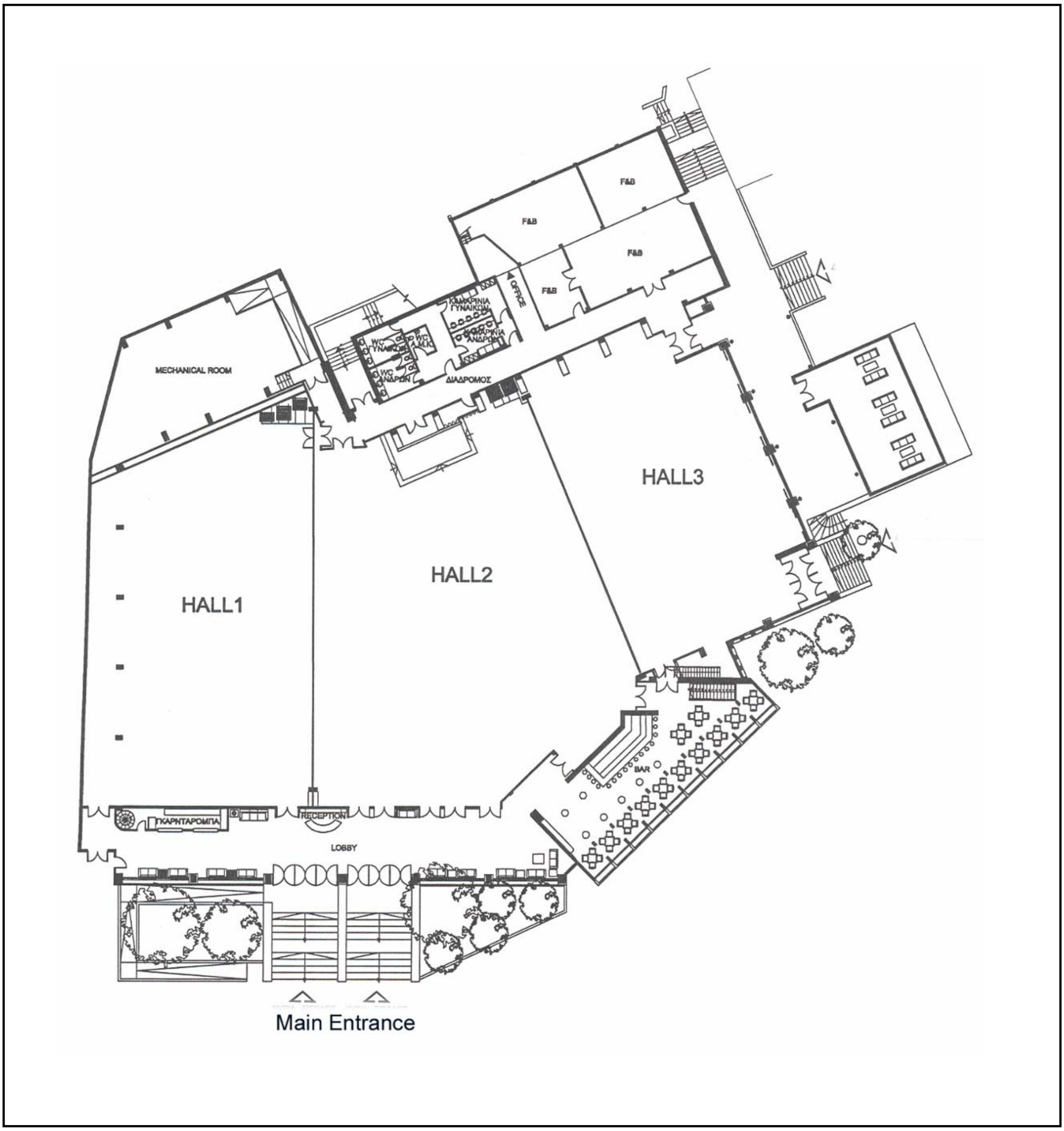
	Session 3.2.1 – Hall 2 *chair: V. Pavlidis*
8:30 - 9:00	**Keynote Speech: CAE contribution to vehicle development in NISSAN** Toshihiro Araki, NISSAN Motor Company, Japan
9:00 - 09:30	**An insight to the deployment of ANSA within BMW CAE processes** M. Goedecke[1]▲, M. Tryfonidis[2] [1]BMW Group, Germany [2]BETA CAE Systems S.A., Greece
9:30 - 10:00	**Common CAD modeling for multiple automotive FEA disciplines** B. K. Shahidi[1], R. Shen[1], M. Ahmed[1], S. Earla[2]▲, R. Nimbalkar[2], R. Mothukuri[2] [1]Ford Motor Company, North America, USA [2]BETA CAE Systems USA Inc., USA
10:00 - 10:30	**Automation of CAE pre & post processing activities using ANSA and μETA scripting capabilities** A. Palacio[1]▲, X. Latorre[1], C. Mitjans[1], P. Cruz[2] [1]IDIADA Automotive Technology S.A., Spain [2]IDIADA Automotive Technology India Pvt. Ltd., India
10:30 - 11:00	**Coffee Break**

	Session 3.1.2 – Hall 1 *chair: N. Drivakos*	**Session 3.2.2 – Hall 2** *chair: G. Korbetis*	**Session 3.3.2 – Hall 3** *chair: K. Haliskos*
11:00 - 11:30	**Integrative optimization of injection-molded plastic parts – Multidisciplinary shape optimization including process induced properties** A. Wüst▲, T. Hensel, D. Jansen BASF SE, Germany	**Parametric shape optimization of vehicle body for weight reduction and stiffness improvement** J. Rakowska[1], B. K. Shahidi[1], S. Earla[2]▲, R. Nimbalkar[2], V. Gandhi[2] [1]Ford Motor Company, North America, USA [2]BETA CAE Systems USA Inc., USA	**Automated pre-processing for high quality multiple variant CFD models of a city-class car** E. Skaperdas▲, C. Kolovos BETA CAE Systems S.A., Greece
11:30 - 12:00	**Analysis of solar panel support structures** A. Mihailidis, K. Panagiotidis, K. Agourides▲ Laboratory of Machine Elements & Machine Design Mechanical Engineering Department, Aristotle University of Thessaloniki, Greece	**Multidisciplinary design optimization (MDO) using ANSA/mETAPOST and Isight** F. Krabchi SIMULIA, France	**Predicting and improving the performance of a bagless vacuum cleaner using CFD** F. J. Campos[1]▲, D. Sykes[2], J. Ferguson[2] [1]ICON Ltd., UK [2]Hoover Candy Group, UK
12:00 - 12:30	**Postprocessing analysis results of burst test simulations for automotive plastic air intake manifolds** P. Kondapalli, presented by M. Lambi▲ BASF Engineering Plastics, USA	**Multi-objective optimisation integrating ANSA with modeFRONTIER** A. Clarich▲, P. Geremia ESTECO srl, Italy	**Implementing Advanced CAE Tools in Automotive Engineering Education at Chalmers University of Technology** L. Christoffersen▲, C. Landström, L. Löfdahl Chalmers University of Technology, Sweden
12:30 - 13:00	**Methodologies for deterministic and probabilistic optimization in NVH using re-analysis** Z. Mourelatos Oakland University, USA	**Coupling mesh morphing and parametric shape optimization using SimuOpti** Liu Wei, Shao X.J., Dai C. H. ▲, He H.R. Beijing FEAonline Engineering Co., Ltd, China	**New applications of ANSA in CEM** P. Tobola▲, I. Grac Evektor, spol. s r.o., Czech Republic
13:00 - 14:30	**Lunch**		

	Session 3.2.3 – Hall 2 *chair: S. Saltiel*
14:30 - 15:00	**NAFEMS - The international engineering analysis community** A. R. Oswald NAFEMS GmbH, Germany
15:00 - 15:30	**Teamcenter - ANSA Integration** Z. Petrovic[1], S. Seitanis[2]▲, I. Charalampidis[2] [1]Siemens PLM Software GmbH, Germany [2]BETA CAE Systems S.A., Greece
15:30 - 16:00	**Simulation, Process, Data and Resources Management (SPDRM)** S. Seitanis BETA CAE Systems S.A., Greece
16:00 - 16:30	**Technical Roundtable Q&A - Closing**
	End of conference

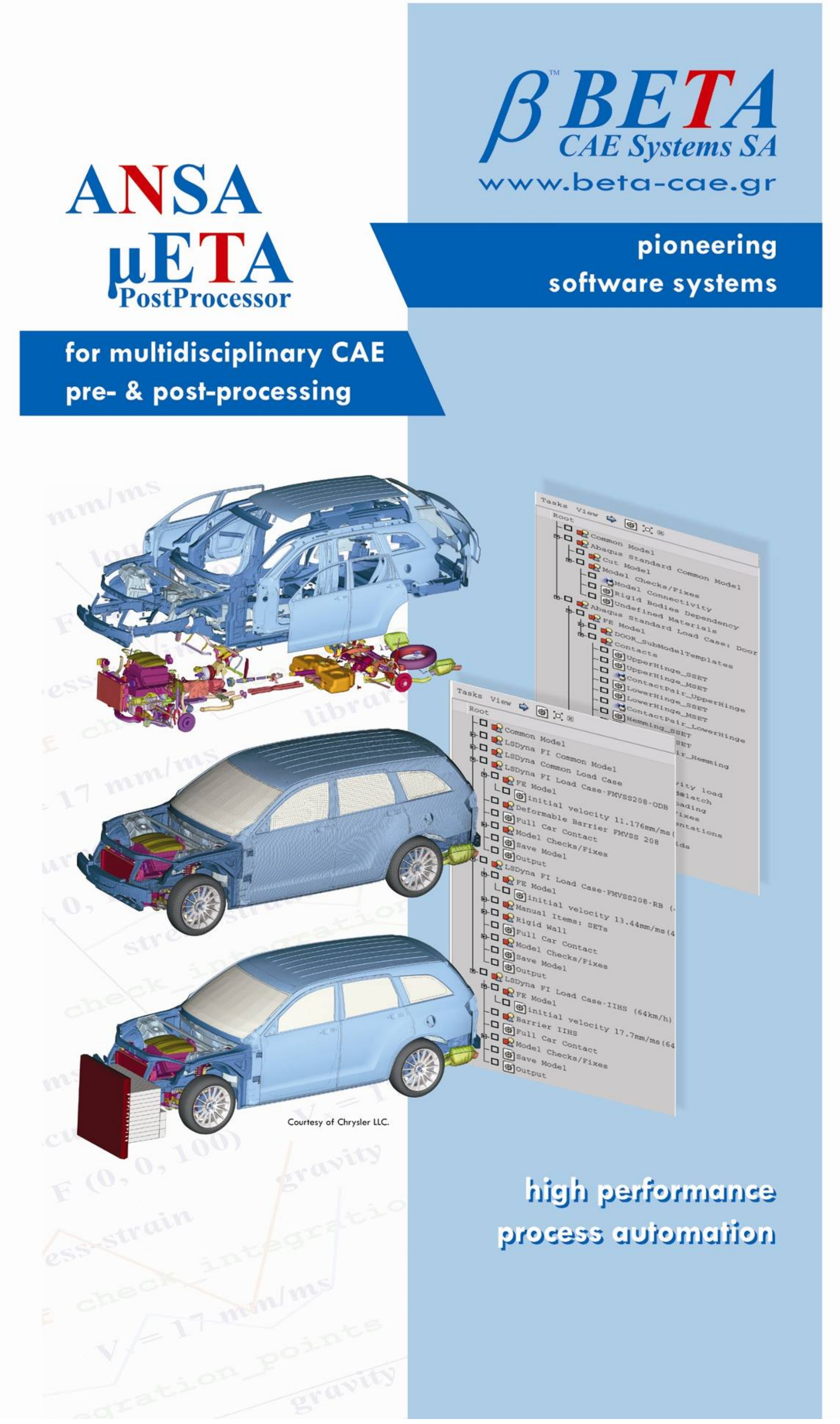
Venue Plan

Olympic Convention Hall, floor plan



Porto Carras Grand Resort Hotel, site map

Abstracts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Session 2.2.1

KEYNOTE SPEECH: FUTURE INNOVATIVE CAE FOR NEXT-GENERATION VEHICLE DEVELOPMENT

Hiroo Yamaoka
TOYOTA MOTOR CORPORATION, Japan

KEYWORDS – latest vehicle CAE, future CAE tasks, remained issues, co-simulation

Mr. Hiroo Yamaoka is Project General Manager at the Advanced CAE Division of Toyota Motor Corporation, Japan.

