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SIMPACK News

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Simpack User Meeting 2006 at the Kurhaus, Baden-Baden, South West Germany

SIMPACK User Meeting 2006 - A Review

The 7th SIMPACK User Meeting took place on the 21st and 22nd of March in the magnificent 'Kurhaus' in Baden-Baden in South West Germany. The circular hall with its baroque stucco work was used for most of the presentations; the presentations as always coming from both INTEC and the SIMPACK users. The two days of the User Meeting offered a full programme, including what INTEC is currently focussing on as well as nearly 30 presentations from SIMPACK users. This year the presentations came from users from ten different countries.
The User Meeting presentations can be downloaded from www.simpack.com (software, publications).

The Kurhaus in Baden-Baden was built as a spa resort at the turn of the 19th century. To this day it is still used as a health and wellness centre. It also of course houses the famous casino. For these two days, however, the entire first floor was reserved for the SIMPACK User Meeting.
As is the tradition, the User Meeting was opened with a very enlightening presentation from Lutz Mauer. He gave us an insight into the cultural background of Baden-Baden and the famous figures that have either come from the town or lived there over a number of years. These include Fjodor Dostojewski, Clara Schumann, Johannes Brahms and the architect Egon Eiermann.

INTEC ON TRACK

Alex Eichberger reviewed what has been happening at INTEC since the last User Meeting. He also gave an insight into the commercial performance of INTEC which has shown continuous growth in all business divisions. The strength in international markets has also been further developed with new partners in France and Brazil.
He also highlighted that the new devel-

Erni Sabine Engert
Intec GmbH

The Kurhaus Baden-Baden, Germany

The Auditorium Watches SIMPACK Animations in 3D View

Erik Pfleger, Siemens AG A&D, Germany

opments in SIMPACK 8.8 are heavily customer driven; these include more than 30 brand new features. These developments have been in all areas with the major focus on the modules SIMPACK Automotive and Engine, SIMPACK Wheel/Rail, SIMPACK Wind and SIMPACK Loads, Stress and Durability. A key feature of INTEC's future objectives is to provide the customers with interfaces which allow as much flexibility as possible in the overall CAE process.

WORKING WITH SIMPACK 8.8

Wolfgang Trautenberg focused in his presentation on the new post-processing module, which has now been extended from the highly capable new plot module to also include the animation of the simulation results. The animation offers 3D capabilities which were shown during the presentation. 3D glasses were handed out and the new capabilities of the animator were presented.

SIMPACK CODE EXPORT

Frank Kohlschmied presented the current functionality in SIMPACK's Code Export as well as the current development stage. For those that don't know SIMPACK Code Export is used for the automatic generation of the dynamic equations of a SIMPACK model as either Fortran or C code. The further developments to the SIMPACK Code Export include extensions to the solver functionality, new supported elements including elastic bodies, the export of C-code and more comfortable access to HIL environments.

SIMPACK GEARWHEEL

Lutz Mauer presented the SIMPACK Gearwheel module which he developed. He gave an in depth account of the theory behind this module including how the contact stiffness is calculated. The calculation is dependent on the overlap ratio and he showed how to calculate the optimum overlap ratio. He also presented some application examples of the Gearwheel module for use in an engine timing mechanism and in the simulation of wind turbines.

SIMPACK ENGINE

Marcus Schittenhelm gave us a very informative presentation on the enhancements to the product suite SIMPACK Engine. This module can be used to simulate the dynamics of combustion engines and their corresponding excitations.
Whilst showing the enhancements in the field of modelling elements, solver methods, analysis processes and the model database, Mr. Schittenhelm highlighted the easy and effective SIMPACK Chain model set-up process and presented complete engine models which are used by SIMPACK users in the automotive industry.

MBS NUMERICAL METHODS IN SIMPACK

Martin Arnold, the leading expert on MBS numerical methods from the university Halle-Wittenberg, gave us a most impressive insight into SIMPACK's engine – the solver and its numerics. Beginning with the basics of SIMPACK time integration, he then went on to explain the different solvers available, what they can do and the respective advantages of using one solver over another.
His enthralling presentation captivated the audience and so it was elected as the best presentation at this year's User Meeting.

AUTOMOTIVE USER PRESENTATIONS

Thomas Ille (MAN Nutzfahrzeuge AG) presented the use of SIMPACK Code Export for the "easy-to-use" simulation for engineers without any SIMPACK know-how. This presentation, amongst the automotive presentations, was considered by the audience to be the best.
Sven Dronka (DaimlerChrysler AG) showed the development of a Co-Simulation interface for user force elements.
Darko Meljnikov (DaimlerChrysler AG) provided us with an insight into the use of SIMPACK at DaimlerChrysler Nutzfahrzuge AG. He also presented the DaimlerChrysler Driving Simulator, which is in Berlin, that is used with the SIMPACK real-time models.

Erni Sabine Engert
Intec GmbH

Franz Huber (DaimlerChrysler AG) showed us the use of SIMPACK Engine for simulating engine timing chains. DaimlerChrysler switched in January of this year from using one of our competitor's tool to SIMPACK for simulating engine dynamics. Radek Tichanek from University Prague (CVUT) looked at the simulation of overhead camshafts. Basileios Mavroudakis (University of Stuttgart) showed us the potential of SIMPACK in chassis design for use in motor cycles and racing cars.
Johannes Edelmann (University Vienna) showed a combined driver model for lateral and longitudinal vehicle dynamics.
Andreas Gibbesch (DLR Oberpfaffenhofen) gave us an alternative, but excellent presentation, which demonstrated, with the help of SIMPACK, the planetary rover mobility on soft terrain. The use of SIMPACK for simulating rover mobility on Mars is obviously not the most common usage for SIMPACK in the automotive field, but showed the versatility of SIMPACK.

