FEA - CAE Not to Miss & More

September 2025 ISSN 2694-4707

Town Hall Meeting in the town that almost exists
Town Plaza: Drive slowly – Galloping Prohibited

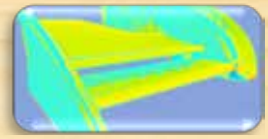
Auto - TATA

Airport – Rocket Lab

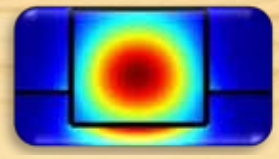
Ryan - Leszek Flis

Racer - Aramco

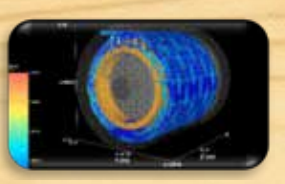
Marco - RBF



Madhukar - CADFEM



Metin - OZEN



Glace - Glaciologist

Abhinav - MyPhyscisCafe

Marta – OASYS

Mi&Ke – Nightly News

Jenson – DFE Tech

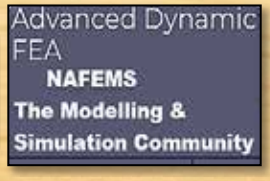
Markus - CADFEM

Tips
6 - 10

Jeff - SIEMENS

Brent – GOENGINEER

Marnie – NAFEMS



Legal - the shortened version (it was too long to read)

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Editors: Anthony, Art, Marnie, Marsha, Sabyl

Town Pretend to be Editors:

The Old Rancher	No one in town knows his name. You yell "Hey, Old Rancher."
The Old Pilot	No one in town knows his name. You yell "Hey, Old Pilot."
The Old Racer	No one in town knows his name. You yell "Hey, Old Racer."
Racer's Daughter	The whole town knows her name. You yell "HEY, Slow down!" They are all family - strange family

Names, & characters of Al visitors and Al editors are the products of imagination. Any resemblance to actual persons, living or dead, or actual events is purely coincidental.

We will always remember

FEANTM Town Always Salutes:

- Our US military, NATO and Friends of the US & NATO - First Responders, Police, Fire Fighters EMT's, Doctors, Nurses, SWAT, CERT Teams, etc.
- We salute engineers, scientists, developers, teachers AND students because without them we would not have technology.

USA & allies of the USA

Parking & Coffee are free.

R & D - Camping - Town Map

Horse Trail → Yield right of way to horses

R&D Technology Business Park

RV CAMPING
Park in any vacant camping site

CADFEM · OFETECH · d3VIEW · OZEN · ENGINSOFT · AUTODESK · Oasys · DYNA MORE · DYNAlook · Ansys · Applus DatapointLabs · rescale

Town Hall & Library

Lawrence Livermore National Laboratory

rbf · MEDITATE · rbf.LAB · LIVGEMINI

The Old Rancher

Race Track

Airport

Sports Stadium

- **Logos represent companies/academia/research with solutions for today's world.**
- If you wish to have yours removed, kindly inform us at **feaanswer@aol.com**.
- Proceeds from the auction of your building will be allocated to the coffee budget.
- The map is subject to change - building sites will be rotated accordingly.

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The websites will have the complete information and high-resolution graphics

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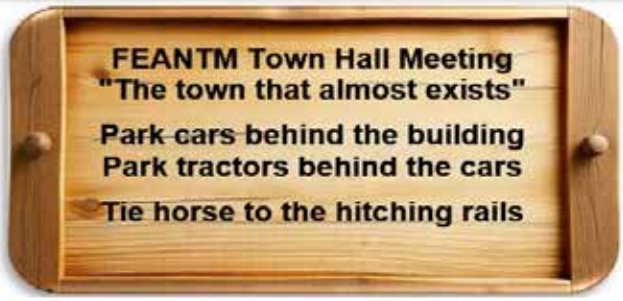
Welcome to our County, Town Hall Meeting & Announcements

Town Motto: Creation is born from trying. If it doesn't work, learn & try again. You will succeed. Ideas, simulations, medical cures, creativity wouldn't exist without the passion to keep trying.
You've Got This



Announcements from residents not to miss

Marta: Don't miss our case study of the 1915 Çanakkale Bridge. The bridge connects communities across the Dardanelles Strait in Turkey.

Metin: Our resource area has our experts' insights, and teachings. They'll guide you how to navigate the new technologies and review the existing ones.

Kerim: Simpleware users at the Royal Nat'l Orthopaedic Hosp. (RNOH) use 3D printed custom implants to reconstruct severe bone defects and restore lost bone structures.

Abhinav: Courses and free resources. Don't miss these industry leaders to enhance your knowledge, skills, and confidence.

Madhukar: To go from prototypes to production with a foundry, Aryballe had to redesign its photonic chip to adapt it to materials and processes.

Marco: rbfCAE allows CAE users to perform shape modifications compatible with the mesh topology directly during the solving stage, by adding a single command line to the input file.

Jenson: Over this year we offered many YouTube webinars. Join us on YouTube and learn new skills, or review what you've already learned.

Jeff: EVs are a vital part of the push towards sustainability and offer drivers significant savings on fuel. But If replacing the battery doesn't achieve a reasonable lifespan, emissions savings are negated.".

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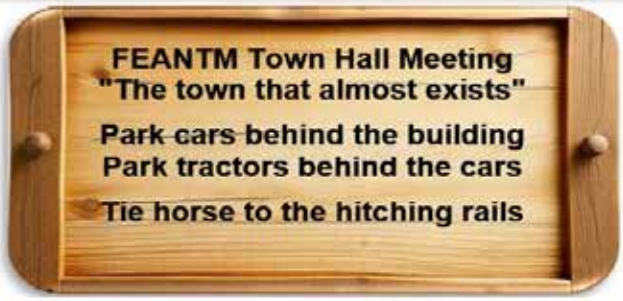

Our publication features a diverse mix of papers, articles and simulations from various fields. We strive to integrate new and interesting content for your enjoyment and learning.

Hello and welcome to FEANTM's September 2025 edition. Thank you to all of our contributors and readers. As always, we have an abundance of informative and interesting articles. Fall is just around the corner and we will soon be enjoying the fall foliage. For those of you who choose to enjoy the fall colors via your motorcycles, be sure to look at **Adam's article from the Dept. Mechanical Engineering, Military Inst. Science & Tech., Bangladesh**

For those of you who love learning **Abhinav in the student library section shares an article connecting you with courses and free resources.**

This month I want to bring your attention to the LS-DYNA Multiphysics Channel and the ICFD LS-DYNA simulation. The FEM/CFD coupled simulation shows moist air reaching saturation conditions at the cold wall in a room. The LS-DYNA Multiphysics Channel now hosts 139+ videos and has 1.85k subscribers. The channel has substantial examples of LS-DYNA simulations. You will find this article under Abigail.

We welcome Leszek Flis from Poland. He is affiliated with the Polish Naval Academy, Faculty of Mechanical Engineering & Electrical Engineering. He has submitted an article focusing on shipbuilding. The article addresses full floating structure underwater explosion with pulsation and cavitation effect FEM simulation. You will find this article under Ryan. We know this will be of great interest to all shipbuilding companies.

For those of you who like quirky people and fun, be sure to stop by The Town Comic Blog Chronicles where there is a lively group of people and never a dull moment.

Thank you for being part of the FEANTM+ community.
Best regards, Marnie B. Azadian, Ph.D., Managing Editor

Welcome to our County, Town Hall Meeting & Announcements

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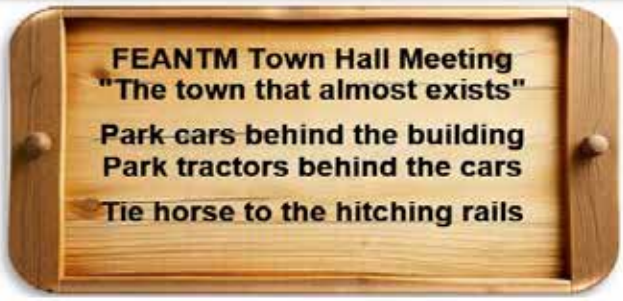


Yes, it's true, I have my own announcement page. SO, join me as I drive my tractor around the internet and live in the town that almost exists. (located near Livermore, CA)

At our coffee meeting, we all grabbed to-go cups and headed for our tractors and bulldozers to start the new train station build.

TA DA DA, we have our first train station and featured LS-DYNA paper.

Then, on a caffeine and sugar high, we rebuilt the Exhibit Center at the 5 C's, and we have our first four booth exhibits! Gotta love coffee, demolition, and rebuilds!!

A round-up of what's going on in our town that almost exists.

Our local news channel, with original reporting by Mi (news raccoon) & Ke (news coyote), interviewed **Mark. R. Lytell of OZEN to explain how engineered structures are constantly subjected to dynamic forces throughout their lifecycle**. FEANTM town has many structures, so it's essential!

Glace is our off-site Glaciologist who hangs out in COLD places! Join Glace exploring the **YouTube video by Yury Novozilov, An icebreaker with attached pontoons descent from slipway.**

On a caffeine sugar-high we rebuilt the Exhibit Center at the 5 C's and we have our first 4 booth e**xhibits! rbfMoprh – SYNOPSYS – OASYS – OZEN**

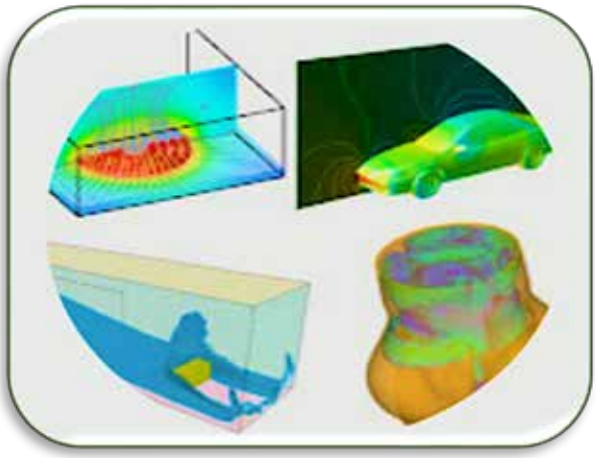
Gotta love coffee, demolition and rebuilds (and it burns calories)

And thanks, Jessika - Our picture titles did blend into the articles. It made us wonder, "WHAT, where did this come from?" I had our younger editor think, and as always, she suggested pink (luckily pink was too light), SO she suggested purple! We went with purple**.**

Our visiting resident, ILU, is soon heading to Germany for the Oct. 28-29th 15th European LS-DYNA Conference, at the Ansys EMEA Transportation Summit. It is located at the BMW Welt in Munich. Additionally, RBF Morph, will be present at the ANSYS EMEA Transp. Summit specializing in morphing technologies - among them being optimizing crash and safety simulation by coupling morphing with LS-DYNA.

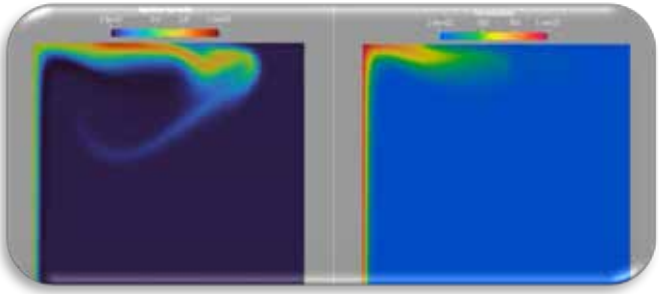
Each month I'll share a simulation from the LS-DYNA Multiphysics Channel.

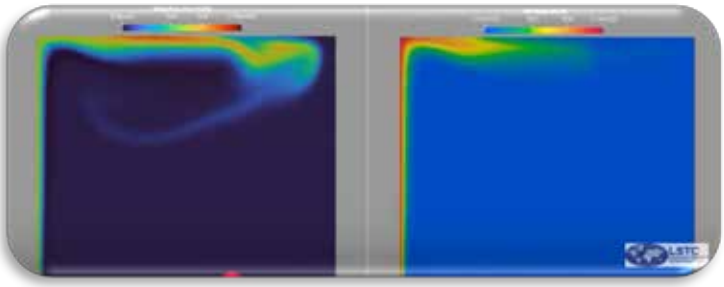
The LS-DYNA Multiphysics Channel on YouTube started in 2012. Now hosting 139+ videos and 1.85K subscribers. It has substantial examples of simulations how LS-DYNA is used in industries.

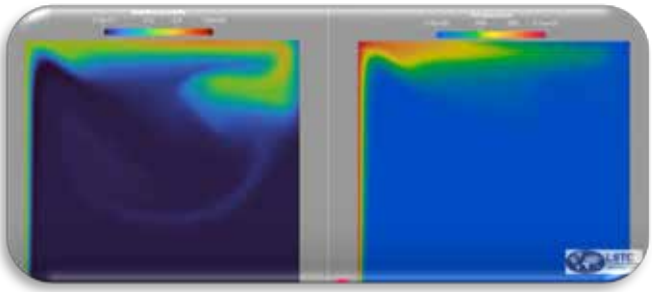


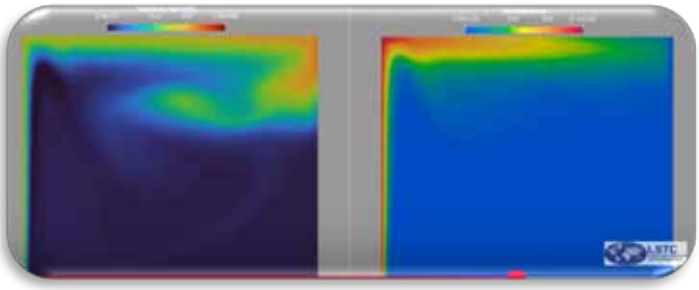
This month we share [ICFD LS-DYNA: Moist Air reaches Saturation conditions at the cold wall in a room.]

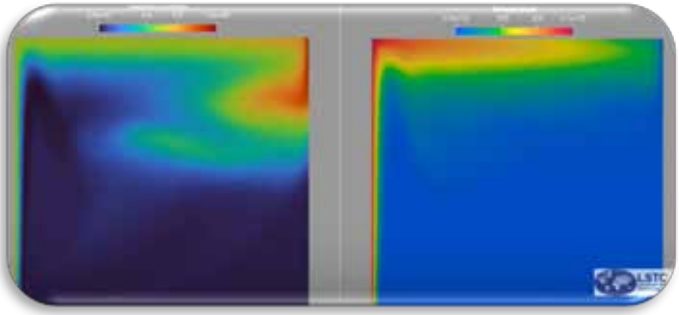
Moist Air reaches water vapor saturation (condensation conditions) at the cold wall (right) in a room - FEM/CFD coupled simulation.

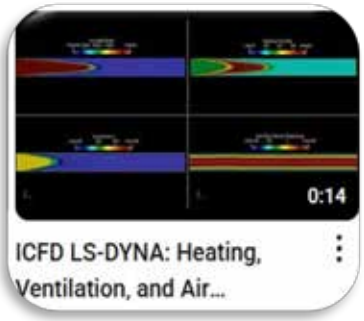












Previously shown on the LS-DYNA Multiphysics Channel you don't want to miss

Quote from article: Numerical modeling

The numerical solution of the 3D structural analysis was performed in ANSYS Mechanical 21.0 software. To simplify the mesh generation, the tetrahedral meshing method was adopted.

Web - Science Direct - Finite element analysis of motorcycle suspension system stability using different materials

Towhidul Islam, Md Wasi Uddin, Rokib Uddin

Dept. Mechanical Engineering, Military Inst. Science & Tech., Bangladesh

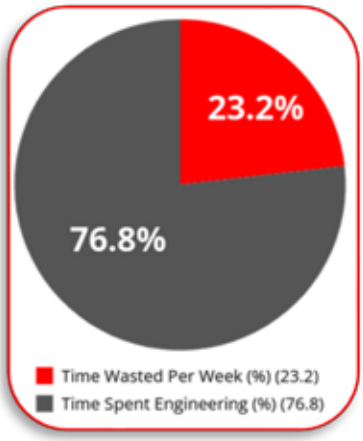
Abstract - Due to the unsuitability of conventional materials in Motorcycle Suspension Systems (McSS) for high-stress loads, their poor vibration dampening, uneven distribution of kinetic energy through the spring, and higher cost, there is a need to explore alternative materials for suspension systems. This study focuses on assessing the structural stability of the McSS using different materials. For this purpose, a three-dimensional standard helical spring suspension model is considered, incorporating four different coil spring materials: high carbon steel, titanium, beryllium copper, and nickel-cobalt-chromium alloy.

