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FEA Not To Miss Software

&

Engineering Solutions

Town Hall Meeting & Gossip

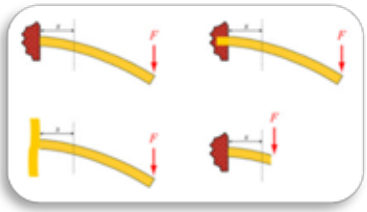
OASYS

DYNAmore

CADFEM

CADFEM Medical

Mallet



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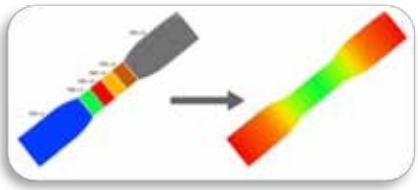
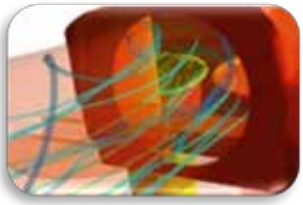


RBF Morph



Cattle Ranch - Witte

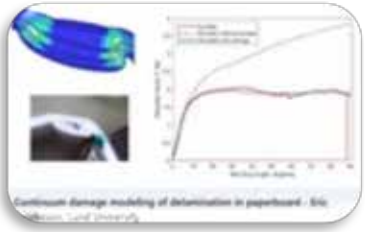
ESI-GROUP

Kistler

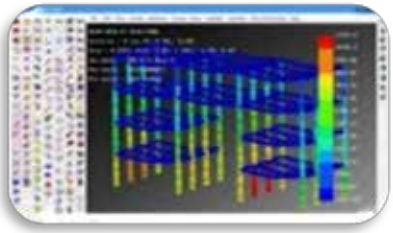
SIEMENS - BSIM

MIT

Library - E. Jakobsson



M3d FEA



BMW

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Contact us at: feaanswer@aol.com

Table of contents

Author and/or person using social media, or information from the company website September

The respective websites will have the complete articles, and higher resolution graphics/videos.

Town Announcements will be in this style box throughout the magazine.

Table of contents

Author and/or person using social media, or information from the company website September

Town Library - **Excerpts and links to the paper** - First named author is listed:

Old Cattle Rancher's Ranch

FEANTM

Town Hall

Convention Center

The respective websites will have the complete articles and high resolution graphics and videos.

Monthly town hall meeting.
Serving - coffee & dark chocolate candy!

Our town comprises companies, engineers, scientists, mathematicians, universities, professors and students, consultants, and all individuals interested in software, hardware, and solutions. Oh, and gossip at the local coffee shop, and your pets are welcome.

As presiding town Supervisor, I call this meeting to order:

First, our town secretary yells a special thanks to "reactions" on LinkedIn.
Yuvaraj, Julia, Marta, Hao, Metin, Muhammad, Andrea, Georgios. Marco, Metariver, Miloslav, Marc, Marko

1. We welcome Mallet Technology, M3d free Finite element software, and we have a NEW town map.
2. We regret to announce the Annex Building burned to the ground.
   Old Cattle Rancher handed out water balloons to throw at the fire. He is so weird!
   Town secretary handed out marshmallows to roast.
   (She was arrested by the Town Police. She paid her bail fee using the police budget!)
3. The **Convention Center has opened a booth display area. It replaces the annex building.**
4. "Uli of DYNAmore, please sit down. What papers are you handing to the town secretary?"

Town secretary - I requested our Town Secretary to mail highlights from our "Town Agenda"
1. I was surprised when none were returned "return to sender" (like my previous town mailing)
2. The Town Secretary advised me that my "town" agenda was tedious. She mailed a different agenda.
3. She mailed the DYNAmore 13th European LS-DYNA Conference 2021 agenda.

Town Hall - Town Secretary - DYNAmore Conference Agenda.
Someone please explain to our Town Secretary that a "Town Agenda" is not a "Conference Agenda"

Fire Department - Where are the new town hall fire doors?
1. Who used the Fire Department budget to purchase old broken scrap wood doors?
2. The request was for fire doors, that is not wood doors we can use for fire.
3. We appreciate the scrap wood doors - we will use them for the roasting marshmallows party.

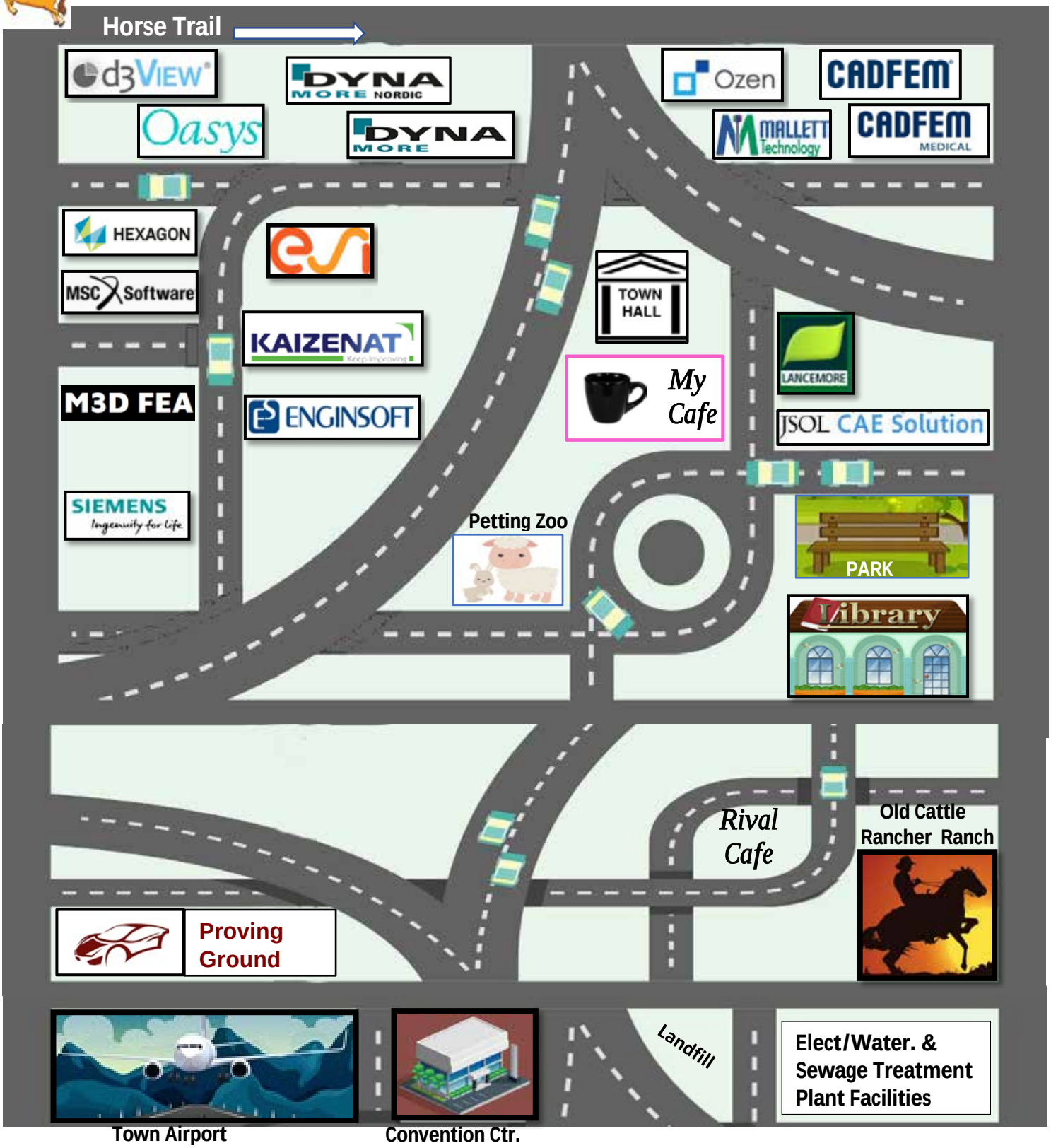
Town Hall - Fire Dept - Numerical methodology - thermal-mechanical analysis of fire doors.

Town equipment - Please return the 3,000 nets to catch a swarm of bugs.
1. We appreciate it but that's not the type of bug swarm we were referring to. I said, "sniffy bugs."
2. Someone explain "swarm of bugs, and "swarm of Sniffy Bugs" - We need the sniffy bugs!

Town Hall - Town Equipment - Sniffy Bug: A Fully Autonomous Swarm of Gas-Seeking Nano Quadcopters in Cluttered Environments

Why is there a mop and an excavator bucket in my parking spot?
1. I'm washing my floor and requested a mop and bucket - NOT a mop and excavator bucket!
2. Someone please ask the Old Cattle Rancher to take home his excavator bucket - leave the mop.

Town Map



* **The logos displayed, of content in our magazine, do not represent their endorsement.**
* **To be removed, please notify feaanswer@aol.com with the request.**
* **Your town lot will be auctioned, with the Town applying all proceeds to the coffee budget.**
* **The town map changes pending information, and rotational building rentals.**

Map Vector & town graphics in our magazine are courtesy of vecteezy

Marta Kempa, MBA - Marketing Coordinator,
Oasys LS-DYNA
&
Seppi
Oasys Software, Tutorials & Classes Not To Miss

Not To Miss on YouTube

On line courses,		Webinars - View The complete on line webinars	
Sept 28	Intro to LS-DYNA)	**Sept 29**	Advanced seatbelt modelling in Oasys PRIMER:
Oct 19	Introduction to Oasys PRIMER	Oct 27	Oasys POST: User Defined Components
Oct 26	Introduction to Oasys POST	Nov 25	Modelling FRP composites in LS-DYNA
Nov 10	Introduction to LS-OPT		

Oasys SHELL

Your portal to the Oasys LS-DYNA Environment

Oasys SHELL provides you with an easy way of accessing each stage of your analysis from model set-up in Oasys PRIMER to interrogation and reporting of your results in T/HIS, D3PLOT and REPORTER.

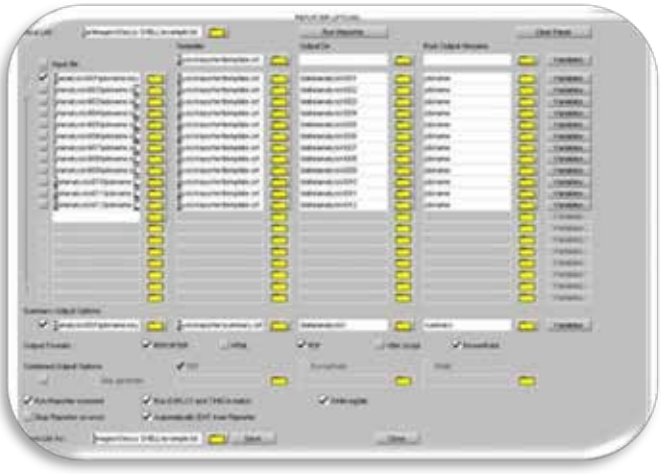
Oasys PRIMER, T/HIS, D3PLOT, and REPORTER can all be launched from the Oasys SHELL. Most importantly, there is an advanced LS-DYNA submission shell for submitting analysis that gives you easy access to the all the various options available when submitting an LS-DYNA run. It also provides easy access to the Oasys and LS-DYNA manuals.

Main features:

- Online, background, batch and queue (NQS/LSF/ CODINE) submission.
- Full control over queue and job CPU and memory limits.
- Selection of all LS-DYNA input and output files.
- Switch from the LSTC to the Arup naming convention (d3plot vs jobname.ptf).
- Simplified restart procedure.
- Run Oasys REPORTER templates in batch.
- Access to manuals (both HTML and PDF available).

LS-DYNA Job Submission

The LS-DYNA submissions windwo withon Oasys SHELL gives you full access to the various options available when submitting and LS-DYNA job and will work with most major queuing systems. It also allows users to easily choose the required dump file when performing an LS-DYNA restart.



Oasys REPORTER Templates in Batch

Oasys SHELL allows you to configure batch runs of your Oasys REPORTER templates, allowing you to generate reports for multiple jobs automatically

CO2-HyChain

The "CO2-HyChain" research project is intended to drive forward research into innovative lightweight designs and further develop existing solutions for the production of high-strength aluminum and hybrid aluminum-steel tailor-welded blanks. The objective is to significantly reduce CO2 emissions from passenger cars.

At around 160 million tons, road traffic is responsible for around 20% of total CO2 emissions in Germany. One way of lowering this figure is to reduce vehicle weight through functional lightweight construction. The "CO2-HyChain" research project is intended to drive forward research into innovative lightweight designs and further develop existing solutions for the production of high-strength aluminum and hybrid aluminum-steel tailor-welded blanks. The objective is to significantly reduce CO2 emissions from passenger cars.

In a consortium of three institutes of the University of Stuttgart and 9 industrial partners, the project "CO2-HyChain" has been successfully launched under the leadership of the Materialprüfungsanstalt Universität Stuttgart (MPA). With a financial volume of 5.7 million euros and a duration of three years, this is the largest project to date funded by the technology transfer program Initiative Leichtbau (BMWi).

As part of the research project, solutions developed at the MPA under laboratory conditions for joining sheet metal blanks made of aluminum and steel by friction stir welding are being further developed, scaled up and transferred to industrial practice in an interdisciplinary research network.

By joining aluminum and steel, the positive properties of the two materials, such as the high strength of steel and the low weight of aluminum, can be combined in a positive way. This allows the weight of vehicle bodies to be reduced in the double-digit percentage range, resulting in significant fuel, electricity and CO2 savings.

The core elements of the project are the development of two complementary prototypes of production facilities suitable for series production for the manufacture of tailor-welded blanks and tailor-welded coils, as well as a tooling concept developed for the subsequent deep-drawing of sheet metal joined as flat blanks into a lightweight component.

Deep drawn friction stir welded aluminum steel hybrid

As representatives of the University of Stuttgart, the Institute for Forming Technology (IFU) and the Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW) are involved in the project in addition to the MPA.

From the industrial side,

- Matec GmbH and Profilmetall Engineering are involved as equipment manufacturers.
- Klaus Raiser GmbH & Co. KG and Preter CNC Dreh- und Frästechnik are involved in the design and manufacture of the plant technology,
- CeramTec is providing wear-resistant tools.
- Optimess Engineering GmbH is developing concepts for non-destructive testing to safeguard the process. csi entwicklungstechnik GmbH and DYNAmore GmbH are participating in the project as development service providers.
- voestalpine Automotive Components Schwäbisch Gmünd GmbH & Co KG is providing support, as is Speira GmbH (formerly Hydro Aluminium Rolled Products GmbH) with test material. The automotive manufacturers Audi and Mercedes Benz are also involved.

Project Partner: University of Stuttgart

Institutes:

- IFU
- ISW
- MPA

Companies:

- CeramTec
- DYNAmore
- MATEC GmbH
- Optimess
- Preter
- PROFILMETALL
- raiser
- voestalpine

Associate Project Partners

- Audi
- Daimler

Contacts: DYNAmore

Status.E - SCALE.project (Simulataion Data Management

The antenna dish in the tail unit must be constantly aligned with the satellite

Wire-race bearings from additive metal manufacturing - **Franke, Rosswag and CADFEM analyze and optimize lightweight bearings**

Franke GmbH, based in Aalen, Germany, develops and manufactures wire-race bearings, a lighter alternative to the usual "solid bearings". In partnership with simulation experts from CADFEM and Rosswag as a solution provider for 3D printing in metal, Franke's bearing specialists pushed the technology to its limits.

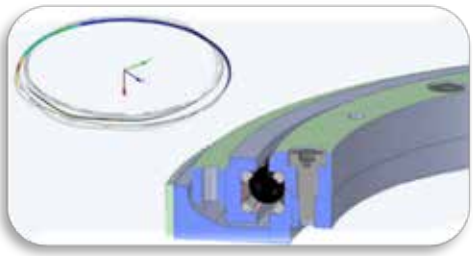
Author: Ralf Steck - Freelance journalist for CAD/CAM, IT and mechanical engineering in Friedrichshafen - rsteck@die-textwerkstatt.de

3D printing for lightweight construction of wire-race bearings - Since the sixties, lightweight construction has been one of the drivers in the further development of wire-race bearings. For some years now, Franke has also been relying on 3D-printed aluminum bodies, as additive manufacturing makes it possible to save material without losing strength. Arne Jankowski from Franke's technical sales department adds, "Innovative, customer-specific solutions are our core competence."

Such bearings are used, for example, in the storage of satellite antennas for telephone and Internet in aircraft. These antenna dishes are often housed in the tail unit. They must remain constantly aligned with the satellite during flight to enable data transmission. At the same time, of course, the bearings should be as light as possible in order to minimize the aircraft's kerosene consumption and, specifically, increase the payload.

Excerpt: About Franke - In 1936, engineer Erich Franke invented a particularly space-saving rolling bearing. Instead of steel inner and outer rings, between which spherical or roller-shaped rolling elements run, Franke used ground wire rings. In 1949, the inventor founded his own company to manufacture and sell these wire-race bearings. In the 1960s, the wire races were integrated into stainless steel (or aluminum bodies) for the first time - lightweight construction made its debut in rolling bearing construction. In 1970, the Franke principle was transferred to linear motion; today, these linear systems contribute to about a quarter of total sales.

Topology optimization and additive manufacturing - Franke has been supplying such weight-optimized bearings to the aerospace industry for a number of years, but so far with conventionally manufactured bearing bodies. In order to explore what further savings are possible with the latest technologies - such as topology optimization and additive manufacturing - Franke brought two partners on board for an industrial project: The first of which, Rosswag Engineering, a specialist for metal 3D printing that emerged from open-die forging, has long been Franke's supplier for additively manufactured lightweight bearings. The second, CADFEM from Grafing near Munich, is a specialist for numerical simulation, which, among other things, sells high-end simulation tools from ANSYS, and also offers its own engineering services.



