Sabine E. Engert
INTEC GmbH

SIMPACK User Meeting 2001

SIMPACK User Meeting 2001 in Bad Ischl

The SIMPACK community met on the 13th and 14th of November for the 4th SIMPACK User Meeting. In line with SIMPACK becoming more globally orientated, this year's User Meeting was the first to be held in English. INTEC revealed the positive business development and strong growth of the company during the last one and a half years and showed the concepts for the future developments. The new SIMPACK, Version 8.5, was presented and given to the customers as an early bird release. The sixteen excellent user presentations made this year's meeting a resounding success.

INTEC's Business Development

After Dr. Mauer, Managing Director, welcomed all guests to the meeting, Dr. Eichberger, Managing Director, reported on the development of INTEC's business since the last User Meeting. Since last year's User Meeting the turnover at INTEC is increased by 30% and the number of employees by about 60%. This ties in with INTEC being responsible for the overall product development of SIMPACK, while the partnership to DLR will continue in terms of research activities and project based collaboration. The new partnership with Etas has been disclosed as reported in detail in this SIMPACK News.

Director of Sales and Marketing Johannes Gerl reported the ongoing internationalisation of INTEC's business. With 67% of the companies that became SIMPACK customers since the last User Meeting being from outside the home market, INTEC executed the step to a global player on the CAE software scene. The SIMPACK of the future, the product to carry forward this process, was characterised: Leaving behind the competitors in simulation technology, the new versions will offer a maximum of usability and control for the experienced user – standing to benefit from a solver that is expected to be "a hundred times faster" than today.

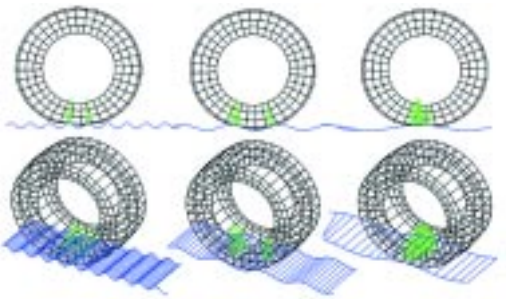
New SIMPACK Version 8.5

Dr. Wolfgang Trautenberg, Director of Product Development, demonstrated the new features of SIMPACK 8.5 with an online presentation.

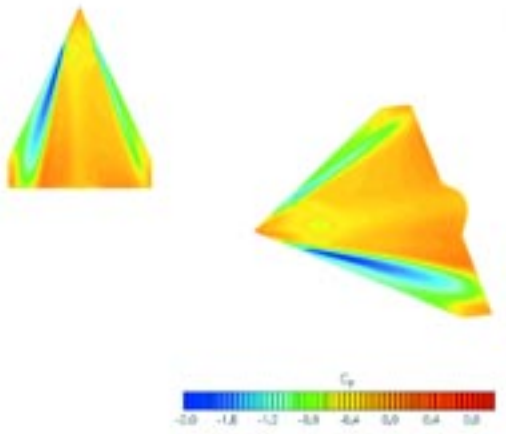
He set up a couple of well-known SIMPACK tutorial models. Many new features and new functionalities were presented both in terms of usability and in solver technology.

Dr. Stefan Dietz, responsible for the development of the SIMPACK FEA interface, showed enhancements in the new version of FEMBS, which from now on will be released together with SIMPACK. The new features include the new GUI, a new file standard that simplifies the data exchange to FE-codes and above all a brand new approach to generally interface FEA with multibody codes. This approach will allow an analytical rather than a numeric solution of the FEA-part of the combined system and it will therefore be both very fast and unsusceptible to high frequencies and big model sizes. This makes it the perfect solution, for example, for NVH calculations with flexible car body structures.

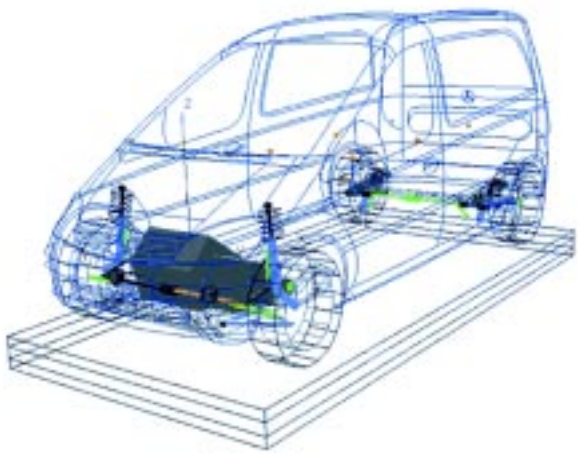
Marcus Schittenhelm and Christoph Weidemann, INTEC's experts for automotive and railway systems, then showed the applications of the new SIMPACK in connection with cars and trains. The main highlights include the completely revised,



Tyre Model RMOD-K [1]



SIMPACK-CFD Interface by DLR [2]



Model of the Vaneo from Mercedes [3]

and now 3D, track module, numerous new modelling elements and the improved database handling.