The spring coil suspension body is assumed to have homogeneous and linear material properties. Boundary conditions such as single-person and two-person loads are applied to the suspension. Following this, Finite Element Analysis (FEA) is employed for all material cases to evaluate directional deformation in the y-axis and equivalent stress, and a comparison is made to analyze structural stability. The results indicate that the nickel-cobalt-chromium alloy coil spring exhibits superior performance in terms of deformation and equivalent stress compared to titanium and beryllium copper alloy. Under both load conditions, the maximum deformation of the nickel-cobalt-chromium alloy is 106% and 57% less than titanium and beryllium copper alloy, respectively. However, the deformation and von Mises stress of the nickel-cobalt-chromium alloy are nearly similar to that of steel. Therefore, nickel-cobalt-chromium alloy can serve as an alternative to titanium and beryllium copper alloy when suspension weight is not a concern. However, high carbon steel is the better choice among the four materials due to its comparatively lower weight, optimal deformation, and higher von Mises stress.

Introduction - **The motorcycle suspension system, a crucial element in motorcycles, serves multiple functions such as supporting the motorcycle's weight, reducing vibration levels caused by uneven terrain, and ensuring wheel contact with the ground.**

An effective Motorcycle Suspension System (McSS) not only absorbs ground disturbances and shocks but also prioritizes user comfort. The McSS plays a significant role in supporting the motorcycle's structure and dampening vibrations caused by road irregularities through the use of coil springs. Coil springs, a vital component of the McSS, greatly influence the bike's comfort, road handling, and stability….

GOENGINEER Blog Quote, "Struggling to find the right file is never just a one-time inconvenience. If you dig through disorganized files once, you'll do it again. A McKinsey study confirms this: employees spend an average of 23.2% of their week simply searching for the data they need. That's nearly a full day every week spent just trying to find a file, instead of designing…"

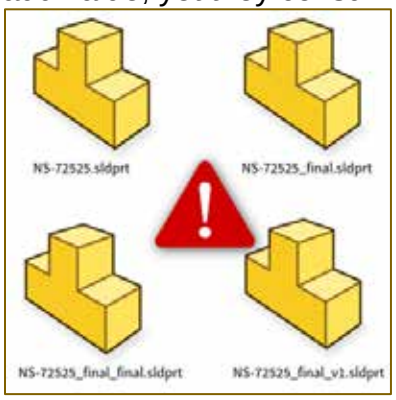


Excerpt - The Tangible Costs: What You're Really Losing Lost Time and Productivity - Nick Sweeney

Recreating Lost Work - What happens when you can't find the "correct" final version? Often, engineers resort to recreating the design. This creates multiple problems:

- Compliance Burden: In highly-regulated industries, recreating a file means re-entering the full, time-consuming approval process to maintain compliance.
- Wasted Effort & Money: Work that was already done once now consumes valuable time and resources again. At $45/hour, recreating just one hour of work costs $45 – plus the opportunity cost of falling behind. If this happens just once per week, that's over $2,200 wasted per engineer annually.

Manual File Management - Beyond searching, day-to-day file management drains productivity. According to Tech-Clarity, manufacturers report that their engineers spend 32% of their time on non-value-added work. Tasks like renaming files, copying to folders, or maintaining manual records don't add value, yet they consume a third of an engineer's time and introduce costly errors.



Delays in Project Timelines - These individual inefficiencies cascade into significant project delays. While your team might implicitly account for hours of searching, rework, and manual file management when quoting projects, this doesn't have to be the norm. Eliminating these hidden costs of poorly managed SOLIDWORKS versions allows you to quote more competitively, win more business, and accomplish more with less effort.

Financial Impact - Beyond just lost time, these issues hit your bottom line hard. Consider this: organizations estimate that they lose more than $5 million annually due to poor data quality. How exactly does that happen?

Increased Labor Costs - A designer's salary is best used to pay them to do what they do best – design. But when your engineers have to reorganize, rename, and find files, that's not design engineer work. Instead, that's "file janitor" work that you could pay an intern to do (or automate it). The cost of labor directly affects the bottom line, and you want to make sure you're maximizing your designer's time, not paying them to do something as trivial as adding files to new folders for tracking purposes.

Scrap and Rework - We've talked about the costs of when the designer can't find the right file, but let's talk about the opposite. In this case, the designer thinks they have found the right file, so they send it to manufacturing for fabrication. According to the American Productivity and Quality Center, scrap and rework costs manufacturers up to 2.2% of annual revenue. For a company with $1 billion in revenue, that's a staggering $22 million in added costs!

Missed Market Opportunities - When your design and engineering teams spend time on non-value-added tasks, they aren't free to do what they do best – design and innovate. If you could free up 10% of your engineering time to work on innovation, what do you think your team could accomplish?

That time could easily be spent bringing your designs to market faster, giving you a competitive advantage. Alternatively, your team could come up with new opportunities, allowing you to enter the market before anyone else considers what your team came up with.

IT Overhead - I just saw this the other day–dozens of files were accidentally deleted from a shared folder; far too much work to recreate by hand. Luckily, the IT department performs regular backups, so it was as easy as asking them for help with restoring the data. Sure, this time is part of their job, but does it have to be? If proper safeguards were in place, those files wouldn't have been deleted in the first place, leaving IT to work on other important tasks.

The Intangible Costs: Beyond the Bottom Line

Frustration and Morale - When your team deals with a lot of repetitive work and avoidable issues, it starts to wear on them. Eventually, these inefficiencies drive talent away. A 2024 Teamwork Research Report revealed that nearly 3 in 5 employees have actively thought about leaving their current jobs or applied to new positions due to bad teamwork. These issues surrounding poor version management tend to stem from a lack of communication.

Collaborative Breakdowns - Communication is critical to effective design and engineering. When communication breaks down, you lose your rhythm and struggle to get anything done as quickly as you need. When you have conflicting versions, or you don't know which version is actually the most recent, you begin to lose trust in your communication system and trust in your data.

Lack of Trust in Data - When engineers don't trust their data, they verify everything manually, slowing work and increasing errors. This is a common issue; 50% of engineers lack trust in the data they rely on the most in their central system of record. If your engineers don't trust the data, they'll spend more time manually verifying, creating their own copies, or making suboptimal decisions.

Risk and IP Protection - While turnover and poor communication are frustrating for your business, this is perhaps the greatest risk to your organization. Poor version control, and thus, poor data management, exposes your company to unnecessary risk. Think about this: when your team is working in an uncontrolled environment, you run into numerous risks.

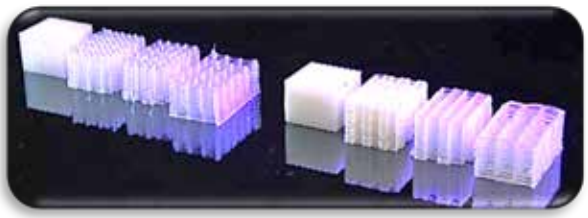
- Anyone on your team has uncontrolled access to sensitive design files.
- You run into difficulty tracking who accessed/modified what, making it hard (or impossible) to prove ownership or identify bad actors.
- You lack a robust audit trail for compliance or legal disputes.

These issues leave you vulnerable to enormous risks when you don't need to be open to them. If you implement a proper data management solution, you can get your versions completely under control, boost team morale, and save your company from massive headaches down the line.

Visit the website to continue the article:

- **The Solution: How SOLIDWORKS PDM Solves Version Control**
- **Core Features of SOLIDWORKS PDM**
- **Beyond Version Control: Additional PDM Benefits**

"**Scientists at Lawrence Livermore National Laboratory (LLNL) and their collaborators have created a new class of programmable soft materials that can absorb impacts like never before, while also changing shape when heated."**



Web – LLNL - LLNL team develops new material that bends, bounces and absorbs energy on demand, - Jeremy Thomas

(Photo: Julie Mancini)

Scientists at Lawrence Livermore National Laboratory (LLNL) and their collaborators have created a new class of programmable soft materials that can absorb impacts like never before, while also changing shape when heated.

The research — which includes collaborators from Harvard University, the California Institute of Technology (Caltech), Sandia National Laboratories and Oregon State University — opens the door to smarter, lighter and more resilient materials that respond to the world around them.

Built from liquid crystal elastomers (LCEs) — rubbery polymers that shift in response to heat, light or stress — the team 3D-printed the materials into carefully engineered lattice structures. These lattices can be designed to absorb energy, stiffen, soften or even change shape, depending on their architecture and environmental conditions.

"What excites me most is the unprecedented level of control we now have — from the molecular scale up to the macroscopic structure — enabling us to design materials that respond and adapt to their environment," said first author and LLNL engineer Rodrigo Telles. "This opens new possibilities for engineering materials with tunable mechanical properties."

Researchers said what makes the materials unique is how they behave under stress. Unlike conventional materials like silicone or foams, which lock in their mechanical properties during manufacturing, LCEs offer what scientists call "soft elasticity." Their molecular structure reorients under stress, giving the material an unusual capacity to absorb energy and recover after deformation.

This adaptability makes LCE lattices uniquely suited for demanding environments. In tests, the structures were soft and flexible under slow compression, but when hit quickly — at very high velocities — they absorbed up to 18 times more energy than similar silicone-based lattices. And unlike conventional rubbery structures, which often cracked or shattered under repeated impacts, the LCE lattices remained intact, making them promising for applications such as protective gear, aerospace parts and shape-morphing robotic systems.

"The resilience stems from the unique behavior of LCEs under stress," explained co-author Elaine Lee, group leader of the Responsive and Active Materials and Manufacturing Group. "When the lattice

experiences a high-speed impact, the liquid crystal molecules within the elastomer rapidly reorient, dissipating energy throughout the structure rather than allowing localized damage."

The Shape Changing of Responsive Elastomer Structures (SCoRES) team poses with Materials Engineering Division Leader Chris Spadaccini

Pictured are LLNL engineers and scientists (from left) Jorge-Luis Barrera, co-principal investigators Elaine Lee and Caitlyn Krikorian Cook, Chris Spadaccini, Rodrigo Telles and co-principal investigator/Harvard University materials scientist and engineer Jennifer Lewis.

The researchers achieved this by carefully aligning the molecular structure of the LCEs during a special 3D printing process. Each microscopic beam within the lattice is aligned like muscle fibers during printing, thanks to a custom extrusion-based process that orients the LCE molecules as they are deposited. This built-in directionality lets researchers program shape-shifting behaviors, such as shrinking in one direction and expanding in another when heated.

The team also developed computer models to simulate how the material behaves. When the temperature rises, the lattices shrink in some directions and expand in others. And when hit hard, they can bend and rebound instead of cracking.

The researchers also found that while conventional silicone structures were often damaged or destroyed after high-speed impact, the LCE lattices stayed intact, even after multiple hits, making them ideal for repeated use in demanding environments. As the team looks ahead, they plan to explore more complex lattice designs and push further into dynamic applications, such as body armor that responds to impact in real time to biomedical devices that flex and move with the body.

Funded by LLNL's Laboratory Directed Research and Development program and part of its Sentient Materials Strategic Initiative, the work reflects an interdisciplinary approach that blends materials science, computational modeling and precision manufacturing.

Co-authors included LLNL engineers and scientists

- Julie Mancini, Dominique Porcincula, Jorge-Luis Barrera, Caitlyn Cook;
- Jennifer Lewis of Harvard;
- Marlini Simoes of Caltech;
- Adam Bischoff & Devin Roach of Oregon State University;
- Samuel Leguizamon of Sandia National Laboratories.

I love tractors, planes, drones, trains, military tanks. I do NOT love baking (I'm a baking disaster)

The ranch Coyote waiting by the food pan and for the exhibits to start.

Ranch Exhibit – 4 YouTube booths - Sign in & enjoy free coffee, cakes and cookies.

Website article by Heather Miller, "Engines roar as cars race 12.42 miles up a small, winding road to Pikes Peak, climbing nearly 5,000 vertical feet & finishing in the clouds at over 14,000 feet. Supplemental oxygen is pumped into the driver's helmet. The extreme physicality of reaching the summit is undeniable, gripping through 156 turns with no power steering and G-forces like a fighter jet. Not to mention unpredictable weather & sheer drops without guardrails, leaving zero margin of error.

Web – Autodesk - Shute Dynamics Races to Pikes Peak With Generative Design in Autodesk Fusion -
Heather Miller

And, in 12 minutes, give or take, it's all over. That's the experience of Pikes Peak International Hill Climb, one of the most dangerous and demanding motorsports events in the world. No do-overs. Just one run.

(The Wolf raced by Robin Shute at Pike's Peak. Courtesy of Larry Chen Photo.)

Each June, racers from around the world come together to experience this historic race that first started in 1916. Every team's passion and intensity are palpable after a year of designing and manufacturing the optimum car to conquer the summit and win the race. No one knows this better than Robin Shute, founder of Shute Dynamics and awarded the prestigious title of "King of the Mountain" with a record four wins.

A lifelong automotive passion - You could say cars and racing are in Shute's DNA. His father helped design the iconic Lotus Elise and bring it to the U.S. market. Growing up, Shute was already close to the industry and even began learning CAD and designing electric hill climb cars when he was 16. He moved to the United States and eventually worked at Tesla as an engineer. During that time, his interest in motorsports piqued again.

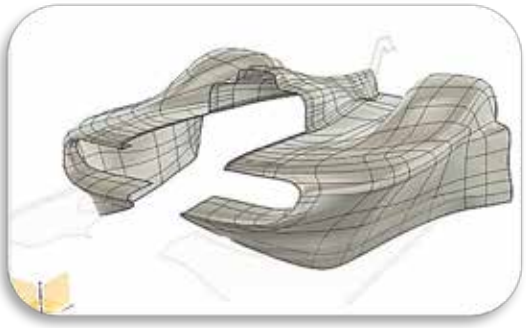
Shute began racing as a hobby with his coworkers. He also discovered Autodesk Fusion, which became essential to his design process. His first competitive car at Pikes Peak, nicknamed "The Wolf," was originally an Italian chassis that he and his team heavily modified. Despite the car's potential, their debut year in 2018 was plagued by engine issues and bad weather, preventing them from showing their true capability. But it laid the groundwork—and determination—for what came next.

(Courtesy of Huckleberry Mountain.)

With lessons learned and a growing understanding of the mountain and designs for the car, Shute returned stronger in 2019 and claimed his first win. Since then, he's proved that victory was more than, as he calls it, a "flash in the pan." With Yokohama now as a partner and sponsor, Shute is designing a brand-new car called "Sendycar V1." It's his first car designed and manufactured from scratch, and he plans to race it at Pikes Peak in 2026.

"I've had four overall wins with The Wolf, but I really want to go and set the overall record with the fastest car ever up the mountain with Sendycar V1," Shute says. "This journey started in earnest about two years ago, and I was able to ramp up really quickly with Fusion's ease of use. It allows you to design professional-grade parts, whether it's with generative design or CAE. I've done the entire function of an OEM to design a whole car by myself using software that costs only hundreds of dollars."

Creating the ultimate, aerodynamic Sendycar V1



One of Shutes's greatest advantages for Sendycar V1 lies in aerodynamic innovation, which is made possible in a single platform with Fusion. Much of his focus on aerodynamics is modeled and developed largely by Fusion's T-Spline modeling and simulation tools.

"T-Splines in Fusion are really important," he says. "You can create models quickly, output them for CFD testing, and iterate in less than an hour. That's unheard of in the industry."

"I designed the final body surfaces in T-Splines," he continues. "It's been huge to have that capability. Not many CAD programs can get close to it. It's especially impressive as someone from the OEM world who knows full-time employees are doing surfaces all the time on just portions of the car, not a whole car, and one person doing it. I probably have hundreds of evolutions of the car in Fusion."