The latest vehicle CAE applications to each discipline, fulfilling the requirements for the economical and environmental-friendly vehicles, are introduced in this presentation.

The future CAE tasks towards the resolution of remaining issues are also discussed, with examples of interactive or co-simulated trial analysis results.

FEM BODY IN WHITE MODELLING PROCESS

[1]Richard Lindner ▲, [2]Athanasios Fassas
[1]AUDI AG, Ingolstadt, Germany
[2]BETA CAE Systems S.A., Thessaloniki, Greece

KEYWORDS – BIW process, Task Manager, ANSA DM

ABSTRACT – The short development period and the high degree of precision of simulation reports makes it necessary to built FEM BIW models more efficiently and in a short time period.
Since 2007 Audi has been creating the FEM BIW models internally. The reason for this was to decrease the modelling time, create an efficient BIW modelling process and a standardization of this procedure. Audi chose to implement the FEM BIW modelling process with the Pre-Processor ANSA.

This presentation demonstrates how we have approached this problem and how we plan to deal with the critical stages that appear during this process.

The first section shows step by step the actually status of the FEM BIW modelling process. The process flow starts with the Input of the CAD Department (CAD-Data) and Ends with the Output of an Solver dependent BIW Include (e.g. Nastran).

The second section shows the implementation of this BIW modelling process within the ANSA Task Manager and its interaction with the ANSA Data Management in order to semi-automate the whole process.

Session 2.1.2

ANALYSIS OF S&R PHENOMENA THROUGH SIMULATION IN ABAQUS

Inés Lama, Jordi Viñas▲, Yannick Blecon, Xavier Montané
IDIADA Automotive Technology, Spain

KEYWORDS – NVH, Squeak, Rattle, Postprocessing, Automotive Structures

ABSTRACT – In recent years car manufacturers have been working intensively on new ways to improve the quality of the interior trimmings because they are extremely important to the perception of quality by customers and can be a source of after-sale complaints. Consequently, the study of squeak and rattle has become one of the main concerns for car manufacturers. Generally, S&R problems (mainly produced by interior trimmings) are solved in the final development phases when the trimming geometry has already been frozen and so any modification means extra cost. Furthermore, countermeasures at this stage of the development are normally proposed after intensive testing work. Simulation of S&R phenomena is one of the most complicated issues to reproduce virtually, because it is difficult to study using methods based on eigen-modes due to the impossibility of using contacts in this type of FE model, since modal theory is based on the hypothesis of linearity. In this frame, IDIADA has developed a simulation protocol that can help in the detection of potential S&R problems during the development phase. The main objectives of this protocol are the following: use of common software packages used in normal NVH analysis in the company, minimum modification of NVH models and simplicity of pre/post-processing. This paper describes the main points of such a methodology. The core of the protocol has been implemented in ABAQUS by using a specific element of this solver as virtual contact sensor in the frequency domain simulation.

ESTABLISHMENT OF SIMULATION OF SOUND-PROOF PACKAGE FOR A VEHICLE USING ANSA SCRIPT

[1]Fumihiko Ide, [2]Hideshige Okamura▲
[1]Honda R&D Co.,Ltd. Automobile R&D Center, Japan
[2]TOP CAE Corporation, Japan

KEYWORDS – sound-proof, road noise, calc thick, ANSA script

ABSTRACT – Recently, increasing the quietness of automotive cabins is an important element in enhancing commercial performance. Improving the acoustic performance of sound-proof package, including the floor carpet, is an effective way to increase the quietness. In general, two parameters are used for showing the acoustic performance of sound-proof package; absorption coefficient and transmission loss. These parameters are determined by the material specifications of sound-proof package, the thickness of this material, and surface area. Because of the restrictions imposed by the shape of the panels and other aspects of the layout which are air-conditioning duct, harnesses, it is unable that the sound -proof package is assigned a constant thickness. Therefore, evaluating the thickness distribution in the sound-proof package is challenge in drawing stage of vehicle development.

There is a function in ANSA, which enables to evaluate the thickness distribution and determine the acoustic performance of sound-proof package. However, in the vehicle development, this function is inadequate since the evaluation time is unpractical. In this study, in cooperation with Beta CAE Systems SA, it is succeeded that dramatically improve the performance of the thickness distribution.

In this presentation, the method of improve the performance of thickness distribution and the ANSA script for determining the acoustic performance of sound-proof package are reported by demonstration

ANSA – A PERFECT TOOL FOR STRUCTURAL OPTIMIZATION

Lauber Boris▲
FE-DESIGN GmbH, Karlsruhe, Germany

KEYWORDS – non-parametric Optimization, Topology Optimization, Shape Optimization, Parametric Optimization, Morphing

ABSTRACT – Optimization plays a more and more important role in industrial applications. Components have to be light and meet the functional requirements. At the same time, the development cycle is shortened. Using Optimization in an early design phase helps to run multiple simulations in order to quickly evaluate designs.

The setup of optimization tasks is a challenging work for engineers. Not only have the simulation models be correct and robust, also the optimization targets have to be formulated correctly. Different optimization methods are available in different commercial software solutions. ANSA integrates a large variety of optimization technology that will be illustrated in the presentation with different examples.

The integration of TOSCA Structure in the Task Manager of ANSA allows to setup a complete non-parametric Topology, Shape or Bead Optimization task. The tasks are setup interactively and may be executed for different finite element solver interfaces. Not only is the optimization preprocessing included but the complete optimization process, including an automatic validation run, is available in the Optimization Task.

In the field of parametric Optimization, the complete parameterization via mesh Morphing can be setup in ANSA and fully automated for the use in the parametric optimization system OPTIMUS. Additionally, the process automation workflow can be defined, tested and automated using the task manager. Finally, the parameters for optimization are selected and exported to a batch file.

NON-LINEAR MULTI-SCALE ANALYSIS OF AEROSPACE STRUCTURES

Orlin Mintchev▲, Reinhard Diez
LASSO Ingenieurgesellschaft, Leinfelden-Echterdingen, Germany

KEYWORDS – non-linear FE analysis, pre-processing, decohesion, buckling

ABSTRACT – A reliable analysis of aerospace structures submitted to extreme loads is still a challenge for the engineering community.The complexity of such structures due to their huge size and specific design of some parts requires the use of modern tools for pre- and post-processing and a robust non-linear solver, on one hand, and on the other - a multi-scale approach that allows a better description of the expected non-linear response avoids oversimplifications of the obtained FE-Models.

In our case, a complete section of central fuselage is taken as a representative example. The pre-processing was completely realized with ANSA, that clearly demonstrated its advantages when compared to all the other tools currently available on the market. Different repre-sentations were prepared in order to address the issues on two levels: a macro level, i.e. the complete section, and micro level - small assemblies suffering extreme loads. In such a way it is possible to describe phenomena like large deformation and buckling on macro scale and delaminations, decohesion and/or failure of junctions on micro level. The connection between these two levels of resolution is established by using a sub-modelling technique, that is suitable for this type of non-linear analyzes.

Session 2.1.3

ADVANCED CAPABILITIES OF μETA FOR NVH POST-PROCESSING & SUBMODELLING

Vasileios Pavlidis▲, Dimitrios Siskos
BETA CAE Systems S.A., Greece

KEYWORDS – NVH, modal responses, cavity-structure coupling, modal model, MAC

ABSTRACT – NVH behavior plays an important role in all phases of vehicle design. Accordingly, the use of Finite Elements for NVH analysis has become necessary for meeting efficiently the desired standards.

As a consequence, the increasing significance of NVH simulations imposes the need for bigger and more accurate models which contributes even more to the generation of vast amount of results, an issue inherent to NVH analysis. Owing to that fact as well as due to the use of multiple software tools, NVH post-processing can be very demanding and time-consuming.

This paper presents NVH oriented 3D and 2D tools embedded in μETA. Capabilities such as the support of related results and the derivation of more variables, the easy and fast calculation of modal responses, the calculation of Acoustic responses involving also the coupling between the air cavity and the structure, the modal correlation (calculation of MAC), are discussed. Moreover, the use of all these tools is related to high performance, an aspect of paramount importance for handling such big volumes of data. Modal submodelling, necessary for reducing the model size and simulation time, can be also conducted and a fully automated process with ANSA / μETA for the creation of modal models is also proposed. Finally, the extensive support of diverse results from NASTRAN design optimization, so frequently used in NVH analysis, is also presented.

A STEP FORWARD IN PROCESS AUTOMATION: RESULTS MAPPING AND AUTOMATED MULTIPLE ABAQUS/STANDARD LOAD-CASES DEFINITION

[1]Michael Tryfonidis▲, [2]S. Vasudeva-Rao
[1]BETA CAE Systems S.A., Greece
[2]Chrysler LLC., USA

KEYWORDS – results mapping, process automation, Abaqus/Standard, template driven pre-processing, task manager

ABSTRACT – During the vehicle development process the body structure undergoes many simulations for the assessment of its durability performance. The evaluation of the body structure for numerous scenarios involves both static and dynamic loads, leading to the generation of a large number of load cases. Following the demonstrated automated process, the results of previous multi-body simulations are mapped to the model in the form of Abaqus boundary conditions. This approach allows the fast identification of the worst case scenario of several loading maxima within the requested time intervals.

The presented model-build up method for these simulation scenarios, has the following characteristics:

- The modeling is performed quickly and easily, without forcing the analyst to use excessive interaction, scripting or text files editing.
- The simulation model demonstrates high fidelity and quality, ensuring the confidence in Abaqus/Standard simulations.
- Model updates and design changes are applied promptly, while maintaining the association between the updated model and the load case definition.