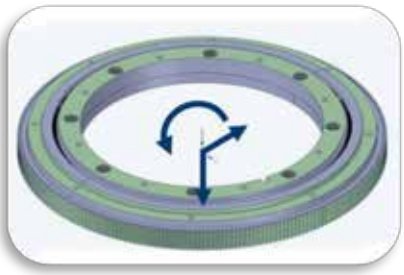
Bearing forces can be determined quickly and easily with Rolling Bearing inside Ansys

From CADFEM's side, Florian Hollaus of CADFEM Austria has taken part in the project. Hollaus was able to bring to the bearing optimization project his many years of experience in numerous customer projects in which he performed topology optimization and other simulations as an external service provider. Many of these engineering projects, in which he often works directly with the customer and integrates into their team, also involve additive manufacturing, so Hollaus was able to draw on his wealth of experience here as well.

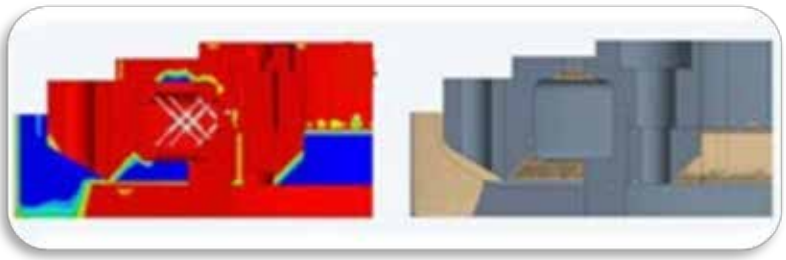
Excerpt - About Rosswag - The family-run Rosswag GmbH was founded in 1911 and is a leading supplier of forged components. Since 2014, the Rosswag Engineering division has been drawing on over 100 years of experience in the processing of more than 400 different metal materials and expanding its range of services to include engineering services and additive manufacturing processes. The globally unique and holistic process chain was expanded in 2017 to include in-house metal powder production for material qualifications. As a result, more than 35 materials have now been qualified for additive manufacturing. www.rosswag-engineering.de

More freedom in the shape design of rolling bearings - The starting point was a geometry supplied by Franke of the bearing used so far, which is constructed with a conventionally manufactured base body made of aluminum. Hollaus recalls, "the bearing with a diameter of about 25 centimeters consists of an outer ring and a two-part inner ring. The three aluminum parts were manufactured by the CNC method and optimized as far as possible in terms of weight for this process. With additive manufacturing, we are much freer in terms of shape design, so further material savings are possible, for example by replacing solid material with grid structures known as lattices."

Hollaus imported the geometry supplied by Franke into Ansys Workbench to prepare it for simulation. Defining ball bearings in FEM simulations is fundamentally difficult, but Hollaus was able to rely on an extension recently developed by CADFEM itself called CADFEM Rolling Bearing inside Ansys: "Each ball can theoretically have contact with the wire rings at four individual points, which is difficult to represent in the FEM mesh. Our extension automatically modifies the model so that the calculation can deliver optimal results."



An essential preparation of the topology optimization is the exact load case definition

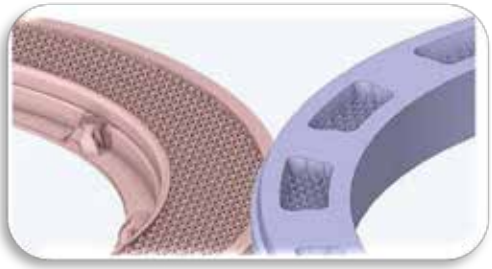


In the topology optimization, areas are removed (shown in blue) that do not play a role in stability

The loads were calculated for two cases - Franke also provided the loads on the bearing. Two cases were calculated: First, the real loads from flight operations and second, the significantly higher loads that are embedded in the approval regulations. In addition, the bending moments in the bearing had to be taken into account.

After defining all loads and the invariable geometry areas of the bearing, the topology optimization was started. An interesting result of the calculations with Ansys was that in a larger area of the basic body only negligible stresses occurred and the material at these points was removed by the topology optimization.

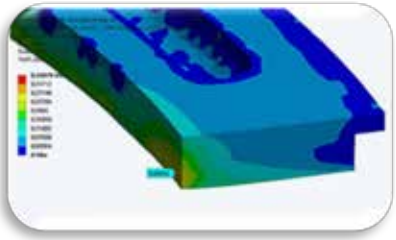
Weight of the bearing body has been noticeably reduced - Hollaus imported the optimized geometry into the SpaceClaim CAD system integrated in Ansys. There, the corresponding area was filled with a lattice structure, because this leads to higher stiffness at very low weight. With the topology optimization, it was possible to reduce the weight of the 3D-printed bearing body by a further 16 percent compared to the conventionally manufactured counterpart, which was already highly optimized - a very good result.



Lattice structures give the cavities additional stability

Simulation to optimize the 3D printing process - A second important area of application for simulation is the printing process itself. In metal 3D printing using the powder bed process, focused laser beams are used to introduce the energy required to completely melt the metal powder particles at the desired locations. Rapid cooling rates and high temperature gradients create strong stresses in the workpiece. To enable heat conduction during the additive manufacturing process and to absorb the resulting forces and stresses, “support structures” are required. On the one hand, support structures are therefore important for the success of the printing process, but on the other hand they are also cost drivers due to the material and time required.

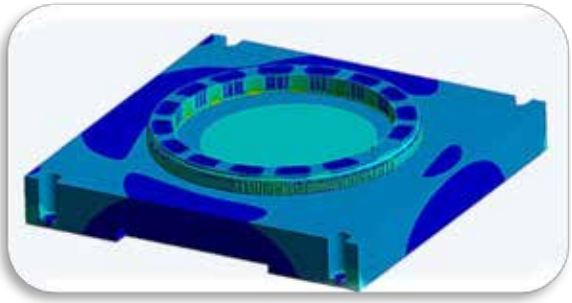
Hollaus clarifies: “**In the simulation with the Ansys Additive Suite**, we work with material parameters that were obtained in lengthy test series. By the way, some of the material data included in the scope of delivery of the Additive Suite were developed by Rosswag Engineering. With this data, we achieve a very accurate representation of what is really happening. This pertains to, for example, the formation of the melt pool when the laser beam hits the powder, or the distribution of heat by the respective scan strategy for the individual layers. In order to minimize distortion, we don’t work in a line, as with a plastic filament printer, but the laser beam jumps back and forth over the entire print area.”



Component deformations can already be detected and evaluated before printing

Support structures fix the 3D printed parts - “Nevertheless, a laser beam applies heat to the material extremely selectively - that's the whole point, after all, to be able to print fine details,” Hollaus continues. “That's why the printed parts have to be fixed in place using support structures so that they don’t warp or even bend upwards, where they then collide with the coater lip when the next layer is applied. On the other hand, these structures have to be removed manually and consume material, so a balance has to be found between too little and too much support structure. For this purpose, pressure parameters such as speed and exposure time of the laser can be varied, but also the orientation of the component in space. It’s exactly this optimal setting that we determine with the Additive Suite and thus avoid any misprints.”

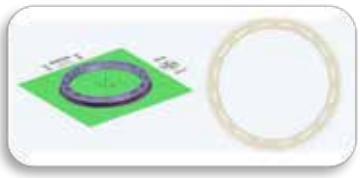
Hollaus worked closely with Philipp Schwarz, Rosswag's project engineer, to simulate the printing process. Schwarz recalls the collaboration, “Each of us contributed our experience. For example, we selectively added material to the geometry calculated by CADFEM at the points where machining was necessary, such as in the bearing seat. We also defined the positioning in the installation space and the support structures. Then the overall model went back to CADFEM for simulation of the construction process.”



With process simulation, all components of 3D printing are taken into account: Component, supports and building panel

Construction process is calculated layer by layer - Hollaus adds, “In the Additive Suite, we were able to calculate the construction process layer by layer and thus find the optimal manufacturing settings that would allow the bearing bodies to be produced reliably, precisely and with as little rework as possible - which was then confirmed during printing at Rosswag.” Schwarz agrees: “That’s right, the three components could be printed without any complications. For the current prototypes, we used the standard material AlSi10Mg. However, in the next step we are also thinking about new alloys that are not yet available in the Additive Suite. In the past, we have already been able to add our own material models to the Additive Suite in close cooperation with Ansys. Working out all the theoretical and experimental data for the material model of a higher-performance aluminum alloy would be the next big step in this project.”

Schwarz then generated the data in Ansys Additive Prep for the SLM Solutions metal 3D printing system, on which all the parts were manufactured. The finished printed bearing bodies were then shipped to Franke, where they were in turn processed and completed with the bearing components - wire rings, rolling elements and housing. Franz Öhlert, design engineer at Franke, explains the machining process: “The CNC milling machine is used to machine the seats for the wire rings, the contact surfaces of the two inner ring parts with the outer ring, and the points where the bearing is connected to other components. Until now, it has not been possible to print these surfaces so cleanly that they can be used without further machining.”



The SLM file is generated in Ansys and can be read directly from the machine or simulation

Good cooperation even under corona conditions - Other than the kickoff meeting, which was able to be held as a real meeting shortly before the lockdown in March 2020, nearly the entire project ran under Corona conditions. Further arrangements were then made via Microsoft Teams. The 3D representations from Ansys proved their worth as a means of communication. Thanks to the coloring of the 3D models with the different stresses in the component, problem areas could also be clearly communicated in the video meeting and solutions found.

Franz Öhlert is very satisfied with the cooperation in the partnership: “It is true that this was not a real customer order, but we wanted to find out on our own initiative which savings could be achieved with topology optimization and additive manufacturing. It was nevertheless a very realistic collaboration, and we would have cooperated with Rosswag and CADFEM in real projects as well (which we have already done). Our team - consisting of Franke’s bearing specialists, Rosswag’s experience in 3D printing and metal materials, and CADFEM’s simulation experts - was efficient and everyone was impressed by the pleasant collaboration. We achieved a great result with acceptable effort and will certainly be able to use the experience gained from this project in further practice.”

Bearing rings for wire race bearings (Source: Franke)

Avoidable misprints bring big savings - Florian Hollaus is also very satisfied with the project: “We were able to show that we can simulate and optimize the manufacturing process so realistically with the Ansys Additive Series software, that the printing process took place without any problems. And the 16 percent savings in weight, on an already optimized component, illustrates what is additionally achieved with topology optimization and the freedoms of 3D printing.”

Philipp Schwarz concludes, “as an experienced service provider, we benefit from the manufacturing process optimization that we have implemented with CADFEM. Metal 3D printing requires very high investments in machines, materials, and know-how, so every avoided misprint leads to a noticeable saving. Ansys Additive Suite not only convinced us in this project, but has also been successfully used by us in our daily business for several years.”

CAFEM Contact: Keno Kruse

Time and cost savings through in silico quality assurance

Ulrich Medical strengthens doctor's back (website)
Ulrich Medical strengthens doctor's back (pdf)

Screws in the human spine and other bones are subject to the most demanding requirements. ulrich medical meets them perfectly – and uses simulation solutions from CADFEM Medical to do so.

Simulation in the development and production of spinal systems

The task: The direct interaction of ulrich medical's medical technology products with the human body requires the highest degree of precision in development and consideration of the special properties of biomechanical processes. However, as with all development processes, an unknown remains in the creation of innovative medical devices: Any potential problem areas could be identified too late, resulting in complex corrections.

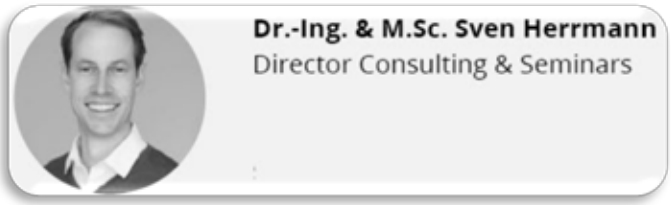
The solution: The Ulm-based long-established company reduces this risk with simulations that accompany development and are carried out with Ansys and, if necessary, backed up with advice and support from CADFEM Medical. Surgeon and patient must be able to rely on the optimal design of an implant or screw system. For titanium screws, for example, Ansys is used to calculate exactly the force with which they can be screwed in without the pin twisting or breaking due to friction or clamping.

Figure 1: ADDplus™ Distractible vertebral body replacement with fixed plates for the ventral, cervical and cervicothoracic spine

The result: The static-mechanical FE analysis was able to prove the safety of the product in silico.

Under the given assumptions, the FE analysis showed that the stresses and strains at the screw neck do not differ when changing the screw angle from 0° to 25°. Likewise, the stresses and strains do not change significantly when the tulip edge is in contact with the screw neck.

Thus, Ulrich medical was able to virtually eliminate the risk of necessary corrections and the associated time and expense during development, to the benefit of surgeons and patients.

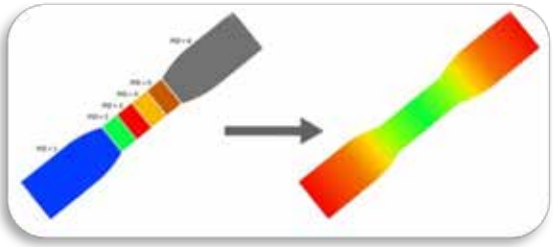


Contact our expert Sven Herrmann to find out how we can add value to your products.

-

Explore Non-Scientific Data in Simlytiks®

As a data-to-decision platform, d3VIEW supports a wide-variety of data. Let us see how Simlytiks, d3VIEW's data visualization application, helps in visualizing non-scientific data. Leading the way in this enhancement is Simlytiks' Bubble Chart visualization, which effortlessly harmonizes with simple data, as well as scientific data, to create smooth comprehension....



Generate Part Contours with New d3VIEW Workers

Measuring the behavior of materials via specific procedures such as tension or shear tests aids in designing sound and safe products. d3VIEW supports this process by offering tools such as Material Calibration workers in our Workflows application. Recently, two new workers have been created for this, Key Value Generate Part...

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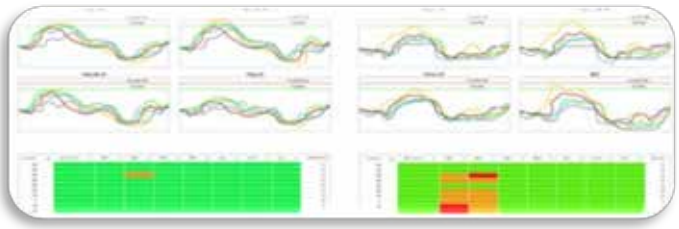
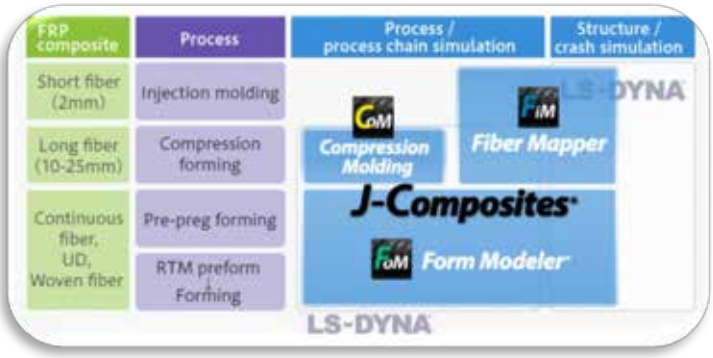


Using aPLI Templates for Crash Safety in d3VIEW

Data-processing in d3VIEW is made simpler and easier with its 'Templates' application. Templates help standardize and organize data imported from a wide range and variety of simulations and test data-sources. We tailor these templates to suit the business needs of users from different science areas. One of the templates generated...



J-Composites is a set of tools, which works in cooperation with the multi-purpose solver LS-DYNA, to facilitate the complex forming process and process-chain simulation of resin composite materials. It supports the shortening of development time and reducing cost for press forming and resin flow manufacturing processes.

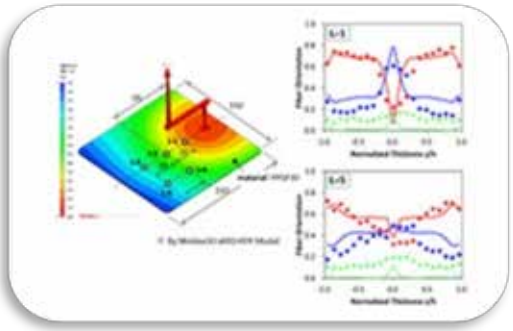
J-Composites Series -The J-Composites series consists of ”Form Modeler”, a tool to set up press forming analysis, ”Compression Molding”, a tool to set up compression molding analysis, and “Fiber Mapper”, a tool to map a resin flow simulation result on to a structural mesh. The J-Composites series is a set of software for facilitating process and process-chain simulation of resin composite materials

Case Study - Prediction of anisotropic properties of an injection molded product

Structural simulation accounting for the distribution of fiber orientation resulting from the forming process - The material properties of a discontinuous fiber reinforced plastic material are greatly influenced by the changes in fiber direction, form (aspect ratio), and content rate that occur during forming. This is why a proper prediction of mechanical properties requires taking into account the effects of the forming factors.

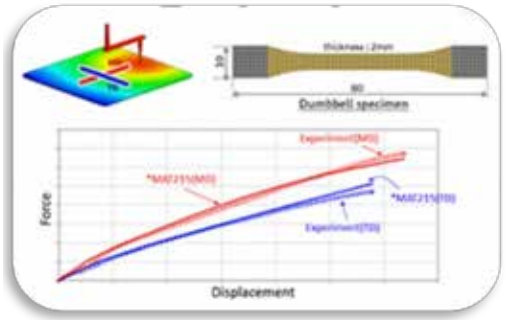
From resin flow simulation to structural simulation - In this case study, injection forming simulation of a discontinuous fiber reinforced plastic material was performed using the resin flow simulation software Moldex3D. Moldex3D’s “iARD-RPR Model” was used to predict the post-forming fiber orientation.