Software Associated with SIMPACK and General Applications

Andreas Fandre from gedas presented the tyre model RMOD-K which is now available with the new integrated interface directly in SIMPACK for current RMOD-K users.

RMOD-K comprises a driving dynamics (rigid ring) model and a ride comfort (flexible) model; the latter valid for frequencies of up to 300Hz. The new version 7 which is currently developed at Anhalt University of Applied Sciences and gedas available in May (rigid ring model) and October (flex ring model) 2002 will offer features which make RMOD-K one of the very best tyre models. It includes a new solver with adaptive numerics, an FEM based flexible ring model.

Christian Armbruster from Imagine showed various possible applications of a co-simulation interface between SIMPACK and the French 1D-mechanics, hydraulics and pneumatics simulation tool AMESIM.

Two new innovations for aerospace applications have been presented by the SIMPACK development partner DLR: a so-called Aero-FEMBS which uses a very effective modal approach to enhance FEMBS with aerodynamic properties (Martin Spieck) and an approach which couples SIMPACK to the DLR own CFD-code TAU (Gunnar Einarsson).

Siemens Dematic AG (Dr. Henning Bork) uses SIMPACK for simulations of the Siplace Placement Lines (machines for the assembly of electronic devices). Flexible parts are imported as FE models from ANSYS. If controlled systems have to be simulated, the SIMPACK models are exported to MATLAB Simulink using the Symbolic Code.

SIMPACK Automotive

DaimlerChrysler, represented by Volker Sing from Mercedes, presented the "Set up of an Automotive Test Rig in SIMPACK". The experimental force data, measured at the wheel centre, was used as the input for the SIMPACK multibody simulation. The results determined the loads for FEM and fatigue analysis as well as the excitation of a hydraulic test rig. The problem of a drifting vehicle (which would appear not connected to the ground by springs) was solved in a very elegant way by eliminating the drift forces with a closed loop control system, that was completely realised within SIMPACK Control. The results of a model equipped with a flexible body showed an excellent correlation between simulation and measurement.

Andreas Raith from BMW was intensively involved in "The application of Dynamic Reduction in Modelling Exhaust System as a Flexible Body". His presentation gave a very valuable outline of the usage of the unique FEMBS speciality 'frequency response modes' and the usage of dynamic mode reduction which will be supported by FEMBS in the very near future and which was made available for BMW in the framework of an earlier project.

Thomas Schrüllkamp from IKA RWTH Aachen used SIMPACK to support the measurements taken from a kinematic and elasto-kinematic wheel suspension test rig. A mathematical simulation model was successfully derived, based on the measurements taken, which provided good correlation without having to model geometrical input or mounting elements.

The Technical University of Prague used SIMPACK to simulate "Vehicle-Pedestrian Collision". Prof. Kovanda demonstrated with a impressive simulation the performance of SIMPACK's numerical capabilities. Comparisons to similar simulations in Madymo and to experimental data showed good over-all correlation.

Mr. Neubeck from FKFS Stuttgart demonstrated how The SIMPACK Code

1) courtesy of gedas gmbh

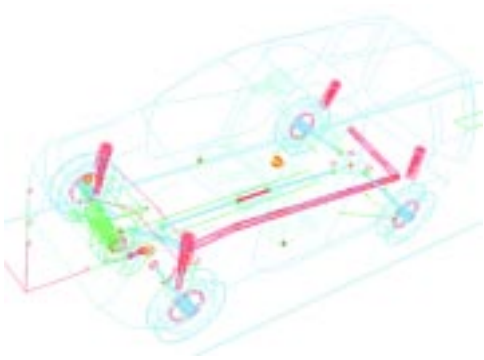
2) courtesy of DLR

3) courtesy of DaimlerChrysler AG

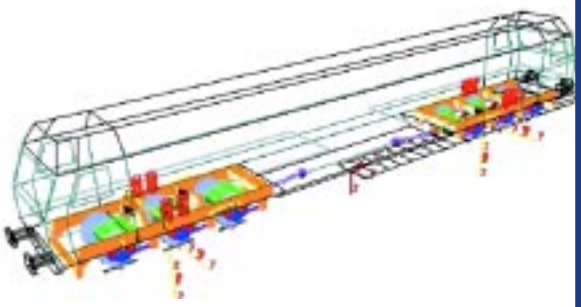
Export was used to carry out real-time simulations of heavy trucks with up to 35 degrees of freedom and 7 rheonomic drives that run in real-time. Industrial standard PCs were used for hardware-in-the-loop simulations and as simulation engine for the driving simulator at FKFS.
Finally Bob Thurman from Land Rover gave an overview about the activities at Land Rover. A big number of simulations in the fields of power train analysis, chassis analysis, body analysis and vehicle refinement analysis was carried out. A highlight was added showing the simulations 'bridge jump' and 'idiot start', where SIMPACK could demonstrate its outstanding stability and reliability when performing a time integration. Very good results have been shown as well in simulations with flexible car bodies imported from FEM tools.