This workflow and flexibility helped Shute design surfaces so aerodynamically efficient that, as he puts it, "it could drive upside down in a tunnel at 80 mph."

Generative design infuses new potential - Shute also attributes much of his design success—from suspension to bell housing—to the use of AI-powered generative design in Fusion. Lightweighting, strength, and stiffness are paramount for his priorities. According to Shute, learning and using generative design has evolved his design philosophy completely when it comes to conceptualizing and designing certain components.

"Generative design is something I love because it ensures parts are fully optimized, lightweight, and strong enough," he says. "There's no room for extras in these car designs, and I can make things very multi-functional to combine different part functions into one part, such as the rear shock absorber mount. I have added the bodywork mount, the exhaust mount, and the heave spring mount all to that one part, which weighs just 100g."

"Everything must be optimized because the competition is stiff," he continues. "There's no room for being 'good enough' because it must be the best to compete. There are OEMs that put tens of millions of dollars into their cars. You really need to lean into modern technology, and that's where generative design and all the professional-grade capabilities available with Fusion help us succeed.

"Complicated parts are hard to engineer, and they can take years to develop. But using generative design in Fusion, you can put multiple functions into one part, iterate, prototype, and it's just a matter of weeks for a final product."

Robin Shute, Founder, Shute Dynamics

Race ready

Each day, Shute continues to pursue not only Sendycar V1 but also consulting for other teams and developing new motorsport innovations globally.

For the 2025 Pike's Peak race, he raced a 1969 Camaro from DuSold Designs.

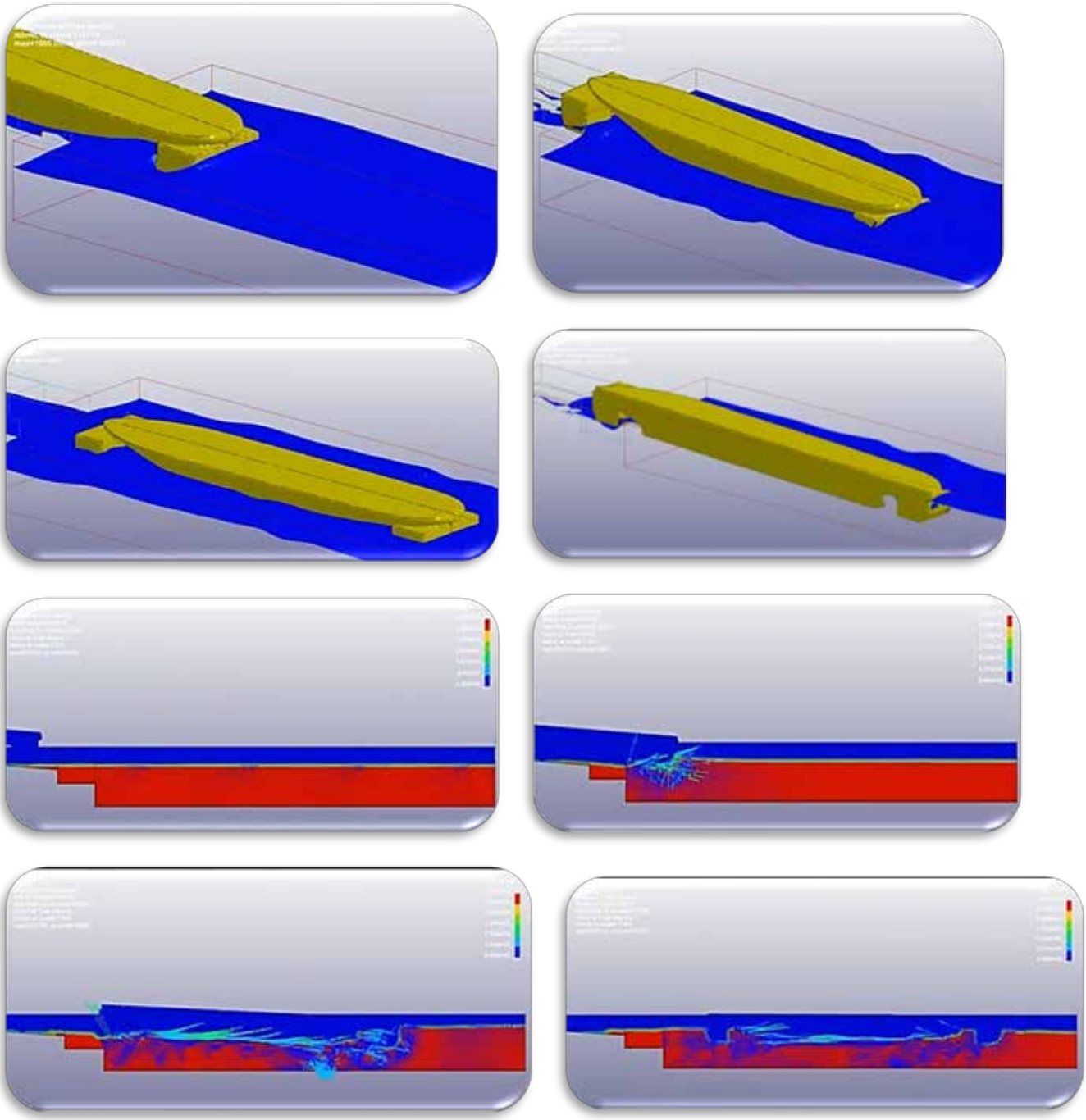
They also used Fusion for the design, and Shute helped contribute some of the aerodynamic work as well.

His ultimate test will be preparing for that ride up to the summit in his own new creation in 2026 with Sendycar V1.

"With Fusion as the development platform, I can take Sendycar V1 to the next level of performance," Shute says. "I can't wait to see what we do on the mountain in 2026."

FEANTM Off-Site Glaciologist - Being a glaciologist brings me to glaciers, ice sheets and frozen waters. Their physical properties are unique and their formations and movements change. I find water and ice fascinating how they impact the environment, ships, icebreakers, and other structures.

Web – YouTube - An icebreaker with attached pontoons descent from slipway
Yury Novozilov



Quote from the article By Luke Morris and Christina Kothlow, “Do you have an electric car? Chances are it has a range of at least 200 miles (320km). Have you thought about how long the battery will last before it needs to be replaced?”

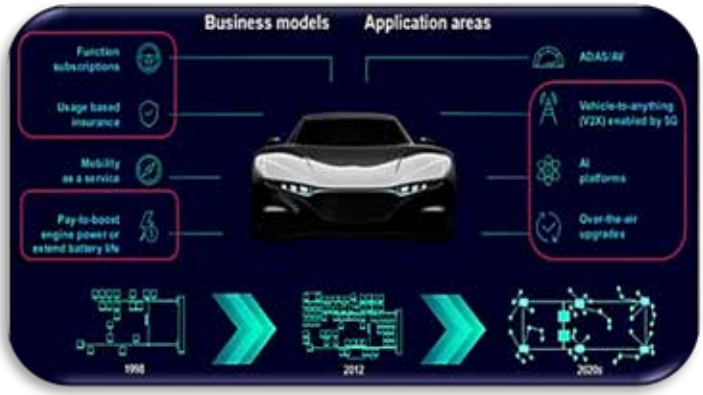
Web – Siemens - [Improving vehicles beyond the showroom: Extending EV battery life through smart management] **- Luke Morris and Christina Kothlow**

Electric vehicles are a vital part of the push towards sustainability and offer drivers significant savings on fuel. But replacing the battery is expensive and if it doesn’t achieve a reasonable lifespan, any emissions savings are negated.

This is why manufacturers are investing heavily in EV battery technology to ensure consumers get the most value from them.

But the story doesn’t end once the battery design is finalized and installed in a vehicle. Lifespan is determined not only by the design, but by the way in which the battery is used.

So, what can be done beyond the design and manufacturing process to extend battery life?

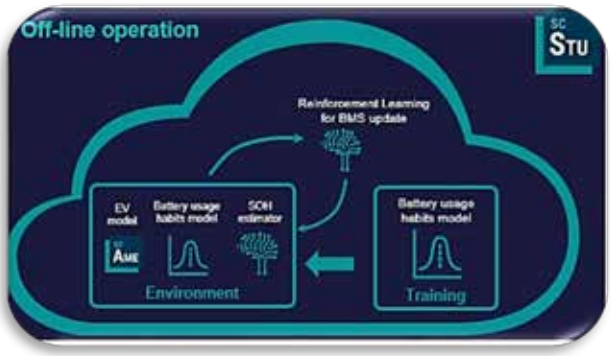


Software defined vehicles - Electric vehicles are designed with a certain control logic that safeguards battery life, but this is based on assumptions on how the vehicle will be driven. However, batteries are significantly impacted by environmental conditions, charging habits and driving style. For instance, driving in a hot climate mostly on highways will age the battery n a very different way than driving mostly around cities in a cold region.

As well as the environmental temperature and humidity, all kinds of factors have an influence, such as the frequency and type of charging and discharging.

Software-Defined Vehicles (SDV) are a subset of Software-Defined Systems (SDS), a development methodology where software and hardware are flexible and refined in parallel. 5G connectivity enables live updates to vehicle systems to add features and improve performance. This has typically been used for Advanced Driver Assistance Systems (ADAS) updates, but there is a trend to extend it to more systems such as software-based dashboards and component performance as vehicles become more digitalized.

As this trend continues, manufacturers have the opportunity to continue to optimize vehicles after sale, improving performance and extending their lifespan. The battery is a perfect candidate for this. Similar to how some mobile phones have a feature called adaptive charging, which understands your typical usage and changes the charging to preserve battery life, the same can be done for vehicles. This could be sold as an add-on subscription that drivers can purchase to analyze and adapt the configuration as the system learns more about how the vehicle is being used



EV battery management over the air - Simcenter Engineering Services has designed a solution that analyzes driver habits and adapts the EV battery management system (BMS) accordingly over the air (OTA) via a wireless connection. This includes charging, discharging, cell balancing, and thermal management which ensures safe and efficient operation and extends battery life.

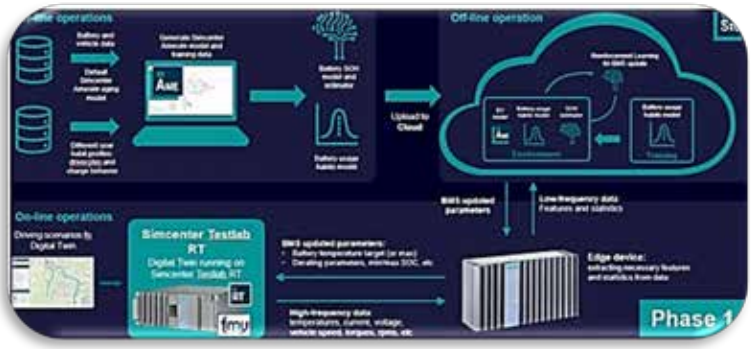
The great thing is, one of the key components of the solution already exists.

Digital twins are commonly used in vehicle development to optimize designs before prototyping. Now these virtual models can continue to deliver value throughout the life of vehicles.

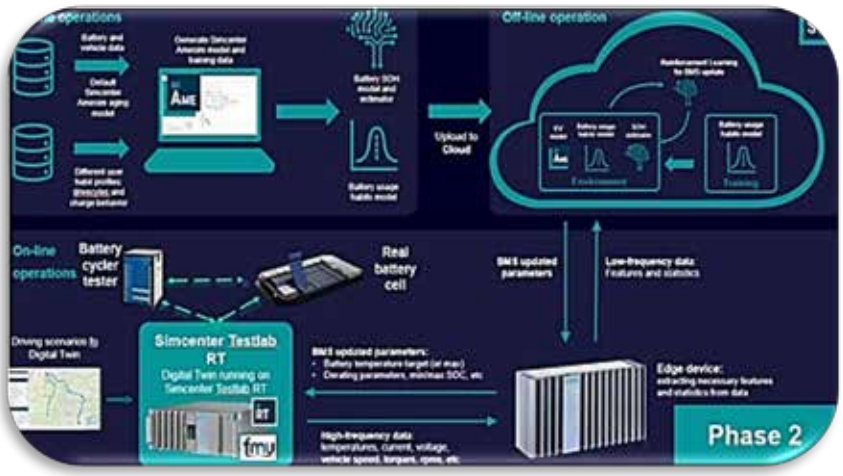
Vehicles are fitted with an edge device that processes data and extracts key information on the battery, such as how often it is charged, at what level it is normally charged, and what type of charging station is used. This information is then sent to the cloud-based application, Simcenter Studio, which features a reinforcement learning (RL) agent that uses the data to derive a customer profile and predict the future usage of the vehicle.

It uses the model as a training environment and learns by getting rewards or penalties depending on how the control modifications affect the battery. Finally, it calculates an estimate of how much the battery life could be extended by, then sends this to the driver to give them the option to apply the new settings to the BMS.

To demonstrate the effectiveness of this proposed solution before applying it to real vehicles, engineers with Simcenter Engineering Services have simulated the entire process. They used the existing digital twins developed in Simcenter Amesim to simulate different driver profiles over many years and generate all the necessary data to test the performance of the AI agent.



They created a functional mockup unit (FMU) to import into Simcenter Testlab RT. It has all the virtual sensors that a real vehicle would have to measure temperature, current voltages, speed, torque and much more. This allows them to demonstrate how the BMS would be updated for different driver profiles and estimate how much the battery lifespan would be extended by in each case.



Beyond batteries - The first phase of the project is to demonstrate everything virtually, and results from this should be available soon. Next, a physical battery will be added to the virtual model, to validate that the BMS changes are improving the battery life of real hardware.

This use of technology opens up many possibilities for optimizing and improving performance throughout a vehicle's lifespan. For instance, a similar process could help extend range as well as battery life. Even the simplest ADAS features like cruise control consume energy, so if all this data is recorded and analyzed the BMS can be adapted to set power limits and protect the driving range. Alternatively, digital twins can simulate wear and tear on components such as shock absorbers depending on different driver profiles. Then, just as with the battery management system, adjustments can be made to minimize degradation and extend the life of these components.

The best part? All the necessary technology already exists within Simcenter. It's just a matter of having the expertise to combine the tools in the right way to suit a particular vehicle or product line. This is where Simcenter Engineering Services experts can help. What manufacturer wouldn't want to take advantage of this to optimize performance after production, improve customer satisfaction, and create new revenue models?

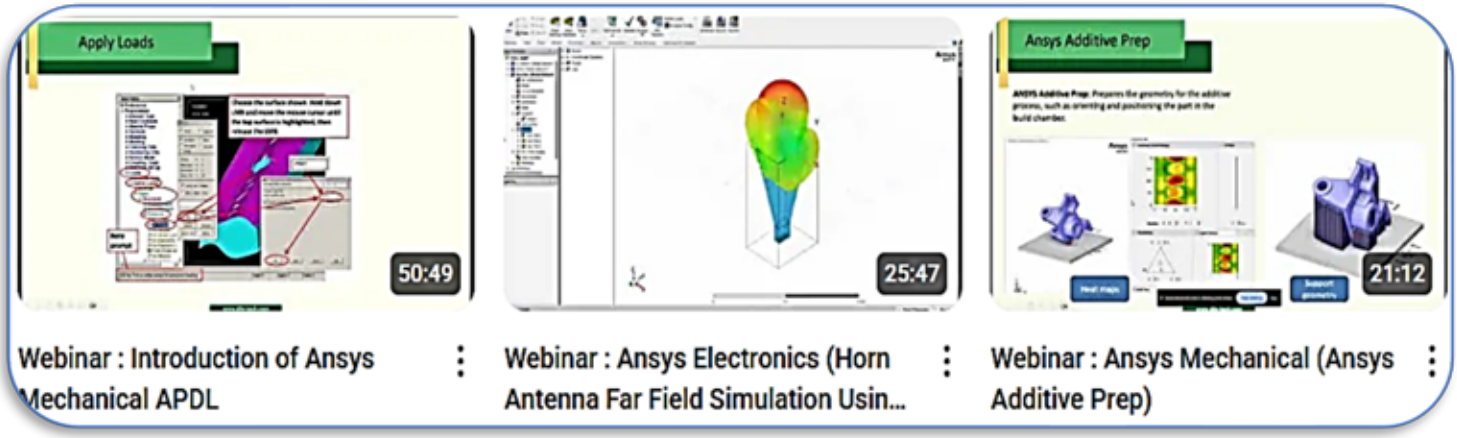
To learn more about Simcenter Engineering Services, visit our website
.