After injection molding a rectangular plate of PP which contains 30% glass fiber, the fiber orientation was measured at the area shown in the image below, “Prediction of the fiber orientation distribution (Moldex3D)”. Based on the measured fiber orientation information, J-Composites / Fiber Mapper was able to build an anisotropic nonlinear material model for structural simulation which can predict product properties accounting for the effects of the forming factors.



Prediction of the fiber orientation distribution (Moldex3D)

Validation of simulated material properties against a dumbbell tension test



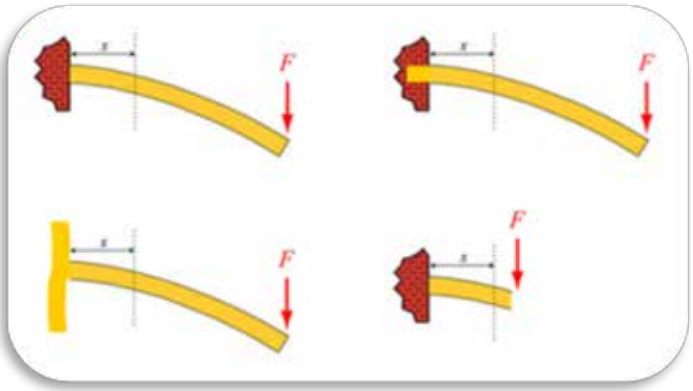
Metin Ozen
Principal & CEO at Ozen Engineering, Inc. and Mallett Technology, Inc.

What ASSUME does to you and me... (blog)
By Jason Mareno

"I once sat in a seminar where the instructor asked his audience – a group of experienced engineers – a series of simple questions. On the surface, each question had a quantifiable, "correct" answer. As we dug deeper, differences of opinion arose and heated debate ensued."

The instructor chuckled through it, as he'd done this shtick before, but left us all wondering: How could this group of experts fail to agree on simple problems governed by basic engineering principles? We came to realize that many of us had jumped to conclusions, others had ignored subtle cues, and some were applying familiar but inappropriate principles to the problem.

One might think modern FEA software helps today's engineers avoid such pitfalls. Unfortunately, the pitfalls are more tempting than ever before, and worse, people rarely even realize that they've fallen in.



Take a simple cantilever beam for example. What is the stress at the root? Any classically trained mechanical engineer will reflexively reply, "M-c over I!" It's trivial to replicate this result in our flashy modern FEA software, but the best and most experienced engineers will ask further questions before blurting out an answer or firing up their software.

- What have you assumed about the actual end conditions of the cantilever?
- Does Poisson's ratio affect your answer?
- Is the beam length less than 10X the thickness? Are shear effects important?
- Is deflection significant compared to beam length?
- How rigid is the wall compared to the beam itself?
- Do any dynamic effects exist?
- How quickly is the load applied and how heavy is the support structure compared to the beam?

Once you see the pictures and read the questions, it's difficult to imagine such effects being ignored. You'd like to think that you'd never fall prey, but it happens to the best of us every day.

The upfront planning stages of a Finite Element Analysis (FEA) effort are critical. A good analyst will ask lots of questions before they jump into nodes, elements, and pretty pictures.

They may ask about the operating environment, assembly process, design history, etc. They'll want to know how and why the loads were selected. They'll aim to understand the system and will resist the temptation to assume that they "just know" how it works.

Once the FEA modeling is underway, these same principles must continue to guide the effort. Two unique catch phrases often come up during project reviews at Mallett Technology:

"True physics." "Let the model talk to you."

To capture true physics, no behavior may be imposed on the model that would not occur naturally. Applied loads and boundary conditions must be well understood and justified. Part-to-part interactions must be realistic. Any preloads should be accounted for. Material properties should be verified. The model should represent "true physics!"

If the model shows anything unexpected, it is imperative to dig deep to understand precisely why. Conversely, if the model is behaving exactly as expected, then perturb it and make sure that it responds according to expectations. Assume nothing and listen closely. "Let the model talk to you."

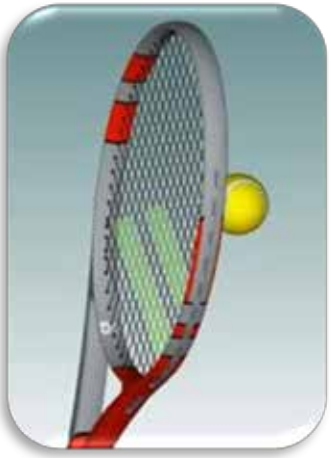
We've been surprised on several occasions to discover behaviors in our customers' designs that even they did not foresee. For instance:

- We concluded that water vapor must be present in an enclosed fluid system that was originally thought to be dry. According to our conjugate heat transfer CFD model, the water just had to be there. Residual gas analysis proved that water vapor was indeed adsorbing to/from aluminum vessel walls during heat cycling.
- Pressure shocks in a fluid-filled tank were thought to be negligible, but our transient dynamic and random vibration FEA models, complete with the sloshing fluid effects, showed exactly why the effects were not negligible and how they resulted in the existing failures. Detailed weld fatigue analysis captured the crack initiation and agreed with the test results perfectly. A redesign based on these analysis techniques later passed with flying colors.

Jason Mareno is a Licensed Professional Engineer with 20+ years of experience.

Having a background in product development as well as CAE, he has led product development teams from concept through commercialization for products with volumes of 20 million units and revenues in excess of $4 billion. He heads up Mallett's consulting group and is responsible for business development, staffing, and technical excellence/quality.

Siemens Solution Partner - BSIM



(EXCERPT) - The ingredients to the perfect tennis serve with Simcenter Amesin

Here in BSIM almost 50% of our team is made up of tennis players or fans: we could pretty easily set up an in-house BSIM tournament!

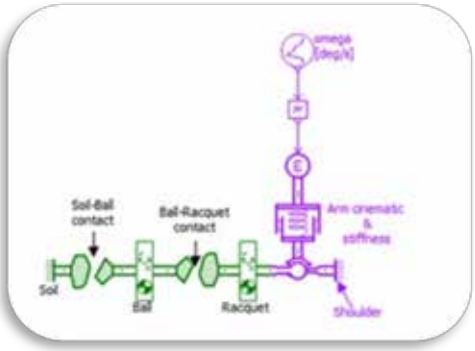
Our application engineer Giancarlo De Giuseppe has been playing around with Simcenter Amesim to simulate the perfect serve – and beat us all.

Yes, Simcenter Amesim was born as a 0D/1D simulation tool, and we'll be talking about the specificities of this type of simulation very soon in one of our next posts, but it does contain 2D and 3D mechanical modelling libraries.

These libraries allow the user to simulate the movement of a body in a 2D plane or in a 3D space, and assess the effect of contact forces and of the body's elasticity.

Our tennis serve application example, is perfect to showcase this feature: a racket hitting a ball, a ball traveling in a 2D plane and then hitting the court!

Let's here all about it from Giancarlo, in today's fun Friday post.



First off, I set the icons in proper positions. To simulate our tennis serve, at least 3 bodies are necessary and 2 contacts: 1 body for the field, 1 for the ball and 1 for the racquet, the 2 contacts are for ball-field and ball-racquet.

For each body and contact a dimensional characterization is necessary, while for the moving bodies, just like the ball and the racquet, mass and stiffness properties are also needed.

Then I worked on the initial conditions in order to achieve the proper cinematics: I aligned the ball's initial position to a few centimeters before the end-line, same as the raquet's initial position and rotation. Another important element for the serve (and for the simulation) is the height at which the ball is hit. The higher the toss and the higher the ball is hit, the better the serve. This is why the player's height has such an important role in his game.

I have just joined the sport, so I asked a veteran tennis player and colleague, Marco Longhitano, for some help. From this highly-scientific test, we took some measures for the initial positions and the typical arm lengths. Then I had to set the racket speed at the moment of impact.

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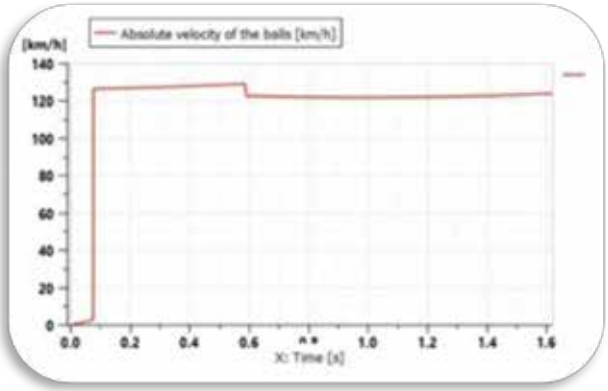
The ingredients to the perfect tennis serve with Simcenter

Marco could only help me to a certain extent here, so I looked-up the serve speed of one of the best players ever (sorry Marco): **John Isner's serve is 249.4kph/155.0mph. We're quite aware of our athletic limits here in BSIM, so I set our serve speed at about the half of Isner's speed (~120 km/h).**



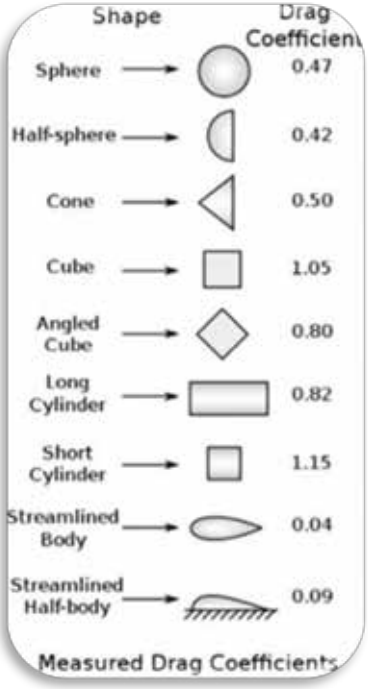
But, just for fun, let's take a minute to admire Isner's serve and recognize we will never in our wildest dreams be anywhere close to it. (via GIPHY)

Ok, moving on.

As you can see, the ball starts its trajectory with 0 speed, when it's at its highest position. Then we have a slow speed increase, due to the gravity effect, till we have the impact (~0.08 s) where the racquet hits the ball and the velocity rises up to 125 km/h.

The whole trajectory until the first soil impact (~ 0.6s) is about 0.5 s. As you can see, after the racquet impact, the velocity slightly continues to raise, this is due to the physics considered: no air resistance was set, and so the gravity effect won pushing the ball to accelerate a little bit more. So, to obtain the 'definitive' solution with a more realistic velocity profile, the air resistance has to be estimated.

Since we are managing a simple shape (sphere) we can use tabled coefficient easily findable in literature:

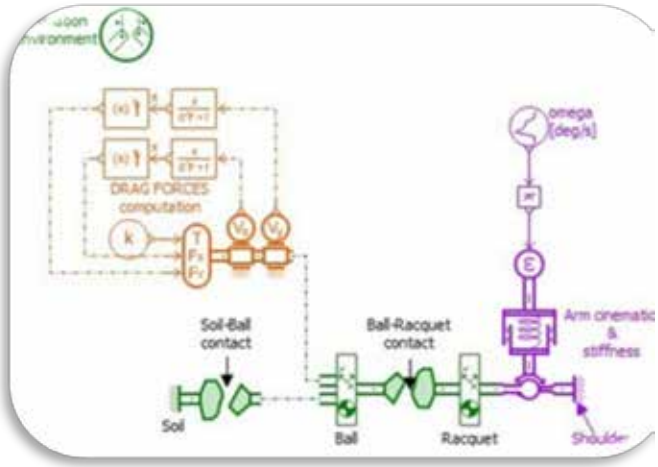


Source: (Wikipedia: https://en.wikipedia.org/wiki/Drag_coefficient)

Using this coefficient associated with the drag force formula:

$$F_{drag} = \frac{1}{2} \cdot \rho \cdot v^2 \cdot C_d \cdot A$$

Out sketch now looks more complete:



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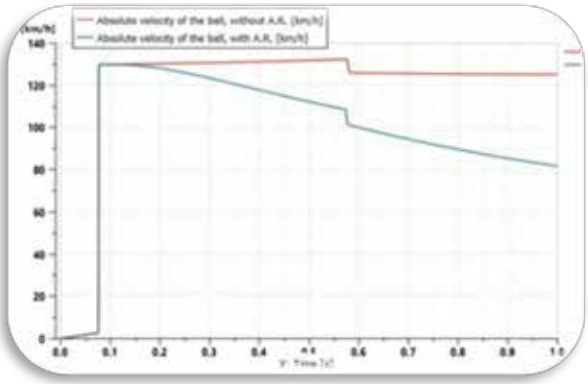
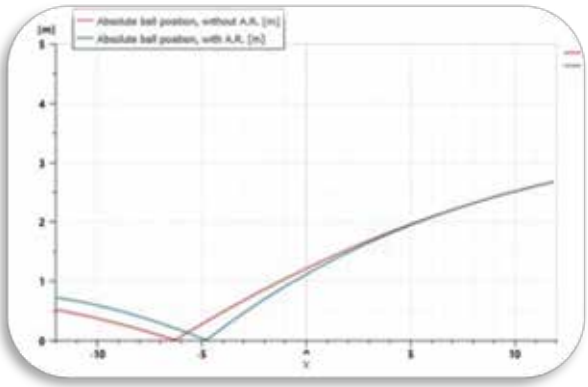
The ingredients to the perfect tennis serve with Simcenter



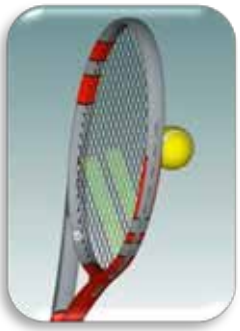
Lets look at the comparison before/after Air Resistance introduction:

Now the ball decelerates, as it should, in a physically coherent way.

And here we can see the ball's trajectory along a X-Y plane. Its initial position is to the right of the graph.:



Obviously with the air resistance the ball hit the ground at a shorter distance.



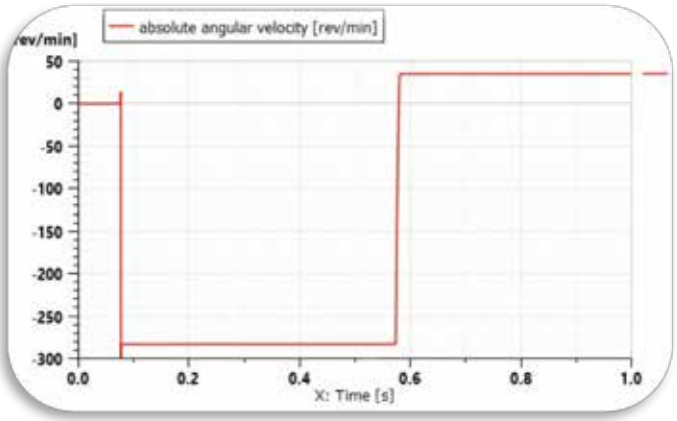
Video on website

Just a quick look at the impact moment:

Didascalia: the ball and the racquets chords seems to compenetrate, but this is just an optical effect since in the contact a certain stiffness was been considered, while the CADs are simply linked to the centre of gravity of the objects. This prolonged contact is at the basis of the ball spinning and cinematics.

"Is the ball spinning?" I can here you asking. The answer is: Yes!

Before the racquet impact the ball's absolute angular velocity was null. After the racquet impact it reaches the value of about 280 rpm.



After the impact with the court, the ball continues to spin at about 35 rpm but in the other direction.

This means that the ground-impact just reversed the ball spinning direction, making it even more difficult for the other player to respond to our serve.

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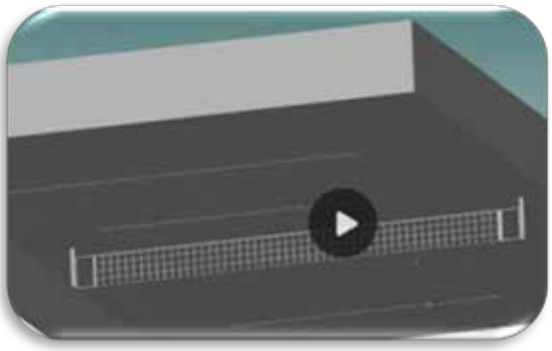
The ingredients to the perfect tennis serve with Simcenter



Video on website

Video on website

Looking at the future, a more complex model can be obtained only in cosimulation with a CFD 3D software:

In the tail behind the ball, due to ball rotation, there are some perturbations in the flow caused by the ball streaks placed on the surface. This is an additional level of detail that with some work we could be able to address.

But this, is another story…

The standard features mentioned in this analysis, are part of Simcenter Amesim software. However, based on real Simcenter Amesim capabilities, several simplifications were applied to this light-hearted application example.

Please visit the website for higher graphics and all videos

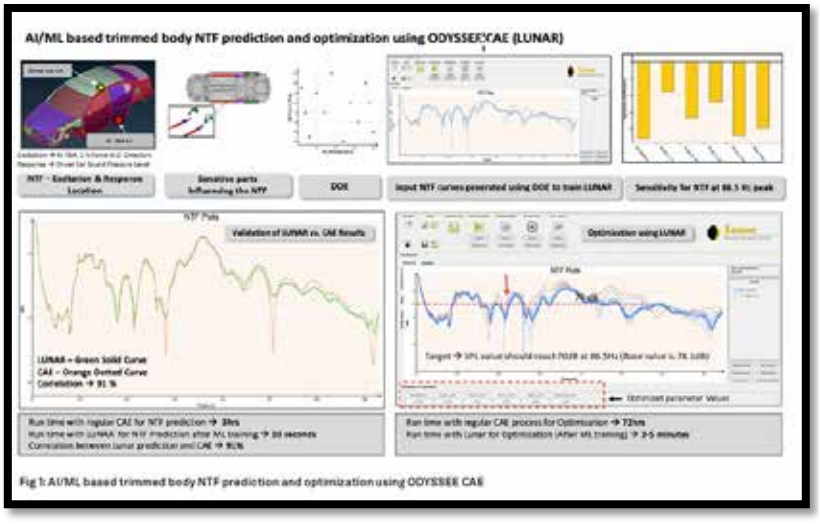
About BSIM- A team of skilled engineers with a problem-solving mentality
Simulation and testing experts, with one mission: help clients to solve their engineering pains and innovate.