SIMPACK Wheel/Rail

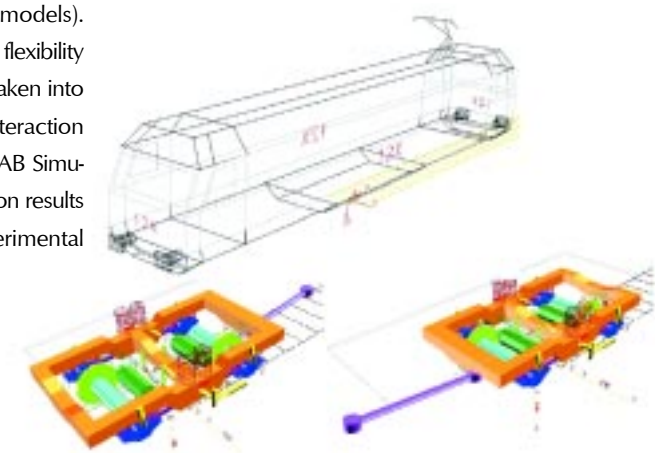
The second day of the SIMPACK User Meeting was opened by Dr. Anton Stribersky from Siemens Transportation Systems in Vienna. The SIMPACK simulation of the Vienna Metro was carried out with flexible car bodies imported from ABAQUS and a large number of model variants were investigated using a model database created at INTEC. Moreover the results obtained by multibody simulation have been transferred to a so-called active digital mock up tool. The required space for a vehicle, for instance passing through a tunnel or entering a station was calculated using the dynamic results of SIMPACK ("gauging"). The required information for the vehicle's dimensions was made available by the 3D CAD system. This project was carried out at different Siemens sites in different countries, which meant it was vital that the data was continually up-to-date.
Roger Gansekow, Siemens Transportation Systems Krefeld, showed how the structural dynamics of a high speed train were optimised with a special focus on the influence of particular coupling elements; such as hydro rubber springs or conical rubber springs. The simulation results could successfully be verified by experiments on the roller rig.
Nicola Bosso from Politecnico di Torino presented and discussed his work in rail research. Different bogie concepts of a mass transit vehicle (articulated, conventional; no traction, side traction, motor wheels) have been compared in terms of regarding curving behaviour and stability.
Mario Romani from Ansaldobreda, Pistoia showed how SIMPACK was used for the design of the low floor tram SIRIO for Naples, Milano and Gothenburg. Remarkable both for the simulations as well as for the vehicle in reality; the modularity and the variability in combining different car and bogie types. Extensive studies of linear as well as non-linear models were shown.
Mrs. Claudia Kossmann concluded 2001's SIMPACK User Meeting with an overview of the complex use of SIMPACK at Bombardier Transportation Winterthur, part of the company's COC for bogie dynamics. Models of urban, mass transit as well as high speed trains have been shown, having conventional and articulated as well as running and motor bogies (including drive train models). Projects were presented where flexibility of bogies and car bodies was taken into consideration and also the interaction between SIMPACK and MATLAB Simulink was covered – the simulation results compared well with the experimental data.

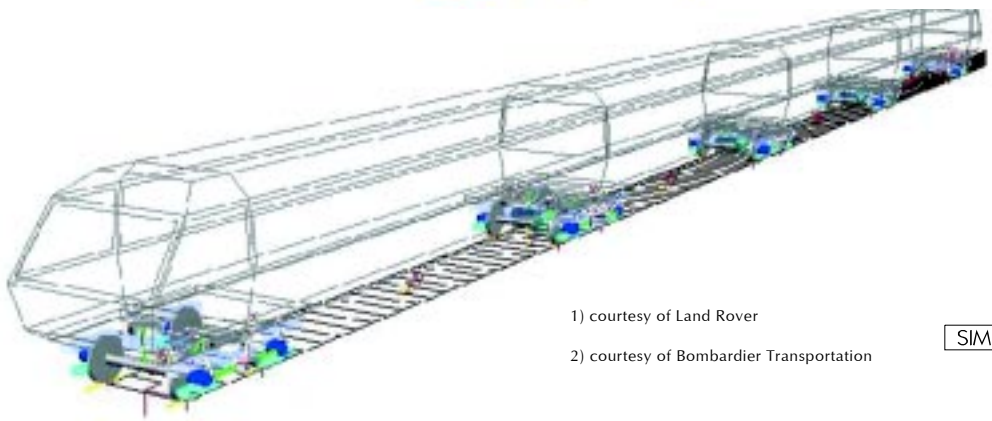


Model of Land Rover Defender [1]



Models from Bombardier Transportation [2]





1) courtesy of Land Rover

2) courtesy of Bombardier Transportation

Dr. Lutz Mauer: Welcoming

Dr. Alex Eichberger: INTEC on Track

Johannes Gerl: The International Market

Dr. Wolfgang Trautenberg:
Working with SIMPACK 8.5 and Beyond

Andreas Raith, BMW AG

Volker Sing, DaimlerChrysler AG

Nicola Bosso, Politecnico di Torino

Dr. Anton Stribersky,
Siemens Transportation Systems