This paper presents the implementation of the above automated model build up process, using ANSA Task Manager, in Chrysler LLC..

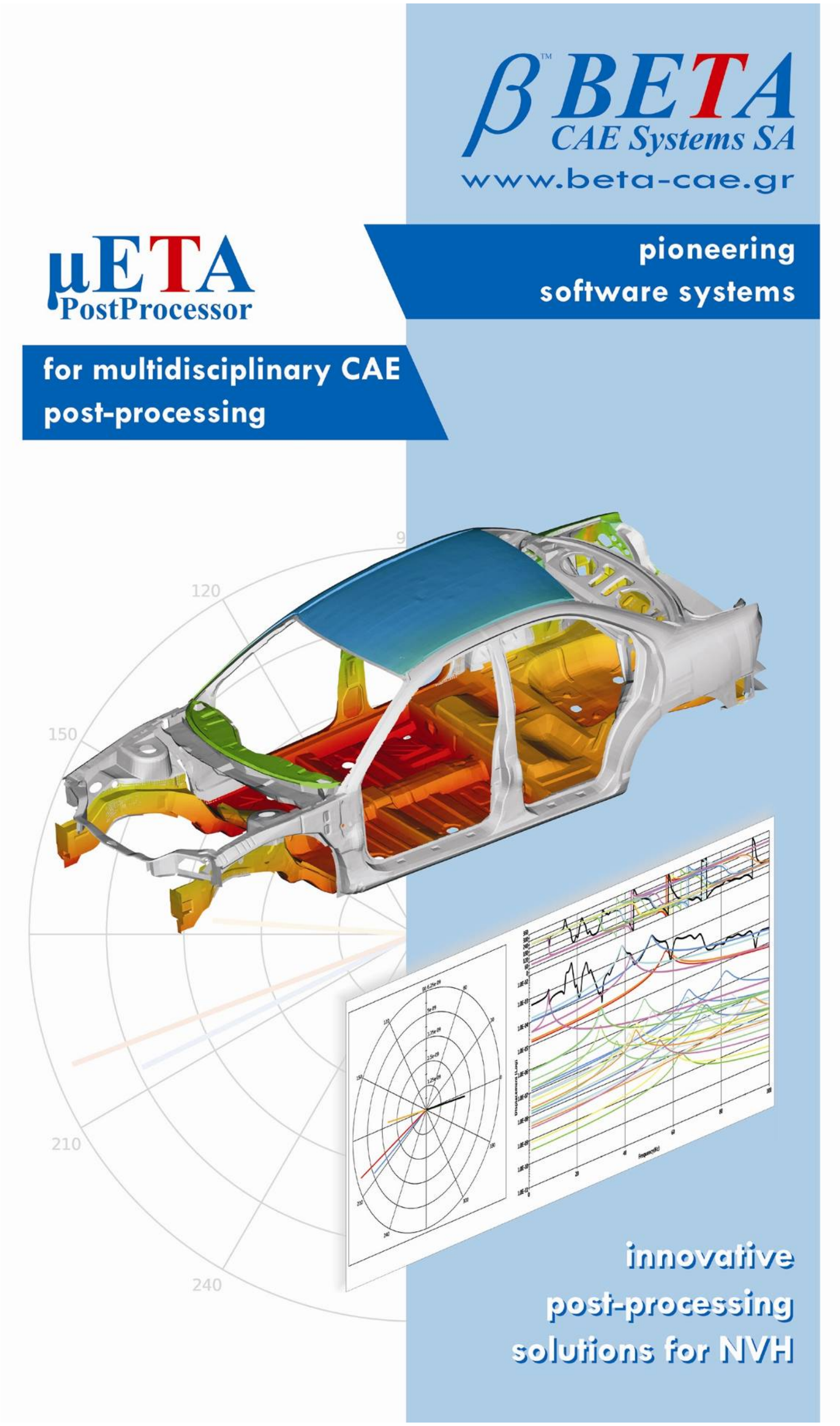
ANSA AS A PRE-PROCESSOR FOR FLUID-SOLID COUPLING SIMULATIONS

Chen H.Y.▲, Liu Wei, Lv X. M., Zhang L.Z.
Beijing FEAonline Engineering Co., Ltd, China

KEYWORDS – fluid-solid coupling, mesh generation, Non-linear analysis, Thermal-structural coupling, FEA, CFD

ABSTRACT – Recently, the important significance of the fluid-solid coupling is generally recognized. Due to the importance of the coupled problems, considerable effort has been devoted in many engineering applications.

The preparation of the mesh for CFD analysis and FEA analysis is complex laborious process that usually involves the combination of different software for the specific tasks. This paper presents the workflow of the fluid-solid coupling simulation with a model under complex load including thermal load, bolt load and large numbers of contact relationship. The workflow involves mesh generation with ANSA, CFD analysis with CFX, FEA Non-linear analysis with ABAQUS, CFX data interfacing with ABAQUS by SimuFSI (in-house software of FEAonline).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Session 2.1.4

IDENTIFICATION OF ANISOTROPIC ELASTIC MATERIAL PROPERTIES FROM MICRO-FEM SIMULATIONS FOR NATURAL MATERIALS

[1]Ralf Schneider▲, [2]Ulrich Hindenlang, [1]Michael Resch
[1]High Performance Computing Center Stuttgart (HLRS), Germany
[2]LASSO Ingenieursgesellschaft mbH, Germany

KEYWORDS – Cancellous bone; elastic material properties; Representative volume element RVE; micro CT

ABSTRACT – Aim of this study is the determination of continuum elastic material properties for natural materials via direct numeric simulation of the material's micro structure. The subject matter to this study and an example for a natural material is cancellous bone.
The calculation procedure which is based on the so called direct mechanics approach is applied to a cube shaped bone specimen taken from the knee joint region of a human femur.

The bone specimen of approximately 8mm edge length was scanned with a micro computer tomograph with 0,014mm isotropic spatial resolution. From this dataset a high resolution FEM model was created.

As a start the procedure is applied to the model in its original size. The results will be shown and discussed in detail to demonstrate their plausibility. Further on the model will be divided into sub domains and the procedure is then applied to each domain. By means of these results the influence of the chosen RVE size to the derived continuum elastic material properties will be shown.

AN APPROACH TO THE EFFECTIVE NOTCH STRESS CONCEPT TO COMPLEX GEOMETRY WELDS FOCUSING ON THE FE MODELING OF WELD ENDS

M. Malikoutsakis▲, G. Savaidis
Aristotle University of Thessaloniki, Greece

KEYWORDS – Fatigue, welds, automotive constructions, finite elements, modelling

ABSTRACT – Automotive structures such as axles of motor trucks are sensitive to fatigue loading due to their construction and loading conditions. The welded components that form the mid-series rear axle under investigation are categorized as thin-walled, with structure thicknesses $1.5<t<15$mm. This fact makes their influence dominant for the durability of the structure in addition to the operational loading conditions.
In more detail, the fracture occurs at the weld ends, an area difficult to model and – to the author's knowledge – with no literature available offering ways to treat such cases. An approach is attempted in this paper adapting the Effective Notch Stress Concept to this complex case, focusing on the modelling techniques and the element number decrease concept using ANSA. Comparison of numerical stress-strain results with experimental ones determined on an own test rig under monotonic and cyclic loading confirms the accuracy of the modelling technique used. The proposed modelling technique can be transferred to various components providing similar weld-end geometries (and failure under operational loading) in order to assess the stress-strain behaviour and fatigue life in an early stage of development where no prototypes are available.

Session 2.2.2

MODULAR BUILD-UP OF VEHICLE CRASH MODELS USING ANSA DATA MANAGEMENT

[1]H. Klamser, [2]A. Kaloudis▲
[1]Dr. Ing. h.c. F. Porsche A.G., Germany
[2]BETA CAE Systems S.A., Greece

KEYWORDS – Modularisation, ANSA Data Management

ABSTRACT – In recent years two of the biggest challenges that faced the automotive industry were the reduction of real prototypes' number and the time to market cut off. In order to help overcome these challenges, the CAE engineers increased the degree of detail and complexity of their digital models, especially for crash simulations. Models of three, four or even more millions of elements are built in an attempt to predict accurately their global behaviour and simultaneously many local effects (such as : deformation, damage and fracture of material and welds, contact forces, etc.), in a rather big variety of crash load cases.
In addition:
- the ever increasing number of model-variants due to customers' requirement for individualization (different types of roof, engines and gearboxes, roadsters/CCs, etc.),
- the trend of OEMs to assign the development of car-modules to contractors and subcontractors,
- the reality of common "platform" vehicles, and
- the dominance of "multi-material" design of BiWs
had as a result the strong modularisation of vehicle models.
The tasks of creation, organisation, handling, assembly and maintenance of both the modules and the resulting complex digital model variants, are very demanding and time-consuming.
This presentation will demonstrate a strategy for achieving the aforementioned goals in a flexible and fast way.
The mesh-generation, update and management of the modules (especially the BiW) was performed using ANSA Data Management and ANSA Batch Meshing Tool, the assembly using the LS-DYNA *INCLUDE_ capability and the final check of model's quality and integrity again with ANSA.
As an alternative the same assembly procedure was performed with ANSA Task Manager.

OPTIMISATION OF OCCUPANT SAFETY WITH COUPLING OF KINEMATIC AND OPTIMISATION TOOLS

[1]Dipl.Ing. (FH) Christian Giesen▲, [2]Dipl.Ing Martin Schallmo
[1]Volke Entwicklungsring GmbH, Germany
[2]Volke Entwicklungsring GmbH, Germany

KEYWORDS – Optimisation, Kinematic Tool, Dummy Positioning

ABSTRACT – The idea for this project came up when knee mapping was introduced. Knee mapping is part of the EURO NCAP occupant safety test procedure. The knee mapping calculations take place in the Adult Occupant Safety Procedure in case of an instrument panel modifier. The goal of the optimisation tool described in this paper is to optimise the dummy and seat position procedure to finally find the optimum position of the dummy and the seat such that it meets the prescribed regulations by Euro-NCAP.
The optimisation tool consists of four steps and couples several programs. The pre-processor step (1) is performed by ANSA after which a numerical simulation (2) is performed in PAM CRASH 2008. The results are post-processed (3) by META post which forwards its outcome to the mathematical optimisation tool (4) DAKOTA. To demonstrate it's functioning the optimisation tool is applied to a knee-mapping test procedure.

SIMULATION OF PEDESTRIAN SAFETY FOR AMG C63 USING ANSA & μETA

Holger Friese
LASSO Ingenieurgesellschaft, Leinfelden-Echterdingen, Germany

KEYWORDS – pedestrian safety, pre processing, post processing, automization, regulation

ABSTRACT – Pedestrian safety rules for passenger cars were introduced as regulation for all new series-production vehicles in Europe and Japan in 2003. All cars have to fulfil these regulations from 2005 on, when sold in European markets. Japan requested their regulations fulfilling in 2004. Challenges according to these rules have been the contradiction between stiffness requirements due to every day load cases and the necessary softness of hood and bumper to fulfil safety aspects. Furthermore there are design and aerodynamic aspects, and of course package is demanding too. Due to all this, a pedestrian safety simulation in an early development state seems to be beneficial.