20 years and counting - BSim was founded back in 2010 by Marco Brunelli, building upon his expertise in the field of CAE (computer aided engineering) and more specifically in 0D/1D system engineering simulation.

PDF - AI/ML based trimmed body NTF & global modes prediction & optimization using ODYSSEE CAE - ODYSSEE CAE helps Satven reduce the time required for trimmed body NVH simulations and optimization from multiple days to a few minutes

Satven was established in the year 2000 with a singular focus & objective – to cater to the varied & complex design & engineering needs of the automotive industry. The company has today grown multifold to become one of India's leading automotive engineering bureaus.

Challenge - The emergence of AI and ML in vehicle development promises to transform the automotive industry and spur innovation. As a leading engineering solutions provider to the automotive industry, Satven was keen to leverage the advantages of AI and ML to ensure superior services and deliver a definite competitive advantage to its customers. To this end, Satven embarked on a competency development project to strengthen its capabilities in delivering AI/ML-based solutions to its customers. The team decided to explore an AI/ML approach for quick predictions and optimization. In particular, the effect of BIW Panel Thickness and Young's "E" modulus on Trimmed Body NTF/VTF/Global Modes was studied and accordingly optimized.



Solution - The Satven team was keen to use ML techniques available in the ODYSSEE CAE software from Hexagon (see https://www.mscsoftware.com/product/odyssee).

The ODYSSEE CAE optimization package is an innovative tool built by exploiting machine learning and reduced order modelling (ROM) techniques to replace traditional response surface solutions by ROMs, thus allowing for predicting of arbitrary time dependent and non-linear physical phenomena.

Satven decided to use open source Honda Accord 'Body in White' FE model for the evaluation (https://www.nhtsa.gov/crash-simulation-vehicle-models).

The evaluation had following objectives

1. Noise Transfer Function (NTF) –

a. Study of BIW component thickness & material sensitivity on NTF
b. NTF predictions using ML approach (without actual CAE simulations)
c. NTF optimization using ML approach (without actual CAE simulations)

2. Global Modes –

a. Study of BIW component thickness & material sensitivity on front end lateral bending mode
b. BIW front end lateral bending mode prediction using ML approach (without actual CAE simulations)
c. BIW front end lateral bending mode optimization using ML approach (without actual CAE simulations)

Experience Your Product – Before You Build or Service It – Through the World of Immersive Virtual Reality

Sometimes new concepts need to be experienced to be trusted. You build something and watch as an idea or concept comes to life.

But what if, once constructed, you realize that it isn't as you imagined your product would be? That by walking around and building your project, you discover that the real product or finished assembly has inconsistencies, flaws or errors that are not evident in concepts or designs until you experienced the build. At this point, what you have built is scrap, design changes will set you back weeks, if not months, and costs will certainly rise – if redesigning this late in the game is even an option. If it's not, going to market with a less than perfect product or flawed process might be a reality you must come to terms with.

Or, **what if you could work in a virtual world where you could bring your product to life—really experience building, operating, or maintaining it – without physically constructing a single thing**. In this immersive Virtual Reality, you can walk around your product in a true-to-life environment at a 1:1 scale, looking at it, reaching for needed tools, and interact with your new product concepts as you, or your customers, would in real life. In this way, any unforeseen assembly, operating, and maintenance challenges that are not acceptable can be experienced in time to identify them and fix them. Fully digital, virtual, and before decisions are "cast in stone".

With IC.IDO this – and much more – awaits you.

"Due to ESI Group's disruptive virtual reality solution, IC.IDO, it was an easy decision for us to implement their software. It met the growing need for increasingly assertive virtual simulations generated by industry 4.0." - **Eric Beremis Baier Laia - Virtual Reality Specialist of MFG2020 / FCA LATAM**

Benefits of IC.IDO

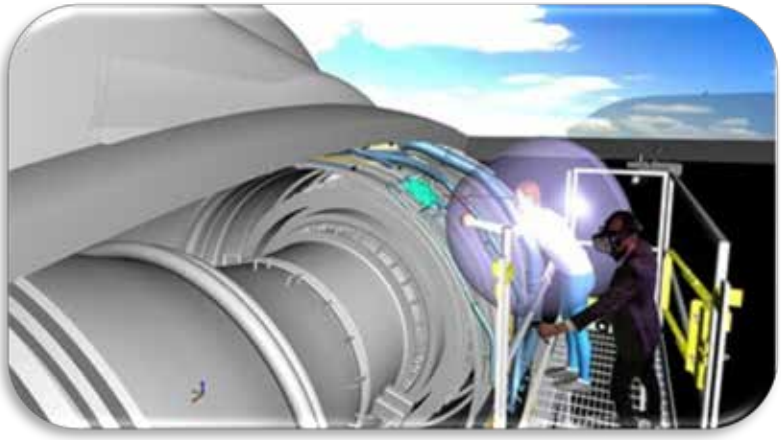
- Best-in-class immersive interface-engage with your product, virtually, without barriers
- True-to-life interaction with product, assembly cells & tools, and maintenance environments
- Fast turnaround results – from data acquisition and preparation to analysis and sharing
- Real-time collaborative decision making – make decisions and evaluate corrective actions with your team regardless of your physical location
- Performance – gain access to large and complex data sets in real-time to see your complete products in interactive contexts

Virtual Integration - We apply Virtual Reality in engineering with a holistic approach, recognizing that VR has value beyond visualization for cross-functional teams at major review gates and fulfills a role for the engineer performing in-process packaging or functional reviews. Engineering the best products require more than a mere focus on deterministic simulation but also designers and engineers to integrate their products, processes, and people to ensure the highest safety, quality, cost, and delivery time performance.

Virtual Integration or Virtual engineering is the aspect of product packaging that assures that the parts and components of the complete product are merged and evaluated for how well the different objects fit together, often included as a requirement for product engineering release. Beyond just testing the assumption that the design "envelope" or "space claim" is maintained statically, integration also involves validation for collision or clash of parts during planned use and normal ranges of motion, evaluation of visibility of and accessibility to parts/components as required by service or production requirements, and the appropriateness of the human factors in design and assessment of ergonomics.

This process historically was completed as mock-ups of the product were produced and evolved as part of the product development process. However, as digital engineering practices have successfully reduced the reliance on practical mock-ups and replaced with CAE and FEA modeling, the learning and emergence of design integration issues that resulted in unplanned from the building of mock-ups have been lost.

The creation of production-intent prototypes and mock-up builds of products, would often give insight into the assembly and service of the product, inform engineers and designers of potential conflicts between the design intent and practical completion of the product, and raise physical constraint issues that may not have been envisioned during the packaging and space claim planning for the product.



Integration challenges include:

- static and dynamic space-claim of components
- cable and hose routing
- installation and removal of components or parts
- customer acceptance (bespoke or highly customized products)
- in-situ part movement, rocking, or shifting
- visibility and accessibility requirements
- design for assembly and service requirements engineering

Virtual Build - Assembly & Production - Releasing the production-intent product data, engineering, and optimizing production process plans for a new product creates complex engineering tasks, like the sourcing of production tooling, commissioning of facilities, and workforce planning-preparation for production launch. During prior product engineering tasks, the assumption is that production requirements and service requirements may trigger product design changes. Design for Manufacturing and Design for Service, activities initiated during those early engineering integration reviews, should yield benefits in terms of the overall capability of the product to be made and supported, however now is the time to put that assumption to the test.

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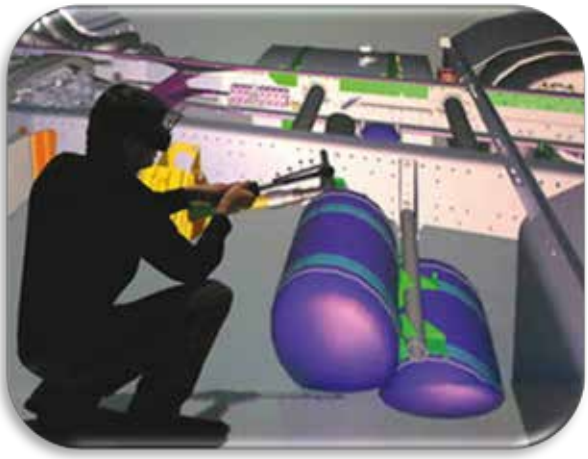
In the past, production pilots and prototype builds would have yielded much of the exploratory and development opportunity needed to plan for the upcoming product launch effectively. However, with the recent reliance on digital modeling instead of practical prototypes and piloting activities, there is an increased risk that production issues can go unobserved until production ramp-up.

Such risk can be mitigated and removed as long as the new products can be appropriately modeled during the design and commissioning of the production tools, processes, and facilities

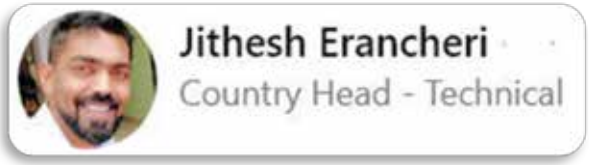
Virtual Service - After Sales Support - Planning for effective service need not wait until practical prototypes or production products are available

Service and Warranty Engineering and Planning are emerging as more urgent tasks in the development of new products as we see the sales models for new products and technology evolve. With the cost of service being built into the ownership model of some of the most innovative new products, OEMs are recognizing that Total Cost of Ownership (TCO) is no longer the sole burden of the customer, but a possible competitive advantage for their enterprise. Rightly so, during product development more attention is being placed on the serviceability and maintainence of cutting edge products. Is the consumer buying the car or are they investing in personal mobility, is the utility buying a turbine or are they buying an expectation of megawatt hours of production, is the construction firm buying the excavator or are they buying the hole, or is the municipality buying a train or the mobility of their citizens?



Engineering the service operations of a new product is more than merely imagining from the CAD design data a likely order of operations, nor is it just establishing a Bill of Service from the Bill of Materials. One cannot just reverse the Bill of Process from assembly and assume that it will support planned or unplanned maintenance activities. Visibility and accessibility of a replaceable component during after-sales service is very different than when we are constructing a new product around that component. The decisions made during engineering to optimize assembly and initial build are likely different than decisions one might make to optimize maintenance and repair.

Assessing a product's serviceability without access to the complete product is an exercise in extreme imagination and creativity. An exercise that is fraught with risk for the enterprise if imaginations or creativity fall short of recognizing critical errors. Many can recount a nightmare scenario where a commonly replaced component is completely inaccessible without the removal of key components or subassemblies. The sparkplugs that require the removal of the engine, the filter that requires the disconnection of the pump, an access panel too small to allow the components to be removed.



Kaizenat Technologies Pvt Ltd

[Kaizenat Features Videos]

Videos

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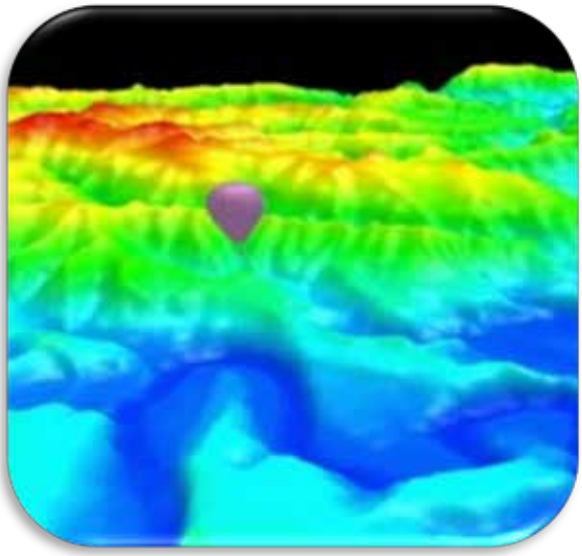
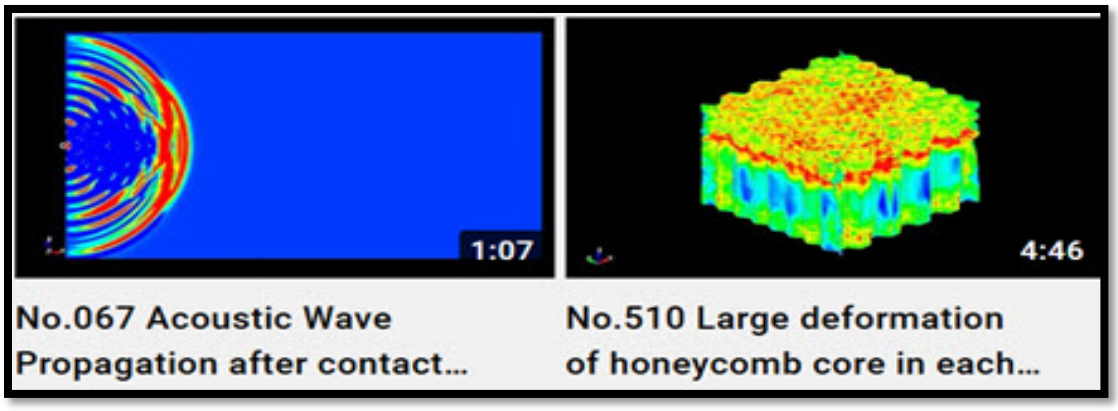
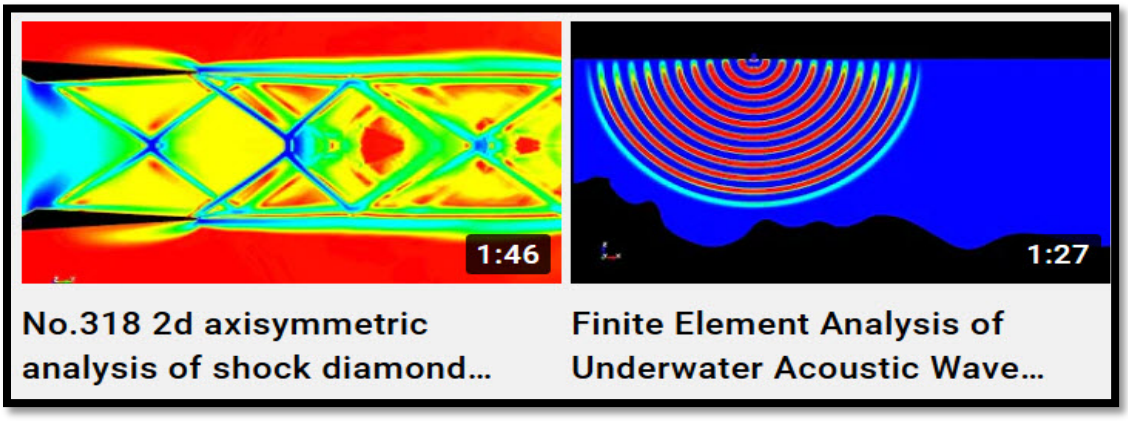


LS-DYNA Sample Models Part 2

No.006 Balloon Trip

"Land surface shape mesh" was created using "Points Cloud to Mesh" of LS-PrePost.





For this month our editors have chosen the following case study (yes, coffee related!)

Improving a coffee capsule machine's capacity and performance using multibody simulation

Improvements achieved by optimizing laws of motion governing machine components

Fig. 8 - Overview of the RecurDyn model of the cut and weld unit including flexible bodies

ABSTRACT - This technical article describes a project undertaken by OPEM to optimize and validate the laws of motion governing the moving operations of a machine that produces coffee capsules, namely the cut and weld unit, the film feeder, the conveyor and the support structure.

Capacity is the most important feature of an automatic packaging machine since it defines its main competitive advantage. As a result, OPEM's designers are constantly looking for new solutions to increase the capacity of their machines without compromising costs, size and efficiency.

The main objective of this project was to increase the machine's capacity by 25% without affecting the architecture and size of the machine. Using an iterative approach, EnginSoft's engineers generated multibody models developed in RecurDyn, to assist OPEM's designers to reduce the cycle time for performing the moving operations by well over 25%.

The RecurDyn models were also used to correctly size the main components of the machine, to verify the machine's dynamic behavior when subjected to the new laws of motion implemented, and to calculate the loads acting on the frame, which were subsequently used for structural verifications.

Capacity is the most important feature of an automatic packaging machine since it defines its main competitive advantage.

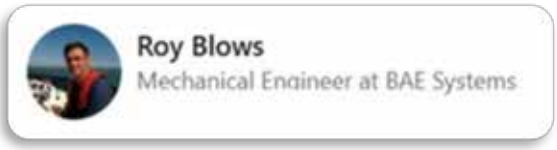
This project focused on a machine for the production of coffee capsules. The main objective was to increase capacity by 25% without affecting the architecture and size of the machine. The machine's operations can be divided in two main areas: 1) Stationary operations; 2) Moving operations.

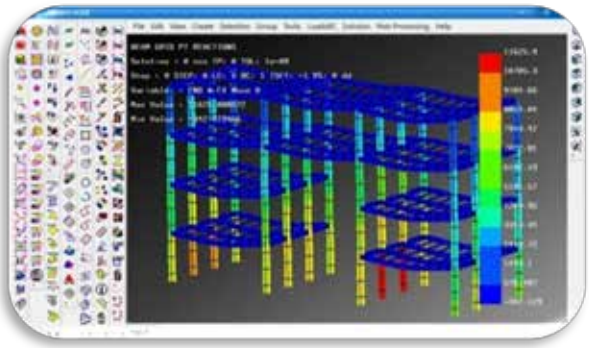
The filling and sealing of capsules are "stationary operations". During these operations, the capsule must remain stationary for a prescribed amount of time. The forward movement of the capsules, and the feeding, cutting and transport of the sealing film are "moving operations". Stationary operations were not addressed by this project (i.e. the time constraint resulting from these operations remained the same). As a result, the cycle time for performing the moving operations was reduced by well over 25%.