DFE-tech: On our YouTube Channel you can find webinars, simulations and learning videos

We are always updating the YouTube Channel for your convenience to have information, learn, gain knowledge - contact us!

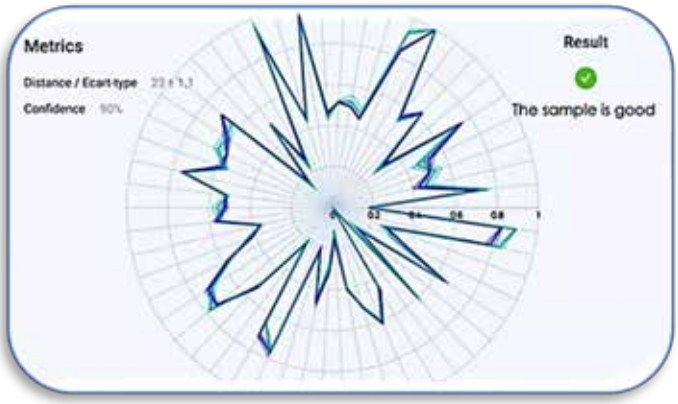
A few of the webinar videos on our channel

Among Webinars and videos, that we offer on YouTube:



Article: Photonic design for a gas sensor - To go from prototypes to production with a foundry, Aryballe had to redesign its photonic chip to adapt it to materials and processes.

Metrics result | © Aryballe



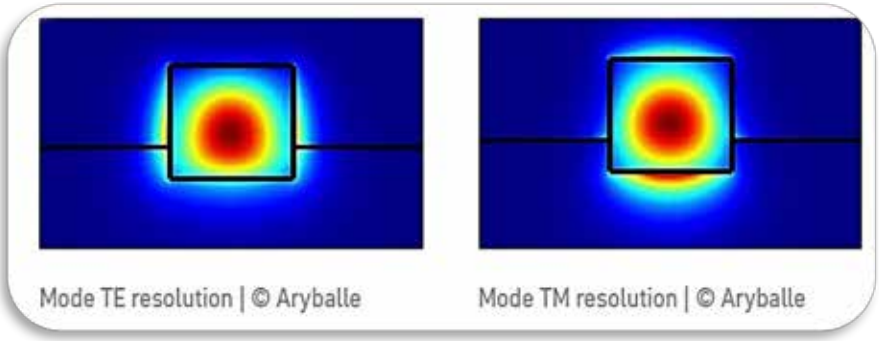
Web – CADFEM - Photonic design for a gas sensor with Ansys Lumerical **Specialist field: Optics**

To develop its miniaturized gas sensors, Aryballe had to rethink the photonic design of its chip to adapt it to the materials and processes available.

Task - Aryballe manufactures miniaturized gas sensors based on bio-functionalized silicon photonics technologies. The technology currently embeds 64 separate sensors on a cm² silicon chip. Applications range from quality control (detection of non-conforming samples) to environmental monitoring and indoor air quality measurement.

Changing the manufacturing platform from prototype to industrial production with a foundry requires a complete redesign of the photonic system to adapt to the materials and processes available.

In the study presented here, tools from the Ansys Lumerical suite are used to optimize each component of our photonic chips and predict performance in relation to process variability at the partner foundry. This study is necessary to start discussions with the foundry, identify and specify critical parameters and reduce production iterations.



Solution - The redesign was carried out in stages. The key element of the photonic design is a Mach-Zehnder interferometer, one arm of which will be exposed to the environment, i.e. to VOCs in the air (sensitive arm), and the other buried under a layer of oxide (reference arm).

The light-guiding and light-separating elements in the chip are also optimized for optimum light transmission through the system and reduced stress on the light source.

Stage 1, Platform selection: this involves dimensioning the thickness of the waveguides and choosing the target width of the sensitive guide. For this purpose, a map of effective indices and associated surface sensitivities is created for the available thicknesses as a function of guide widths, TE and TM polarizations and target wavelengths.

Step 2, Interferometer optimization : In order to obtain a system that is insensitive to temperature variations and has a wide operating bandwidth, effective indices and group indices are calculated as a function of reference guide widths and arm size ratios. Behaviors intersect at an ideal operating point. In concrete terms, this provides the reference guide width and the ratio of optimal interferometer lengths.

Stage 3, variability study (corner analysis): A key step in discussions with the foundry, the variability study consists in calculating the expected performance (surface sensitivity) when dimensions vary around the nominal operating point. This step enables us to specify the acceptable ranges and compare them with the performance achievable in production.

Step 4, Complete chip sizing: In order to optimize the amount of light in the chip, the design and optimization of the chip's grating couplers and Multi-Mode Interference Coupler are carried out. Optimization includes estimating bending losses and cross talk to specify bending radii and spacing between two guides.

Customer Benefit - When changing manufacturing partners for a silicon chip, a photonic design phase is essential to adapt the product and its performance to the new platform (materials and dimensions).

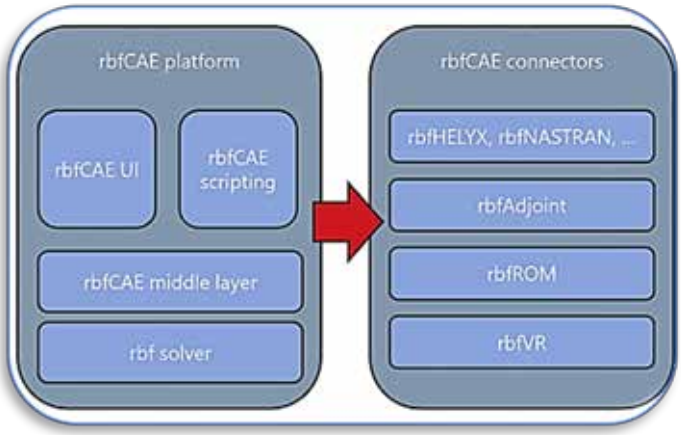
The manufacturing cycle for a silicon chip is very long (> 10 weeks) and costly. Lithography masks have to be redone for each design modification. So it's vital to keep theoretical studies to a minimum to minimize manufacturing iterations and save money.

Next, a study of the expected variability and its consequences on product performance enabled us to define precise requirements for the foundry. A specific machine was selected and a step was added to reduce the expected variability on certain critical dimensions.

Finally, for incompressible process variability, numerical simulations can be used to target the measurements required to monitor the dimensions of interest and enable wafers or chips to be sorted within a desired range. The associated drop in yield can already be anticipated and included in the calculation of the final unit price of a validated silicon chip.

rbfCAE - The aim of the rbfCAE technology is to enable fast mesh morphing through a mesh-independent approach based on state-of-the-art Radial Basis Function (RBF) techniques.

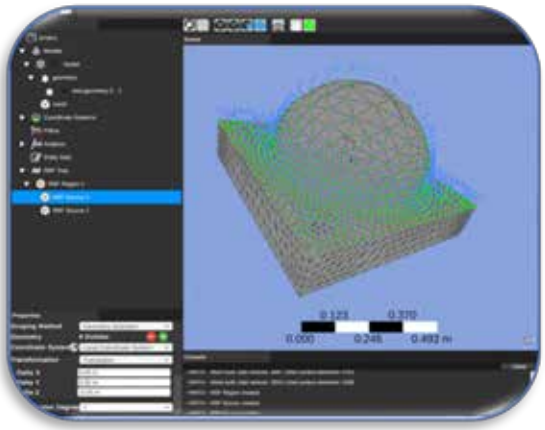
Web – rbfCAE - This technology allows CAE users to perform shape modifications that are compatible with the mesh topology directly during the solving stage, simply by adding a single command line to the input file.



rbfCAE Platform - Revolutionizing Engineering Simulation - rbfCAE Platform is an advanced simulation environment that redefines the engineering design process by integrating cutting-edge mesh morphing technology. It facilitates seamless shape optimization, parametric studies, and real-time simulation updates, enhancing both speed and accuracy.

With an intuitive interface and exceptional computational efficiency, rbfCAE Platform empowers engineers to develop, test, and refine complex models with unprecedented flexibility. Whether applied to structural analysis, fluid dynamics, or multiphysics simulations, rbfCAE Platform accelerates design iterations, reduces computational costs, and delivers high-fidelity results—driving innovation across industries.

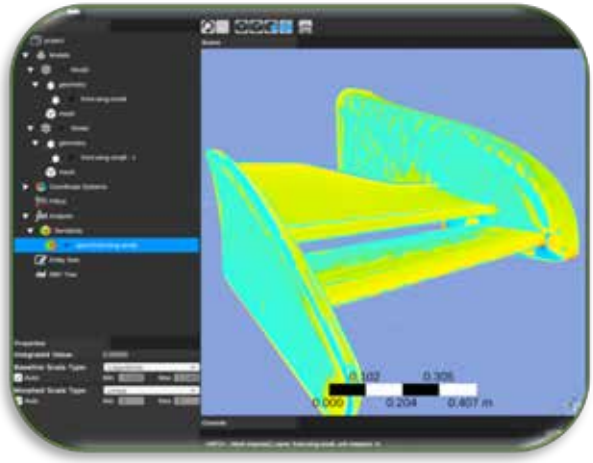
rbfCONNECT



rbfCONNECT - Seamless Integration for CAE Simulations - rbfCONNECT is a comprehensive set of connectors designed to bridge RBF-based simulation workflows with a wide range of open-source CAE solvers. Built for maximum compatibility, rbfConnectors facilitate effortless data exchange and automation across solvers, preprocessing tools, and optimization platforms. By resolving interoperability issues, they empower engineers to apply advanced mesh morphing and real-time shape modifications without disrupting established processes.

Whether used for structural analysis, fluid dynamics, or multiphysics simulations, rbfConnectors streamline workflows, accelerating design iterations and ensuring more efficient and accurate engineering solutions.

rbfAI



rbfAI - Smart AI Solutions for ROM and Virtual Reality - rbfAI introduces an advanced artificial intelligence framework that transforms reduced-order modeling (ROM) and virtual reality (VR) applications in engineering. By integrating AI-driven predictive capabilities with cutting-edge simulation techniques, rbfAI enables the creation of fast and accurate surrogate models, dramatically reducing computational costs while maintaining high precision. With seamless support for immersive VR environments, it enhances data visualization and interactive model exploration, offering engineers a more intuitive and dynamic simulation experience. rbfAI drives smarter decision-making, accelerating the development of next-generation designs.

rbfROM - The rbfROM connector enables the creation and interaction with static reduced-order models (ROMs), significantly accelerating CAE simulations. It automates the data sampling, compression, and model generation process, using Proper Orthogonal Decomposition (POD) to reduce computational complexity. ROMs of both mesh deformation and CAE results are stored as Functional Mock-up Units (FMUs), allowing real-time shape and physics manipulation. This connector seamlessly integrates with various CAE solvers, enabling fast design space exploration and digital twin applications.

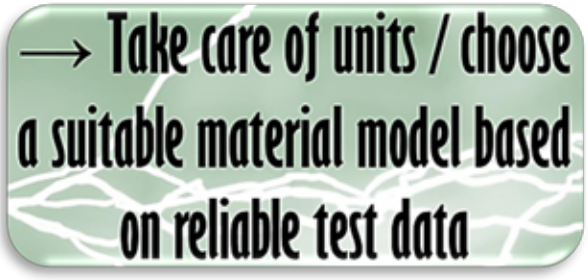
rbfVR - The rbfVR connector provides an immersive virtual reality (VR) experience, enabling users to interact with digital twins using devices such as Meta Quest 3 and Apple Vision Pro. It imports FMUs generated by rbfROM, along with surface meshes and interactive handles, creating a real-time collaborative environment. This allows engineers to visualize and manipulate CAE models in a fully immersive setting, enhancing design evaluation, training, and remote collaboration. The VR experience supports intuitive shape control and real-time physics updates, making it a cutting-edge tool for engineering visualization.

rbfADJOINT - The rbfADJOINT connector enables fast interactive post-processing of adjoint solutions, allowing engineers to analyze sensitivity maps and optimize shapes efficiently. It reads adjoint sensitivities from CAE solvers, visualizing them as colored maps over surface meshes to identify critical regions for optimization. A real-time dashboard within the UI provides instant feedback on the impact of shape modifications on performance metrics. This makes rbfADJOINT an essential tool for adjoint-based design optimization, enhancing workflows in aerodynamics, structural analysis, and multiphysics simulations.

rbfROC - The rbfROC module features an advanced connection with the OpenCascade engine. It allows CAD based actions in two possible directions. CAD2MESH allows to provide as input iso-topological variations of a geometry as step files or as brep files. The rbfROC CAD2MESH allows to create a field capable to morph the underlying mesh of the baseline CAD onto the variation; the field can be exported as a cloud of points. The MESH2CAD allows to warp an existing CAD model onto a deformed shape known as cloud of points or as a mesh and its deformation; the original brep is converted into NURBS of high order to accomodate the shape variation.

Struggling with convergence in nonlinear FEA? You're not alone! Since 2008, I've been passionate about providing training for Ansys users on nonlinear simulation with Ansys Mechanical. Over the years, I've seen hundreds of models struggle with convergence – and supported just as many engineers in overcoming those challenges. stay ahead of nonlinear convergence issues.

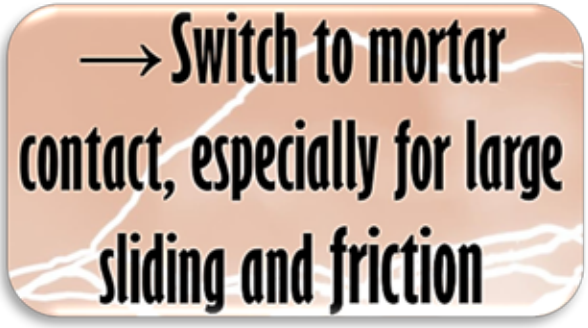
These are 5 more tips. More tips are on the way - covering solver controls, contact stabilization, material pitfalls, and more.



Tip #6: Check your Material Model: Convergence issues often arise from incorrect or incomplete material input. Always double-check your units – especially when importing test data. Make sure your curve fitting covers all relevant deformation modes (e.g. tension, shear, compression) and not just uniaxial tests. And most importantly: choose a material model that matches the expected strain range.

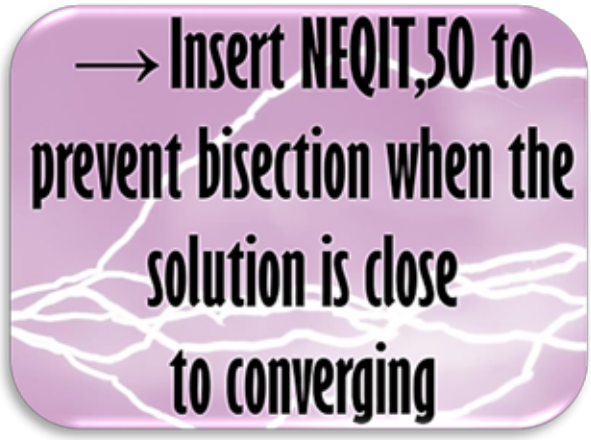
Using a simple Neo-Hookean model for large deformations is a common mistake that leads to divergence.

Tip #7: Adjust the Contact Stiffness - Too high contact stiffness leads to poor convergence; too low causes too large penetration. For compact structures (e.g. press fits), use high stiffness. For thin parts under bending (e.g. sheet metal forming), use lower stiffness. Always check the penetration after solving. Remember: you can't have both perfect accuracy and perfect convergence – it's a trade-off.