Basically the crash model could be used, however bumper and hood have to be modelled different. More complex models are needed, especially the mechanical behaviour of hood mounts, connecting clips, springs, dampers, seals, locks and hinges should be taken into account. In addition the bonding model of inner and outer sheet is crucial for the results. In case of the bumper with build in spotlight the interaction of plastic parts with foam and metal parts has to be modelled correctly.

Regulations require a certain area where head and leg impacts should be approved. These areas of the car have to be distinguished according to the rules. Especially the head impact zone should be created with a program in order to avoid manual work and errors. Due to the large area of the hood a large number of impact points has to be simulated in a manor of a raster in order not to miss any problematic zone or point. In addition „hard points" should be marked wherever an aggregate is close to the hood. The task to come from CAD data to a ready to run solver deck is solved by ANSA in a quite fast and efficient way and includes the support of regulations.

A large number of simulations give a tremendous amount of data that has to be post processed. Acceleration plots, HIC values, movies and overviews have to be calculated and created for each impact point so that fast examination and interpretation of results is possible. The advantage of using automated μETA post processing for this issue is shown.

CALCULATING FORCES ON USER DEFINED CROSS SECTIONS IN μETA PREVENTS FROM RE-SOLVING CRASH MODELS AND FACILITATES SUBSTRUCTURING FOR DURABILITY MODELS

Stavros Kleidarias▲, George Kalaitzidis
BETA CAE Systems S.A., Greece

KEYWORDS – Cross Sections, Section Forces, Substructuring

ABSTRACT – Throughout the design cycle of a structure using the finite element method, the calculation of section forces at selective regions proves to be an important aspect to accurately forecast the structure's behaviour and monitor the way forces are transmitted within it.
For crash analyses, forces are calculated only for cross sections predefined in the solver’s input file, thus making a second run unavoidable in case section forces should had been requested also for other regions.
For static analyses, the resultant forces over cross sections are not available by the solver thus not providing full insight of the structure's behaviour. Moreover, in case of performing substructuring out of the solver, it should be possible to use these results readily as loads for the region to be substructured.
This paper presents a new tool in μETA for the calculation of section forces from existing results extracted from several implicit and explicit solvers. Forces on any cross section of a crash model can be calculated by the Section Forces tool of μETA, having very good correlation with those calculated by the respective solver.
Resultant forces can be graphically visualized in 3D display on the model and can be output in the respective format to be used in the boundary conditions' definition of the substructured region.

Session 2.2.3

LATEST DEVELOPMENTS AND ADVANCEMENTS IN ANSA AND META FOR CRASH AND OCCUPANT SAFETY SIMULATION AND MODEL CREATION

Lampros Rorris▲, Yianni Kolokythas, Michael Tryfonidis, Dimitrios Siskos
BETA CAE Systems S.A., Greece

KEYWORDS –

ABSTRACT – The increasingly demanding and complex requirements in Crash Analysis, require continues and innovative software development. BETA CAE Systems in an effort to meet, and exceed, the demands of the industry is introducing new cutting edge technologies. Both in the pre processing area with ANSA, and in post processing with μETA. This paper presents these new technologies.

Support for all the Explicit solvers used for crash analysis is extended and always updated keeping in line with the current releases of the solvers in terms of keyword support. More importantly, model checks, that are needed to make sure that the model quality is the highest possible, are continuously added and customized to meet each different solver's unique requirements.

With the introduction of a new version of ANSA in 2009 a new user interface was presented. New data browsing and model handling tools have been developed to simplify the handling of complex crash models. The new interface is a long term effort that allows the CAE engineer to work in a modern software interface environment leading in increased productivity and "ease of use".

On the same time the development of highly specialized tools can greatly reduce the time of pre processing by automating various difficult operations. Examples are, a kinematic solver that allows the manipulation of complex kinematic mechanisms of crash, tools to automate positioning of the various impactors and barriers, automate assembly, connector, mass trim and load creation for load case generation. In the field of occupant and pedestrian safety new tools were introduced that automate the procedure of implementing the various test protocols in all stages, from target identification to impactor positioning.

The existence of single, isolated functionality with high degree of automation does not suffice for improving the overall CAE workflow. This is why the above ANSA functionality can seamlessly work with and exploit the integral tools of ANSA DM for data organization and streamlining, and ANSA Task Manager for capturing, executing and safeguarding all model build up actions.

In the area of post processing the advances are equally impressive in the latest μETA versions. Better system resources utilization such as smaller memory footprint and a huge speedup in graphics performance, guarantee that the responsiveness and feel of the software environment won't be compromised even by the biggest models. Additionally advanced functionality, like the direct calculation of section forces, provides the tools that are needed for the evaluation of the results. Recently process automation tools are introduced which together with advanced report generation functionalities make the automation of post processes easy.

STAMPING SIMULATION STUDY ON AL-6061 ALLOY USING FEA APPROACH

[1]Trivikram N L▲, [1]Vasantha R Sural, [1]Mrityunjaya R Yeli, [1]Ramesh Venkatesan, [2]Dr.Ramesh C.S
[1]EASi Technologies – Technology Support, Bangalore, India
[2]Professor of Mechanical Engineering. P.E.S.Institute of Technology, Bangalore, India

KEYWORDS – Metal Forming, Stamping, LS-DYNA, ANSA & μETA Post

ABSTRACT – Roof header made of Al-6061 alloys an important component in a passenger car. It is the roof headers profile that plays an important role in giving the befitting elegance to an automotive vehicle. The key features of the roof header are built in using the stamping operations of a sheet metal of light alloys like Al. 6000 series. During the stamping process it's of utmost importance to ensure all the key features in the roof header die gets impressed to the closest tolerance. It is equally important to ensure good surface finish during the stamping operation. All the above factors discussed in this section are mainly controlled by the stamping process parameters. Ram velocity, clamp holding pressure, the uniformity in the thickness of the sheet metal, the design of the die and the punches are some of the important parameters to control in order to ensure high quality roof header. Optimizing the stamping process for the metals in producing high quality roof headers is time consuming and very expensive because of much Iteration involving several combinations of the designs of the die and the punch and the work piece materials. In the light of the above: researchers are currently adopting FEA based software's to overcome the challenges associated with the stamping process. With the advent of high computing technologies, complex shaped sheet metal profiles for automotive applications can be modeled with ease and can be imported to FEA solvers for design optimization studies of die and tooling's . In this regard the present work focuses on the use of ANSA. For modeling of roof headers, dies, punches and blank holders. For roof header, tooling and dies the modeling and assembly is carried out using ANSA modeling software and Stamping simulations are solved using LS-Dyna. Its been observed from the present study that with the increase in the thickness of the sheet, the resultant displacement of the sheet gets along the Z direction marginally. With the initial increase in thickness of the sheet the plastic strain and the max. von misses stress decreases up to a certain thickness level beyond which there is a further increase in the max. von-Mises stress and the plastic strain. It's been observed that the variation in the clamp holding force has no effect on von misses stress, plastic strain, displacement and on the shear stress. Its been observed that increase in the ram velocity, the von misses stress, max shear stress, plastic strain and displacement along Z direction also increases along with the ram velocity. Further energy changes during the variation in the thickness of the blank, clamp holding forces and the ram velocity have been predicted and are observed to be closely associated with each other.

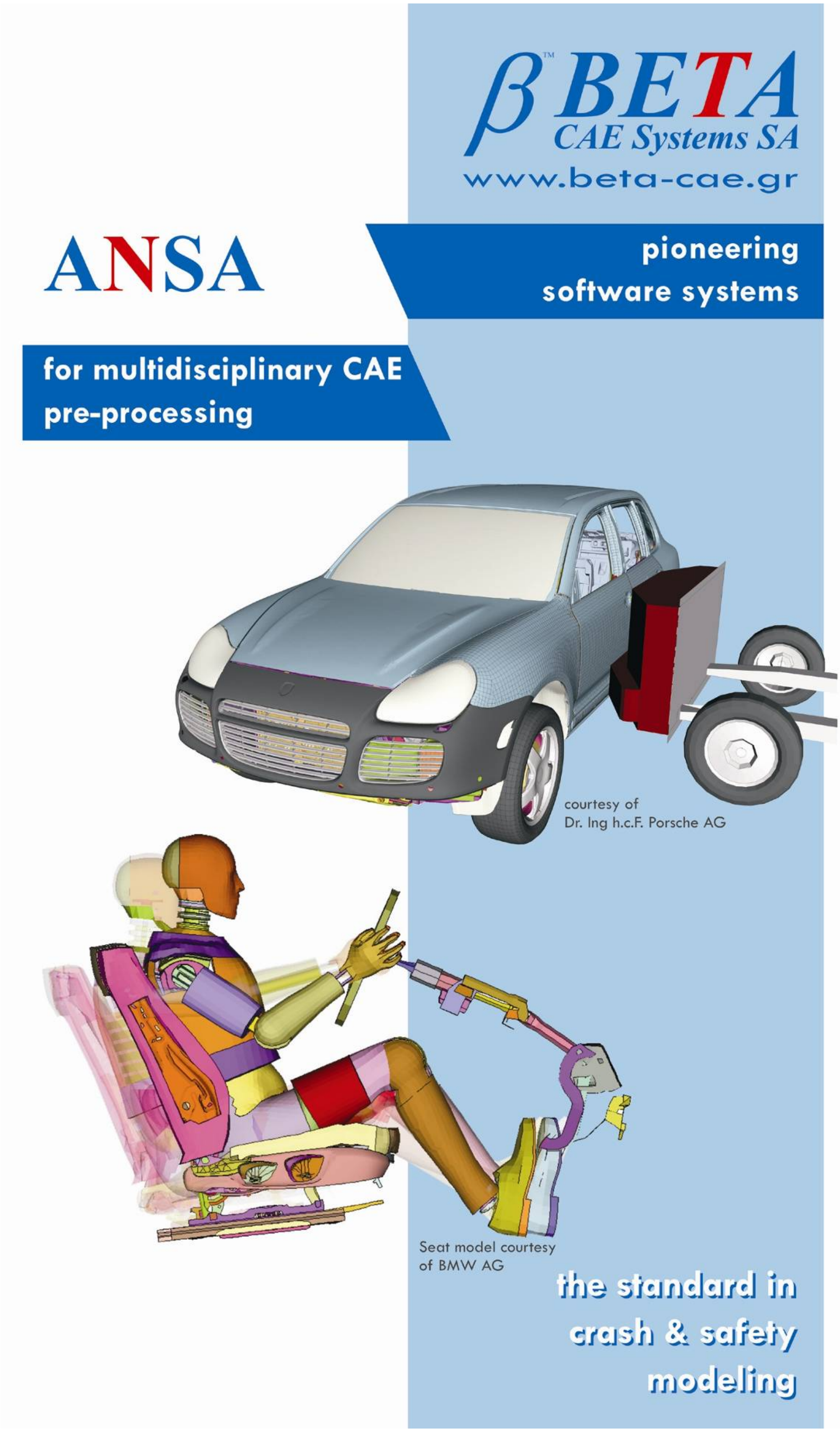
INTEGRATION OF MORPHING AND OPTIMIZATION WITH THE CAX-LOAD CASE COMPOSER AT AUDI

[1]Marko Thiele▲, [2]Holger Meissner
[1]DYNAmore GmbH, Germany
[2]AUDI AG, Germany

KEYWORDS – Morphing, CAE process automation, shape optimization, FE-model assembling

ABSTRACT – The increasing demand to evaluate vast amounts of load cases has led to a highly standardized and automated way of model assembling at AUDI. This model assembling is greatly assisted by the software “CAx Load Case Composer” which has been developed by DYNAmore in cooperation with AUDI. The **Lo**adcase **Co**mposer (LoCo) provides the user with convenient ways to manage FE-model include files and allows to automatically select appropriate include files for each load case. Thus the use of redundant includes can be avoided or at least reduced by significant amounts. One mayor concept of LoCo is the capability of integrating parameters in the FE input files. Parameters for design changes, such as for example airbag settings or seat/dummy transformations can be specified and administrated within the software. This allows the user to apply parameter studies, optimization and stochastic analysis very fast and easily. Through the integration of LS-OPT in LoCo, powerful optimization algorithms can be employed.