To achieve the desired objective OPEM partnered with EnginSoft to optimize the laws of motion governing different mechanisms. The optimization process was supported by multibody simulations performed in RecurDyn to verify the dynamic behavior of systems subject to these new and highly demanding laws of motion.

Excerpt- About OPEM - OPEM S.P.A was founded by Fabio Binacchi in 1974…which started with the purchase of a pasta business…The coffee market was still on the distant horizon, but continuing requests for new weighing and packaging machines led the company to study and design systems…

Found on Social Media thanks to Girish Hirekerur





The new 5.7 release of M3d is available to download from the website.

Left: I beam structure under gravitational loading solved in M3ds internal F.E. solver.

M3d is a fully integrated Finite Element modeller, solver and post-processor in one small executable. M3d supports a basic form of command line scripting making it easy to automate basic tasks. It also has an API which can be accessed directly using MS-EXCEL visual basic. Consider M3d for bespoke integrated solutions tailored to your specific company needs

M3d was primarily designed as a Pre and Post Processor for the Nastran finite element code and has been used on many large Aero-Space projects.

Our wide range of engineering experience and knowledge of numerical methods gained over 20 years have given us the advantage in developing process improvement software solutions. Many companies are unaware what is possible when unconstrained by commercial software. A bespoke software solution that fits a particular process needs can radically improve productivity and dramatically reduce cost.

"To explain the basic operation of M3d and the work flow I have created my first video tutorial on you tube (with voice over)."

It covers:-

1) creating nodes and elements

2) creating and applying materials and properties

3) model checks

4) applying loads and boundary conditions

5) linear static solution

6) post-processing

"I did go over 15mins so the end is slightly truncated - the bit where I thank you for watching. Hope it will explain a bit more about how to use M3d and hopefully I will improve my you tube skills for further tutorials."

Look out, pothole! Mercedes-Benz further expands Car-to-X Communication

Stuttgart. Large potholes are a safety hazard, because if drivers do not recognise them in time, they can no longer take evasive action or reduce their speed.

There is also a risk of damage to tyres and the suspension system. In the worst case, accidents can happen. Mercedes-Benz is now increasing safety with additional Car-to-X functions.

Three million Mercedes-Benz passenger cars produced in 2016 or later can receive even more information

New C-Class and S-Class models as well as the EQS[1] can detect potholes or speed bumps. If the chassis control unit registers such an event, and the "Car-to-X Communication" service is activated, the information is sent to the Mercedes-Benz Cloud in real time via the mobile phone network, together with positional data. Mercedes-Benz passenger cars in the vicinity are informed, and the events are displayed with icons on the navigation map. About ten seconds before the relevant lane section is reached, an audible warning is given and the icon is visually highlighted.

Mercedes-Benz passenger cars produced from 2016 onwards can receive the warning information. In total, that's over three million vehicles worldwide. Prerequisites are a Mercedes me account as well as activation and online availability of the "Car-to-X Communication" service. In these vehicles, warnings are given with the familiar voice output "Traffic event ahead". In the new C-Class, S-Class and EQS, the audible warning is "Look out, pothole!" or "Attention, speed bump". The new alerts are now available in selected markets worldwide, and in all 36 languages recognised by the infotainment system.

Mercedes-Benz developed the new Car-to-X functions completely in-house. The new pothole detection system was tested at the Immendingen Test and Technology Centre (PTZ), among other locations. More than 30 different test and trial tracks are available there over an area of 520 hectares, including what are known as comfort tracks with bumps and potholes of all kinds

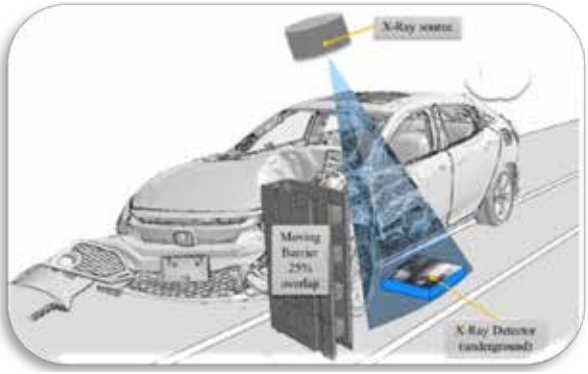


Figure 1: Overview of the reverse Small Overlap test configuration with X-Ray device

PDF - An Engineering Approach of an X-Ray Car Crash Under Reverse Small Overlap Configuration

Y. Leost 1, A. Nakata 2, P. Bösl 1, I. Butz 1,
T. Soot 1, M. Kurfiß 1, S. Moser 1, F. Kase 2,
T. Hashimoto 2, S. Shibata 2

1 Fraunhofer Institute for High-Speed Dynamics, Germany
2 Honda R&D Co., Ltd., Japan

Abstract

During a crash event, conventional optical measuring systems provide information about the deformation of parts that are directly visible. The new measuring method called X-Ray Car Crash (XCC) developed at Fraunhofer EMI allows accessing the crash kinematic of specific parts inside the vehicle. This method provides precious information that is currently not accessible in a crash test and allows for better comparison with FEM simulations. The present paper describes a preliminary study performed in collaboration with Honda R&D Co., Ltd. The load case under consideration is a reverse variant of the IIHS Small Overlap with integrated X-Ray technology.

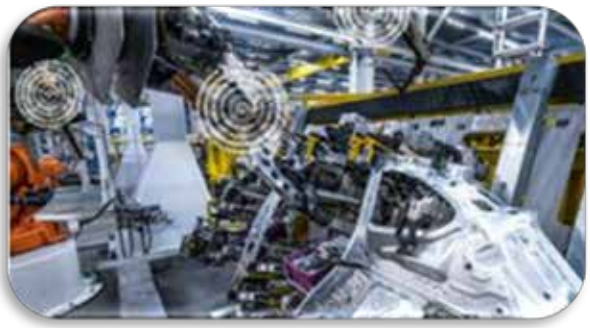
Fraunhofer EMI Research Crash Center aims at developing new measurement methods to investigate non-standard high-speed dynamics safety issues. Most of these specific requests are coming from car manufacturers. In order to achieve maximum test reproducibility and simplify boundary conditions, the facility is equipped with a propelled sled system on rails. Thus, it enables to perform impactor to vehicle scenarios with moving barriers up to 3000 kg by 22 m/s.

The standard Small Overlap at 64 km/h belongs to the vehicle to barrier scenario and requires some preliminary computations to adapt it for the EMI Crash test facility. Special consideration was given to energy balance in order to determine the right barrier velocity and mass to achieve a similar intrusion in the car to in the standard configuration.

Numerical simulations were required at each step to meet the different challenges of this study. This paper describes first the numerical assessment of the validity of the reverse scenario. FEM simulations were then used extensively for developing a special moving barrier presenting maximal structural robustness, well-balanced dynamic behavior and allowing on-sled measurement technics and braking system. Then, LS-DYNA® simulations provided necessary data to perform ray tracing simulations and thus finding the right placement for X-ray source and X-ray detector. Finally, numerical simulations played an important role for an enhanced test setup, by finding the best balance between appropriate mechanical robustness of supporting structures (so called Pit-cover) and low X-ray attenuation.

BMW Group Predictive maintenance: When a machine knows in advance that repairs are needed.

+++ Predictive maintenance enhances efficiency and sustaina-bility at the BMW Group +++ Smart digital monitoring and maintenance prevent unplanned production downtim es +++ Cloud-based platform integrated into global BMW Group production network +++



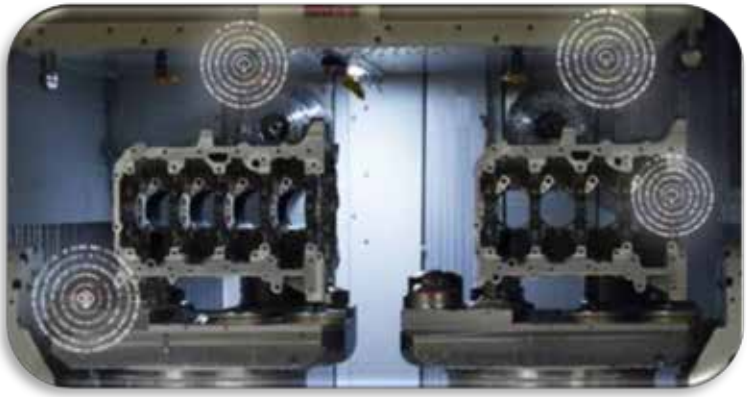
Munich. When it comes to maintaining production systems, the solution of choice at the BMW Group is to use sensors, data analytics and artificial intelligence (AI). So rather than the previous approach of rule-based maintenance at regular intervals, predictive maintenance is carried out, based on the current condition of the system. This not only prevents unscheduled downtimes in production but also makes an important contribution to sustainability and the efficient use of resources by ensuring optimum system availability. Innovative, cloud-based predictive maintenance solutions are currently being rolled out across the global production network.

Predictive maintenance as an early warning system in production - The increasing digitalisation of maintenance has made a predictive approach more and more important.

By monitoring equipment and status data, predictive maintenance can forecast system failures before they actually happen.

To optimise the upkeep of systems, data is used to decide when to replace components as a precaution so as to prevent unnecessary downtimes. Predictive maintenance also enhances efficiency and sustainability by ensuring intact components are not exchanged too early.

Forecasting states via a cloud-based platform - Predictive maintenance uses a cutting-edge cloud platform to obtain early warnings about potential production downtimes. The data comes directly from the manufacturing systems themselves, which are connected to the cloud only once, via a gateway, for monitoring, and then constantly transmit data – usually once a second. Individual software modules within the platform can be switched on and off flexibly, as needed, to accommodate changing requirements immediately. And with a high degree of standardisation between its individual components, the system is globally accessible, highly scalable and allows new application scenarios to be implemented easily and existing solutions to be rolled out fast.



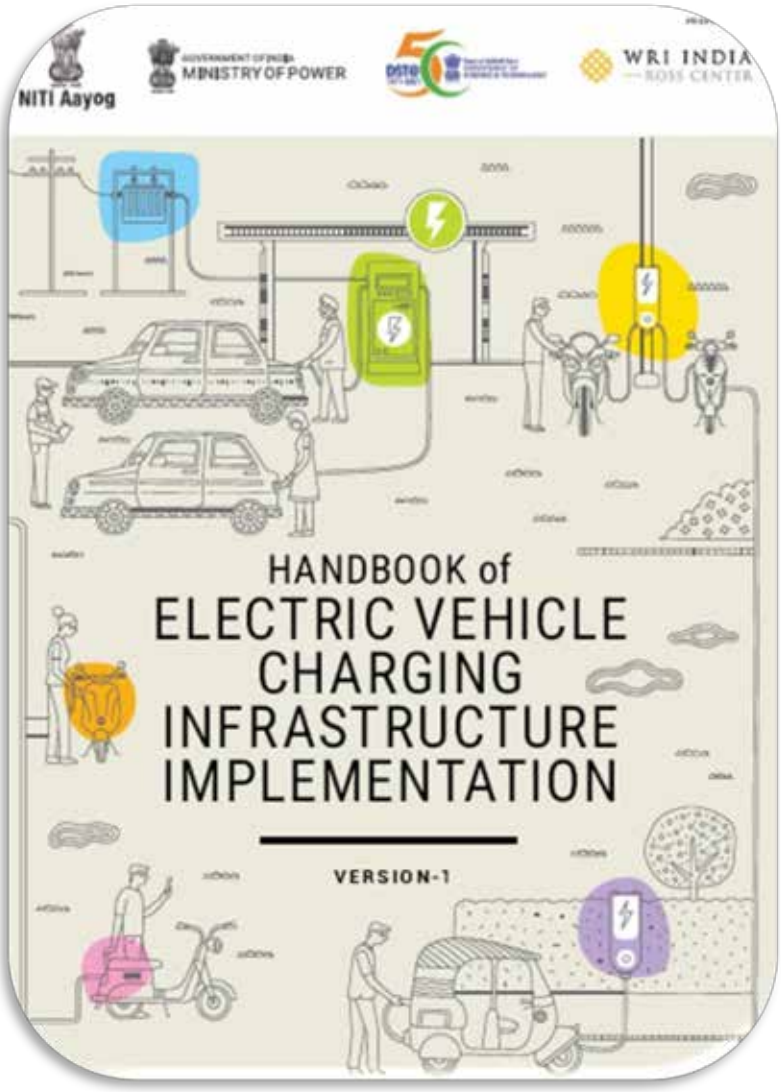
Predictive maintenance allows maintenance and repair processes to be carried out as required by the actual condition of the system and planned into already-scheduled production downtimes. Repairs can be more accurately targeted and carried out more cost- and resource-efficiently. In addition, extending running times prolongs the service life of tools and systems significantly. The guiding principle behind the provision of this solutions is: Developed once, rolled out often – across the BMW Group production network.

Diverse range of applications - The flexible, highly automated systems in mechanical drivetrain production manufacture a conventional engine or casing for an electric motor every minute. To keep these machines in good condition, predictive maintenance uses simple statistical models – or predictive AI algorithms, in more complex cases – to detect any anomalies. It then issues visual warnings and alerts to inform employees that maintenance is due.

Over in the body shop, the welding guns perform about 15,000 spotwelds each per day. To prevent potential downtimes, data from welding guns around the world is collected by specially developed software. It is then sent to the cloud to be collated and analysed with the help of algorithms. All the data is displayed on a dashboard for worldwide use to support the maintenance processes.

In vehicle assembly, predictive maintenance helps prevent downtimes in conveyors. At BMW Group Plant Regensburg, for example, the control units of the conveyor systems work 24/7 to send data on points such as electrical currents, temperatures and locations to the cloud, where it is constantly evaluated. The data specialists can then identify the position, condition and activities of every conveyor element at any given time. Predictive AI models use the data to detect any anomalies and locate technical problems.

Found on Social Media thanks to Yuvaraj Gopi and Sreejesh Mammily



NITI Aayog released the version-1 of Handbook for EV Charging Infrastructure Implementation.

PDF - Handbook

All EV Charging Infrastructure developers are requested to check this document as a guide.

The quiz was left in the suggestion box by The Old Retired Pilot. No one in town knows his name. You yell, "HEY, Old Retired Pilot." We are sending it out to the residents and guests.
1. The Pilot suggested to make a friend happy and forward it to them.
2. He then suggested - send it to someone you dislike, without your return address.

This quiz was to give you a break from planes.

Do you know Big Bertha?

Is Big Bertha a woman, a golf club, a new sport car, a new 2024 Olympic sport?

What or Whom is Big Bertha? Check all that apply.

A. ____The old Cattleman's prize chicken statue
B. ____A German siege howitzer
C. ____Callaway Golf
D. ____Town supervisor if she doesn't stay on her diet (stay safe: wear a mask & don't check D)

(The answers are at the bottom of the Goodbye page)

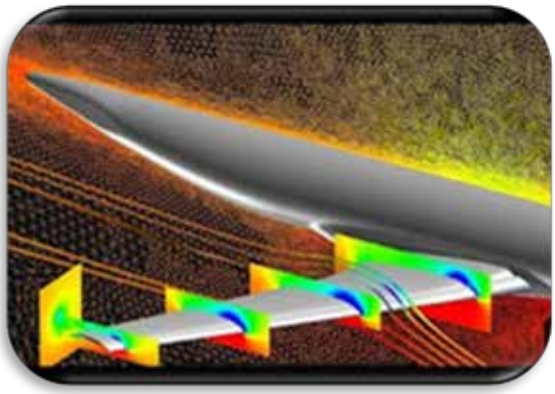
No town supervisor picture.

She tends to be volatile if you mention diets.

The Old Retired Pilot. No one in town knows his name. You yell, "HEY, Old Retired Pilot."

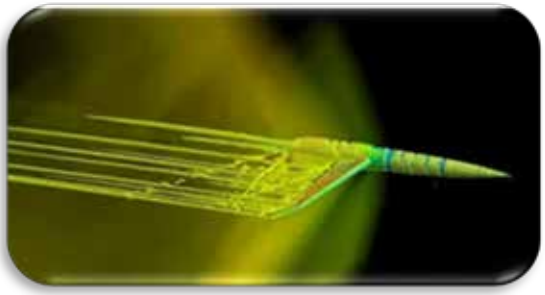
This month you can learn from the following simulations.
(He will probably have a surprise quiz, so pay attention to the following instructional videos)

Focused on Science in general and Engineering in particular. You will find video tutorials in CFD simulation using ANSYS Fluent and other software, hydraulic modeling, and other tutorials in Physics, Mathematics, and Engineering.



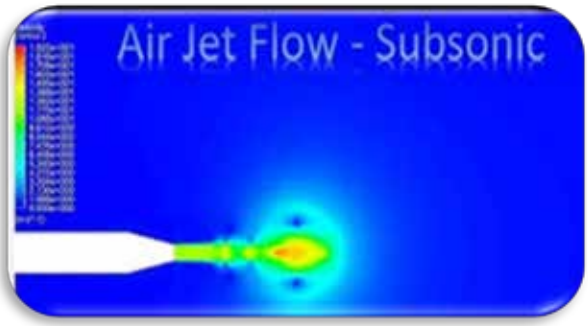
[Airplane wing mesh for CFD simulation | ANSYS tutorial]

This tutorial demonstrates how to mesh a commercial airplane wing to be used for a CFD simulation in Fluent from ANSYS, the mesh is tetrahedral with a set of inflation layers. The programs used to carry out the mesh is ANSYS mesh tool and Rhino 3D



[CFD ANSYS Tutorial - 3D Aircraft aerodynamics, CFD simulation | Fluent]

In this ANSYS CFD tutorial, I will demonstrate how to model and analyze the aerodynamics of a 3D aircraft or projectile. The aircraft will be flying at 1.15 Mach speed and the objective of this tutorial is to visualize the shock wave and calculate lift and drag using FLUENT ANSYS.