RAILWAY USER PRESENTATIONS

The presentations given by our SIMPACK Wheel/Rail users covered diverse railway topics. The event was very international with users coming from all over Europe.
The first presentation came from Guido Saporito (Ansaldobreda) and dealt with the DMU IC4 Car for DSB. Peter Häse (Bombardier) presented the drive train investigations he undertook for the Monorail in Las Vegas. He used SIMPACK to reduce the noise problems which had plagued the vehicle.
Christophe Collette (University of Brussels) looked at the modelling of rutting corrugations and how they were validated with measured data. Pavel Polach (Skoda Vyzkum s.r.o.) went into great detail on how the simulation of railway car excitations are carried out on a virtual test rig. One of the highlights was the presentation from Roger Enblom (Bombardier Sweden); he showed us how he simulated the wear of railway wheel profiles over various different track sections. Nicola Bosso (Politecnico di Torino) presented the development of a spatial track module in SIMPACK and its application for simple roller coasters.
Peter Kotz (Siemens TS) showed us the application of the linear system analysis for railway vehicles as a mechatronic system. Claudia Kossmann and Karl Tillmetz gave an insight into the use of SIMPACK at Stadler Rail for Model Verification and Optimisation. Erik Pfleger (Siemens AG A&D) presented the simulation of the dynamic behaviour of nose-suspension drives. Bernhard Kurzeck (TU Berlin) presented his analysis of middle frequency range vibrations which occur in light railways whilst cornering. Antonio Carrarini (DLR Oberpfaffenhofen) closed the presentations and gave us an insight into an analysis of the stability of railway vehicles due to crosswinds.

MACHINERY DYNAMICS

An insight into the use of the Gear Pair Force Element for the advanced simulation of gearwheels was given by Saeed Ebrahimi (University Stuttgart). Janko Wuchatsch (University Magdeburg) showed us the use of SIMPACK for the simulation of piezo-electric and shape memory elements.
Kersten Hahns (Voith Turbo) presentation shows the modelling of the drivetrain of a natural gas compressor.

WIND TURBINES/DRIVE TRAINS

This year we had once again two presentations from wind turbine specialists. Tobias Schulze (TU Dresden) gave us an impressive look at the state of the art dynamics used for the simulation of drivetrains, wind turbines, concrete mills and research ships.
Jens Pfisters (Voith Turbo) presentation looked at the drive concept of wind energy plants at Voith Turbo. His presentation slides can be downloaded, like all the presentations, from www.simpack.com, software, publications, User Meeting 2006 in Baden-Baden.

We would very much like to thank all those who attended this year's User Meeting and particularly those who presented their work with SIMPACK.

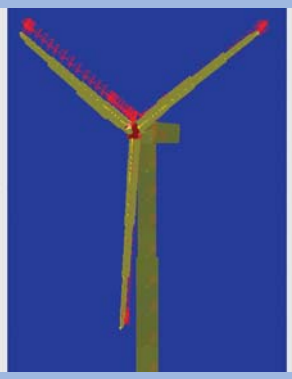
Martin Arnold from University Halle-Wittenberg, Germany

Roger Enblom from Bombardier Transportation, Sweden

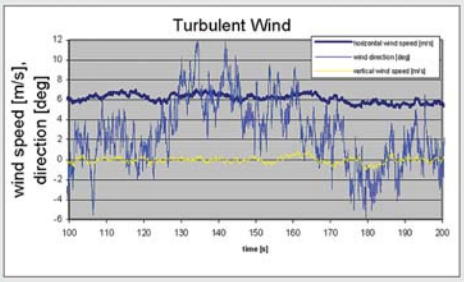
Thomas Ille from MAN Nutzfahrzeuge AG and Dr. Weber from Hilti AG, Germany

Stefan Hauptmann
University of Stuttgart

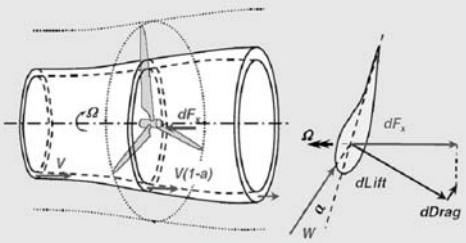
Integration of an Aerodynamic Wind Turbine Module



MBS Model of the Entire Wind Turbine



Turbulent Wind Used in Simulation



Blade Element Momentum Theory Linking of the Global Rotor Flow Field (left) to the Local Blade Flow Field (right) by the Induction Force dFx at an Annulus

In the last years wind turbines have increased dramatically in size so that their structural-dynamic behaviour is becoming progessively more important. Industrial simulation codes for wind-turbine-specific problems have some shortcomings in structure modelling, especially for drive trains. This leads to new approaches to wind turbine simulation. The Endowed Chair of Wind Energy at the Institute of Aircraft Design (University of Stuttgart) initiates the usage of SIMPACK for the simulation of wind turbine models. This requires some add-ons to SIMPACK. The most important of these consists of an aerodynamic module to consider rotor aerodynamics and turbulent wind field input.

STATE OF THE ART

The structural dynamics of wind turbines are nowadays simulated with special software codes, developed solely for this application. The majority of these simulation codes use a modal approach that considers only a rather limited number of natural modes. A few other tools apply finite element methods which are more powerful in principle but computationally inefficient due to the kinematical and material non-linearity of the system and the overall long calculation times. Recently it became obvious that all codes so far have deficits in modelling the drive train dynamics and its interaction with the other main components like blades, tower, etc. This leads to a poor significance of component coupling.