In this paper it is shown how morphing parameters for geometrically shape changes have been integrated in LoCo. This will be demonstrated with an example. The close integration into the standardized simulation workflow allows performing parameter studies of shape design changes with a minimum effort. In addition, it can be used in conjunction with the LS-OPT integration in LoCo. Together with LS-OPT and LoCo an engineer at AUDI has the ability to set up an optimization with very little effort. Thus it allows that optimization, parameter studies and stochastic analysis become operations of daily use.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Session 2.2.4

LS-DYNA® DURABILITY LOADCASES: AN AUTOMATED TEMPLATE DRIVEN PROCESS USING THE ANSA TASK MANAGER

[1]Dietmar Fels, [1]Matthias Weinert, [2]Yianni Kolokythas▲
[1]Ford-Werke GmbH, Werke, Germany
[2]BETA CAE Systems S.A., Greece

KEYWORDS – Loadcase, Durability, Automation, Task Manager, Scripting

ABSTRACT – Process organization and standardization are essential in a CAE turnaround cycle. In an era, where the vehicle development time is getting reduced and the number of loadcase analysis is getting increased, the need for automatic standard processes is increasing.

Ford-Werke and BETA CAE Systems SA are cooperating to develop streamlined, automatic processes, using the ANSA Task Manager. The goal, of these template driven processes, are to create realistic, repeatable and robust durability simulation models.

The ANSA Task Manager supervises the generation of the simulation models, while ANSA Data Management, in the background, facilitates the components management, ensuring that the engineering teams will always work with the most up-to-date data. The simulation model set-up becomes a repeatable and user-independent procedure, safeguarding the model quality and fidelity.

SIMULATION OF EXPLOSIONS IN TRAIN AND BRIDGE APPLICATIONS

Mrityunjaya. R. Yeli▲, Trivikram. N L, Vasanth Sural, Ramesh Venkateshan
EASi Technologies – Technology Support, Bangalore, India

KEYWORDS – Bridge, Blast, Train, LS-DYNA, ANSA & μETA Post

ABSTRACT – The application of practical engineering, propagation processes of shock waves is simulated using the ANSA/ LS-DYNA software. Explosion is carried out on the surface and underground. The analysis results interpreted to assess the damage to the intended target such as coach on the track over a bridge. The results are also extended to study the collateral damage to a bridge or to a nearby building. Material Pseudo Tensor and Linear Plasticity in LS-DYNA have been used for the simulation. Explosives were initiated at ground level, bottom of the bridge, between centers of the two abutments. The effects of the locations were studied to extent of damage to the bridge and to the coach on the track. The conclusions have also indicated that bridge after the blast encountered with some major cracks, and can be made blast resistant bridge structure by providing additional dampers and springs, suitable structural modifications to the bridge structure, rails, its anchorage structure on either side and also the abutments.

Session 2.3.2

USING OPEN FOAM AND ANSA FOR ROAD AND RACE CAR CFD

Robert Lewis▲, Andrew Mosedale, Ivor Annetts
TotalSim Ltd, UK

KEYWORDS – aerodynamics, optimisation, RANS, DES

ABSTRACT – Optimisation of the glass-house of a small car has been carried out in a parallel study of RANS and DES numerical methods. Are sponse surface method based on a Kriging analysis using Latin hyper cube sampling has been used to carry out the optimisation. The parameters to be optimized were front and rear screen rake, a-pillar angle and roof slope. The RANS-based optimization worked well, although it was found that the baseline was already near minimum drag for the parameters. The roof slope was found to be the dominant factor in changing the simulated drag. TheDES approach suggested a similar direction of optimization to the RANS cases and a low-drag configuration was found. However the data was too noisy to effectively complete the optimisation, with the convergence being dominated by oscillations in the separation of the front wheel-wakes. This forced the simulations to be run for long periods to extract the underlying statistical average behaviour, making it more expensive. Further work is needed to understand how and when DES can be applied in such cases.

MESHING AND ACCURACY IN CFD

Marco Lanfrit▲, Werner Seibert
ANSYS Germany GmbH, Darmstadt/Germany

KEYWORDS –

ABSTRACT – Geometry preparation and meshing are the starting points and basis for each CFD simulation. Perhaps more than in any other CAE discipline, the quality of results in CFD depends on the usage of adequate meshes.
The present paper deals with questions regarding all kinds of quality criteria, like cell quality, mesh resolution, and the validity of meshes for a given application or combination of numerical models. Further more it gives an overview on the existing modeling approaches and illustrates the dependency of results for academical and industrial problems, solved with CFD methods.

CAE FRAME WORK FOR AERODYNAMIC DESIGN DEVELOPMENT OF AUTOMOTIVE VEHICLES

[1]Pravin Peddiraju▲, [1]Arthur Papadopoulous, [2]Rajneesh Singh
[1]BETA CAE Systems, USA
[2]General Motors Corporation, USA

KEYWORDS – CAE, CFD, Design of Experiments, morphing, shape change

ABSTRACT – Maximizing fuel efficiency of a vehicle is one of the prime areas of focus in the highly competitive automotive industry which requires development of efficient and optimized vehicle designs. External aero analysis using Computational Fluid Dynamic (CFD) techniques is widely used in the accurate estimation of an automotive vehicle's drag coefficient, often critical in determining the fuel efficiency of the vehicle and thus drives the design development process. In a typical design process, several design variations are analysed, their effect on specific parameters such as the drag and lift coefficients is studied, and thereby, an optimum vehicle design is developed. Numerous techniques can be used to develop design variations from an existing design and to perform design development studies. Morphing is one such technique that offers significant advantages. Using Morphing, design variations can be developed very easily and quickly with minimal effort. In addition, statistical methods can be used to establish correlation between shape change parameters and performance parameters, such as the drag coefficient, to generate optimum design.

In this paper, Meshing and Morphing tools in ANSA, a commercial Computer Aided Engineering (CAE) pre-processing software developed by BETA CAE Systems S.A., are used to develop the baseline Computational Fluid Dynamics (CFD) mesh model and subsequent design variations from the baseline model. Statistical analysis methods are then used to establish a correlation between the geometrical parameters and the drag coefficient to guide the design (shape) development of a General Motors' (GM) automotive vehicle.

HIGH LEVEL GEOMETRY RESTORATION FOR CFD PURPOSES IN ANSA

Peter Gullberg▲, Lennart Löfdahl
Chalmers University of Technology, Sweden

KEYWORDS – Automotive CFD, Vehicle Safety, Le Mans

ABSTRACT – In the 1955 Le Mans race, the worst crash in motor racing history occurred. This accident would change the face of motor racing for decades. Numerous investigations has been carried out on this disaster, however still today a number of key questions remain unsolved; and one open area is the influence of aerodynamics on the scenario, since the Mercedes-Benz 300 SLR involved in the crash was equipped with an air-brake and its influence on the accident is basically unknown.

In a first attempt to establish CFD as a tool to aid in resolving aerodynamic aspects in motor sport accidents, a research project was started where CFD is used to investigate the aerodynamics of this vehicle and potentially uncover the aerodynamic aspect of this accident.

To generate a representative base model of this vehicle, suitable for CFD-simulations, the project borrowed a 1.24 die-cast collector's item of the Fangio/Moss vehicle. This model was then laser-scanned, however since it had metallic coating the scanner had severe issues with reflections and the resulting geometry was bad.

Although looking really bad, with the FE-tools in ANSA this model was salvaged and a clean surface was recreated of the input data. With this data the project carried on, and first step of results was published on SAE Motorsports Engineering Conference in the autumn of 2008, the second step of the project was published on European Automotive Simulation Conference EASC, Munich 2009.

Session 2.3.3

AN EFFICIENT APPROACH FOR CFD TOPOLOGY OPTIMIZATION OF INTERIOR FLOWS

[1]Ioannis Nitsopoulos▲
[1]FE-DESIGN GmbH, Karlsruhe, Germany

KEYWORDS – CFD, optimization, topology optimization, shape optimization, morphing, TOSCA Fluid

ABSTRACT – Optimization methods for structural components, for example shape and topology optimization, are well-known and frequently used in the field of structural analysis. In the field of CFD, optimization methods are rarely employed today. The reason for this is often the lack of CFD-specific optimization approaches that allow an efficient optimization without the need of hundreds of simulations. In this paper a new approach for the topology optimization of CFD problems with TOSCA Fluid is presented.

First, a brief review of optimization techniques is shown to outline fundamental approaches and to clarify important concepts. From this two approaches are deduced for the application of optimization methods together with CFD problems. The first approach is based on a parameter optimization scheme in conjunction with sophisticated mesh morphing techniques to realize a shape optimization concept. The principle theory as well as the concrete application to an example is presented.

The second approach with TOSCA Fluid is based on a completely new methodology for the automatic topology optimization of channel flow. The aim here is to minimize the occurrence of recirculation areas and „dead water“ within a “design space”. Starting from the flow in this “design space”, the optimization scheme determines the topological design of an optimum flow channel that is free of recirculation and dead water regions. As a consequence the resulting pressure drop in this new channel is reduced efficiently. The optimization process is coupled to the CFD solver solution process and therefore very efficient. Only one single CFD solver run is needed for optimization. The basic process is explained and illustrative examples are shown.

NUMERICAL SIMULATION FOR IMPROVING A ROTARY MOTOR EFFICIENCY BY FLOW OPTIMIZATION INSIDE THE MOTOR'S CHAMBERS

Savvas Savvakis▲, Zissis Samaras
Lab. of Applied Thermodynamics, Aristotle University of Thessaloniki, Greece

KEYWORDS – ICE, rotary engine, thermodynamic analysis, quad meshing, hexahedral volumes

ABSTRACT – A clear understanding of the flow inside the chambers of a rotary engine would help the optimization of the injection, vaporization and combustion quality in order to improve the efficiency of the whole operating cycle of the motor. The objective of the present project was to optimize the design of the chambers with the use of ANSA and CFD tools. The 3D-modelling and finite element analysis has been created by the preprocessor ANSA, while the thermodynamic analysis of the resulting model has been carried out by the CFD-solver Fluent.
The focus of the present contribution is put on the ability of ANSA to make hexahedral volumes of simple and complex designs. Although ANSA has been focused on creating triangle Finite Element Analysis of every possible geometry, it supports functions able to generate structured and unstructured fully hexahedral Finite Element Models (FEMs). The current presentation will show how quad surface mesh and hexahedral Grid may be applied in geometries, which seem complicated enough to be analyzed in a no tetrahedral volume mesh.
Finally, the presentation ends with an illustration of the motor's operating cycle as well as the overview of the thermodynamic analysis results.