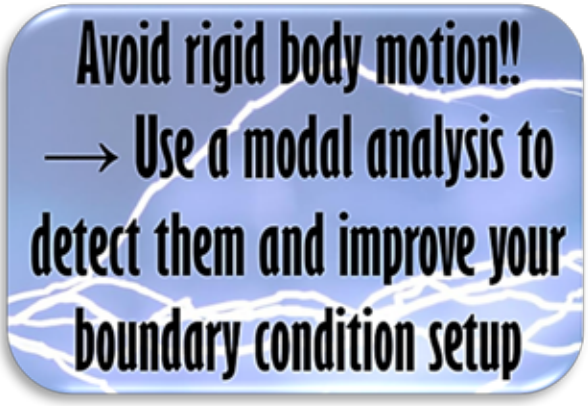


Tip #8: "Mortar" Contact for Sliding - Mortar contact (Nodal Projected Normal from Contact) improves convergence (and accuracy) in sliding contact scenarios (especially with friction!) by enforcing contact constraints over the entire interface, not just at discrete points.

This continuous formulation distributes contact forces more smoothly, avoiding artificial stress peaks that often cause divergence in traditional methods like Gauss or nodal-based. Mortar is working pretty good for non-matching meshes and also very large sliding distances. But be aware that it also needs more computational time as the projection and constraint matrices must be updated in each step.



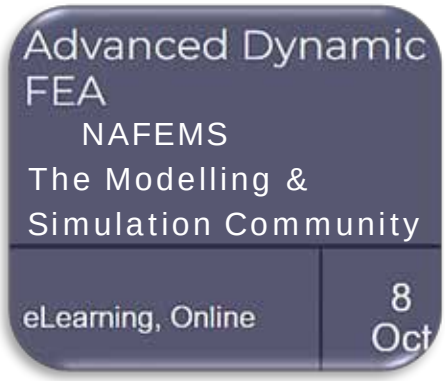
Tip #9: Increase Iteration Limit - You might know this situation: A solution is close to converging but fails because the iteration limit is reached. Increasing the maximum number of iterations per substep can help. Use the APDL command NEQIT (e.g. NEQIT,50) to raise the limit and give the solver more room to finish. This tip works especially well in combination with a restart.



Tip #10: Verify your Boundary Conditions - One of the most common causes of convergence problems is missing or insufficient boundary conditions, leading to rigid body motion. When the model isn't fully constrained, it can move freely in space, causing singularities in the stiffness matrix and preventing convergence. To detect this, perform a modal analysis for example: if zero-frequency modes appear, they indicate unconstrained degrees of freedom. Add supports to eliminate these modes without over-constraining the system. Stabilization techniques might also help, but always compare the introduced artificial energy with the actual strain energy in your model. I could share a dozen tips on this classic issue - maybe in my next post :-)

Continuous learning is the key to personal & professional growth. It enriches our lives with new skills, fresh perspectives, & opportunities for success & fulfillment.

WEB – NAFEMS – Advanced Dynamic FEA



Why does a PSD plot have such strange units?
Why are dynamic effects important in shock spectra?
Why does non-linear stiffness dissipate energy?

Get the answers to these questions and more with this industry-leading, code-independent e-learning course

This course covers a broad range of solution types, beyond the usual natural frequency and dynamic response methods. This allows more physical phenomena to be investigated and simulated using dynamics in FEA.
Topics covered include; Random Vibration, Shock and Response Spectra, Nonlinear Dynamic Response, Explicit Dynamic Analysis and Complex Eigenvalue Analysis.

What will you learn?

- The theory behind advanced dynamic analysis techniques
- A practical understanding of advanced applications
- Hints and tips for setting up advanced dynamic analyses
- A roadmap for understanding the results from dynamic analysis
- The limitations of simulation methods

Who should attend?

- Designers and engineers who are familiar with dynamic analysis and want to learn more
- Experienced engineers who want to brush up on their advanced dynamic analysis knowledge

The course is completely code independent. This is a 4-session online training course, with each session lasting for approximately 2/2.5 hours, depending on homework submissions, questions & discussions.

You can attend the sessions live, and/or stream on demand. When you register you will get access to a dedicated course forum where you can contact the tutor with questions, submit homework, download pdfs of course notes and access all session recordings. To get the most out of the course, participation in forum discussions is encouraged. Questions? Contact us on e-learning@nafems.org

- Session 1: Shock and Response Spectra
- Session 2: Random Response
- Session 3: Nonlinear Dynamics
- Session 4: Explicit and Complex Analysis

Visit the website for complete information on the above sessions and registration.

Don't miss our case study of the 1915 Çanakkale Bridge. The bridge connects communities across the Dardanelles Strait in Turkey. Arups's expert design verification used OasysGSA, OasysAdSec, and Grasshopper3D

Web – ARUP - Bridging the gap from concept to reality: How Arup used Oasys Structural software to verify the design of the 1915 Çanakkale Bridge

Image: Director at Arup, Richard Hornby (left), Bridge Engineer at Arup, Jonas Winterhalter (right).

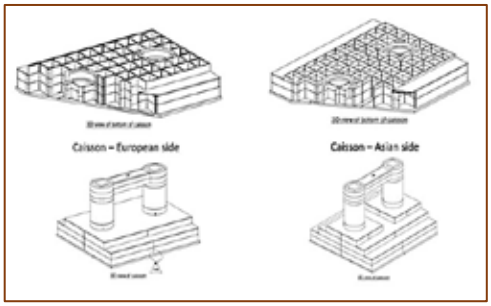
Project Overview - The 1915 Çanakkale Bridge is a long-span line with UN SDG 11, suspension bridge crossing over the Dardanelles straits in Turkey. In the bridge makes the connectivity between local communities faster and safer, while reducing fuel emissions and reducing the need for ferries. Employed by the Contractor joint venture DLSY, Arup provided design verification for both permanent and temporary structures using Oasys GSA, Oasys AdSec and the associated Grasshopper API.

Picture: 1915 Çanakkale Bridge general characteristics

How Oasys proved invaluable - Arup was tasked with the technical review of the design packages issued by the designer COWI. Following review, the engineers carried out the calculations to verify the conformity of the design packages with the project Design Basis.

To do this, detailed verification tools were developed using Oasys AdSec, Oasys GSA, and parametric modelling using Grasshopper and its Oasys plugins. The bridge towers are supported by concrete caissons, resting at the bottom of the sea on their 80mx70m base slab. The caissons were erected in a dry dock, then floated out and sunk to their final position. The caissons are hollow and made of an array of slabs and walls.

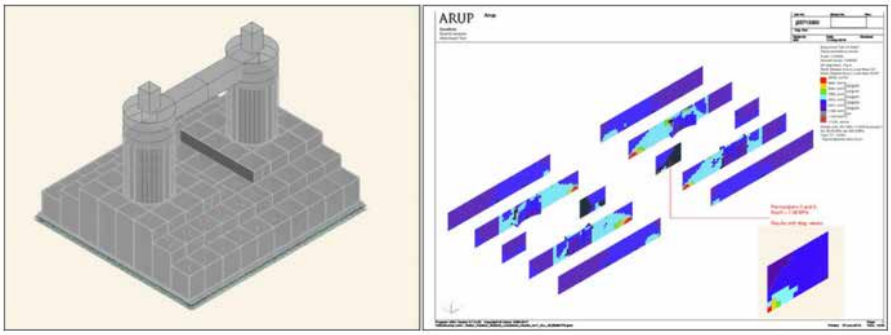
Arup identified several errors in the rebar design of the caissons. Local models of the caissons were generated in GSA using 2D shell elements, allowing to model the proportions of the walls and slabs, allowing to model the proportions of the walls and slabs, identify load paths, and assess in-plane effects. The general actions were applied at the top of the caissons and were extracted from the Global Analysis Model (GAM) developed by a sub-consultant.



(Tower foundation caissons float-out)

(Isometric overview of the foundation caisson)

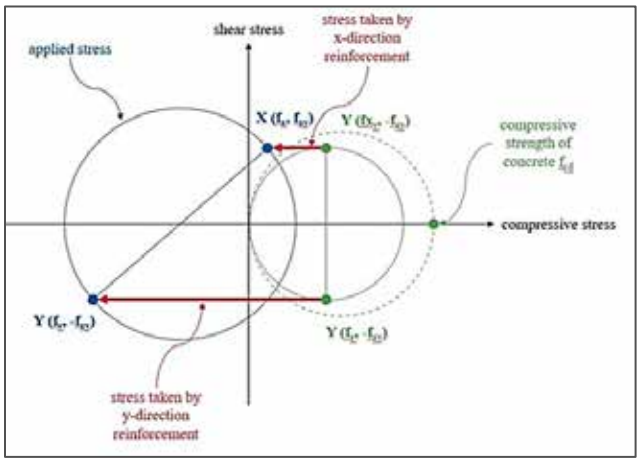
The models enabled the engineers to assess the effect of actions in each wall and slab of the caissons. A postprocessing tool implemented in GSA, called RC Slab Design, was used to determine the section area of reinforcement requirements based on the internal stresses in 2D elements.



Comparisons were drawn between designs reinforcement drawings and the reinforcement requirements extracted from the model.

Overview of the caissons local GSA model (left), and result output from RC Slab Design (right)

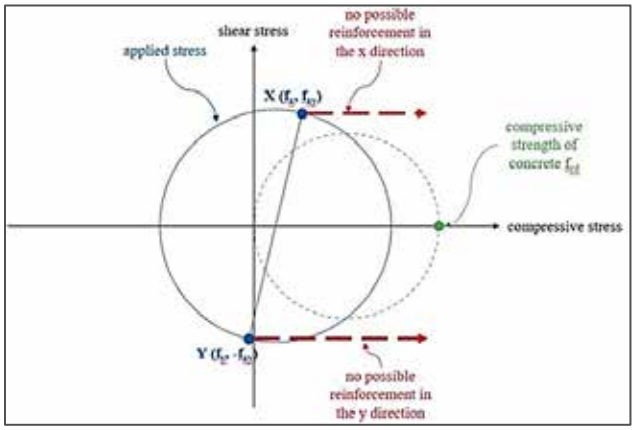
RC Slab Design can express concrete failures' by showing the elements in a black colour, meaning the postprocessor is unable to determine a section area of reinforcement that would make the element resist the loads. Typically, the concrete failures exposed by RC Slab Design are due to an excess of either compression or in-plane shear. From the model outputs, the engineers identified that the compressive stresses in these areas were far below the concrete strength. By process of elimination, they concluded that in-plane shear was the issue.



To verify the result output of RC Slab Design, they drew Mohr circles of the failing elements to identify their stress state, using the stress outputs from GSA. The Mohr circle representation for an element that would pass an in-plane shear check is shown.

Left: Mohr circles for an element without in-plane shear failure

Similarly, the Mohr circle representation of an element undergoing in-plane shear failure would look like is shown below. No amount of reinforcement in orthogonal directions would prevent the failure.



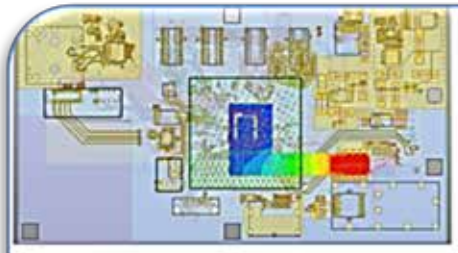
Left: Mohr circles for an element with in-plane shear failure

The engineers determined that three options can improve the resistance of concrete to in-plane shear: Increase the grade of concrete, increase the wall thickness or align the reinforcement with the direction of the shear force. It was agreed to align reinforcement to the principal directions of stresses, leading to the local addition of diagonal reinforcement in the walls. The wall areas were located and measured where diagonal reinforcement was needed, before modifying the GSA verification models to implement the use of diagonal reinforcement. Further analyses were run to determine the necessary reinforcement in these specific directions.

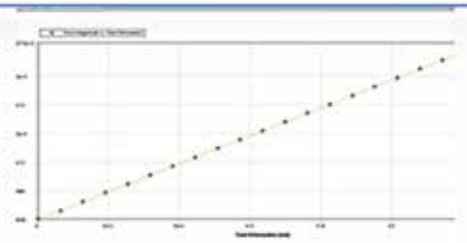
Our experts regularly publish insights, resources and learning in our Resources area on the Ozen Engineering website.

Below, you'll find a few of the many blogs published.
Be sure to check back each week for new articles & learning opportunities.

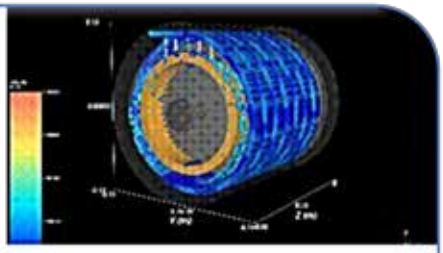
Ozen Engineering Resources Page to read informational postings



DC IR Drop Analysis Using ANSYS SIwave

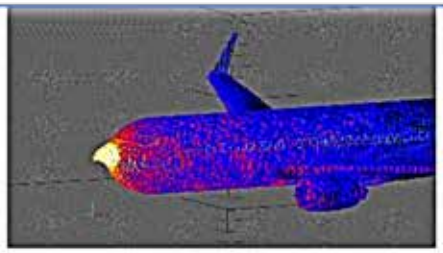


Retrieve and Transform Reaction Force Components in Workbench LS-DYNA



Simulating Electric Motor Cooling with Ansys FreeFlow: Oil Spray and Water Jacket Methods

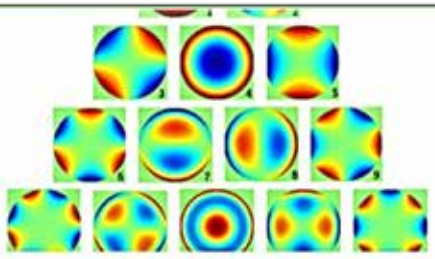
Begin Zemax: First Lens Design



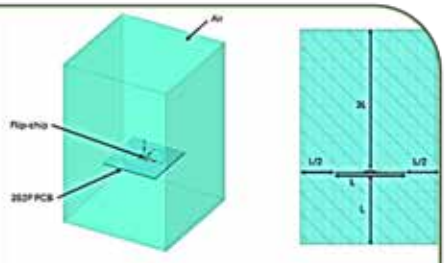
From Antenna to Airframe: A High-Fidelity Workflow for Aircraft EMC Simulation with HFSS and EMA3D

Combining Static and Harmonic Stress Analyses for Fatigue Assessment Using Ansys and nCode DesignLife

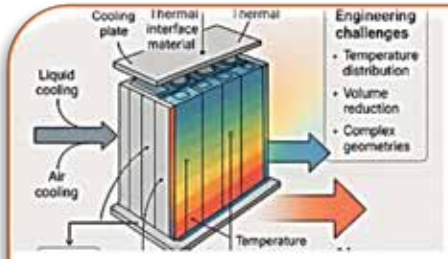
From Datasheet to Demagnetization: A Guide to Magnetizing N48 Magnets in Ansys Maxwell



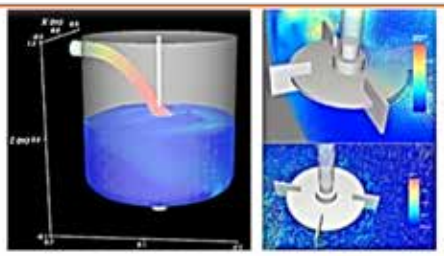
Lens Design in Zemax - Aberration Theory



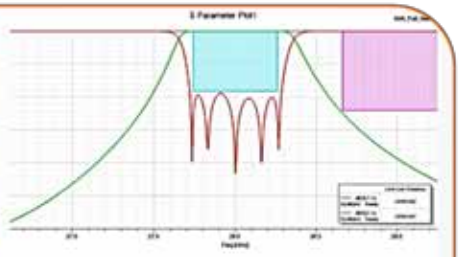
Flip-Chip Package Theta-JA Thermal Resistance Characterization Using Ansys Fluent



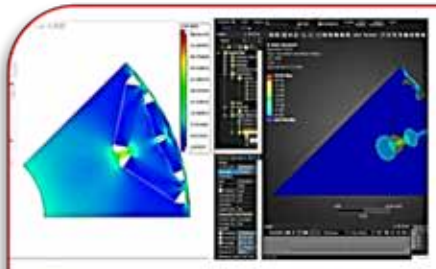
Singular Value Decomposition Reduced Order Model for Battery Module