SIMPACK AS SIMULATION SOFTWARE FOR WIND TURBINE DYNAMICS

The multibody simulation software SIMPACK features an advanced simulation of structure dynamics. The multibody approach allows detailed modelling especially of the coupling of different components. This is why SIMPACK is already used for the simulation of wind turbine components such as the drive train, for example at the Technical University of Dresden (Schlecht B. et al.; Assessment of Dynamic Loads in Multi-Megawatt-Drive-Trains by means of Multibody-System-Simulation; Int. Conf. on Gears 2005; Munich VDI-Report 1904, Vol. 1, 537-560). SIMPACK features a more exact simulation of structural dynamics than presently used standard software by employing non-linear beam models, coupling of degrees of freedom, etc. It offers a free choice of degrees of freedom, it has interfaces to implement further modules and it offers options to implement controllers. It also features general pre- and post-processing tools that can be used for wind turbine simulation. However, SIMPACK has to be extended to include further features of wind turbines, particularly rotor aerodynamics and wind field modelling. As standard simulation software codes for wind turbine simulation sufficiently consider rotor aerodynamics, they can be used to integrate into SIMPACK a state-of-the-art aerodynamic module. SIMPACK with its User Routines offers the possibility of implementing external modules.

AERODYNAMIC MODULE "AERODYN"

AeroDyn is a module for the simulation of wind turbine rotor aerodynamics developed by the US National Renewable Energy Laboratory (NREL). AeroDyn is already used in conjunction with other wind turbine simulation software. As all other industrial wind turbine rotor aerodynamics design tools, AeroDyn calculates aerodynamic loads using a combination of blade element and momentum theory, i.e. Blade-Element-Momentum-Theory (BEM). The global flow field is described by Froude´s actuator disk theory originating from 1889 which was later adapted to wind turbine applications by Betz. In order to overcome the shortcomings of this rather crude method, several engineering rules are applied as corrections. AeroDyn considers most of these corrections, like Blade Tip Loss and Hub Loss. These corrections are necessary because of the 3-dimensional flow. The stream tube

Stefan Hauptmann
University of Stuttgart

approach cannot sufficiently describe larger misalignment of rotor axis and flow pattern since undisturbed wind and the wake are no longer parallel. This requires the Yawed Flow correction. A correction for conditions with high axial loading, the Turbulent Wake State is also implemented. The flow around wind turbines operating in the atmospheric boundary layer is inherently unsteady. Dynamic Inflow denotes all unsteady aerodynamics associated with the global rotor flow field. On the blade scale, the fluctuating external conditions result in hysteresis effects of the aerodynamic coefficients in the stall region (Dynamic Stall), depending on blade geometry and the frequency and amplitude of the flow variation. Another correction model takes the influence of the tower on the flow field into account. The most significant dynamic loading of wind turbines originates from operation in the turbulent atmospheric boundary layer. AeroDyn is able to read in 3-dimensional full-turbulent wind fields. A pre-processor called TurbSim, developed by NREL, can be used to generate such wind fields. Accordingly, AeroDyn with its pre-processors is a powerful module to simulate rotor aerodynamics.

INTERFACE AERODYN & SIMPACK

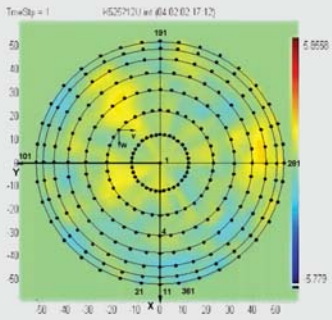
The interface that integrates AeroDyn into SIMPACK is written in a SIMPACK user routine. User routines provide a powerful capability for SIMPACK. They allow additional functionality to be imported into SIMPACK. Moreover, they are open for modelling features from other engineering disciplines to be included in a MBS model. It is possible to define user routines for different MBS elements such as force elements, joints, constrains, etc. The programming language can be either FORTRAN or C. The user routines can read in data during simulation via the SIMPACK Access Functions. Such Access Functions also allow the measurement of kinematical dependencies in the MBS model. Since AeroDyn calculates aerodynamic forces, the interface is realised as a SIMPACK User Force. Aerodynamic forces depend on structural velocities of the blade elements. SIMPACK Access Functions are used to gain these velocities during simulation when the SIMPACK solver calls the interface code which conducts the aerodynamic calculation in AeroDyn. The interface code collects the relevant kinematic information of each blade element and transfers it to AeroDyn. By the time AeroDyn finishes the calculation, the interface affects the blade elements in the MBS model with the calculated forces.

SIMULATION EXAMPLE

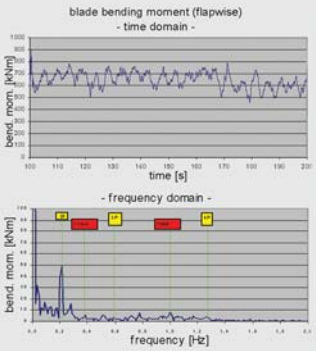
A typical wind turbine model with 1.5 MW power and 70 m rotor diameter was used to demonstrate the SIMPACK coupling and to analyse mass and aerodynamic imbalances in the presence of a turbulent wind field. It would have been possible to use a detailed structural model of the drive train, but the focus was on aero-elastic coupling. The interpretation was performed in both the time and frequency domains. It could be seen that the transient and stochastic effects of turbulent wind in particular have a major influence on the results.

CONCLUSION

The multibody approach of the simulation software package SIMPACK is a sophisticated tool to simulate the complex structural dynamics of modern wind turbines. SIMPACK's User Routines offer an easy way to implement external user-defined modules for specific problems like rotor aerodynamics, control, etc. These promising results encourage the further development of the wind turbine simulation capabilities of SIMPACK to serve the needs of the fast-growing energy industry.



3-dimensional Turbulent Wind Field Possibly Used by AeroDyn [Fig. GE Wind Energy]



Simulation Results: Structural Response on Turbulent Wind in Time and Frequency Domain

Universität Stuttgart
Germany

SWE Stiftungslehrstuhl Windenergie am Institut für Flugzeugbau

Dr. Alex Eichberger
Intec GmbH

Survey on Optimisation Software

INTEC is considering and partly working on integrating interfaces to optimisation software solutions. For this further development INTEC would like to meet the needs and wishes of the SIMPACK user community.
We look forward to getting your opinion before the 30th November 2006.