[CFD ANSYS Tutorial - Air jet flow simulation through a nozzle revisited | FLUENT]

I am revisiting this CFD ANSYS tutorial once again to produce a better flow result than the last attempt at creating a symmetry boundary condition at the center of the jet flow. The air ejected from the nozzle flows at a speed less than Mach 1 - subsonic flow and this transient CFD simulation will give us chance to look at the development of the flow with respect to time. I used the K Epsilon Realizable model. A Final result video animation follows the tutorial. Enjoy!

Arizona MQ9 supports Northern Strike 21

An Arizona Air National Guard MQ-9 Reaper parks on the flight line at the Alpena Combat Readiness Training Center, Mich., as its crew prepares to participate in exercise Northern Strike 21-2, Aug. 5, 2021.

Northern Strike is a National Guard Bureau-sponsored exercise bringing together more than 5,100 participants from various states and countries to the National All-Domain Warfighting Center.
(U.S. Air National Guard photo by Staff Sgt. Jay Grabiec)

Operation Pacific Iron 21 wraps up at Andersen

A U.S. Air Force F-22 Raptor assigned to Joint Base Elmendorf-Richardson, Alaska, takes off during Pacific Air Forces' Dynamic Force Employment operation at Andersen Air Force Base, Guam, Aug. 9, 2021. The operation focused on projecting forces into the U.S. Indo-Pacific Command's area of responsibility in support of the 2018 National Defense Strategy, which called on the military to be a more lethal, adaptive and resilient force. (U.S. Air Force photo by Master Sgt. Richard P. Ebensberger)

Red Flag Nellis: Night moves with B-52 crews

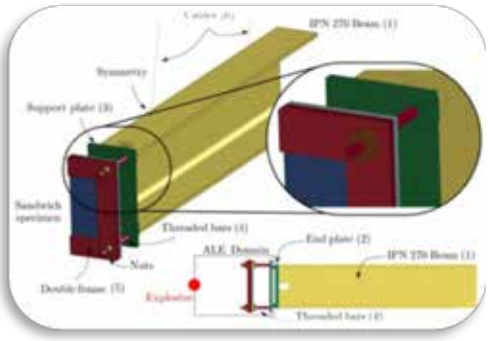
An F-16C Fighting Falcon assigned to the 64th Aggressor Squadron takes off for a night training mission during exercise Red Flag-Nellis 21-3 at Nellis Air Force Base, Nev., Aug. 2, 2021.

During the exercise, the 414th Combat Training Squadron works hand-in-hand with the 64th AGRS to create agile problem-solvers capable of correct decision-making under pressure from joint partners. (U.S. Air Force photo by Tech. Sgt. Alexandre Montes)

applied sciences

Publication Excerpt

MDPI



Cork Core Sandwich Plates for Blast Protection

Jesús Pernas-Sánchez, Jose A. Artero-Guerrero, David Varas
Department of Continuum Mechanics and Structural Analysis
University Carlos III of Madrid, Spain

Filipe Teixeira-Dias
School of Engineering
The University of Edinburgh, UK

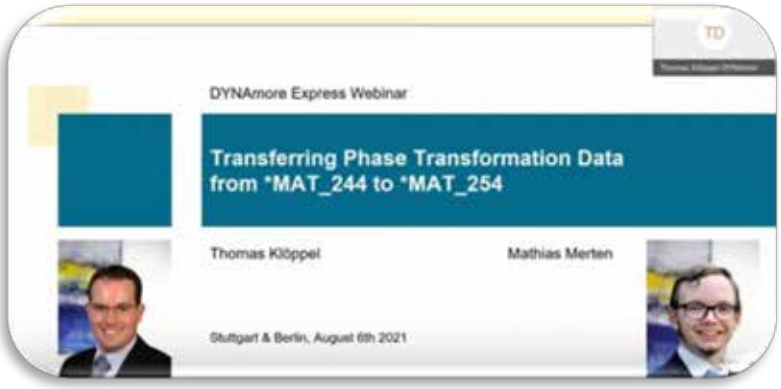
Figure 2. Numerical model of the 4-cable ballistic pendulum subjected to blast:
(1) IPN 270 beam, (2) 20 mm end plate, (3) 15 mm support plate, (4) threaded connecting bars, (5) specimen support

Abstract -

A numerical model is developed and validated to analyse the performance of aluminium skin and agglomerated cork core sandwich plates subjected to blast loads. Two numerical approaches are used and thoroughly compared to generate the blast loading: an Arbitrary-Lagrangian–Eulerian approach and the Load Blast Enhanced method. Both of the models are validated by comparing the numerical results with experimental observations. A detailed analysis of the sandwich behaviour is done for both approaches showing small differences regarding the mechanical response of the sandwich structure. The results obtained from the numerical models uncover the specific energy absorption mechanisms happening within the sandwich plate components. A new core topology is proposed, based on these results, which maximises the energy absorption capacity of the plate, keeping the areal density unchanged. A wavy agglomerated cork core is proposed and the effects of different geometrical parameters on the energy absorption are thoroughly analysed and discussed. The proposed optimised plate configuration shows an increase in the total absorbed energy of close to 40% relative to a reference case with the same areal density. The adopted optimisation methodology can be applied to alternative configurations to increase the performance of sandwich structures under blast events.

Keywords: cork; sandwich panel; blast wave; Arbitrary Lagrangian Eulerian (ALE); finite element analysis; impulsive loading; high-explosive; LS-DYNA software FEM

Presentation - YouTube DYNAmore GmbH



[Transferring phase transformation data from MAT 244 to MAT 254]

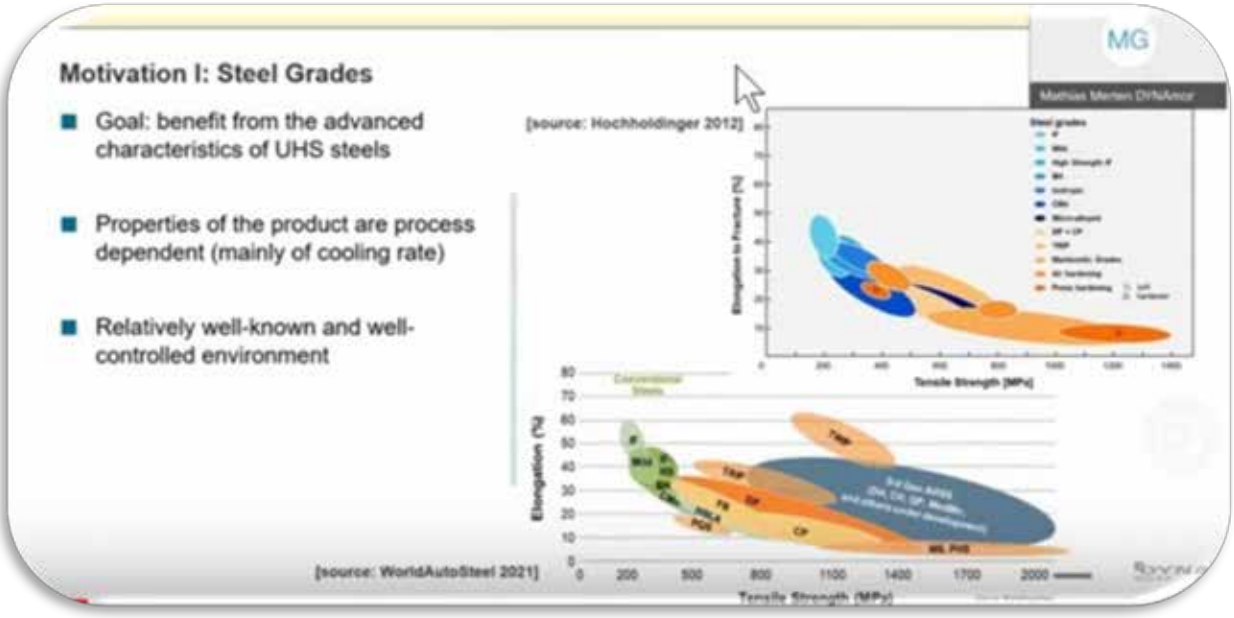
DYNAmore GmbH

Speaker: Thomas Klöppel
and
Mathias Merten

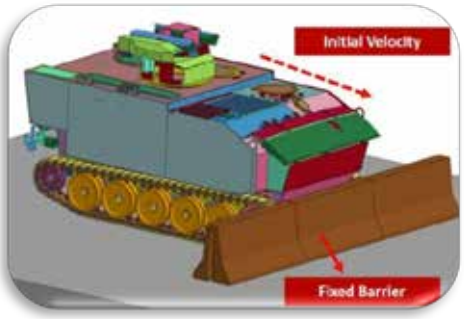
This webinar briefly introduces the material law *MAT_254 for thermal-mechanical coupled simulations of processes like press-hardening, welding or 3D-printing. Possible approaches to get the necessary data for the phase transformation kinetics modelled in *MAT_254 are shown. Based on virtual experiments with Mat_244 two different procedures are presented.

AGENDA

- Motivation
- Introduction to *MAT_244/*MAT_UHS_STEEL
- Introduction to *MAT_254/*MAT_GENERALIZED_PHASE_CHANGE
- Parameter identification or phase evolution in *MAT_254 based on *MAT_244
- Summary



12th European LS-DYNA Conf. 2019, Koblenz, Germany - © 2019 Copyright by DYNAmore GmbH



PDF - Determination of Impact Loads for a Tracked Military Vehicle during a Crash Scenario

B. Balaban (FNSS Savunma Sistemleri)

Abstract - In this study, crash simulation for a tracked military vehicle is performed and equivalent static and dynamic design loads are determined for a subsystem using LS-DYNA® and LS-OPT®.

Detailed finite element model of the track geometry, suspension system and the hull is created. In order to have an accurate vehicle suspension behavior; some verification simulations are conducted with another commercial multibody software and the suspension kinematic is optimized. Full vehicle crash simulations are performed firstly and stress results are obtained from the sub-system mounts of the vehicle. Afterwards, small scale simulation model of the sub-system is created and LS-OPT® is used to get equivalent static and dynamic acceleration loads using the stress results which are obtained from crash simulation.


Fig 1: Some operating conditions of military vehicles [1], [2]

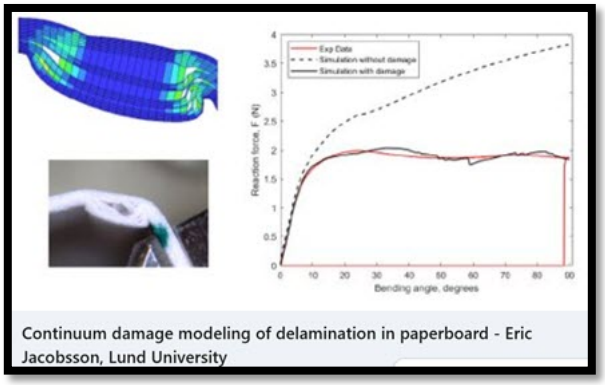
2 Introduction - Tracked military vehicles such as battle tanks and armored personnel carriers designed for high mobility capability for a wide range of terrain surfaces. These vehicles operate under harsh conditions and should withstand high impact loads at various fields as shown in Figure 1.

In order to have a successful final design in terms of strength and durability; structural engineers carry out various computer simulations during the design phase of the vehicle. Since the full vehicle crash simulations require extensive computational resources, mostly design iterations are solved with static or dynamic small-scale simulations.

The aim of this study is to determine static and dynamic designs load for a subsystem by using the stress results of a detailed crash simulation. In this study, LS-DYNA® is used for static implicit and dynamic explicit simulations of the vehicle and LS-OPT® is used for load determination. Firstly, full vehicle crash simulations are performed and stress results are obtained from the sub-system mounts of the vehicle. Afterwards, small-scale simulation model of the sub-system is created and LS-OPT® is used to get equivalent static load using the stress results, which are obtained from crash simulation.

Different crash scenarios are designed in order to determine the ultimate design loads that the military vehicles are exposed to under operational conditions. As shown in Figure 2, for some cases; the vehicle is crashed to different types of obstacles or fall on a flat or sloping ground at different speeds. In this study, rigid barrier crash scenario of the vehicle is investigated.

"Paperboard packaging plays a crucial role in how food is produced, processed, distributed due to the combination of recyclability and product safety. A vital part of converting the paperboard is the combination of creasing and folding of the paperboard into packaging, where the knowledge of the paperboard and its mechanical properties is of utmost importance. This issue was addressed in a Master's Thesis performed by Eric Jacobsson at Lund University. **Eric successfully combined a paperboard material model with an add-on damage model in LS-DYNA to improve the accuracy of the creasing and folding simulations."**



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Continuum damage modeling of delamination in paperboard

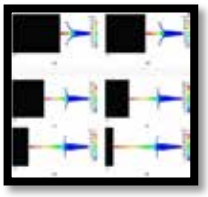
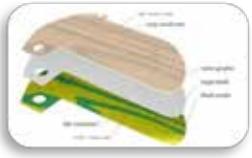
Jakobsson, Erik
LU (2021) In TFHF-5000 FHLM01 20211
Department of Construction Sciences - Solid Mechanics

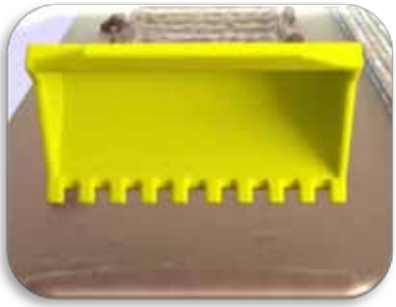
Abstract

This work concerns the creasing and folding of a continuum paperboard material model developed by Eric Borgqvist. Creasing is an operation that induces permanent deformation in the material, undertaken for the folding to be performed along a straight fold line without any in-plane cracks. The material model concerned is complex and involves a high degree of anisotropy, and it has earlier been proven to be able to predict many of the material behaviors observed during experimental testing. However, not all test setups are predicted accurately. One such setup is the folding of creased paperboard. This issue is considered in this work.

To give a short background of the concerned problem, it is stated that the paperboard is an anisotropic material which, in a simplified manner, can be viewed as possessing three fundamental material directions. The creasing and folding operations can be undertaken in both in-plane directions of the paperboard, which are called the MD- and CD-direction, respectively. It has earlier been observed that the material model quite well predicts the creasing and folding of uncreased paperboard. However, for the folding of creased paperboard, the material model does not predict the response in a sufficiently satisfying manner - the response is too stiff.

The scope of this work is to investigate if the folding of creased paperboard in the MD-direction can be predicted more accurately by including damage in the material model. The creasing and folding operations are simulated by using the commercial engineering software LS-DYNA, which is an advanced general-purpose simulation software. The introduction of damage is made as an add-on feature to the continuum material model via an LS- DYNA built-in software called eGISSMO. Damage is thus introduced on top of the existing material model. The results in this thesis show that, by introducing damage in LS-DYNA, it is possible to accurately predict the folding response of MD creased paperboard

	Aerodynamic drag in cycling team time trials **Bert Blocken, Yasin Toparlar, Thijs van Druenen, Thomas Andrianne,**
	Numerical Analysis and Experimental Test for the Development of a Small Shaped Charge **Piotr Malesa, Grzegorz Sławiński, Karolina Pęcherzewska**
	Computational ballistic analysis of the cranial shot to John F. Kennedy **C. Then, K. Nelson, T.J. Vogl, K.E. Roth**
	Cyclist aerodynamics through time: Better, faster, stronger **Fabio Malizia Bert Blocken**
	Numerical Simulation of the Forming Process of Veneer Laminates **David Zerbst , Christian Liebold, Thomas Gereke, Chokri Cherif**

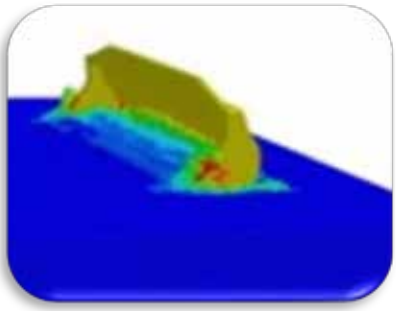


LS-DYNA SPH: Cohesive soil modeling,

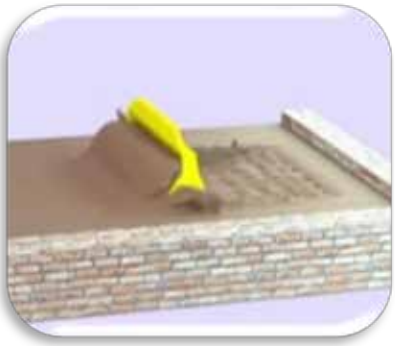
Blender visualization -

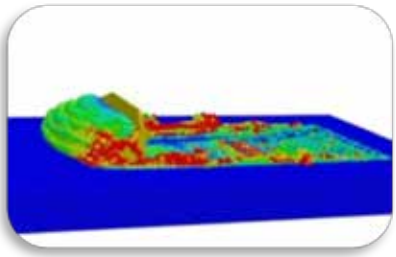
LS-DYNA Multiphysics Channel

A Moving Least-Squares based formulation is used to model large deformations of cohesive soil.



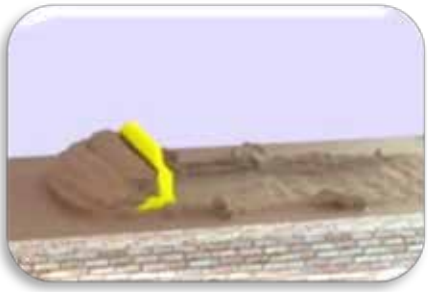
SPH simulation performed in LS-Dyna, surface generated in Paraview, and rendered in Blender through VisualSPHysics.