STRATEGIES AND TECHNIQUES FOR RAPID PARAMETERIZATION OF VEHICLE SURFACE MESH

[1]Robert Lietz, [1]Mark Tessmer, [1]Shaoyun Sun, [2]Sunil Earla▲, [2]Ravi Nimbalkar
[1]Ford Motor Company, USA
[2]Beta-CAE Systems, USA

KEYWORDS – Aerodynamics, ANSA

ABSTRACT – Designed experiments and optimization studies require the rapid generation of multiple base model variants and rapid analysis techniques. Recent advances in mesh generation and simulation speed have significantly reduced the time requirement for computational analysis of vehicle exterior airflow. Time associated with CAD construction & CAD modification is now becoming the dominant factor in defining total throughput time for vehicle aerodynamic analyses. This paper describes the strategies and techniques used for rapid morphing of vehicle models used to support early theme analysis.


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Session 2.3.4

MINIMIZING FUEL CONSUMPTION WITH CFD AND AUTOMATED MORPHING

[1]Simon Michalowski▲, [1]Andrea Pieck, [1]Morten Goedecke, [2]Michael Teller
[1]Wilhelm Karmann GmbH, Germany
[2]University of Applied Sciences Trier, Germany

KEYWORDS – aerodynamics, optimization, morphing, LS-OPT, POWERFLOW

ABSTRACT – Minimization of fuel consumption becomes more and more important against the background of limited energy resources. Modern CAE methods provide high capabilities for optimized designs and fast design processes. The practical use of these processes is shown by an example of an efficient car for the Shell Eco-marathon. The Shell Eco-marathon, which has been started in 2009 for the 25th time, challenges students around the world to design, build and test vehicles that travel further using less energy. The proTRon Team of the UAS Trier is a successful participant in the prototype class for the last two years. In 2009 the students started for the first time in the UrbanConcept Group, which has special rules and regulations to realize more realistic cars.

The Wilhelm Karmann GmbH supported the team in the styling process and in some aerodynamic optimization issues. This work demonstrates the product development, which needed to be realized in a very short time, i.e. starting in October 2008 until the race in may 2009. As an example for a modern development process and the use of computational methods, the shape of the car's nose has been designed to realize the best aerodynamic performance. Therefore an automated CAE process was built. Here the optimization software LS-OPT controls the morphing in ANSA with a batch mode script and the CFD solver POWERFLOW as well as a post-processing script to capture the drag coefficient C_D.

With this process, a drag coefficient for a two-seated car could of C_D = 0.18 could be realized.

OPTIMIZATION OF AIR FLOW THROUGH A HEAT EXCHANGER IN AN AUTOMOTIVE HVAC

[1]Vivek A. Jairazbhoy, [1]LeeAnn Wang, [1]Mehran Shahabi, [2]Ravi Nimbalkar, [2]Sunil Earla▲
[1]Automotive Components Holdings, USA
[2]BETA CAE Systems USA, USA

KEYWORDS – Shape Optimization, Airflow, HVAC, ANSA, Morphing

ABSTRACT – Heat Exchanger performance in an automotive HVAC is critically influenced by the uniformity of flow through the core face on the air side. Performance is generally measured in terms of both Core Duty and Pressure Drop. HVAC units are typically tightly constrained by packaging requirements imposed on components under the Instrument Panel resulting in maldistribution of flow across typical cross-sections. In order to improve heat exchanger performance, such maldistribution upstream of the device must be rectified without infringement of packaging boundaries.

In this paper, we show how vanes, or baffles, may be used in automotive HVAC units to achieve certain objectives relating to flow uniformity upstream of heat exchangers. CFD is used as a means of capturing the impact of design changes on performance objectives. A "guide vane" with qualitatively desirable characteristics is parameterized, and the ANSA morphing capability used to introduce the parameterized feature into the flow domain. The parametric representation permits examination of the design space in search of optimum solutions with respect to the objectives. Formal optimization methods are used to drive the solution search. ANSA™ is used for morphing and meshing, FLUENT® is used to perform CFD, and iSIGHT-FD ™ is used for all optimization algorithms.

Session 3.2.1

KEYNOTE SPEECH:
CAE CONTRIBUTION TO VEHICLE DEVELOPMENT IN NISSAN

Toshihiro Araki
NISSAN Motor Company, Japan

Mr. Toshihiro Araki is General Manager of the Integrated CAE Department of the Vehicle Component Technology Development Division of Nissan Motor Company, Japan.

This presentation deals with the terms of "CAE value" and "CAE technology development way" as these are treated within a high-technology CAE environment.
It is shown how "CAE value" is evaluated by several indices based on vehicle development cost and performance achievement. "CAE technology development way" is explained on the basis of R&D technology strategy.

AN INSIGHT TO THE DEPLOYMENT OF ANSA WITHIN BMW CAE PROCESSES

[1] M. Goedecke▲, [1]J. Fuerfanger, [2]M. Tryfonidis,
[1]BMW AG / Germany
[2]BETA CAE Systems S.A., Greece

KEYWORDS – assembly, batch mesh, welding, process automation

ABSTRACT – Establishing a pre-processing workflow, starting from cad data to the model assembly is a big challenge. The high number of FE simulations as well as their increasing quality requirements lead to the need of reducing time consuming procedures as well as error prone manual interventions. Target of BMW AG is to built an automated and robust process that will lead to the creation of high quality FE models, suitable for the Concept as well as for the Series phase.

This paper gives an insight to some of the key steps of the development phases where BMW AG, in cooperation with BETA CAE Systems S.A., succeeded in drastically reducing the model preparation phase by deploying the capabilities of ANSA.
The presented steps of the development process are:

- Nastran arbitrary cross sections in ANSA
- Batch meshing with ANSA
- Spot weld definition for durability analysis
- Modeling of “door bag” for pressure sensors
- Seat und dummy positioning with ANSA

COMMON CAD MODELING FOR MULTIPLE AUTOMOTIVE FEA DISCIPLINES

[1]Behrooz Shahidi, [1]Richard Shen, [1]Mohammed Ahmed, [2]Sunil Earla▲, [2]Ravi Nimbalkar, [2]Ramu Mothukuri
[1]FORD MOTOR COMPANY, Dearborn, MI
[2]BETA CAE SYSTEMS, Farmington Hills, MI

KEYWORDS – Ford Motor Company, Common CAD CAE Models, Automotive, Body In Prime, Model Resource Efficiency

ABSTRACT – The downturn in the automotive sector has forced large automotive companies to develop new engineering strategies that will deliver world class automotive products faster using minimal development cost. Ford Motor Company has recently instituted a "One Ford" vision that integrates the various engineering disciplines. So that, products are designed by disciplines that are in-sync with each other, have a common engineering strategy and using common engineering practices.
The "One Ford" strategy has promoted CAE at Ford to commonize among the company's differing CAE attributes (Durability, NVH, Safety, Aero, Paint, etc). Typical of large size automotive companies, CAE model build at Ford has been made by various engineering attributes independently, thus causing labor redundancy, and inconsistency in design levels, these issues are being analyzed.
Although, each CAE attribute has differing FEA modeling requirements (Mesh and Welding methods between Safety and Durability attributes, for example), the source for each FEA model is ideally derived from the same Body-In-Prime top hat sheet metal CAD.

The opportunity is to have one source develop a single top hat Common CAD model based Task. Which is checked, applied and corrected/validated for proper connections, connectors, Cad Design issues (Design Mismatch /Designs flaws) and Materials using ANSA Task Manager, Data Management and other ANSA functionality. The Common CAD based task could be given to the various CAE attributes to build their discipline specific models using their discipline specific model building guidelines and requirements. The communization of top hat CAD model will ensure design level consistency, high CAD quality, eliminates labor redundancy, and shortens model build cycle time.

The following paper will detail the advantages of ANSA based Common CAD modeling concept by exploring various available ANSA functionality and their benefits, and currently implementation at Ford Motor Company.

AUTOMATION OF CAE PRE & POST PROCESSING ACTIVITIES USING ANSA & μETA SCRIPTING CAPABILITIES

[1]Alejandro Palacio▲, [1]Xavier Latorre, [1]Carles Mitjans, [2]Pablo Cruz
[1] IDIADA Automotive Technology S.A.
[2] IDIADA Automotive Technology India Pvt. Ltd.

KEYWORDS – Automation, pre & post processing, scripting, efficiency, quality

ABSTRACT – Automation of routine tasks is a demanding and necessary tool to increase productivity and control quality of CAE activities. The latest versions of ANSA and μETA software include scripting language capabilities that allow automation of many of their commands and processes.

The IDIADA CAE department works in different fields of automotive engineering for many clients around the world, performing a wide range of CAE simulations. All these capabilities demand flexible and centralised pre & post processing tools.

A pre-processing tool has been developed for conversions between different types of files, meshing of geometries and reparation of meshes, and works simultaneously with high volumes of files. It includes several scripts that execute ANSA sessions, following mesh criteria and parameters defined specifically by IDIADA engineers for each field of simulation.

In the future, the objective is to integrate this tool as the first step of workflow for both the ANSA Data Base and Task Manager. This phase is already under development, together with new tasks to automate model building and other specific scripts.

Finally, another similar tool has been created to post-process CAE simulations. Post-processed information includes outputting 3D models and curves, comparisons of simulations, storage of curves and images, generation of reports, etc., presented in a corporate and stylish format. This program contains a generic script that, depending on user requirement's, calls independent functions written using the scripting editor of μETA.

The majority of these new tools have been implemented into the work areas of the IDIADA CAE department. Results have shown a considerable time saving and an important reduction of error prompts while performing routine tasks. Furthermore, the learning process of junior engineers is accelerated and a new quality standard has been defined. An important effort is being made to extend automation tools to all areas of CAE within IDIADA.

ACKNOWLEDGEMENTS – Pedro Rubio.

Session 3.1.2

INTEGRATIVE OPTIMIZATION OF INJECTION-MOLDED PLASTIC PARTS – MULTIDISCIPLINARY SHAPE OPTIMIZATION INCLUDING PROCESS INDUCED PROPERTIES

[1]**Andreas Wüst▲, Torsten Hensel, Dirk Jansen**
BASF SE, E-KTE/AE – F206, 67056 Ludwigshafen, Germany

KEYWORDS – ULTRASIM™, Morphing, Shape Optimization, Injection Molding, Short fiber-reinforced thermoplastic

ABSTRACT – The Integrative Approach described in this paper incorporates effects of the part's manufacturing process (here: injection molding) into a new workflow for optimization of the part performance. The new approach is able to close the gap between process simulation/optimization and mechanical simulation/optimization.