Every participant takes part in the lottery of

1. prize	Participation in a SIMPACK Academy event of your choice for one person (accomodation incl.)
2. - 3. prize	Two free training days at INTEC for the training courses out of the regular training schedule for one person
4. - 10. prize	SIMPACK memory stick (128 MB memory space)

PLEASE COPY AND FAX TO

INTEC GMBH
DR. ALEX EICHBERGER
+49 8153 9288-11

Highest award for the participation in this survey: participation in a SIMPACK Academy event of your choice for one person (accomodation incl.)

Entry deadline is the 30th Nov. 06

1. IS IN YOUR COMPANY OPTIMISATION SOFTWARE ALREADY USED?

☐ yes, in the MBS simulation department

☐ yes, in the following department _____

☐ no

☐ don't know

What is the name of the used software?
_____

2. HAVE YOU EVER THOUGHT ABOUT USING AN OPTIMISATION SOFTWARE?

☐ yes ☐ occasionally ☐ seldom ☐ no

☐ don't know

3. DO YOU KNOW THE OPTIMISATION SOFTWARE ISIGHT BY ENGINEOUS SOFTWARE?

☐ yes ☐ heard of it ☐ no

IF YOU KNOW ISIGHT OR HAVE HEARD OF: WHAT DID YOU HEAR OR WHAT WAS YOUR PERSONAL IMPRESSION?

_____

_____

4. DO YOU KNOW THE OPTIMISATION SOFTWARE MODEFRONTIER BY ESTECO?

☐ yes ☐ heard of it ☐ no

**IF YOU KNOW MODEFRONTIER OR HAVE HEARD OF:
WHAT DID YOU HEAR OR WHAT WAS YOUR PERSONAL IMPRESSION?**

_____

_____

5. DO YOU KNOW THE OPTIMISATION SOFTWARE OPTIMUS BY NOESIS SOFTWARE (SALESPARNTER IN GERMANY FE-DESIGN)?

☐ yes ☐ heard of it ☐ no

**IF YOU KNOW OPTIMUS OR HAVE HEARD OF:
WHAT DID YOU HEAR OR WHAT WAS YOUR PERSONAL IMPRESSION?**

_____

_____

6. IF YOU WOULD USE OPTIMISATION SOFTWARE OR ALREADY DO SO - FOR WHICH SORT OF MBS CALCULATIONS (IN WHICH CONTEXT) WOULD YOU APPLY IT?

_____

_____

_____

7. DO YOU PLAN IN THE FORESEEABLE FUTURE TO PURCHASE AN OPTIMISATION SOFTWARE PROGRAM FOR USE IN MBS CONTEXT (WITH SIMPACK)?

☐ yes, this year ☐ yes, next year ☐ don't know when

☐ rather not

☐ no

8. IF YOU PLAN TO ESTABLISH AN OPTIMISATION SOFTWARE PROGRAM WHICH ONE WOULD YOU PROBABLY CHOOSE?

☐ _____

☐ don't know

Name _____

Company/University _____

Harald Meyer-Tuve,
TU München

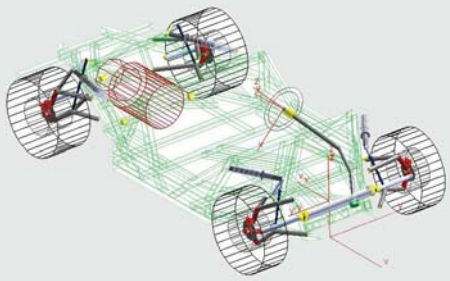
Research on the Open Road at the TU München

Professor Heißing, TU München, and the Team Working on the EHV

A number of questions concerning the interaction of components on the vehicle dynamics are often left unanswered during a degree course. The hands-on side where students are able to examine a mass-produced vehicle is often missing. The Experimental Handling Vehicle (EHV) is a research vehicle within the automotive engineering module at the TU München which provides this hands-on experience. The students simulate the vehicle components and the overall vehicle dynamics before applying these results to the EHV.

INSIGHT IN THE EXPERIMENTAL DESIGN VEHICLE

The first design of the suspension uses a conventional double wishbone suspension which can be viewed from the driver's seat. The vertical forces are directed into a longitudinal spring-damper system via pushrods. This makes them more easily visible and allows a modular design. The vehicle frame was designed with a torsional stiffness of more then 10 kNm/° which allows each wheel, regardless of the applied forces, to be mounted on separate suspensions.
The first suspension that was developed during the course is extremely flexible. There are over 15 different ways in which the position of each wheel can be adjusted allowing countless possibilities and almost all kinematic variants to be created. These variants can then be used for either training or research purposes.

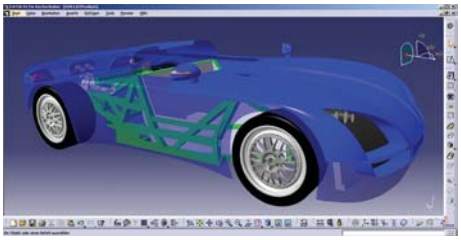


The Experimental Handling Vehicle in SIMPACK

THE EHV PROJEKT IS A COOPERATION

The EHV project, in cooperation with a number of partners, improves the students' technical understanding. In addition, a contact forum has be formed which provides a relaxed atmosphere in which the partners can get to know and assess the students as potential future employees. The partner INTEC GmbH e.g. supports the project with the software SIMPACK. The EHV driving dynamics, the vehicle controller, the eigenfrequencies of the front and rear axes and the kinematic design were all simulated in SIMPACK. In addition the applied load cases were calculated in a finite element simulation.
The individual components of the vehicle have been fitted with the help of a number of German vehicle manufacturers. Audi AG has helped with the drivetrain, BMW provided, among other things, chassis components and DaimlerChrysler has provided technical support along the way. Automotive suppliers have also helped out, e.g. Hirschmann with uniball universal joints and Robert Bosch GmbH with the fuel injection systems. The visual design of the vehicle was created in collaboration with the design house Pollmann. The vehicle in its first setup should be up and running within the course of 2006. Future components of e.g. suspensions are planned to be added in Cooperation with ZF Sachs, ZF Friedrichshafen, and ZF Lemförder Fahrwerktechnik.
The stage at which the project is currently at, is presented at regular intervals. This provides a constructive discussion platform between the cooperation partners, students, faculty and those interested in the project. The points raised, the ideas collected and the direction in which the project is to go, all which have been discussed during the meeting, are then brought together. These changes are first tried out in the virtual prototype model and advice is also taken from the cooperation partner TÜV Süddeutschland before these changes are implemented in the vehicle.
It is not just at these meetings when the focus is placed on the handling and driving dynamics. INTEC have supported the students of the automotive engineering module offering industrial placements using SIMPACK and therefore giving them valuable experience in a commercial MBS tool.