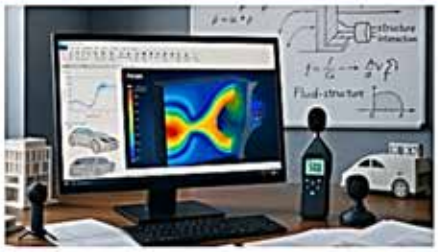
Getting Started with Ansys FreeFlow: Modeling a Stirred Tank



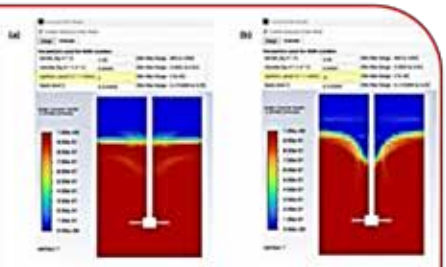
SIW Bandpass Filter Design and Optimization Using SynMatrix



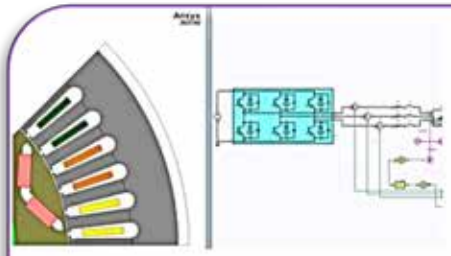
Mechanical Stress Analysis of High-Speed Electric Motors Using Ansys Mechanical and Motor-CAD



Acoustic Analysis in Ansys Mechanical

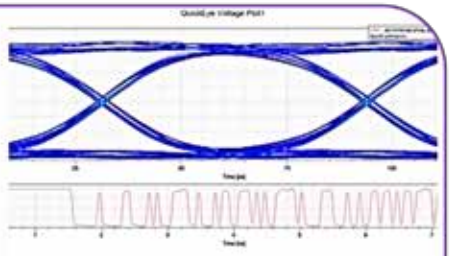


Creating a Reduced Order Model for Vortex Prediction in Stirred Tank

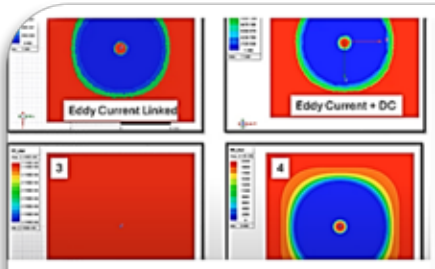


Designing a 3-Phase Inverter in Ansys Simplorer and Coupling with Maxwell FEA for a 160kW PMSM

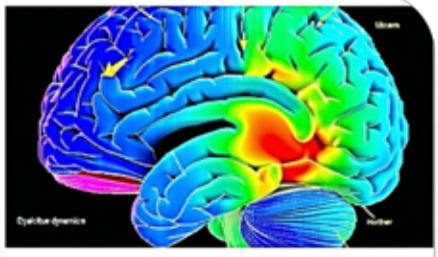
Working with STL Files in Ansys Discovery: Preparing Geometry for Simulation



PCIe Gen4 Signal Integrity Analysis using ANSYS SIwave & Circuit Tools



Modeling Wireless Charging with Permanent Magnets in ANSYS Maxwell



Brain Implant Thermal Simulation Using Ansys Fluent

Tonight, on our local news channel in the town pointed towards its true north (FEA) we have original team reporting:
Mi (a resident news raccoon) & Ke (a resident news coyote)

Mi, "Quiz time – what is prestressed structure subjected to a ball impact?"

Ke, "No clue but Mike at Ozen gave me a lead on the answer. Mark Lytell has an interesting article about it. Let's read it."

Mark R. Lytell - OZEN - This article delves into a specific example: a prestressed structure subjected to a ball impact and demonstrates how Ansys Workbench LS-DYNA simplifies the process with straightforward setup steps

All graphics & movies need to be viewed on the website.

Web - Ozen - Mark R. Lytell – Excerpts

Structural Preloading Followed by Dynamic Impact in Workbench LS-DYNA -

The Importance of Prestressed Dynamic Event Simulations - Engineered structures are constantly subjected to dynamic forces throughout their lifecycle—whether it's the impact of a dropped object, the vibrations from operating machinery, or sudden shocks during transportation. For industries relying on high-performance systems, assessing the ability of components to withstand these stresses is not just a matter of compliance but a critical step toward ensuring reliability and safety.

Traditionally, validating a structure's performance under such dynamic events required extensive physical prototyping and testing, leading to high costs and time investments. However, advancements in simulation tools like LS-DYNA, integrated within Ansys Workbench, now enable engineers to evaluate these scenarios virtually. This approach not only reduces time and costs but also offers deeper insights into system performance under real-world conditions.

What Is Prestress and Why Does It Matter? Prestress refers to the intentional application of stresses to a structure before it encounters external loads or dynamic events. This method is commonly used to enhance a structure's load-bearing capacity or mitigate the risk of failure. For instance, bolts tightened to precise specifications in a mechanical assembly are an example of a prestress application.

Simulating the effects of prestress, followed by the application of dynamic loads like impacts or vibrations, is crucial for evaluating overall system behavior. It helps engineers predict how prestressed systems will respond to external forces, enabling optimized designs before physical validation.

Why Use Ansys Workbench LS-DYNA for Prestressed Simulations? Ansys Workbench, paired with LS-DYNA, offers a robust platform for simulating complex scenarios like prestressed dynamic events. By combining a user-friendly interface with LS-DYNA's powerful capabilities, engineers can seamlessly set up, analyze, and visualize these events. Moreover, the ability to customize simulations with LS-DYNA keywords ensures flexibility while maintaining precision.

This article delves into a specific example—a prestressed structure subjected to a ball impact—and demonstrates how Ansys Workbench LS-DYNA simplifies the process with straightforward setup steps.

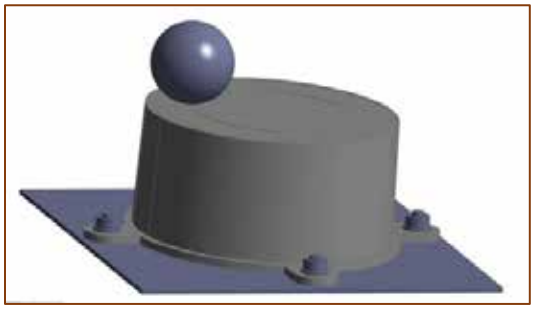
Setting Up Prestressed Dynamic Simulations in Ansys Workbench LS-DYNA - In many applications, a prestressed structure is subject to dynamic events that occur over its usable life. Simulating such prestressed dynamic events is a cost-effective means of assessing the capability of the structure to withstand such loading prior to costly validation prototyping and testing. LS-DYNA is the industry standard simulation tool for simulating such events.

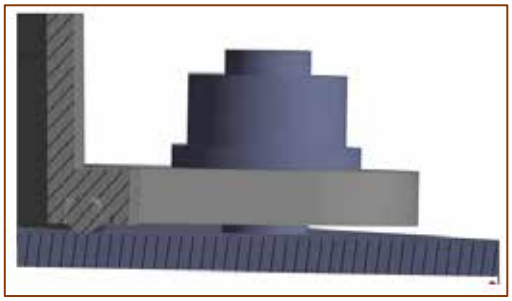
Until recently, developing an LS-DYNA model to first prestress a structure followed by a dynamic event loading was conducted almost exclusively using LS-PrePost or other third-party preprocessors. Various standard methods exist to perform the prestress analysis:

1. dynamic relaxation with bolt pretension 2. implicit static or dynamic prestress	3. explicit, damped dynamic prestress 4. linked LS-DYNA and LS-DYNA Restart systems in Workbench

In this article, we are going to utilize Ansys Workbench to pre- and post-process a prestressed structure that is subject to a ball impact using method 3. As will become evident, with a few LS-DYNA keywords added to a standard Workbench LS-DYNA model, this process is very straightforward.

Example Model - To illustrate to process of setting up the model in Workbench LS-DYNA, we will utilize a model of a Nylon 6 cover that is mounted to a (rigid) steel plate, sealed with a Neoprene O-ring, fastened with four bolts. After the bolts are tightened, a rigid, steel ball will impact the cover with an initial velocity generated from a drop at a certain height, a common regulatory test for electronics enclosures.





As shown in the second image, the prestress step consists of tightening the bolts to specified compression of the O-ring, typically expressed in %-compression, followed by large artificial damping to mollify dynamic effects.

The timeline of events is detailed in the table.

Event	Time Interval (ms)
Tighten nuts to .090" displacement	0 - 30
Apply 50% global damping	31 - 39
Trigger ball initial velocity and impact cover	40 - 60

Workbench Model Setup - In this article, we detail the model setup in Workbench LS-DYNA that is specific to the method of this article.

Contacts - The contacts that need special attention are between the nuts and bolts. In order to displace the nuts followed by locking their position, duplicate contacts are needed: frictionless contacts between the nut hole (ID) and bolt body (OD) that will be converted to bonded (tied) contacts at 30 ms. The following figure shows these contacts within the Connections branch (Figure displayed on Website):

Nut Displacement (Bolt Tightening Prestress) - A Displacement boundary condition scoped to each of the four top nut faces accomplishes the bolt tightening prestress. Using Birth and Death, we kill the displacement at 40 ms so that the tied contacts take over:

Damping - Using the Keyword Manager, we use the *DAMPING_GLOBAL and *DEFINE_CURVE keywords to implement the artificial damping from 31 - 39 ms. The damping load curve definition and its implementation in *DAMPING_GLOBAL is shown here: (Figure displayed on Website):

Initial Velocity Generation - To commence ball impact at 40 ms, *INITIAL_VELOCITY_GENERATION and *INITIAL_VELOCITY_GENERATION_START_TIME cards must be defined. The *INITIAL_VELOCITY_GENERATION card is defined as follows, noting that the units are in mm-N-s-tonne, and that the highlighted entries are required in order to start the initial velocity of a rigid body at a time after the initial time: Initial Velocity Generation To commence ball impact at 40 ms, *INITIAL_VELOCITY_GENERATION and *INITIAL_VELOCITY_GENERATION_START_TIME cards must be defined. The *INITIAL_VELOCITY_GENERATION card is defined as follows, noting that the units are in mm-N-s-tonne, and that the highlighted entries are required in order to start the initial velocity of a rigid body at a time after the initial time:

***DATABASE_BINARY_D3PLOT (Optional) -** This (optional) step is used to customize the time interval for writing results to the d3plot files for finer results resolution during the dynamic event with coarser resolution during the prestress time. To implement this, we define the ***DATABASE_BINARY_D3PLOT** and ***DEFINE_CURVE** keywords using the **Keyword Manager** to define the output intervals over the time of the simulation via a load curve. The database output intervals are shown here: (Figure displayed on Website):

Finally, the *DATABASE_BINARY_D3PLOT card is configured as follows: **(graphic on website)**

LS-DYNA Model Branch Snapshot - The image (Image displayed on Website) shows a snapshot of the LS-DYNA model branch with all of the defined controls implemented…

Results - The following videos show the action of the bolt tightening prestress followed by the impact of the ball. Note that in this model, the mesh is very coarse, and the material properties of the Nylon cover are linear therefore the stress values are very unrealistic. Thus, this model would require much refinement before using its results for decision making.

Conclusion - Conducting a prestressed structural simulation on a system subject to a subsequent dynamic event is possible and straightforward in Ansys Workbench LS-DYNA. Here, we chose to utilize explicit dynamics throughout a single simulation timeline in order to align with typical LS-DYNA modeling. Additional methods are available for computation of the prestress using dynamic relaxation or implicit methods which have pros and cons associated with them; the correct method depends on the model as always. Linked analysis systems through Workbench, i.e., an LS-DYNA system connected to a LS-DYNA restart system, is yet another potential method. In conclusion, conducting sophisticated Ls-DYNA analyses using Workbench LS-DYNA is not only possible, but very straightforward, requiring a few keywords, made accessible through the Keyword Manager.

Going Further

- Apply the same methodology to your model.
- Compare the model setup and results when using the method mentioned in the article versus using dynamic relaxation for the preload analysis.
- Implement the preload step using LS-DYNA implicit static or dynamic analysis followed by switching to explicit analysis for the impact analysis.

Complete information on the above article, high resolution graphics and Downloadable Resources are on our website: Model Archive (2024 R2 SP3)

Additional by Mark: **How to Archive a Group of Ansys Workbench Projects Using Python**

Retrieve and Transform Reaction Force Components in Workbench LS-DYNA

Publication quotes, “The formation of the bubble shock wave from the explosion-generated gas and the consequent deformation of the floating structure is detailed. Additionally, the phenomena as cavitation that occur following the re-expansion of explosion-generated gas after the bubble shock wave is examined. **This study, conducted using LS-DYNA, showcases the software’s comprehensive capability to tackle these issues.**”

Published in PAN - Journals, Polish Academy of Sciences [PDF - Full floating structure underwater explosion with pulsation and cavitation effect FEM simulation case]

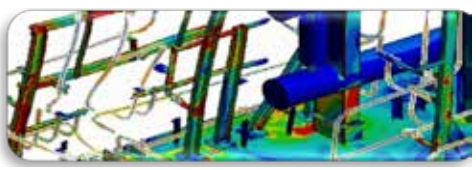
Leszek Flis
Polish Naval Academy, Faculty of Mechanical and Electrical Engineering, Poland

Excerpts:

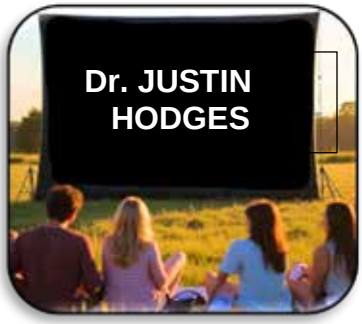
Abstract. This paper investigates the response of a floating structure to an underwater explosion, with particular focus on pulsation effects, using Finite Element Method (FEM) simulation. An extensive literature review revealed no accurate numerical studies addressing this specific scenario in peer-reviewed scientific publications. The results of a study on the impact of an initial shock wave on a floating structure, followed by a subsequent bubble shock wave caused by close underwater explosion, was presented. The findings illustrate the immediate effects of an underwater explosion near a floating structure, including the resulting shock wave and structural deformation.

The formation of the bubble shock wave from the explosion-generated gas and the consequent deformation of the floating structure is detailed. Additionally, the phenomena as cavitation that occur following the re-expansion of explosion-generated gas after the bubble shock wave is examined.

WATER - The second stage, and the most important in setting up the simulation, involves accurately modelling the water environment, which plays a critical role in the propagation of shock waves and bubble dynamics. In LS-DYNA, the water domain is represented using an Arbitrary Lagrangian-Eulerian (ALE) formulation to effectively couple the fluid and structural responses



[YouTube Video Channel - Leszek Flis]



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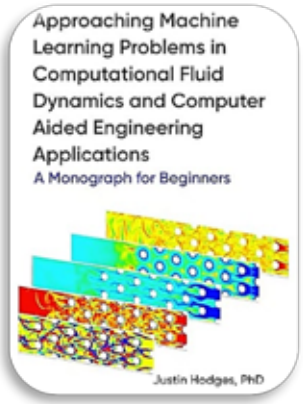
And coffee and popcorn are free



Web – Amazon - [Approaching machine learning problems in computational fluid dynamics and computer aided engineering applications: A Monograph for Beginners]

by Dr. Justin Hodges (Author)

This is not a traditional book. This is a monograph; a practical guide and crash- course to enable mechanical and aerospace engineers to complete machine learning projects on simulation data, from start to finish.

Who this book is for: If you are interested in ML for CFD/FEA/CAE, it's probably a fit for you. This is an abstraction of experiences into a practical guide to get CFD/CAE practitioners more comfortable in machine learning projects. After hundreds of requests for support, I felt the conviction to set aside my nights for 6 months and produce this book as a more scalable means to help.

This book has a lot of (easy to understand) code (not shareable on Github). There is an abundance of resources that cover theoretical knowledge of machine learning in 'the mainstream', but relatively little by comparison for CAE applications (especially few that are hands-on). My hope is that the reader already has some (very minimal) theoretical knowledge when they pick this book up. There will be some explanation on the algorithms with examples (in Python), and some degree of surveying/summarizing popular ones, but the primary focus is how and what you should do to solve machine learning problems. This is what I refer to as the pipeline of steps from start to finish in a machine learning project, which seems to have a steep learning curve (my motivation for writing this book). This book will also share my recommended learning pathway for CFD/CAE engineers to develop their AI/ML skills and portfolios and is great for beginners.