To find the input decks, please visit :
http://www.dynaexamples.com/

See all DYNA conference publications:
http://www.dynalook.com/



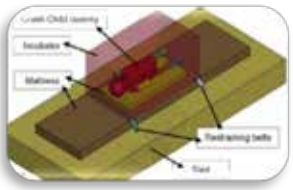
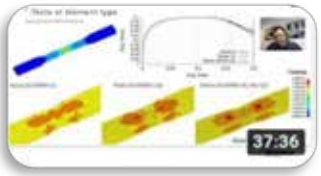
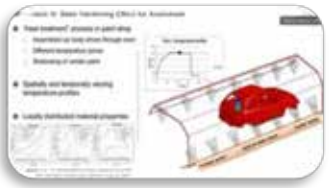
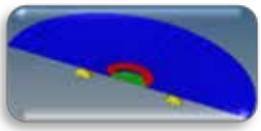
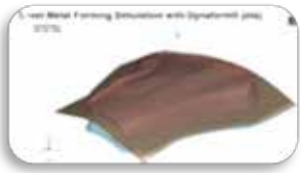
Old Rancher Award

to Bert Blocken

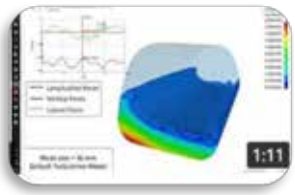
Photo is copyright to armyblackhawkpilot

Higher resolution on the website - Bee photo-bomb, Gamble Gardens, Palo Alto, CA

	8/30/2021 - Gotta love ranch living - NOT! You pick up some hay and a Tarantula falls out. Really beautiful - looked like he had black velvet on his lower back. NO, I did not kill it. SO, I carried him on the end of a shovel and moved him off the ranch into the ravine where he can dig a hole and be a happy spider. Ranch is living in a darn food chain! Yes, I shake out my boots before putting them on. EWWWWW spiders!!
	08/23/2021 - Here is the owl on top of the pole - he sits there every evening. I think this must be a favorite pole - I have taken a picture of a Vulture on it, a hawk, and my ravens love to sit on top of it. Now, last night I heard Mr. and Mrs. Owl hooting and then a screech! I thought an animal must be hurt in the arena so I went and looked - Nope, only a baby owl. I guess it can't hoot yet but wanted dinner and, wanting it right away!
	08/16/2021 - The quiet of sundown gazing out on the mountains and a CROW lands on the pole and starts cawing! WHAT? I am trying to relax and it is just cawing away. It didn't even bring me coffee!
	08/09/2021 - Well I watched Olympic throwing javelin - shot put - AND I want for the 2024 Olympics Manure Throwing. You take your bucket rake - fill it - and see how far you can throw it.
	08/02/2021- Our ranch coyote came home starved. Why he can't catch things to eat is beyond me - Not to worry that is not a dead critter he is eating - it is dog food I bought him. He will now do his usual routine of sleeping in the garden close to our house, eat dog food and gain weight and then he leaves!! THEN comes back looking like below! Well, at least he hasn't been shot by a neighbor yet. It is blurred because it was night and for once I kept a good distance.

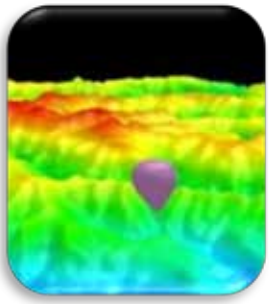
PAPERS		TUTORIALS	
	**A. Rabiee** Effect of side incubator padding on unrestrained child crash dummy under deceleration force		08/30 - Maik Schenke (DYNAmore GmbH) - Beyond FEA - The Element-Free Galerkin (EFG) Method
	**M. Lechner** Evaluation of simulation results using Augmented Reality		08/23 - Keynote - Recent activities in material modelling, by Dr André Haufe, DYNAMore GmbH
	**T. Fras** Armor Steel Impacted by Projectiles with Different Nose Shapes – Numerical Modelling © DYNAmore		08/16 - T Klöppel - M. Merten (DYNAmore GmbH) -Transferring phase transformation data from MAT 244 to MAT 254
	**H. Chen** Recent Developments in LS-DYNA® S-ALE		Oasys PRIMER tools for LS-DYNA parameters
	**C. Brokmann** A Model for the Stochastic Fracture Behaviour of Glass		K. Liebold, M. Merten (DYNAmore GmbH) - Robustness in metal forming with LS-OPT

	08/30/2021 MSC - Debunking Myth 2: Multibody Dynamics Simulation
	08/23/2021 BSIM - Why a vehicle sound simulator can help you define what should come after “vroom”
	08/16/2021 Rescale - The Script on HPC in the Cloud has Been Flipped
	08/09/2021 DYNAmore Agenda now available - 13th European LS-DYNA Conference 2021 (online and onsite) Oct 5 & 6, in Ulm - on Oct. 6 and 7



08/30/2021 - Of course my coffee cups never slosh. Now that doesn't mean other cups or tanks don't slosh so let's head on out to YouTube so you can learn about Sloshing!

Ameen Topa [3D ICFD: Sloshing in a partially filled tank]



08/23/2021 - Up, Up and Away - balloon coffee today flying high. Or we can stay on ground and drink it. I vote I stay on the ground and drink mine.

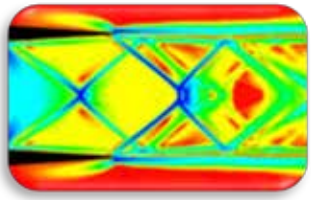
LANCEMORE - [LS-DYNA Sample Models Part2 No.006 Balloon Trip - "Land surface shape mesh" was created using "Points Cloud to Mesh" of LS-PrePost.]

08/16/2021 - So, pop quiz! Is it a soda bottle, a beer bottle or a coffee bottle. RIGHT coffee bottle! Everything is always coffee related. I guess I will have to serve my coffee in bottles with a cap!

DYNAmore GmbH [LS-TaSC optimized bottle opener]

08/09/2021 - GREAT NEWS (no it isn't I lost weight) It is M3d is free! I guess I will have to give free coffee?

M3d - The Free finite element analysis solution - a fully integrated Finite Element modeller, solver and post-processor in one small executable. YouTube How to use M3d Finite Element package to build a basic beam model.



08/02/2021 - Just posted above July. August being mailed to the list on August 4th. And don't miss the guest section this week with Alex Petit, ANSYS - I found it a great Key Note Presentation!
NOW on to Lancemore on YouTube.

Lancemore - [2d axisymmetric analysis of shock diamonds using CESE solver in LS-DYNA]

13th European LS-DYNA Conference 2021 Agenda

Town Secretary, "I refuse to post the Town Agenda. It's tedious to read - boring!"
"The 13th European LS-DYNA Conference 2021 Agenda is interesting."
"I have posted a few of the companies mentioned on a presentation."

The 13th European LS-DYNA Conference 2021 Agenda

Conference will take place on October 5 and 6, 2021 in Ulm and on October 6 and 7 online.

· 4a engineering · AC2T research · AIT · Aix Marseille Univ · Altair · Amir Kabir University · Applus Datapointlabs · Applus IDIADA · Arup · ATECA · Autoliv · BASF · BENTELER · Bertrandt · BETA CAE Systems · BIAS Engineering · BMW · Brigham Young University	· Btechc · CADLM · CASCATE · Chalmers University · Compositence · CoreTech System) · Coventry University · C-TEC Constellium Technology Center · Daimler · Dalhousie University · DLR · Dstl · DYNAMORE · DynaS+ · EDAG · Enodo · FCA · Ford Motor Company · Fraunhofer IGP)	· Fraunhofer IWM · Fraunhofer SCAI · German Aerospace Center · Gexcon France · GM · GNS · Gompute · GRS · Hamburg University · Hilti · Hirtenberger · Hochschule Aalen · Honda America · Honda Europ · Hövding · Humanetics · IBM · IKEA	· IMT · INSA · iSi Automotive · ITP Aero · IWC · Izmir Institute of Technology · Jaguar Land Rover · JSOL · Lightness by Design · LKR · LST · Marcopolo · Mercedes Benz · Mott Macdonald · NAFEMS · NASA · National Research Council Canada · NTNU
· OmniQuest · OSU · Paderborn University · Politecnico di Torino · Polymer Competence Center Leoben · Porsche · Roketsan · RWTH Aachen · SABIC · SAS-TEC · SCALE · Schwer Engineering · ShareFEA Engineering Technology · Stony Brook University · Swerim	· SIDACT · SSAB · Stellantis · Tailsit · TDW · Technische Universität Darmstadt · THM · thyssenkrupp · thyssenkrupp Marine Systems · Tiwa Quest · Tokura Simulation Research Corporation · TU Braunschweig · TU Dresden · University at Buffalo	· TU Kaiserslautern · TUM · Turkish Aerospace Industries · Université de Toulouse · University Hospitals Coventry and Warwickshire · University of Applied Sciences Kempten · University of Applied Sciences Upper Austria · University of Birmingham · University of Girona · University of Kassel · University of Patras	· University of Stuttgart · University of Texas · University of the German Federal Armed Forces Munich · University of Windsor · University of Wuppertal · Urmia University · Volvo · Vortex Engineering · Whirlpool of India · Whirlpool Technical Center · Xitadel

Month	Start Date	Organized by	Conference - Symposium - Event
Sept.	12	SAE	15th International Conference on Engines & Vehicles
Sept.	28	Magna Powertrain	Electrification & All-Wheel Drive Congress - EAWD'21
Sept.	29	ARAI	Symposium on International Automotive Technology 2021
Oct.	05	DYNAmore	13th European LS-DYNA Conference 2021
Oct	12	Hexagon	HxGN LIVE Design & Engineering 2021
Oct.	19	Carhs	Automotive CAE Grand Challenge
Oct.	19	ESI Goup	9th OpenFoam Conference 2021
Oct.	25	Nafems	NAFEMS World Congress
Nov.	11	Kostech	Kostech Users Conference 2021 Seoul Korea
Nov.	17	EnginSoft	37th Int'l CAE Conference and Exhibition - EnginSoft
Dec.	02	Cadfem Medical	Cadfem Medical Conference 2021

Mark Palmer - Medtronic, USA - The Evolution of Modeling & Simulation in Healthcare: Medical Device Perspectives

Mark Palmer, MD, PhD is a Distinguished Scientist in the Core Technologies group within Corporate Strategic Scientific Operations at Medtronic, plc.

(Excerpt) In his current role, Mark leads an internal team of advanced modeling and simulation consultants servicing the global enterprise, manages external collaborations, and leads the strategy and platform technologies for realistic human simulation.

- …Mark is passionate about advancing human simulation, virtual patient technologies, and digital evidence standards for the medical device industry.
- …Mark's expertise includes fully coupled multi-scale finite element methods, large deformation tissue mechanics and modeling, and clinical image-based modeling techniques.
- …In 2020, Mark was named a Medtronic Technical Fellow for his outstanding contributions to the company's technical excellence.

LAST chance for our Town Police to learn dancing!

Let's all give a big shout out - "Officer White GitUp Challenge"

Officer White GitUp Challenge

"Finally got around to making this video. Was more fun than I thought it would be.

Good vibes and have an awesome day."

Fire notice: The request was for fire doors, not doors to be used for fire wood!
Please transport the 3,000 scrap wooden doors you purchased to the recycle yard.

Numerical methodology for thermal-mechanical analysis of fire doors

Alessandro Bozzolo, Carolina Ferrando
D'Appolonia S.p.A - **RINA Group**
Angelo Tonelli, Enrico Cabella2
RINA Group

Fig.1: Standard fire test for one specimen barrier including a pass door – Exposed side (left side) and unexposed side (right side) after fire resistance test

1 Summary - The certification process of a fire door implies that the structure is subjected to a standard fire test, to evaluate its resistance to thermal load. In particular, the door must fulfil specific requirements, such as, that the gaps among the door labyrinths and frame are able to stop flame propagation and that the mean and maximum temperature on the unexposed surface does not exceed defined values. The present paper describes the numerical methodology used to assess the fire performance of large fire doors (single-leaf and double-leaf sliding doors) commonly used for civil/industrial applications, having length and height of the order of 15-25m and 7-8m respectively. These fire doors cannot be tested at laboratory scale, due to their size, and the only way to verify their structural integrity when subjected to fire is via numerical simulations. The developed methodology aims at verifying thermostructural response of fire doors when subjected to fire conditions for 60/90/120 minutes, starting from results of laboratories tests on specimen fire doors. The aforementioned methodology, based on the use of the Finite Element Method (FEM), foresees, first, the implementation of a coupled thermalstructural analysis on the 3D FE model of the specimen fire door, to predict the evolution of the distribution of temperature and deformations, to be validated with the values obtained from a set of instruments during the experimental tests. Then, the second step is the thermal-structural analysis on the FE model of the full scale fire door using the same materials and simulations' parameters used for the specimen fire door's model. The experience carried out for different configurations of door for various applications confirms the procedure is valid and reliable. **Key words:** Fire resistance; fire modelling; finite element; furnace test.

Acknowledgments - The publication of data and information included in the present paper have been kindly authorized and made available by MEVERIN, designer and manufacturer of certified fireproof closures and fixed and movable elements for fire compartmentation.

3 Introduction - Fire doors are used as passive fire protection systems. In order to fulfil and guarantee that functionality is not compromised, they are subjected to certification processes. In general, the certification process of a fire door implies that the structure is subjected to a standard fire endurance test, to evaluate its resistance to thermal load. In particular, the door must fulfil specific requirements according to the standard used as reference (e.g. gaps among the door labyrinths and frame, mean and maximum temperature on door unexposed surfaces), so that to be able to stop flame propagation and maintain acceptable temperatures on the unexposed surface. In the standard test, the fire doors are subjected to a heat flux from gas burners based on a standard time-temperature curve [1]. During a standard fire-endurance test, data such as thermocouple measurements on the unexposed side of the door, deflection measurements at selected locations and visual observations are gathered

Equipment Dept. note: We didn't ask for nets to catch a swarm of bugs. We asked for a swarm of sniffy bugs. The town secretary thought she smelled a gas leak, and we had to evacuate the building. The nets won't help - someone return the nets and get us the sniffy bugs.

Full Professor
Micro Air Vehicle laboratory at TU Delft

YouTube Swarm of autonomous tiny drones can localize gas leaks By Guido de Croon

We have developed a swarm of tiny drones that can autonomously localize gas leaks in indoor environments.

A gas leak in a large building or at an industrial site is difficult to find. Human firefighters cannot see the gas, so they have to use specific instruments for detecting it. Finding the gas leak may take a long time, while the firefighters are risking their lives.

The main challenge was to design an Artificial Intelligence that would fit in the drones' tight computational and memory constraints. In order to tackle this challenge, we have drawn inspiration from nature. This was a joint study with researchers from University of Barcelona and Harvard University,

Paper - Sniffy Bug: Fully Autonomous Swarm of Gas-Seeking Nano Quadcopters in Cluttered Environments

**Bardienus P. Duisterhof, Shushuai Li, Javier Burgués,
Vijay Janapa Reddi, Guido C.H.E. de Croon**

Nano quadcopters are ideal for gas source localization (GSL) as they are safe, agile and inexpensive. However, their extremely restricted sensors and computational resources make GSL a daunting challenge. In this work, we propose a novel bug algorithm named `Sniffy Bug', which allows a fully autonomous swarm of gas-seeking nano quadcopters to localize a gas source in an unknown, cluttered and GPS-denied environments. The computationally efficient, mapless algorithm foresees in the avoidance of obstacles and other swarm members, while pursuing desired waypoints. The waypoints are first set for exploration, and, when a single swarm member has sensed the gas, by a particle swarm optimization-based procedure. We evolve all the parameters of the bug (and PSO) algorithm, using our novel simulation pipeline, `AutoGDM'. It builds on and expands open source tools in order to enable fully automated end-to-end environment generation and gas dispersion modeling, allowing for learning in simulation. Flight tests show that Sniffy Bug with evolved parameters outperforms manually selected parameters in cluttered, real-world environments.

Welcome to our Convention Center exhibit hall & Coffee Cafe. Coffee, of course vanilla, hazelnut, and other flavors are courtesy of our favorite coffee shop (not the rival coffee shop).

MingYao Ding

Founder - CEO
Singularity Engineering LLC

Singularity Engineeering LLC

July 30th announcement: "Exciting Day! Proud to announce we (Singularity Engineeering LLC) are merging with Ozen Engineering, Inc. and Mallet Technology.

Building a team with unmatched history, vastly expanded reach and the same dedication to the success of our customers! A big thanks to our customers, partners and friends for your support! I look forward to providing more to help help you succeed."

Georgios (Yiorgos) Chrysomallos

Director General at cad-experts.gr® SKG
Thessaloniki Metropolitan Area

Cad-experts - We are specialist, with over two decades of experience, mechanical engineers and industrial designers, automation engineers, welding engineers and machinists.

In addition, we are established since 1978 till now, in the field of mechanical engineering constructions and repairs, predictive maintenance …

Marco Evangelos Biancolini
RBF Morph CTO & Founder - Associate Professor of Machine Design

The aim of the RBF Morph technology is to perform fast mesh morphing using a mesh-independent approach based on state-of-the-art RBF (Radial Basis Functions) techniques.

The use of such Technology allows the CFD user to perform shape modifications compatible with the mesh topology, directly in the solving stage, by just adding one single command line in the input file.

Matt Barsotti

Senior Engineer II

Protection Engineering - Engineering services and products for mitigation and protection against hazards, extraordinary events and attacks for hundreds of industry clients and dozens of government, and military customers worldwide.

Our goals remain the same as when the organization was founded: to offer the services of highly capable and motivated staff to industry and government for the analysis, design and development of systems, materials and tools to protect people from these hazards, extraordinary events and attacks. and to partner with our customers in these efforts.