The Experimental Handling Vehicle in Reality

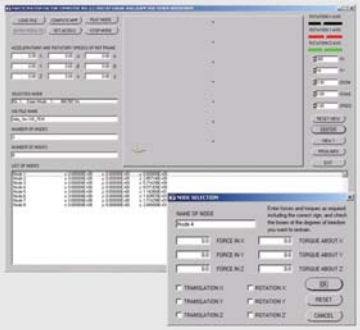


Simon Wiedemann, Prof. Wallrapp,
Munich University of Applied Sciences

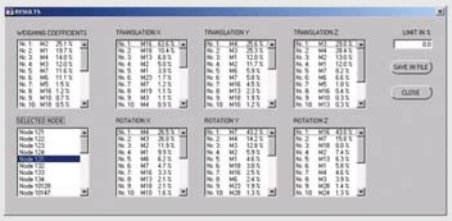
Optimising the Modelling of Flexible Bodies in MBS

Multibody dynamical simulations using flexible bodies usually need a careful selection of mode shapes to ensure that the results are as close to reality as possible. With the free software Mode Participation Factor Computer (MPFC), you can visualise your flexible bodies as stored in SID files, visualise their mode shapes, define boundary conditions and loads, and finally compute the share of each mode shape in the total elastic deflection prior to time consuming dynamic simulations.

It is well known that the quality of dynamical simulations incorporating flexible bodies depends on their modelling. More precisely, it depends on the selection of mode shapes taken into account for the simulations.
The Mode Participation Factor Computer (MPFC) helps you in selecting mode shapes for flexible bodies represented by SID files. After reading in such a file you can see your flexible structure made up of small dots, each dot representing a node or marker in SIMPACK. The more markers your body has, the richer its graphical representation will be. The MPFC will play each mode shape and thus gives you the impression of the vibrating body. You define boundary conditions for your flexible body by applying kinematic constraints and load cases. The latter can be subject to applied external forces or accelerations of the body frame of reference.
After you have defined the boundary conditions, the MPFC computes the mode shape weighing coefficients q for this quasi-static load case just as SIMPACK would do. Moreover, as the elastic deflection of one individual node or marker is the sum of the weighted coefficients multiplied by the mode shape deflections, you can calculate the share of each mode in the elastic deflection at each single node or marker along and about each of the three principal axes. That is with regard to each of the six spatial degrees of freedom.
In time consuming simulations you are usually only interested in some points in time or some load cases. You can estimate the loads in these situations of interest, or you can run a quick rigid body simulation to get an estimate. You use the MPFC to predict the behaviour of your flexible body for these load cases of interest. In SIMPACK, you then only select those modes that are above some level of significance that you define.
This way you can make sure that the mode shapes you select fit the expected load cases that arise in the later dynamic simulations. This might allow you to ignore a number of mode shapes that otherwise you would have to take into account, "just to be sure". It might also turn out that the mode shapes you currently have are not really suited for the expected load cases and should be recomputed with modified boundary conditions. Finally the MPFC can create tab separated log or data files for documentation and for further use by other or future programmes.
We are sure that the MPFC will ease your daily work with flexible bodies in SIMPACK. By playing around a bit, you will create a feeling of what to pay attention to and which modes to select. At www.fh-muenchen.de/fb06/professoren/wallrapp/e_forschung.html, projects, the MPFC and the manual are freely available for download.



The MPFC Main Window with Node Selection Window



The MPFC Results Window

Florian Kuscha

Saravanan Subramanian

Alberto Caballero Martinez

Hello my name is Florian Kuscha

Born in Munich, I grew up on the edge of Bavaria's state capital, in the picturesque town of Gröbenzell, where I went to school and still live.
After completing my A-levels I began studying mechanical engineering at the Technische Universität München. The main focuses of which were vehicle technology and internal combustion engines. As well as the theoretical engineering side I was able to acquire considerable practical experience during my studies. It was during my degree that I was able to first start working with multibody software. I worked on my degree thesis at AUDI AG in Ingolstadt in the summer of last year and later in the year, in December, I joined INTEC. My functions at INTEC are in both the automotive and engine fields, where I am responsible for analysis projects and customer support. I am currently working on two simulation projects looking at the analysis of valve trains.
When not at INTEC I am an active member of the scouts group in my local parish, where I supervise a youth group. As a big football fan I support Bayern München and can sometimes be seen in the stadium on match days. On the sporting front I enjoy jogging with friends and have also ran in the Munich marathon on a number of occasions.

Hello, I am Saravanan Subramanian

I am from India and completed my undergraduate degree in mechanical engineering before starting my career as Engineer in a Foundry and then moving on to work in software development. I decided to enhance my engineering skills and landed in Hamburg to undertake a Master of Science in Mechatronics. During my studies I had a chance to work at Germanischer Lloyd WindEnergie GmbH as a part-time employee and through an internship. It was here where I was introduced to FEM and MBS. After successful completion of my Master thesis in 2005 which focussed on multibody simulation of drive trains used for wind turbines, I continued to work as vocational trainee in the field of dynamic analysis of drive trains for wind turbines. Since April 2006 I have been at INTEC and working on the FEM-MBS interface FEMBS. My responsibilities include development and maintenance of the interfaces, carrying out projects as well as customer support. At present I am developing an interface for the durability analysis with ABAQUS and SIMPACK. In my free time I play cricket and watch movies.