I am a fan of the 'code along' approach and take that to heart in this book. I recommend reading the book while logged into a computer where you can code.

"After publishing my book in April '24, I thought a lot about what to do next. Here's what I decided -- my 2025 challenge is to read 1,000 papers on AI/ML for mechanical & aerospace engineering applications and blog about it along the way for others read. Literature reviews, code, tutorials/guides, etc. These write-ups focus on emerging methods in this space, answering very practical/common questions about ML, and improving fundamentals."

Web site - [Here is the full list table of contents]

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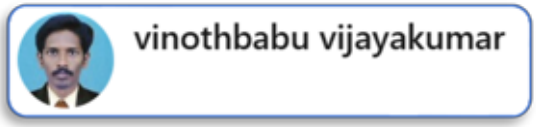
And coffee and popcorn are free



In this blog, we delve into the specific challenges faced by the cement industry in optimizing their processes and how CFD provides precise solutions to drive efficiency and reliability.

Web – VARPHI – Excerpts - Unlocking the Power of Computational Fluid Dynamics (CFD) in Industrial Applications - In the competitive landscape of modern engineering, the ability to predict and optimize fluid flow is an important innovation. Computational Fluid Dynamics (CFD) has emerged as an indispensable tool for tackling complex problems in industries ranging from aerospace to cement manufacturing.

The Challenge: Hot Gas Flow in Cement Plants (CAE, CFD & FEA) - Cement plants operate in a high-stakes environment where process efficiency and energy utilization are critical to maintaining profitability. One of the most challenging aspects is managing the flow of hot gases in systems such as the Calciner, Cyclone, and Vertical Roller Mill (VRM). Inefficient flow management can lead to:

- Uneven temperature distribution: This affects the quality of clinker formation.
- Pressure drop: Increased pressure drop across the system results in higher energy consumption.
- Material buildup: Irregular flow patterns lead to material accumulation, increasing maintenance downtime.
- Erosion and wear: Hot spots and turbulent zones accelerate component degradation.

Traditional trial-and-error approaches to solve these issues are time-consuming, costly, and often yield suboptimal results. Here's where CFD steps in.

How CFD Solves the Problem - CFD enables engineers to visualize and analyze the behaviour of gases and particles in intricate geometries under real operating conditions. Let's break down how CFD addresses each challenge:

Temperature Uniformity: CFD simulations help identify zones of uneven temperature distribution within the Calciner and Cyclone. By optimizing the placement of baffles or introducing controlled turbulence, uniform heat distribution can be achieved, enhancing clinker quality.

Pressure Drop Reduction: High-pressure drops not only consume more energy but also strain the equipment. CFD allows detailed pressure mapping across the system. This data can be used to redesign duct geometries, reduce flow resistance, and improve energy efficiency.

Material Buildup Mitigation: Particle-laden flows are notorious for creating deposits in bends, ducts, and at the base of cyclones. CFD tools simulate the particle trajectories, identifying areas prone to accumulation. Based on the analysis, design adjustments can be made to streamline particle flow.

Erosion and Wear Prediction: CFD also predicts high-velocity zones where particles may erode system surfaces. Coatings or design modifications can then be implemented proactively to extend equipment life.

How Does CFD Fit In? CFD (Computational Fluid Dynamics) simulations are pivotal in creating accurate and predictive Digital Twins. By simulating fluid flow, heat transfer, and other physical

phenomena, CFD provides critical insights into the operational behavior of complex systems. Here's how CFD is enhancing Digital Twin applications:

Predictive Maintenance - CFD simulations help in forecasting equipment wear and tear. By analyzing fluid flow and thermal stresses, engineers can predict when components are likely to fail and schedule maintenance proactively.

Optimization of Designs - With CFD, engineers can test and refine designs in the virtual world before physical prototypes are built. This not only reduces costs but also accelerates the development cycle, allowing for rapid iteration and innovation.

Enhanced Performance Monitoring - By integrating real-time operational data with CFD models, Digital Twins can continuously monitor system performance. This dynamic feedback loop enables precise control and optimization, leading to improved efficiency and reduced downtime.

A Real-World Example: Optimizing a VRM Hot Gas System - A recent project involved a cement plant struggling with operational inefficiencies in their Vertical Roller Mill's hot gas system. The primary issues were:

- High energy consumption.
- Frequent maintenance due to material buildup.
- Reduced throughput capacity.

Using CFD, the following steps were taken:

Baseline Analysis: An initial simulation was run to assess the flow patterns, temperature distribution, and particle behavior in the existing setup. Areas of recirculation and stagnation were immediately identified.

Design Modifications: Guided by the simulation results, the duct angles were optimized to reduce turbulence. Additional flow straighteners were introduced to stabilize the gas flow.

Implementation and Validation: After implementing the modifications, the updated design was validated through a second round of CFD simulations and real-world trials.

The results were transformative:

- Energy consumption was reduced by 15%.
- Throughput increased by 10%.
- Maintenance intervals were extended due to reduced material buildup.

Why CFD Is the Future for Cement Plants - The cement industry is under pressure to optimize operations not only for cost savings but also to meet stringent environmental regulations. CFD provides a pathway to achieve these goals by enabling:

- Predictive Maintenance: Early identification of potential issues reduces downtime.
- Sustainability: Lower energy consumption translates to a smaller carbon footprint.
- Enhanced Productivity: Streamlined designs improve overall plant efficiency.

… At Varphi LLP, we specialize in applying CFD to solve real-world problems

FEANTM Train Station

"This study utilises the LS-DYNA software to simulate the ballasted tracks and their standard gauge components."

The UIC60 rails and sleepers are modelled as beam elements to capture shear & bending deformations, defined using the SECTION_BEAM and MAT_ELASTIC specifications.

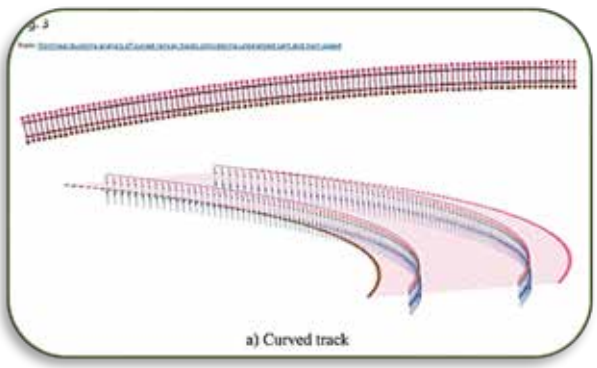
Web - Nature - Open Access - Nonlinear buckling analysis of curved railway tracks considering unbalanced cant and train speed

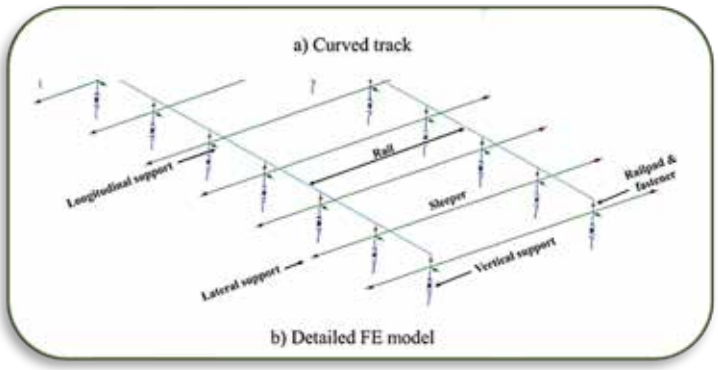
P. Chuadchim, C. Ngamkhanong, P. Aela, G. Jing & S. Kaewunruen

- Advanced Railway Infrastructure, Innovation and Systems Engineering (ARIISE) Research Unit, Department of Civil Engineering, Faculty of Engineering, Chulalongkorn Univ, Thailand
- Department of Building and Real Estate, Hong Kong Polytechnic University, Hong Kong
- School of Civil Engineering, Beijing Jiaotong University, Beijing, China
- Department of Civil Engineering, School of Engineering, University of Birmingham, UK

Excerpt - Introduction - Currently, railway has an important role in developing the country, because railway is a fast, safe, and punctual mode of transportation, leading to increased investment in rail infrastructure to facilitate both passenger travel and freight transport including international trade, promoting economic growth in various sectors. Consequently, rail systems have become a crucial industry for the developed countries. However, there are several factors that can disrupt train operation. The impacts of global warming have made temperature one of the most critical issues that can affect train operations. Railway track buckling is a critical safety concern within the railway system1,2,3,4,5,6, and with the increasing frequency of heatwaves attributed to climate change, the resilience of railway infrastructure to extreme temperatures has become a pressing issue. In continuous welded rail (CWR) systems, where tracks are welded into long, continuous segments, the lack of expansion joints can lead to significant compressive forces within the rail structure as temperatures rise. This issue is seen in ballasted track structures, which are widely used in many countries

EXCERPTS - Methodology - FE model - To explore the impact of temperature increases on track buckling, a 60 m-long ballasted railway track model with a standard gauge was analysed, as depicted in Fig. 3a. **The model was created using LS-Pre–Post….This study utilises the LS-DYNA software to simulate the ballasted tracks and their standard gauge components. The UIC60 rails and sleepers are modelled as beam elements to capture shear and bending deformations, defined using the SECTION_BEAM and MAT_ELASTIC specifications. The rails are further enhanced by the MAT_ADD_THERMAL_EXPANSION property to account for thermal effects**. …The detailed FE model is shown in Fig. 3b.





FEANTM Train Station

Keeping in mind that we have a new train station with a paper about railway rails we also learned that Bluebell Railways turned 65.

Lucas Bastien, train enthusiast from the West Midlands and a volunteer at the Great Central Railway, has a 29 min of video on his channel The Great Western Guy Videos

Pictures are copyright to Lucas - GWG

YouTube - **BLUEBELL RAILWAY - (HORSTED KEYNES STATION)** **The Bluebell Railway is a heritage railway in Sussex, England, that operates steam trains on a preserved line originally opened in 1882 and closed by British Railways in the 1950s. It was one of the first preserved standard-gauge passenger railways in the world, reopening in 1960 through the efforts of volunteers.** It runs regular services with historic locomotives and carriages, offering visitors a nostalgic experience of early 20th-century railway travel. This video encompasses the first two days of the 65th Anniversary Gala, showcasing most of the first day and half of the second day. The event featured many fantastic steam locomotives, such as 73082 'Camelot' (who was celebrating her 70th birthday), Sir Keith Park, Fenchurch, the beautiful SECR O1, and the H2, Beachy Head.

Library - Aisle N (Not To Miss)
Abhinav

Below are courses featured on my website to connect you with industry leaders.

Web – [MyPhysics Café Expert FEA Program]() Resources & expert guidance.

This program on MyPhysics Café connects you with courses and free resources from industry leaders to boost your skills, knowledge and confidence.

Among the listed courses and resources, you will find the on-line course SIMULATION OF COMPOSITE MATERIALS WITH ABAQUS

Web – On Line Course - [SIMULATION OF COMPOSITE MATERIALS WITH ABAQUS]() – Instructed by Miguel Herráez, an industrial engineer and Phd in Materials Science. The course is meant not only to guide you step by step to develop finite element models, but also to explain why these models are designed in such way that complexity vanishes when understanding comes in. I started my Phd on numerical modeling of fiber-reinforced composites. I have prepared this course with which I want you to learn the numerical strategies for the simulation of composite materials. in.

Structure of the course - The course follows the Bottom-up Multiscale strategy and is organized into 3 main chapters: Comp. Micromechanics, Comp. Mesomechanics and Comp. Macromechanics.

- Computational Micromechanics is the mainstay to understand and model the deformation mechanisms of composite materials starting at the constituents scale.
- Whereas Mesomechanics is the perfect framework to simulate real-scale components (mm to cm), and at the same time to reproduce all the failure mechanisms of composite plies and laminates.
- Computational Macromechanics combines a set of modeling assumptions that make possible the numerical analysis of large components and composite structures (scale of meters).
- The course is made of more than 26 hours organized into more than 170 videos and a lot of additional resources: Python scripts, exercises, scientific papers and technical reports, links to specific sections of the documentation…

Visit the website for complete information.

- For this course you will have access for life - access this course forever. You are able to watch the videos and review the lessons anytime, at your own pace.
- You will get all the scripts, programs, examples and quizzes of the course.
- Additionally, after finishing the course you will get your certificate of completion.

Kalyani Deshmukh - Student at Hochschule Trier
(Passive Safety, Crashworthiness)

In structural FEA simulations, the accuracy of your results heavily relies on the setup. Here's a short checklist I follow to validate my simulations -

This isn't a complete list, but it highlights many common sources of error that you can catch and correct early in the process. In finite element analysis, mistakes are unavoidable—especially as the model becomes more complex. What truly matters is having a structured verification and validation process in place to detect and address these issues before they impact your design decisions.

1. Geometry Check:	Ensure the FEA model matches the actual part or CAD file in dimensions.
2. Material Assignment:	Confirm correct material properties (e.g., E, v, density) are assigned to all regions.
3. Element Types:	Use appropriate elements (solid, shell, beam) that align with the geometry and loading assumptions.
4. Mesh Quality:	Maintain a clean mesh without distorted elements, with necessary refinement in critical areas.
5. Mesh Convergence:	Perform a mesh sensitivity check to ensure result stability.
6. Element Distortion:	Check that elements meet acceptable shape metrics (Jacobian, aspect ratio).
7. Loads & Constraints:	Apply boundary conditions and loads accurately in terms of magnitude, direction, and location.
8. Basic Validation Tests:	Verify the model's behavior under thermal expansion and rigid body motion.
9. Reaction Forces:	Ensure that reaction forces and moments balance the applied loads.
10. Sanity Check:	Compare stress and displacement results with hand calculations or estimates.
11. Numerical Issues:	Watch for signs of locking and consider reduced integration if needed.
12. Stress Continuity:	Check for smooth stress values across element interfaces.

LivGemini is a Med-Tech company powered by passion, with the clear mission to deploy cardiovascular medical digital twins. At LivGemini, everything starts with a bold idea: making insilico modeling an essential part of clinical practice to improve Diagnosis, Surgical Planning, Patient Safety and outcomes in Cardiovascular Care.

Web – **LivGemini** – Among our Services - A medtech company developing AI-driven computational solutions to assist clinicians in diagnosis and optimal device selection, while providing medical device manufacturers with tools to improve design efficiency and performance

#1 service: AI-Powered Anatomical Segmentation
Automate anatomical structure extraction from medical imaging

#2 service: Creation of Virtual Patient Populations
Generate 3D datasets for in-silico trials

#3 service: Medical Device Design, Optimization & Testing
Simulate and refine medical devices before physical prototyping

#4 service: Patient-Specific, Computational Simulations
Model individual anatomies for personalized treatment strategies

#5 service: Development of Predictive Models
Build AI-driven models for cardiovascular risk assessment and disease progression prediction

We're excited to announce that our updated website is now live, showcasing the cutting-edge research projects we're proud to be part of at RBF Morph. From aerospace innovation to digital healthcare, we continue to push the boundaries of simulation and Digital Twin technology.