New classes of design variables linked to the manufacturing process complicate the workflow of the optimization. The newly introduced optimization discipline "manufacturing simulation" acts as a preprocessing step for all other disciplines while it can simultaneously be seen as a full optimization discipline as well. Shape optimization by morphing is included as well and further complicates the workflow. The paper outlines the necessary changes in the workflow and discusses the influence in different optimization scenarios.

In a first example the prototype workflow based on state-of-the-art software packages and newly developed script and interface tools was designed, defined and proved to work. A screening phase as well as an optimization had been done with reasonable results. The part considered in this study is a thermoplastic structure, manufactured by injection molding. The most important process induced changes are based on the anisotropic orientation of short glass fibers in the material during filling. These effects had been taken into account using BASF's ULTRASIM™ software. Filling simulation as well as warpage simulation and a mechanical impact simulation were used as single optimization disciplines.

ANSA as well as META prove to be valuable tools for the realization of the proposed changes in the workflow. The incorporation of ANSA in optimization workflows by means of the Task Manager is capable to account for upcoming needs in optimization workflow setup.

ANALYSIS OF SOLAR PANEL SUPPORT STRUCTURES

A. Mihailidis, K. Panagiotidis, K. Agouridas▲
Lab. of Machine Elements & Machine Design, Dep. of Mechanical engineering, Aristotle University of Thessaloniki, Greece

KEYWORDS – Solar array, frame structures

ABSTRACT – The use of renewable energy resources is increasing rapidly. Following this trend, the implementation of large area solar arrays is considered to be a necessity. Several design approaches of the supporting structures have been presented in order to achieve the maximum overall efficiency. They are loaded mainly by aerodynamic forces. International regulations as well as the competition between industries define that they must withstand the enormous loads that result from air velocities over 120 km/h. Furthermore, they must have a life expectancy of more than 20 years. In this paper, the analysis of two different design approaches of solar panel support structures is presented. The analysis can be split in the following steps.

1. Load calculation, which includes the creation of a simple CFD model using ANSA as pre-processor and ANSYS-CFX as solver to determine the pressure distribution on the solar panel area and the application of EUROCODE 1 to determine the resultant magnitude of the forces acting on the surface of the solar panels.
2. Analysis of the structure, which includes the creation of a FE model using ANSA as pre-processor. Loads calculated in the first step are applied to the model. As solver MSC Nastran is used.
3. Identification of the structure critical points. According to the results weak points are redesigned in order to increase the endurance.

POSTPROCESSING ANALYSIS RESULTS OF BURST TEST SIMULATIONS FOR AUTOMOTIVE PLASTIC AIR INTAKE MANIFOLDS

Prasanna Kondapalli, presented by Marios Lambi[▲]
BASF Engineering Plastics, USA

ABSTRACT – Accurate predictions of static burst test simulations of automotive air intake manifolds is a process that requires knowledge of empirical data obtained from a series of part testing. This data is then implemented in the structural simulations using a variety of structural analysis codes. The structural software used in this particular case generates a huge amount of results, depending on the size of the finite element analysis model used. Processing of this data is a very manual and time consuming process to accurately predict not only the location but also the internal pressure that will result to part failure.

The current process requires first the identification of high stress areas. Then the areas of interest are isolated and the analysis results, which are stresses, nodal forces and moments, are manually recorded for each region. The recorded data are then processed outside the postprocessing software, μETA postprocessor in this case, using a proprietary technique developed using empirical data from a large number of experiments to establish appropriate material strength levels at the weld bead regions. This process provides accurate predictions of the static internal pressure at which failure in the vibration welded part will be initiated. Nevertheless, it is a very cumbersome and time consuming process which makes regular use unattractive and it is implemented only in cases where problems are encountered during the validation process.

Using a script developed to execute within the μETA postprocessor the above process is fully automated and can be easily applied for shell as well as solid element meshes. As soon as the non-linear structural analysis is completed the results can be very easily processed using the μETA script. In addition, the limitation of investigating failure at only a few selected locations to reduce the time needed to perform all the calculations is hereby eliminated. Using the μETA postprocessor the calculated "Burst Failure Index" numbers for any area of the weld bead can now be plotted by the software quite easily. This gives the designer a global view of all weld bead regions and thus areas of concerned can be easily identified and modified to further improve burst performance.

METHODOLOGIES FOR DETERMINISTIC AND PROBABILISTIC OPTIMIZATION IN NVH USING RE-ANALYSIS

Zissimos Mourelatos
Oakland University, Rochester MI, USA

KEYWORDS – Design optimization, NVH, re-analysis, reduced-order modelling, reliability, robustness

ABSTRACT – Deterministic and probabilistic design optimization for NVH performance requires repeated finite-element analyses of large models which are computationally expensive. This paper presents various methodologies for deterministic and probabilistic design optimization of large-scale structures using two classes of re-analysis methods; one for estimating the deterministic vibratory response and another for estimating the probability of the response exceeding a certain level. The latter can be used to obtain an optimal design which is insensitive to manufacturing tolerances and/or lack of information (robust design), and simultaneously meets all performance targets even in the presence of variation (reliable design). Emphasis is put on accuracy and computational efficiency in order to have an accurate design tool for realistic large-scale models which can be efficiently used in vehicle development. The deterministic re-analysis method can analyze efficiently large-scale finite element models consisting of millions of degrees of freedom and many design variables that vary in a wide range. The probabilistic re-analysis method calculates very efficiently the system response under uncertainty by performing a single Monte Carlo (MC) simulation of one design. Due to the multi-modal behaviour of vibratory systems, a hybrid optimization scheme is used. It starts with a genetic algorithm in order to explore the entire design space quickly, and then switches to a gradient-based optimizer which refines the optimal design. Realistic vehicle finite-element models are used to demonstrate the efficiency and accuracy of the optimization methodologies and highlight their capabilities.

Session 3.2.2

PARAMETRIC SHAPE OPTIMIZATION OF VEHICLE BODY FOR WEIGHT REDUCTION AND STIFFNESS IMPROVEMENT

[1]Joanna Rakowska, [1]Behrooz Shahidi, [2]Sunil Earla▲, [2]Ravi Nimbalkar, [2]Vasanth Gandhi
[1]FORD MOTOR COMPANY, Dearborn, MI, USA
[2]BETA CAE SYSTEMS, Farmington Hills, MI, USA

KEYWORDS – Ford Motor Company, Parametric Multidisciplinary Shape Optimization, ANSA

ABSTRACT – Designing a vehicle body involves satisfying multiple, often conflicting requirements. Optimization is a way to develop a weight efficient design that also optimizes vehicle performance with regard to attribute targets. This paper presents a real world application of the shape optimization process to reduce the vehicle body weight while satisfying the Torsional stiffness requirements. In this work the response surface approach is used based on DOE computer simulations with Topology Shape changes as design variables. The paper investigates the shape changes and weight savings. It describes how the overall weight saving is affected by individual shape change requirements. The paper discusses the attribute response sensitivities and how they can be used to: (a) tune the design to meet targets, and (b) decouple the process to reduce the number of DOE runs. Furthermore, the paper presents the trade-off analysis, and its application for developing a balanced and weight efficient design.

MULTIDISCIPLINARY DESIGN OPTIMIZATION (MDO) USING ANSA/METAPOST AND ISIGHT

Frederic Krabchi
SIMULIA, France

KEYWORDS – multidiscipline, integration, batchmesher, morphing, optimization

ABSTRACT – Increasingly, industries are using process automation tools in simulation-based design processes to reduce development time and improve product performance and quality. The critical success factor is the ability to capture existing processes involving various design tools in order to help engineers making trade-off studies in the early design cycle. Isight is a simulation process automation framework with design exploration capabilities. It functions like a robot to capture the design process and logic in an easily understood workflow. In this project, we have studied the integration of ANSA and μETA PostProcessor to automate the model building (ANSA) and result postprocessing (μETA) in Isight. The intention is twofold—to realize the rapid integration of these tools in the Isight workflow and to apply this process with a number of multidisciplinary studies combined with optimization strategies. To investigate the possibility of integrating these software products, three simulation use cases are established to demonstrate how the processes are captured, automated, and encapsulated in various Isight design exploration strategies (Design of Experiments, Optimizers, Approximations, Quality Methods, etc.).

MULTI-OBJECTIVE OPTIMISATION INTEGRATING ANSA WITH MODEFRONTIER

Alberto Clarich▲, Paolo Geremia
ESTECO srl, Trieste, Italy

KEYWORDS – multi-objective optimisation, distributed and automatic computational environment

ABSTRACT – This paper is focused on the integration of the multi-objective design environment code modeFRONTIER with the ANSA mesh morphing software.
In this environment, the users can easily define a workflow linking together different modules that represent the „bricks‟ of the optimisation problem: design variables, updated mesh files, CAE nodes, specified outputs, as well as optimisation objectives and constraints.
In particular, several CAE tools can be easily integrated in the process through the available direct interface nodes, including ANSA. This means that as soon as the user prepares an ANSA model, the morphing parameters are automatically updated by the ANSA direct integration node available in modeFRONTIER, and the optimisation process can be run automatically, according to the selected algorithm or strategy.
Several multi-objective optimisation algorithms are available in modeFRONTIER, including Genetic Algorithms, Evolutionary Strategy, Game Theory, Downhill Simplex, Simulated Annealing, Particle Swarm and Gradient Based algorithms, as well as many Design Of Experiments algorithms. To speed up the convergence of algorithms, Response Surface Methodologies are available, as well as many post-processing tools, including Statistical Analysis, Multi-Variate Analysis and Multi-Criteria Decision Making methods, which help the users analyse the influence of the variables on the objectives and assess the optimisation results.
In this paper, ANSA applications combined with FEM and CFD solvers are used to illustrate the easiness of use of the integration between ANSA and modeFRONTIER, as well as to highlight the possible strategies to solve any multi-objective problem with the lowest number of simulations.

COUPLING MESH MORPHING AND PARAMETRIC SHAPE OPTIMIZATION USING SIMUOPTI

Liu Wei, Shao X. J. , Dai C.H▲., He H.R.
Beijing FEAonline Engineering Co., Ltd, China

KEYWORDS – optimization, morphing, shape basis vectors, RSM

ABSTRACT – As the complexity of the analysis task increases the computational volume and requires many hours, the optimization method contribute significantly in optimization design. Simuopti is a powerful optimization software which completely independent of any pre-processor and solver. It's easy to define optimization parameters in pre-processor software, and provide shape basis vectors. A existing FE models, which already have boundary conditions and load, can directly be used for the optimization, using mesh morphing techniques in ANSA brings a lot of convenience , It's easy to define optimization parameters, and provide shape basis vectors.

This paper demonstrates the process of design improvement on rear bracket of front leaf spring. The objective is to reduce the mass of the rear bracket, using Simuopti and ABAQUS. Different new shapes of the structure were created by mesh morphing of ANSA.

