

SIMPACK News

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SIMPACK User Meeting 2004 at the Wartburg, Eisenach, Germany

SIMPACK User Meeting 2004

The history of the Wartburg and the wall paintings in the Wappensaal gave the perfect backdrop for the 6th SIMPACK User Meeting. Highlights of the event were the presentations of the new SIMPACK 8.7, Code Export and SIMPACK Engine. The user presentations demonstrated modelling and simulation work at the highest level with the use of co-simulation or HIL/SIL applications discussed in more than 10 papers.

The Wartburg castle chronicles the history from Romanesque to Romanticism. Founded in 1067 by Count Ludwig, the Wartburg, with the Lutherstube, was witness to the reformation and was also the location of the first democratically assembled meeting of citizens for

the unification of the small individual states in 1817.

The two days of the User Meeting, held November 9-10, offered a full program, including the direction in which INTEC is heading, and 30 presentations from SIMPACK users - coming from both industry and universities.

The User Meeting presentations can be downloaded from www.simpack.com (software, publications).

INTEC ON TRACK

After the welcome speech from L. Mauer to the attendees, this year coming from 10 countries, A. Eichberger reviewed the activities at INTEC since the last User Meeting. He also gave an insight into the commercial performance of INTEC, which shows continuous growth

» USER MEETING01

Dr. Lutz Mauer, INTEC GmbH
SIMPACK User Meeting 2004 at the Wartburg

» CAD INTERFACE04

Dr. W. Trautenberg, INTEC GmbH
CatSIM V5, Interface between CA-TIA V5 and SIMPACK

» REALTIME05

Dr. Alex Eichberger, INTEC GmbH
SIMPACK Realtime Car Model VDYM

» WHEEL/RAIL06

Dr. Ch. Weidemann, INTEC GmbH
What's new in SIMPACK 8.7 Wheel/Rail

» SOLVER08

Dr. Stefan Dietz, INTEC GmbH
The Powerful Linear Subsystem Solver for Flexible Bodies

» SIMPACK NVH010

Steven Mulski, INTEC GmbH
Noise, Vibration, Harshness - NVH

in all business divisions. Our strength in international markets has been further developed with new partners including ATES, ESP and IST. He highlighted the customer driven SIMPACK developments in Release 8.7, which were to be presented at the User Meeting. A key feature of INTEC's future objectives is to provide the customers with interfaces, which allow flexibility in the overall CAE process.

Dr. Lutz Mauer
INTEC GmbH



Martin Hilchenbach, Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany



Alexandra Ratering, University Stuttgart, Germany



Spencer Salter, Land Rover, Warwick, UK

WORKING WITH SIMPACK 8.7

W. Trautenberg, director of SIMPACK development indicated that more than 400 changes have been implemented for the brand new release 8.7. All of which have been strongly driven by the wants and requirements of our customers. SIMPACK 8.7 is both evolutionary and revolutionary. Some of the evolutionary highlights are:

- Scaled transient Animation
- Copy and Paste of Bodies
- Virtual Suspension
- Linux Port

The revolutionary features have been in the fields of the solver, new modules and in the software architecture:

- Linear subsystem solver for flex. bodies
- SIMPACK Engine
- New SIMPACK Plot (pre release)
- CatSIM V5 Interface to CATIA V5

SIMPACK CODE EXPORT

F. Kohlschmied presented the current development stage of SIMPACK's Code Export functionality. SIMPACK Code Export is used for the automatic generation of the dynamic equations of (nearly) any SIMPACK model as source code. The main features are:

- optimised code for saving simulation time (Fortran and C)
- huge subset of SIMPACK elements are supported
- support of SIMPACK User Routines
- usage of model specific database
- interface to MATLAB and ETAS HIL environment
- support of elastic bodies

LINEAR SUBSYSTEM SOLVER

S. Dietz presented a new solver technology for SIMPACK models containing flexible bodies, described in modal co-ordinates. The basic idea of this new method is to treat the modal description of the flexible bodies as a linear subsystem, which can be solved analytically and coupled via a co-simulation to the non-linear system.

SIMPACK ENGINE

M. Schittenhelm gave a very exciting presentation on the product suite SIMPACK Engine, which covers the most

important areas of combustion engines and the corresponding excitations:

- Valve Train (flex bodies for valve shaft, valve spring, rocker and camshaft)
- Timing Mechanism (chain, gear wheels, tensioners)
- Crank Train (flexible bodies for the crank shaft, cylinder block, connecting rod and crank shaft bearings)

For modelling these components a number of very sophisticated modelling elements have been developed:

- 2D and 3D direct contact between flexible bodies
- Detailed Hydraulic Lash Adjuster
- Dynamic Valve Spring (1D multi-mass)
- Dynamic Valve Spring (SIMBEAM model including winding contact)
- Gearwheel (spur and helical, considering multi-tooth contact and backlash)
- Chain (incl. sprocket wheels, guides)
- Implementation of the IST modelling levels Impedance and Reynolds equations for HD bearings

Besides detailed analysis of individual components, the complete engine behaviour, with all the corresponding dynamic interactions, is an impressive feature of SIMPACK Engine.