Hello, my name is Alberto Caballero Martínez

I come from Spain where I studied mechanical engineering at the Polytechnic University of Madrid. I came to Germany in 2003 to finish my studies and to specialize in the field of the vehicle engineering, which I did at the Technical University of Munich. There I started using SIMPACK, especially in my Diploma Thesis, which I carried out at MAN Nutzfahrzeuge AG. Since I graduated in April of this year, I have been working at INTEC in the automotive project department. This has allowed me to deepen, and put into practice, my knowledge in system and vehicle dynamics. I am currently working on a real time simulation project as well as on a motorcycle model, enjoying a great deal of teamwork and gaining experience rapidly. When not working I like to read books, learn languages and travel around with friends, from time to time also back to my dear home country!

Mark Duke,
Intec GmbH

SIMPACK Tips and Tricks - General Plots

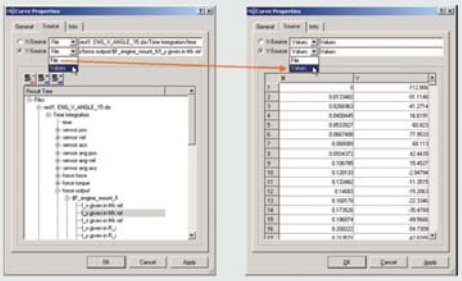
Last year saw the release of the brand new General Plots module. With the SIMPACK release out this autumn this will be extended to include a 3D animation facility to provide a complete 2D and 3D post-processing environment. There are, however, a number of existing features available which you may not be aware of.

COMPARING SIMULATION RESULTS USING REFERENCE CURVES

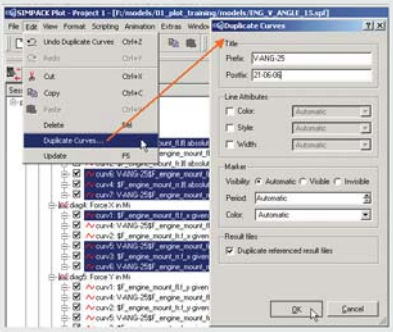
A particularly important feature when plotting simulation results is to be able to compare results either with measured data or results from another simulation.
A number of different possibilities for comparing simulation results have been available since the very first release. These approaches can be split into two different categories – dependent upon the result file(s) or independent of the result file(s). The reference curve data must be available as a result file when dependent; when independent the curve data is stored directly within the project. Each approach has its advantages.
Dependent reference curves will be automatically updated if the respective result file is updated. The reference result file can also be replaced with another result file. This approach offers a great deal of flexibility in managing your references curves and creating new ones. The result file must, however, always be available to the project.
This comparison is best performed using the 'Duplicate Curves' functionality or by simultaneously plotting results from separate result files using the 'Multiple-Curve Plotting' feature.
The independent approach is best suited when creating a 'template' of reference curves. If your future simulation results are always to be compared to exactly the same reference values, then this is a very good approach. It has the advantages that a reference result file is not required and the reference isn't dependent upon a result file which could be changed or updated accidentally. The best way to generate this type of reference Curves is to plot the Curves from a result file and then in the 'Curve Properties' window to switch the Curves' source from 'File' to 'Values'. This removes the dependency and the Curves can be used as a template of reference Curves. This action can of course be performed using 'Multi-Edit' and the Curves can be copied or moved to other Diagrams. Reference Curves can also be generated by directly entering the value pairs. The values can either be entered individually by hand or pasted from an external program, whereby the 'x' and 'y' values must be tab separated.
Don't forget if you have curves of significantly differing magnitude in the same Diagram, then you can always add an axis and assign the Curves respectively. For a detailed description of how to perform these actions, you can always consult the SIMPACK documentation via the SIMPACK assistant.

CURVES WITHOUT A REFERENCE

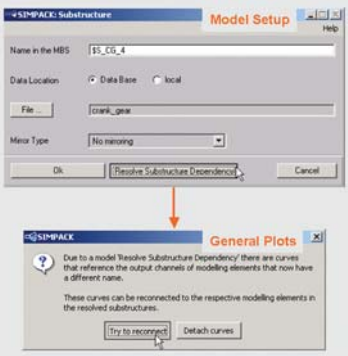
Sometimes Curves can lose their reference to their Output Channels. This can occur, for example, when Modelling Elements are renamed (including Substructure 'Resolve') or the result file is no longer available. All is not lost! The Curves are now set to a 'Detached' state, they still retain their configuration including Filters and are still listed in the Session Tree. However, they cannot be plotted as their Output Channels are no longer available. These detached Curves can, however, be reconnected and will then be displayed with exactly the same configuration. This reconnection can be performed semi-automatically or manually. For more information take a look at the SIMPACK documentation for 'Detached Curves.'
Each new SIMPACK release brings many new features into the post-processing module. You can always see what's new by taking a look at the Release Notes. You can start them from the post-processor by hitting 'F1'.