Session 3.3.2

AUTOMATED PRE-PROCESSING FOR HIGH QUALITY MULTIPLE VARIANT CFD MODELS OF A CITY-CLASS CAR

Evangelos Skaperdas▲, Christos Kolovos
BETA CAE Systems S.A., Greece

KEYWORDS – CFD pre-processing, meshing, morphing, optimization, drag reduction

ABSTRACT – The power to efficiently run reliable CFD simulations is a great advantage for good aerodynamic design. This depends heavily on the ability of pre-processing tools to prepare and also be able to efficiently modify a high quality CFD model, overcoming all the difficulties that arise by the large model sizes and their complexity.

In this study the software ANSA v13 is used for the pre-processing of a medium size external aerodynamics CFD model. The focus here is on the application of the steps and techniques to prepare and modify the mesh of such a model. The results verify the automation and quality achieved by the latest developments of the software. The model geometry is surface and volume meshed using the batch mesh tool, with minimum user effort, following all best practices for high quality models (curvature refinement, boundary layers, volume refinement zones, quality criteria checks etc), as applied in current industrial CFD applications.

In addition, the integrated CAD tools and the Morphing functionality allow the CFD engineers to make their own design modifications when necessary, without any constraints or delays, in order to optimize a design. Here in particular, the effect of different inclinations and forms of the rear roof is examined with respect to the main aerodynamic characteristics of the vehicle, mainly drag and lift. The addition of vortex generators is also investigated to conclude if they can have an effect on such square back vehicle shapes. The resulting morphed design is output back to CAD systems in surfaces description.

PREDICTING AND IMPROVING THE PERFORMANCE OF A BAGLESS VACUUM CLEANER USING CFD

[1]Francisco J. Campos▲, [2]David Sykes, [2]Jim Ferguson
[1]ICON Ltd., UK
[2]Hoover Candy Group, UK

KEYWORDS –

ABSTRACT – Centrifugal cyclones used as inertial gas-solid separators are widely employed in the design of modern vacuum cleaners to eliminate the need for dust bags and minimize suction losses. The vacuum cleaner performance, rated in terms of separation efficiency and pressure losses, is mainly dependent on the individual efficiency and proper arrangement of the cyclone separation devices.

In this work a methodology based on Computational Fluid Dynamics (CFD) is presented to predict and characterise the overall performance of a bagless type vacuum cleaner designed and manufactured by Hoover Candy Group. Attention was focused on the second separation stage, comprising a cluster of twelve cyclones operating in parallel and responsible for discarding the smallest solid particles.

The optimisation code modeFrontier was first employed to run a semi-empirical model for predicting centrifugal cyclones performance in order to define the shape of the cyclones in the 2nd separation stage. A total of 7,200 design evaluations were performed using a genetic type algorithm to maximise separation efficiency and minimise pressure losses.

The performance of the baseline and optimised cyclones was evaluated by means of CFD. First, a model of a single cyclone was defined to verify the results obtained with the semi-empirical model. Second, the baseline configuration was tested in the full vacuum cleaner assembly. In both cases ANSA was used to define tetrahedral grids with near wall prismatic layers, while the CFD solutions were obtained in ANSYS CFX. For the latter a Reynolds Stress turbulence model was used in conjunction with Lagrangnian particle tracking to ensure proper representation of the physics involved.

The CFD solutions for the full vacuum cleaner assembly revealed the presence of cross flows at the funnel dust collector (or hopper). The hopper was redesigned accordingly to achieve a 5% increase in separation efficiency. The introduction of the optimised cyclone separators, on the other hand, led to a decrease of 100 Pa in pressure losses at standard operating conditions.

IMPLEMENTING ADVANCED CAE TOOLS IN AUTOMOTIVE ENGINEERING EDUCATION AT CHALMERS UNIVERSITY OF TECHNOLOGY

Lasse Christoffersen▲, Christoffer Landström, Lennart Löfdahl
Chalmers University of Technology/Applied Mechanics, Sweden

KEYWORDS – CFD, Course, CDIO, Aerodynamics, Formula Student, Eco-marathon

ABSTRACT – Introducing modern CAE software in the classical engineering education is a delicate task. It is always a balance of making sure the student understand the underlying physics and working method of the software as well as giving them the skills so operate it. In this paper it is described how modern Computational Fluid Dynamics software was successfully introduced into the engineering education at Chalmers University of Technology. In the paper the outcome of some of the simulations performed in the course as well as the outcome of two case studies is presented.

The outcome of introducing modern CFD software in the education is an increased job market value for the students and several of the course participants have gone straight into CFD related positions in industry.

NEW APPLICATIONS OF ANSA IN CEM

Pavel Tobola▲, Ivo Grac
Evektor, spol. s r.o., Czech Republic

KEYWORDS – Electromagnetic threats, computational electromagnetics, FDTD & MTLN solver, pre-processing,

ABSTRACT – Environmental electromagnetic threats of an aircraft and its vulnerable systems are examined by Evektor using methods of Computational Electromagnetics (CEM). As an airframe shall provide an inherent systems' protection against the threats (indirect effects of lightning and HIRF), an intensity of internal electromagnetic field as well as responses on cable bundles in this internal environment are to be evaluated to quantify them. The full-wave FDTD (Finite Difference Time Domain) and MTLN (Multi-conductor Transmission Line Network) models with appropriate solvers are used for this purpose.

Although the mentioned above solvers have their devoted special pre-processors usually used for airframe geometry simplifications and meshing, we use ANSA as the universal pre-processor that is irreplaceable for us whenever any effective creation as well as modification of the electromagnetic (EM) model geometry is necessary. Then the devoted special pre-processor is used only for three-dimensional quantisation of the airframe geometric model together with its close surrounding wrapped into unechoic layers with special boundary conditions and when implemented the wire structures on that the responses of cable bundles are to be calculated. The airframe geometry as well as geometries of the mentioned above wire structures are processed together using ANSA to match them each to other before their individual imports into the special pre-processor that makes the EM model treatable by the mentioned FDTD and MTLN solver.

Participating on the HIRF-SE collaborative project (7-th Framework Programme of EU) where a common platform of the EM model data (AMELET) is established to match the data format for various EM solvers (both the existing and future ones), Evektor is interested in continuance to use ANSA as the most powerful tool for creating of EM models and to integrate it into the HIRF-SE framework as an organic part making possible an effective pre-processing for any solver. To achieve this daring goal, we are prepared to create a necessary software sub-module for this purpose in a future close cooperation with BETA CAE Systems S.A.

Session 3.2.3

NAFEMS – THE INTERNATIONAL ENGINEERING ANALYSIS COMMUNITY

Albert Roger Oswald
NAFEMS GmbH, Germany

KEYWORDS – Education & Training – Best Practice – Networking– Analysis Community – Voice of CAE

ABSTRACT – Engineers rely on computer modelling and simulation methods and tools as vital components of the product development process. As these methods develop at an ever-increasing pace, the need for an **independent, international authority** on the use of this technology has never been more apparent.

NAFEMS is the only worldwide independent association dedicated to this technology. Companies from numerous industries and every part of the globe have invested heavily in engineering technologies such as FEA and CFD.

But:
- How do they ensure they get the best return from their investment?
- How do they develop and enhance their capabilities?
- How do they know they are using the technology in the most effective way?

NAFEMS is uniquely placed to help answer these questions.

NAFEMS is a vendor neutral, not-for-profit membership association of more than 900 companies from all over the world. Members range from major corporations such as Boeing through mid-sized organizations such as JCB, to small-scale engineering consultants.

TEAMCENTER – ANSA INTEGRATION

[1]Zoran PETROVIC, [2]Stylianos SEITANIS▲, [2]Ioannis CHARALAMPIDIS
[1]Siemens PLM Software GmbH, Germany
[2]BETA CAE Systems S.A., Greece

KEYWORDS – PDM / PLM, PLM XML, Teamcenter, ANSA

ABSTRACT – The different phases of simulation-driven product development generate significant and increasing amounts of diverse data whose loose management leads to error prone procedures that delay crucial decisions. Integration of the various CAE disciplines in a common PLM environment will help enhance data & human communication, accelerate the PLM process and increase the impact of simulation on all product development phases.

Existing PDM/PLM environments do not have the specialized integral tools required for the completion of CAE work; after all, such tools were not designed having CAE workflows in mind. Subsequently, they have to rely on external software for the preparation, verification and execution of CAE analyses.

To address the needs of today's Automotive Industry, SIEMENS PLM and BETA CAE Systems S.A. have taken the initiative to bring together Teamcenter and ANSA and offer an attractive solution that combines the efficiency of these well established applications in the PDM and CAE fields respectively. Teamcenter – ANSA interaction is facilitated through PLM XML files: a file that describes various aspects of the vehicle is exported from Teamcenter in PLM XML format, along with the associated product data. PLM XML file & associated data serve as input to ANSA. In turn, ANSA performs all required pre-processing actions based only on the information residing inside the PLM XML file. Finally, ANSA reports the result back to Teamcenter again through PLM XML.

This paper presents the framework within which Teamcenter and ANSA interact and provides some illustrative examples of typical use-cases that are currently covered by this interaction. Finally, the application of PLM XML based communication to the build-up process of a ready-to-run solver input file is discussed.

Development of Teamcenter – ANSA interaction is an ongoing process. It is expected that the results of this collaboration will serve the CAE community as an "out-of-the-box" solution for CAE model preparation.

SIMULATION, PROCESS, DATA AND RESOURCES MANAGEMENT (SPDRM)

Stylianos Seitanis
BETA CAE Systems S.A., Greece

KEYWORDS – Simulation Data, Process & Resources Management, Scalability, De-centralization, Job Delegation, Profiling, CAE Workflow Improvement

ABSTRACT – Within an environment of a continuous intensification of product development, with fewer to zero prototypes, industry requires intensive, cost efficient and short CAE cycles with high confidence to their results, at earlier product development stages. Information that is needed downstream throughout the CAE projects is too often unavailable, untraceable, outdated or captive to error-prone manual methods. The value of CAE is constrained by bottlenecks at data mining and dissemination. At the same time, CAE suffers from the lack of knowledge capturing and information reusability as the intellectual property that is gained by the collective experience of best-practices is lost.

Solution to the above is being sought on both individual CAE user and enterprise levels; a solution to efficiently handle existing resources (human, software and hardware) to co-ordinate and drive CAE operations and allow CAE managers, simulation engineers and operators to have a clear vision on what has to be done, how it has to be done, who, when and where should do it and of course over which data; a solution that captures CAE intelligence and is functionally capable of meeting the specific needs of all users; a solution that scales from a single user or workgroup to the entire enterprise and brings the concepts of contemporary engineering intelligence into the CAE simulation community in a simple and direct manner, suitable to today's work conditions.

This work identifies the key characteristics and presents a new tool for the management of product & simulation data, as well as of the required resources involved in the CAE workflow process.

BETA CAE Systems S.A.
Kato Scholari, Thessaloniki,
GR - 57500, Epanomi
Greece
Tel: +30-2392-021420
Fax: +30-2392-021417
Email: ansa@beta-cae.gr
URL: http: //www.beta-cae.gr