YouTube Booths - August videos

Current videos in August (plus or minus one week)

Ameen Topa | DYNAMORE | XSCIENCEY | Oasys LS-DYNA

CADFEM
M3D Finite Element
Lancemore JP
Autodesk Fusion 360

Free Coffee for Guests visiting our exhibitor booths

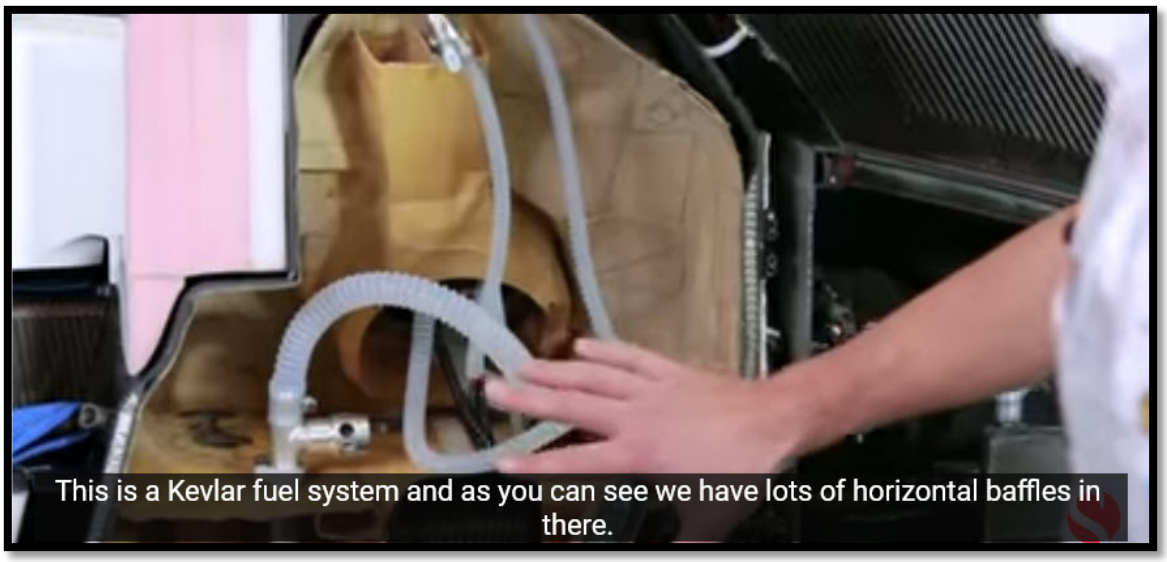
Kaizenat
MSC.Software
METARIVER
NASA

CAE Solutions | CFD Today | ROCKY DEM | LEAP Australia

We found this on social media thanks to Marco Evangelos Biancolini & Marcelo Magiero Webster

Cutaway F1 Race Car - The Original Video - Sauber F1 Team

For two years the Sauber F1 Team mechanics have been using their downtime to slice a Formula One racing car lengthwise down the middle with the precision of true craftsmen. Chief Designer Matt Morris quite literally gets underneath the skin of the F1 car, pointing out where and how the individual components are located within the chassis. Everything is packed in pretty tightly. Sergio Pérez is also on hand to demonstrate the driver's seating position.



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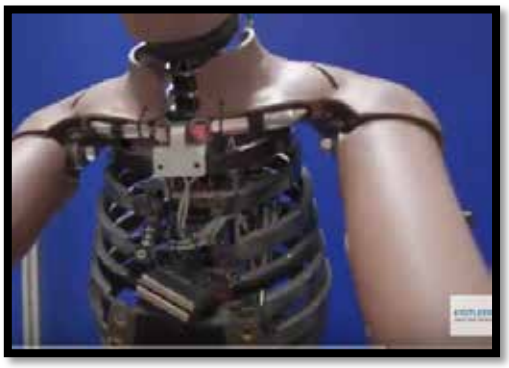


Trust our decades of competence and experience in the field of sensor technology for crash tests.

Everything from one single source:

- Dummy hardware
- Accelerometers and angular rate sensors
- Load cells for force and torque measurement
- 3D thorax and abdominal displacement measurement
- Integrated DTI technology
- Test preparation and execution software
- Dummy certification and calibration of the sensors
- Maintenance contract
- Spare parts delivery

Kistler Dummy - (YouTube)

Alexander Schmitt,
Head of product & project development

"About six years ago Kistler took the decision to actually develop and produce the THOR dummy in-house."

THOR-50M crash test dummy – the complete solution from one single source (website)

With the first anthropomorphic test device (ATD) developed by Kistler at the Heidelberg location, we offer you a complete solution from one single source: this comprises not only the most advanced crash test dummy — including the entire measuring chain from sensor to integration to data acquisition — but also the responsibility for the entire system.

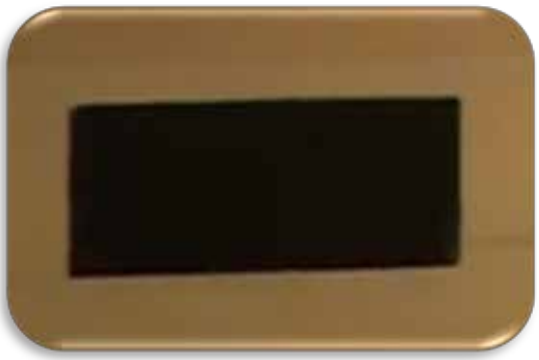
To meet the high requirements for maximum process reliability, we have optimized the handling of our THOR-50M (Test Device for Human Occupant Restraint) dummy in such a way that test preparation as well as measuring data acquisition during the crash test can be performed as smoothly, simply and free of errors as possible.

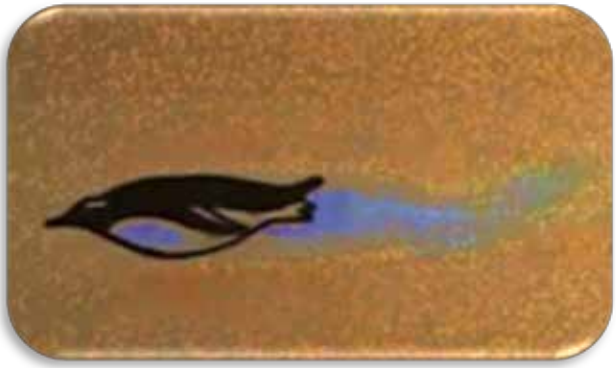
Rely on our DTI technology, which is built directly in and is tailor made for the dummy: thanks to this technology, analog data is digitized directly in the sensor and transferred directly to the data recorder integrated in the spine box of the dummy via a secure bus connection.

After performing a test with just a single cable via the on-board data acquisition system, which records all sensors installed in the vehicle, the stored data is transferred to the host computer of the control center in a final step. The result: high reliability, high data quality and maximum flexibility.

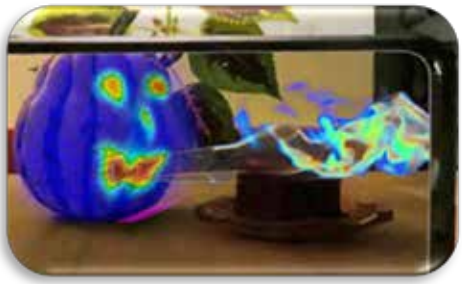
The Kistler THOR-50M Dummy fulfils the requirements in accordance with TB026 (EuroNCAP specifications and criteria for THOR-50M) and since May 2020, Kistler is officially listed as supplier for this dummy for EuroNCAP testing.

Never mess with a penguin. ~ without a simulation - an engineer's perspective
"Never mess with a .....??? When people ask, what a simulation engineer does, it is very difficult to explain in one sentence." "When you show it in a simulation video, it is immediately understandable and you see things from a different perspective. Here you can see an example of a movement with minimal resistance and minimal energy input. At a speed of 2.5 m/s through water. Never mess with a ...??? Watch to the end! CFD simulation is so cool."





Get Ready for Halloween
Why Carve when you can simulate?
an engineers perspective - episode 7
Halloween from a different perspective, the simulation perspective!

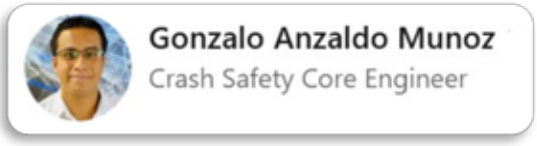


CADFEM MEDICAL - Paving the way to personalized medicine with simulation.
A comprehensive overview and practical examples.
(VIMEO) - Avicenna Alliance webinar

Hosts: Roberta Maggi and Thierry Marchal
(Note from our town - HI Thierry!)

- Take the chance and get insights on the technologies and opportunities of the future in medicine.
- Talk to our CEO Jan Hertwig - he will be happy to answer your questions and support you in all aspects of simulation in medical technology.

Found on social media thanks to Diego Azgar Pérez & Fabian Leonov S. Lopez



"Total Human Model for Safety (THUMS) is a human FE model developed by Toyota Motor Corporation and definitely, represent the future of Safety and Occupant protection simulations."

"Version 6 aims to simulate the kinematics and injuries of the human whole body that includes the brain and internal organ with and without muscle activation, try it! On the website you can find some pictures of the whole body, the left knee and the brain."

"The way of modelling the muscles, bones and internal organs is impressive, you can download the FE models at Total Human Model for Safety (THUMS)"

Toyota Website Information:

Total HUman Model for Safety

Virtual human body model for analysis of vehicle collision-related injuries.

Toyota Motor Corporation makes Total Human Model for Safety (THUMS) software freely available as part of its efforts toward a safe mobility society. THUMS is a virtual human body model software program for computer analysis of human body injuries caused in vehicle collisions. Free access to THUMS, and subsequent use by a wider variety of users, is expected to enhance vehicle safety.

What is THUMS? Total Human Model for Safety (THUMS) is a human body finite element model jointly developed by Toyota Motor Corporation and Toyota Central R&D Labs., Inc. THUMS is capable of simulating human body injuries such as bone fracture, brain and internal organs damage in vehicle collisions. Compared to the physical crash dummies commonly used in vehicle collision tests, THUMS is able to analyze collision-related injuries in more detail because it precisely represents the shapes and durability of human bodies.

THUMS has continually evolved to add a range of models with different genders, ages and physiques that include skeletal structures, brains, internal organs and muscles.

Found on Social Media thanks to Amit Nair

MIT Solar Electric Vehicle Team wins 2021 American Solar Challenge - Student-designed Nimbus solar car travels 1,109 miles in five days, averaging 38.4 miles per hour.

Elizabeth Durant | Office of the Vice Chancellor - Publication Date: August 12, 2021

The MIT Solar Electric Vehicle Team poses with Nimbus, their solar car, after winning the 2021 American Solar Challenge. Credits: Photo courtesy of MIT SEVT.

After three years of hard work, the MIT Solar Electric Vehicle Team took first place at the 2021 American Solar Challenge (ASC) on August 7 in the Single Occupancy Vehicle (SOV) category. During the five-day race, their solar car, Nimbus — designed and built entirely by students — beat eight other SOVs from schools across the country, traversing 1,109 miles and maintaining an average speed of 38.4 miles per hour.

Held every two years, the ASC has traditionally been a timed event. This year, however, the race was based on the total distance traveled. Each team followed the same prescribed route, from Independence, Missouri, to Las Vegas, New Mexico. But teams could drive additional miles within each of the three stages — if their battery had enough juice to continue. Nimbus surpassed the closest runner-up, the University of Kentucky, by over 100 miles.

“It’s still a little surreal,” says SEVT captain Aditya Mehrotra, a rising senior in electrical engineering and computer science. “We were all hopeful, but I don’t think you ever go into racing like, ‘We got this.’ It’s more like, ‘We’re going to do our best and see how we fare.’ In this case, we were fortunate enough to do really well. The car worked beautifully, and — more importantly — the team worked beautifully and we learned a lot.”

Team work makes the dream work - Two weeks before the ASC race, each solar car was put through its paces in the Formula Sun Grand Prix at Heartland Motorsports Park in Topeka, Kansas. First, vehicles had to perform a series of qualifying challenges, called “scrutineering.” Cars that passed could participate in a track race in hopes of qualifying for ASC. Nimbus placed second, completing a total of 239 laps around the track over three days (equivalent to 597.5 miles).

In the process, SEVT member and rising junior in mechanical engineering Cameron Kokesh tied the Illinois State driver for the fastest single lap time around the track, clocking in at three minutes and 19 seconds. She’s not one to rest on her laurels, though. “It would be fun to see if we could beat that time at the next race,” she says with a smile.

Nimbus’s performance at the Formula Sun Grand Prix and ASC is a manifestation of team’s proficiency in not only designing and building a superior solar vehicle, but other skills, as well, including managing logistics, communications, and teamwork. “It’s a huge operation,” says Mehrotra. “It’s not like we drive the car straight down the highway during the race." …

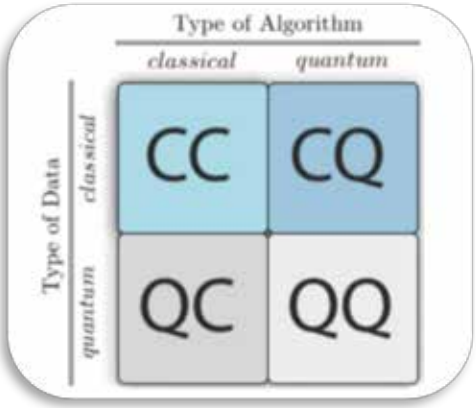
Hybrid Quantum Classical Algorithms

Welcome to the |H(y)Qua> website! First, let me explain what the name of this site means and represents.

This site is dedicated to research related to hybrid quantum-classical algorithms.

In quantum computing, quantum states are represented as vectors in a complex Hilbert space using so-called “braket” notation. For example, a row vector, also called a “ket” vectors, is denoted |a>. That explains the initial vertical line and the final right angle bracket around H(y)Qua.

The H(y) is related to one of the most promising class of hybrid quantum-classical algorithms called variational quantum algorithms (VQAs). In VQAs, the initial quantum state, typically called the ansatz, is often parameterized by a vector of variational parameters. That explains the H(y) where H is the state and y is the parameter vectors. Given an ansatz, VQAs then proceed for form a Hamiltonian related to the problem being solved, e.g. quantum chemistry, whose measurement represents a cost function which we seek to minimize using an optimizing algorithm running on a classical computer.

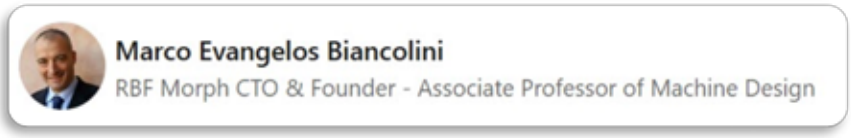


The Qua part of the name has a dual meaning. First it is short for Quantum Algorithms. Second, it is related to QUA which is a new quantum computing programming language developed at Quantum Machines (QM). It is based on Python and serves as an interface to QM’s OPX hardware devices enabling pulse level control of qubits and qubit operations.

This site is part of a brand new research collaboration between the Technion – Israel Institute of Technology’s CFDLAB, directed by Prof. Steven H. Frankel and two quantum computing hardware labs at the Weizmann Institute of Science. Specifically, the trapped-ion lab of Prof. Roee Ozeri and the quantum circuits lab featuring, among other research areas, superconducting qubits, of Prof. Serge Rosenblum.

The goal of the research is to bridge the gap between applications of quantum computing software and actual quantum hardware. Specifically, the goal is explore the combination of VQAs with quantum optimal control at the pulse level mediated by QM’s OPX/QUA middleware system.

Links for more information can be found on the website



"Learn how HSL srl, University of Rome "Tor Vergata" and RBF Morph deployed an automated shape optimisation HPC service that allowed to boost the performances of a Automobili."

PDF - Fortissimo Success Story **Having access to the RBF Morph morphing tool combined with CFD analysis powered by HPC opens a wide range of business opportunities.** In parallel with existing rapid prototyping services, HSL can now propose to its clients alternative component designs corresponding to appropriate performance indicators.

Fortissimo is a collaborative project that enables European SMEs to be more competitive globally through the use of simulation services running on a High Performance Computing cloud infrastructure. The project is coordinated by the University of Edinburgh and involves 123 partners including Manufacturing Companies, Application Developers, Domain Experts, IT Solution Providers and HPC Cloud Service Providers from 14 countries. These partners are engaged in 53 experiments (case studies) where business relevant simulations of industrial processes are implemented and evaluated. The project is funded by the European Commission within the 7th Framework Programme and is part of the I4MS Initiative.

The Company - HSL is a hi-tech centre for the development of new products. With hundreds of products handled over the years, the company has developed experience with materials, traditional and innovative manufacturing technologies, prototyping, dies and moulding. HSL is an SME and a market leader in both Additive Manufacturing and the rapid production of prototypes…

The Challenge- Despite the clear advantages of Additive Manufacture, current design tools have been developed for traditional manufacturing procedures and are not flexible enough. This limits the potential of 3D printing. CAE tools are able to suggest new shapes and accurately predict the behaviour of components making them a natural choice in the design chain. However, and especially when dealing with complex Computational Fluid Dynamic (CFD) simulations, shape optimization can be a prohibitively expensive task for SMEs. The objective of this case study is the development of an optimisation service. The goal is to demonstrate the validity of such a service by optimising a prospective industrial artefact, a Lamborghini 12-cylinder airbox…

The Solution - Numerical grid parameterisation using a mesh morpher avoids the time consuming task of mesh generation (that can take up to 70% of the total analysis cost). Access to CFD simulation through the Fortissimo HPC Cloud allows a further speed-up in calculation times reducing the time to market and to return on investment…

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(UK)

www.oasys-software.com/dyna/

DYNAmore
(Germany)

www.dynamore.de

CADFEM GmbH
(Germany)

www.cadfem.de

University of Rome
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(Italy)

https://en.uniroma2.it

Ozen Engineering
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(Belgium)

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Wipro
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Graphics Courtesy of Vecteezy

Goodbye and Come Back Soon

Our Town Salutes our US military and military of friends of the US.

QUIZ Credit - Correct Answers A-C you are served doughnuts!
Correct Answer D you are served Coffee & Doughnuts!!!!

A. Correct. The old Cattleman's prize chicken statue
B. Correct. A German siege howitzer
C. Correct. Callaway Golf
D. I value my life. If you checked D - delete it!!