Model Setup Substructure Resolve with General Plots Reconnect

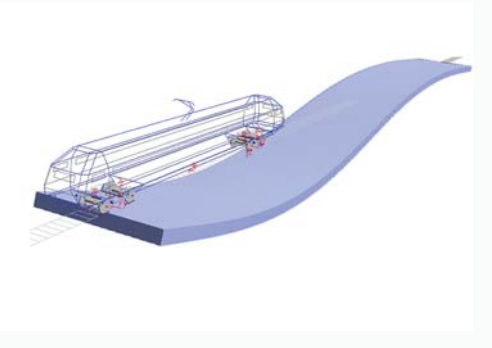


Switching Curve Source to Values

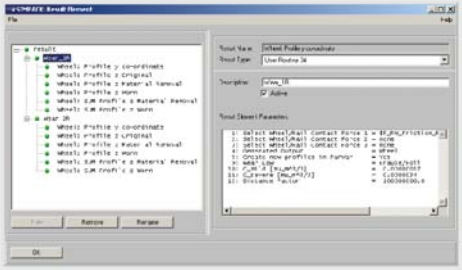


Duplicating Curves

Latest News



Railway Bridge Modelled as Flexible Track



Result Element GUI of the Module SIMPACK Wheel/Rail Wear

SIMPACK WHEEL/RAIL REDESIGN

SIMPACK Wheel/Rail is the market leader in the technically challenging field of the simulation of railed vehicles. To meet the ever increasing demands of our users we have been working on the development of certain features within the Wheel/Rail module. One aspect has been the improvement of the data handling which has removed a number of restrictions, for example with substructures, parameterisation and the orientation of co-ordinate systems.
The other major new feature is the complete redesign of the techniques used in calculating the wheel to rail contact. This new approach guarantees a high calculation speed with stable and accurate results even for critical track elements. Most of the necessary settings are now performed automatically which has made working with the new contact approach a lot easier compared to the current implementation. The work on the new approach is already at an advanced stage and we will be releasing shortly a beta version for those customers who would like to try out the new contact approach.

SIMPACK WHEEL/RAIL WEAR

The new module SIMPACK Wheel/Rail Wear was released with version 8.800. The module uses simulations performed in SIMPACK Wheel/Rail to predict the wear that occurs on the wheel and the rail. Because there are a number of approaches and laws used for the wear calculation (e.g. adhesive wear or rolling contact fatigue) the module is delivered as a User Routine, allowing users to modify the wear approach to their requirements or even implement their own approach. The module returns how the wear is distributed across the respective profile cross-section. Using SIMPACK VTL to perform a parameter variation analysis allows this wear to be applied for the automatic modification of the profile. The continued development of the profile due to the progressive wear can therefore be represented in a simulation.

FLEXIBLE TRACKS

SIMPACK's new module Flex Track was created to consider the interaction between vehicles and flexible tracks. Particular emphasis was placed upon the prediction of the dynamic behaviour of heavy railway vehicles on bridges. Flex Track uses an efficient time-domain solver which is coupled with SIMPACK's time integration via a co-simulation. The flexible track can therefore be accurately represented using a large number of modes, calculated from a finite element representation of the track.
During the simulation, interface forces between the vehicle and the track move along the surface of the track finite element model. In order to reduce the numerical effort when exchanging data between the track and vehicle, the flexible track is represented by an equidistant finite element grid. Structural damping is considered by a modal critical damping approach.
In future releases, Flex Track will be able to generate the input data for strength calculations of bridges and tracks.
An example model of a railway bridge can be downloaded from SIMPACK's website (www.simpack.com, service/support, model database).

LOADS MOVED MARKER 96

SIMPACK Loads, with the release of version 8.8, can also be used with the moved marker 96, Line/Line 2D-Contact, to consider the influence of moved loads on stresses and strength. This allows strength calculations to be performed with SIMPACK Loads Quasistatic and SIMPACK Loads Durability for engine parts such as valves, camshafts, rocker arms, etc.

SIMPACK PLOT NEW FEATURE MACRO RECORDING

It is now possible to record and replay

actions performed by the user in the new Postprocesser GUI. This feature is especially useful for automating repetitive tasks or for capturing complex user interface actions which should be re-usable. Since the actions are recorded in SIMPACK's native QSA JavaScript scripting language the Macro Recording Feature can also be used to generate SIMPACK scripts by GUI interactions instead of manual coding.
Once recorded, a Macro can be assigned to the general scripting pull down menu and to the object specific format menus. In addition to the menu entry, the Macros can also be assigned to user definable icons. This feature has been available since SIMPACK 8.802.

SIMPACK PLOT NEW FEATURE „DETACHED CURVES"

Curves for which the referenced result data cannot be found used to be deleted from the project definition together with the layout and filtering information attached to them.
To prevent this deletion a new curve state „detached" was introduced. Now those curves are not deleted anymore, but set to a „detached" state. Curves that are detached keep all their information and are simply not plotted since no data existst for them. Detached curves can be re-attached to a result file either automatically when the result file is reloaded or manually by selecting a different data channel in the result tree.
This feature is especially usefull when working with result files with non-default measurement configurations or when referenced elements were renamed.

NEW SIMPACK FEMBS INTERFACE TO NX NASTRAN

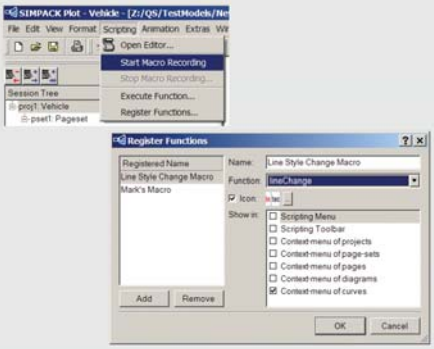
Due to the growing proportion of the customers which use NX NASTRAN in combination with SIMPACK, INTEC has decided to establish the corresponding interfaces. The SIMPACK Fembs interface is available to import NX Nastran data into SIMPACK as well as the SIMPACK Loads interfaces for stress recovery after analyses in SIMPACK have been performed. Stress analyses are assisted by SIMPACK Loads Quasistatic for corresponding FE-analyses with NX NASTRAN and SIMPACK Loads Durability for dynamic stress analysis with NX NASTRAN in combination with FEMFAT MAX.

INTEC AND UGS SIGN PARTERNSHIP AGREEMENT

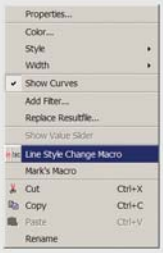
As part of a joint effort of UGS and INTEC to optimally support NX-NASTRAN and SIMPACK customers a partnership agreement was signed between INTEC and UGS.
The partnership enables INTEC to supply a high quality interface between UG NX-NASTRAN and SIMPACK. The interface, which is incorporated into SIMPACK's flexible body module FEMBS, has been available since SIMPACK version 8.800.