QUALITY ASSURANCE

C. Schwientek introduced the quality management process, which has been established for the continuous quality assurance in the SIMPACK Software. One of the important aspects is the extension of the SIMPACK test model and test case library. The library models should cover all modelling and solver functionalities in SIMPACK. Complex customer models are most welcome, which can be used for testing at INTEC. The QM workflow includes tests at different levels:

- Automated processing of all test models on all supported platforms
- Automated comparison of the test and reference results.
- Testing of the GUI
- Acceptance stipulations

AEROSPACE APPLICATIONS

The year's best received presentation was from M. Hilchenbach, who is responsible for the landing gears of

*Dr. Lutz Mauer
INTEC GmbH*

the Rosetta comet lander, which was launched in Jan. 2003. The landing manoeuvre, however, will not happen until 2014. The other two aerospace contributions were from M. Spieck (DLR) and R. Lernbeiss (TU Wien), who presented dynamic simulations of on-ground dynamics of aircraft landing gear.

AUTOMOTIVE USER PRESENTATIONS

Eckhard Rossmann (DaimlerChrysler) presented a detailed study of the braking of commercial vehicles. S. Tuzcu (IST) explained the theory and application of the modelling of hydrodynamic bearings - now available in SIMPACK Engine. H. Weinfurter (MAN) looked at the control design for steer-by-wire trucks, carried out co-simulation with MATLAB. S. Salter (Land Rover) showed us the potential of SIMPACK in the improvement of vehicle ride comfort and drivability, particularly impressive were the amazing animations, which he showed. We congratulate A. Al-Sened (MAN B&W), who was the first user to give a presentation on the application of SIMPACK Engine. R. Frith and J. Knapton (Jordan) gave us an insight into the optimisation tasks required by F1 racing cars to find the right balance between transient and steady state behaviour.

RAILWAY USER PRESENTATIONS

Three of the railway presentations, J. Wingren (Bombardier), R. Gansekow (Siemens) and J. Perez (MMU) dealt with the UK vehicle acceptance procedures, which include dynamic gauging requirements, the sway test and wheel unloading. Perez presented a modelling strategy which works with vehicle and test case database substructures (Bogie rotation test, DQ/Q and Y/Q test, sway test and ride comfort simulations). G. Schupp (DLR) gave an overview of his doctoral work on the bifurcation analysis for the detection of periodic solutions (limit cycles). P. Häse went into detail on the investigations he undertook on shock loads in a drive chain caused by a short circuit in the asynchronous motor. One of the highlights was the presentation from Marc Stiepel (Alstom), he showed the simulation of freight

wagons with friction elements such as chain link suspended leaf springs. The simulation runs covered track lengths of 70 km to obtain the complete UIC 580 assessment. G. Schandl presented the technique of equipping future railway vehicles with piezo actuators for active vibration control.

MACHINERY DYNAMICS

An insight into machinery dynamics was given to us by M. Weber (Hilti) and P. Gomez (Freudenberg). H. Bork (Siemens) looked at control systems for linear axis problems and Alexandra Ratering (University Stuttgart) investigated a parallel mechanism. A. Heckmann (DLR) extended the modal description of flexible bodies to use with thermal modes, in the improvement of the positional accuracy of gantry systems.

WIND TURBINES

The two papers presented by D. Möller (RWTH Aachen) and T. Schulze (TU Dresden) gave an impressive look at the state of the art dynamics used for the simulation of drive line dynamics, which include the interactions with the generator and the control circuit. Schulze showed, that the flexible gear box mounting and the axial movements of helical gears have to be taken into account to obtain realistic natural modes for the drive line system.

BIOMECHANICS

Two university contributions explored the special problems encountered in the modelling of humans for the simulation in the field of bio-mechanical movements.

OUTLOOK

We would like to thank all the User Meeting attendees, whether the contribution was through a presentation or just for coming to listen. This year's best ever User Meeting attendance is an incentive for INTEC to strive to offer the best possible SIMPACK customer service. We're already looking forward to the next SIMPACK User Meeting in Spring 2006, and seeing you again or maybe for the first time.



*Richard Frith, Jordan Grand Prix,
Silverstone, UK*



Tobias Schulze, TU Dresden, Germany



The Wartburg in Eisenach