INTEC BECOMES SILVER LEVEL MEMBER IN THE PTC PARTNER ADVANTAGE PROGRAM

INTEC recently joined the PTC partner program. INTEC has a long history in developing and maintaining ProSIM, an interface between PTC's Pro/ENGINEER product suite and SIMPACK.
INTEC's move to become a silver level member in the PTC Partner Advantage Program is designed to offer improved support and program updates to INTEC's ProSIM customers.
As an immediate result of this, INTEC can offer ProSIM 5.1 for the latest Pro/ENGINEER Wildfire versions. Compared to earlier ProSIM version ProSIM 5.1 gives the user much more control over the way in which SIMPACK model should be generated and also further automates the process by enabling sophisticated merge options.



SIMPACK Plot - Macro Recording 1 and 2



SIMPACK Plot - Macro Recording 3

INTEC Abroad

Dr. Alex Eichberger, INTEC GmbH, Managing Director

Valmir Fleischmann and Leandro Garbin, VIRTUALCAE, Brazil

Dr. S. Shamasundar, ProSIM R&D, India

INTEC GmbH international presence and worldwide support is continually increasing. The huge success of SIMPACK in automotive, engine, rail and wind power plant engineering in Germany and Europe is a perfect reference to bring the world leading multibody simulation features of our product suite to engineers in India and South America as well. As a logical step INTEC GmbH has signed up with two additional distribution partners ProSIM R&D for India and VIRTUAL CAE for South America.

VIRTUALCAE

In spring 2006 VIRTUALCAE Servicos de Sistemas Ltda. was appointed by INTEC GmbH to be the exclusive representative for the SIMPACK product suite for South America. Located in São Caetano do Sul, in São Paulo state area, VIRTUALCAE offers CAE solutions and services for finite element analysis, fatigue analysis and now based on SIMPACK also multibody system simulation. For many years the managing directors of VIRTUALCAE Mr. Leandro Garbin and Mr. Valmir Fleischmann have been working on the sales, support and engineering side for CAE companies. Running their own company with SIMPACK as strategic tool is the key to their successful business development plan. They already have been successful with acquiring new SIMPACK customers in Brazil. For more information see www.virtualcae.com.br.

PROSIM R&D

India is a rapidly growing and important market for CAE-solutions. There is a booming domestic automotive market. The off-shoring CAE-solutions market is expected to attract about 30% of global engineering design work in the coming decade. Therefore INTEC GmbH is happy to announce that they have partnered up with the Indian based company ProSIM R&D, situated in the silicon valley of India and CAE capital, Bangalore. ProSIM is an engineering solution provider, an interdisciplinary team of engineers and scientists providing collaborative engineering and R&D services in product and process design, development, re-engineering, analysis and optimization. ProSIM R&D has heralded and pioneered the application of computer simulation technologies in India since 1996. SIMPACK is a most natural expansion of the existing product suite that ProSIM offers to the Indian market. Dr. S. Shamasundar managing director, founder and promoter of ProSIM is a technological driven expert with international experience in all fields of mechanical engineering. For more information see www.pro-sim.com.

NEW UNIVERSITY AND RESEARCH LICENCES SINCE FEBRUARY 2006

IPT, Instituto de Pesquisas Tecnologicas, São Paolo, Brasil
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SENAI, Servicio Nacional de Aprendijagem Industrial, Sao Caetano do Sul, Brasil
Universidade de São Paolo (Polytechnic School), São Paolo, Brasil
University Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Croatia
Université Catholique de Lovain, Lyon, France
RWTH Aachen, Institut für Regelungstechnik, Germany
Universität Karlsruhe, IPEK, Institut für Produktentwicklung, Germany
Shijiazhuang Odnance University, VR China

NEW COMMERCIAL LICENCES SINCE FEBRUARY 2006

DaimlerChrysler do Brasil Ltda., São Bernardo do Campo, Brasil
BMW Motorrad, München, Germany
BMW Group, Motorsimulation, München, Germany
Kämmerer AG, Stuttgart, Germany
Prose AG, Winterthur, Switzerland
NedTrain Consulting, Utrecht, The Netherlands

SIMPACK Trainings and Conferences

SIMPACK TRAINING COURSES

November 2006	13.11. - 15.11.	SIMPACK BASICS Training
	16.11.	SIMPACK Automotive Training
	16.11. - 17.11.	SIMPACK Wheel/Rail Training
	21.11.	SIMPACK NVH Training
	22.11.	SIMPACK Contact Mechanics Training
	23.11.	SIMPACK Scripting Training
December 2006	11.12. - 13.12.	SIMPACK BASICS Training
	14.12. - 15.12.	SIMPACK FEMBS Training

SIMPACK ACADEMY COURSES

30.01. - 31.01.2007	SIMPACK Academy Durability Load Data Analysis by Dr. Klaus Dreßler, Fraunhofer Institut für Techno- und Wirtschaftsmathematik (ITWM), Kaiserslautern
12.06. - 13.06.2007	SIMPACK Academy Biomechanics by Dr. Valentin Keppler, Universität Tübingen
25.09. - 26.09.2007	SIMPACK Academy Multibody Dynamics by Prof. Martin Arnold, Martin-Luther-Universität Halle-Wittenberg, and Dr. Gerhard Hippmann, INTEC GmbH

SIMPACK AT CONFERENCES AND EXHIBITIONS

06.11. - 07.11.2006	Global Motorsports Congress, Köln, Germany
15.11. - 16.11.2006	SIA Automobile Comfort Conference, Le Mans, France
22.11. - 23.11.2006	DEWEK 2006, Bremen, Germany
23.11. - 24.11.2006	Race.tech 2006, München, Germany
05.12. - 08.12.2006	MICAD, Paris, France

We would be glad to welcome you to our SIMPACK training courses or to a SIMPACK Academy course. We also offer individual training days or courses. To register for one of this courses or to discuss your training requirements please contact

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Ms Engert looks forward to hearing from you.

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