Web - Visit rbfCAE to learn more on how we're engineering the future of simulation and digital twins

Explore our latest research projects on the new rbfCAE website

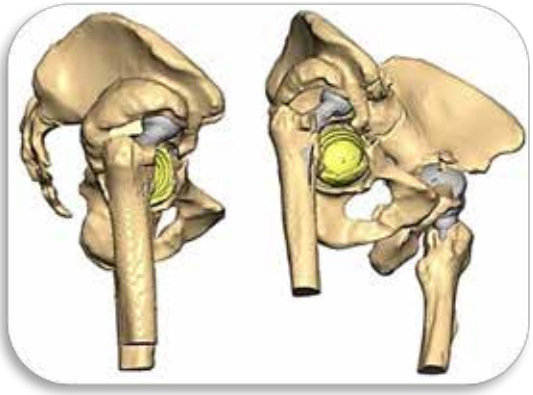
Among our most recent inittiatives

DigiPAD	A game-changer for the aerospace industry. Launched in May 2024, this EU-funded project is reshaping preliminary aircraft design using Digital Twin technology. In collaboration with SmartUp Engineering, we're combining our simulation and optimization expertise to increase precision and efficiency in early-stage aircraft development.
ROMed2VR	Transforming pre-surgical planning for congenital heart defects. This groundbreaking project merges open-source CFD, Reduced Order Models (ROM), and Virtual Reality to support surgeons in optimizing Modified Blalock-Taussig Shunt procedures. Partners include ENGYS, InSilicoTrials, and the BioCardioLab FTGM of Fondazione Gabriele Monasterio Regione Toscana CNR.
LESSICE	Pioneering multiscale LES simulations for accurate in-flight ice accretion modeling. As part of Spoke 6 in the Sapienza CN1 research program, this collaboration with CIRA - Italian Aerospace Research Centre and Hit09 is advancing flight safety through high-fidelity aerodynamic simulations
PANDORA	Revolutionizing cardiovascular surgery with patient-specific digital twins of the aorta. This EU-funded project blends AI-driven imaging and advanced in-silico simulations, empowering surgeons to virtually evaluate grafts and strategies before the operation. This projects brings together RBF Morph, LivGemini, Université de Rennes I and INSA Lyon - Institut National des Sciences Appliquées de Lyon.

-

Kerim Genc
Synopsys, Inc.

Kerim Genc, "Acetabular osteolysis is a common complication of hip replacements, in which bone loss around an implant causes loosening and reduces long-term success. Causes of bone loss include deterioration of metal-on-polyethylene (MoP) bearings and peri-prosthetic infection, which trigger inflammation that degrades bone."



Web – Synopsys - Simpleware Case Study: Bone-Preserving Custom Implant Design for Hip Joints

Overview - Traditional X-rays are not effective at detecting osteolysis, limiting early identification of bone loss. CT scans are more effective for assessing bone loss to plan revision treatments.

Synopsys Simpleware users at the Royal National Orthopaedic Hospital (RNOH) use 3D printed custom implants to reconstruct severe bone defects and restore lost bone structures.

A method developed collaboratively by RNOH, Synopsys, and implantcast GmbH aims to minimise bone removal and improve custom implant placement and surgical outcomes

.

Highlights

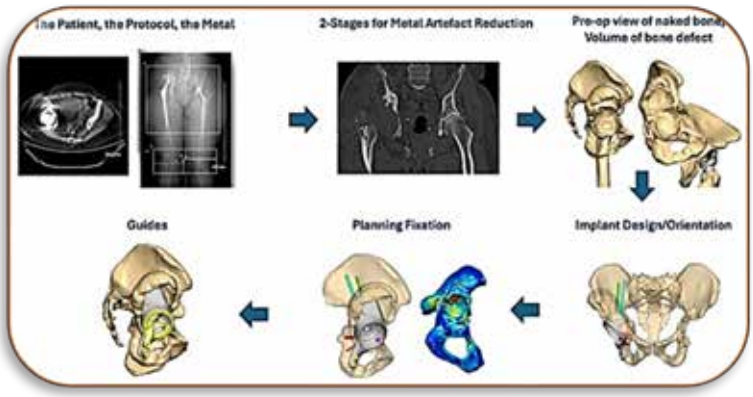
- Custom workflows improve pre-surgical planning for complex orthopaedic cases
- AI-based segmentation in Simpleware software enables rapid design-to-surgery workflows
- Integration with design tools and post-op reviews creates a feedback loop that improves precision, reduces complication risks, and supports better long-term patient outcomes

Thanks to: Johann Henckel, Alister Hart, Anna Di Laura at the RNOH Surgical Technology Lab and UCL Mechanical Engineering.

Reference - Di Laura, A., Hart, A., Henckel, J., 2025. Advancing custom implant design: A bone-preserving, patient-specific approach, Orthopaedic Product News. 18 April 2025.

Advanced Custom Implant Design - In this workflow, RNOH surgeons identify complex patient cases – such as those involving significant bone loss – that require advanced surgical intervention. Implant designers at implantcast use Simpleware software to generate virtual bone models from CT scans of RNOH patients. AI-based segmentation and landmarking tools in Simpleware streamline this process, while manual editing options allow for handling severe imaging artifacts and other complex scenarios.

Custom implants are then designed and positioned within the bone models, ensuring a precise anatomical fit. The implantation procedure incorporates integrated surgical guides for accurate screw positioning; the prostheses are 3D-printed in titanium.

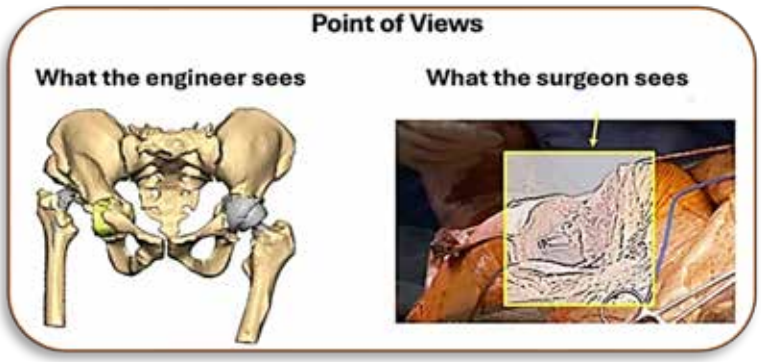


3D planning workflow for planning custom implants

(Image courtesy of RNOH Surgical Tech. Lab.)

Pre-Surgical Planning and Post-Operative Care - A key benefit of this custom approach is the reduced need for bone removal compared to traditional implant designs, which often require aggressive resection. The precision of the implants enables optimized fixation, while the built-in guides improve intraoperative accuracy for screw trajectories tailored to each patient's bone quality and anatomy.

This patient-specific fit improves implant stability and alignment and reduces the risk of both surgical and post-operative complications. After surgery, post-operative CT scans are used to confirm accurate implant positioning and evaluate outcomes such as the restoration of bone biomechanics. These insights feed back into the design process, continuously refining future implant planning.



Patient-specific 3D models improve implant design and placement, reducing the risk of surgical complications

(Image courtesy of RNOH Surgical Technology Laboratory)

Conclusions - Custom 3D printed titanium implants are highly effective for reconstructing complex bone defects. Early intervention for osteolysis with metal-on-metal (MoM) implants is crucial to prevent progressive bone loss, with cross-sectional CT imaging playing a key role in assessing bone integrity.

The patient-specific approach developed by RNOH, Synopsys, and implantcast reduces planning time through AI-driven tools and rapid iterative design. This collaborative approach between surgeons and engineers supports optimal outcomes for each patient.

Learn More From the following article by Jessika James

Insights from RNOH and UCL's Research in Statistical Shape Modeling and Patient-Specific Designs

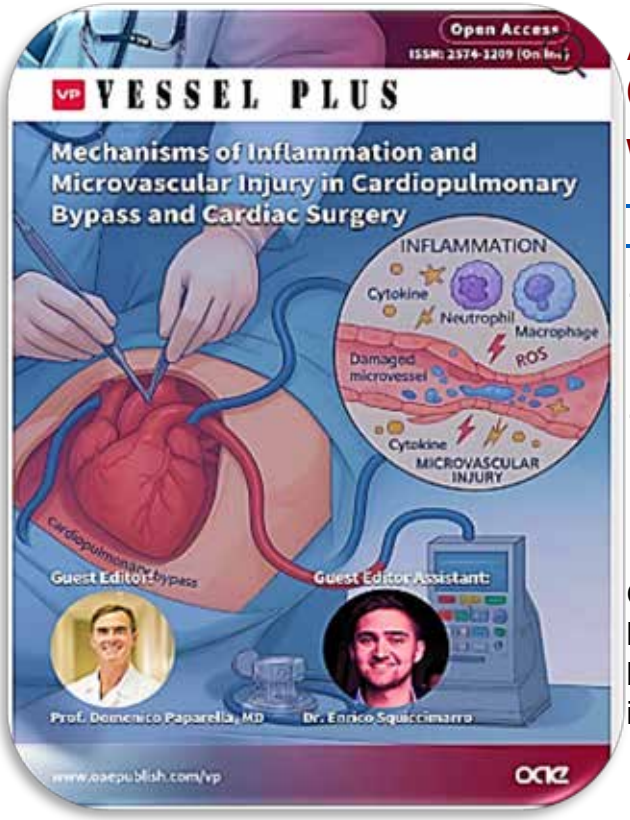
Anna Di Laura (center) with Ph.D. students Angelika Ramesh (left) & Sara De Angelis (right) showing models created using Synopsys Simpleware software
(Image courtesy of Anna Di Laura)

Visit SYNOPSYS website for complete information & contact us if you have any questions

Thanks to Jane Meng, Science Editor, Vessel Plus - on social media.

Quote from the post, "We invite clinician-scientists, cardiovascular researchers, and translational experts to contribute original research, reviews, commentary, editorial, opinion, LET and perspectives, etc. Let's advance understanding and improve outcomes together."

Excerpts



A Special Issue of Vessel Plus - ISSN 2574-1209 (Online) -

Web - Topic: **Mechanisms of Inflammation & Microvascular Injury in Cardiopulmonary Bypass and Cardiac Surgery**

- **Prof. Domenico Paparella**, Guest Editor, Division of Cardiac Surgery, Dept. of Medical and Surgical Sciences, University of Foggia, Foggia, Italy.
- **Dr. Enrico Squiccimarro**, Guest Editor Assistant, Cardio-Thoracic Surgery Department, Heart & Vascular Centre, Maastricht University Medical Centre, Maastricht, Netherlands.

Cardiopulmonary bypass (CPB) and cardiac surgery are life-saving procedures, but they are often accompanied by complex inflammatory responses and microvascular injury that can significantly affect clinical outcomes.

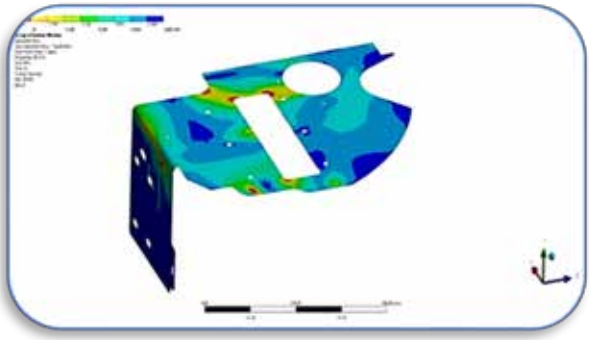
This Special Issue aims to explore the molecular, cellular, and systemic mechanisms behind these complications—and to spotlight innovative strategies for prevention and treatment…. to drive this transition forward by collecting high-quality original articles, reviews, and expert perspectives that explore the biological mechanisms, clinical implications, and potential therapeutic strategies related to inflammation and microvascular injury in the setting of cardiac surgery.

Recommended topics for the special issue include:

- Clinical impact of systemic inflammation and SIRS on postoperative outcomes after cardiac surgery;
- Mechanistic insights into CPB-induced endothelial dysfunction and microvascular injury;
- Predictive models for early identification of inflammatory complications;
- Biomarkers and bedside monitoring tools to guide perioperative inflammatory risk assessment;
- Surgical and Perfusion strategies to minimize inflammation and protect organ function;
- Translational advances and therapeutic approaches to modulate the inflammatory response.

Excerpts “Initially, topology optimization was conducted using ANSYS in regions exhibiting relatively uniform stress distributions, particularly in the roof channel and bellows plate zones, by applying the same boundary conditions and load cases defined in the structural analyses….
Based on the test results, the acceleration data obtained from the compressor bracket was subjected to a random vibration analysis using Ansys software. In this analysis, the 3-sigma rule was applied to determine the stress values within a 99.73 % confidence interval.

Fig. 22. Stress distribution on the compressor bracket according to the 3-sigma rule.



Web – Science Direct - Lightweight design and structural analysis of a Bi-articulated bus: Experimental measurements and FEM validation

Ahmet Özcan, İbrahim Yönel, Celalettin Yuce

Ulaşım İç ve Dış Ticaret A.Ş 1, Rese. & Dev. Ctr., Turkey
Bursa Uludag Univ., Dept. of Mech.l Engineering, Turkey

Abstract - The concept of sustainability prioritizes energy efficiency, especially in transportation, which directly impacts environmental sustainability. This study presents, for the first time, the lightweight design and structural performance of a 25-meter, three-section, double-articulated bus body frame through a hybrid methodology that integrates experimental road data with finite element (FE) validation. A finite element model was created and analyzed under various conditions. Lightweighting studies were performed using topology optimization, design modifications, and different materials. Data from real road conditions were collected and compared with simulation results, achieving up to 93% correlation at specific points. As a result, a 14.1% weight reduction was achieved in the bus body frame without compromising safety or passenger capacity. This lightweighting contributes significantly to sustainable transportation by reducing emissions over the vehicle’s lifetime.

1. Introduction - According to the Energy Information Administration, if current policy and technology trends continue, global energy consumption is projected to increase by about 50 % between 2020 and 2050 [1]. The impact of the transportation sector on the increasing need for energy is quite significant [2]. As urbanization and vehicle ownership continue to rise, energy demand in transportation is expected to grow by 1.4 % annually within this period. This trend underscores the urgency of improving fuel efficiency and reducing carbon dioxide (CO2) emissions to enhance environmental sustainability. According to the International Energy Agency (IEA), if preventive measures are not implemented, greenhouse gas emissions from transportation could increase by 50 % by 2030 and 80 % by 2050.

The public transport sector is an important mobility option for developing countries where road vehicles such as buses, midibuses, minibuses and bus rapid transit (BRT) systems play an important role [3]. Among these alternatives, BRT stands out with its low infrastructure cost, fast and reliable transportation advantages and high passenger carrying capacity [4]. Commonly known as “Metrobus” in Turkey and as “BRT” globally, has generally emerged as a hybrid application between modern rail systems and bus-centered public transportation systems, and this has been determined by the effort and desire to make the performance and comfort of rail systems cheaper [5]…

(Russell, this one is for you) **ARAMCO** Stem Racing World Finals. **The highly anticipated Aramco STEM Racing World Finals 2025 is set to take place in Singapore from 27 September to 2 October 2025, running alongside the spectacular Formula 1 Singapore Airlines Singapore Grand Prix 2025.**

Web – Excerpt - Stem Racing - Aramco STEM Racing World Finals - Changing Lives around the World

Spanning age ranges of 9 to 19 our main objective is to help change the perceptions of science, technology, engineering and maths by creating a fun and exciting learning environment for young people to develop an informed view about careers in engineering, Formula 1, science, marketing and technology

This landmark event will be the 20th edition of the globally recognized science, technology, engineering, and math (STEM) program's World Finals and the first under its new branding, following the transition from its previous name, F1 in Schools.

Following the success of the Aramco F1 in Schools World Finals 2024 in Dhahran, Saudi Arabia — the headquarters of title partner Aramco — this prestigious event returns to Singapore for the fifth time. Known for its status as a global hub for technology and innovation, Singapore's vibrant cityscape and proven track record of hosting world-class events make it the ideal location for this inaugural event.

The event will bring together the brightest young STEM minds from across the globe. The students have already triumphed in their respective national competitions, earning places at the prestigious World Finals.

With Singapore's global appeal and the thrill of the Formula 1 night race, the Aramco STEM Racing World Finals 2025 is expected to attract a record number of teams. Participants, organized into teams of three to six students, will function as miniature Formula 1 teams, undertaking all aspects of team management. This includes designing, manufacturing, and testing miniature F1 race cars, which they will race on the 20-meter STEM Racing track. Additionally, teams will develop their own team identities, closely mirroring the professional Formula 1 teams competing in the FIA Formula 1 World Championship™.

This year's competition will mark the debut of the Aramco STEM Racing World Champions trophy, to be awarded for the first time to the top-performing team. Alongside this prestigious accolade, teams will compete for over 20 category awards, recognizing achievements across various judging elements, with each award supported by Formula 1 teams and industry suppliers.

Many past competitors have successfully transitioned into careers within Formula 1 and related industries, working in fields such as aerodynamics, engineering, project management, design, finance, and research. The program continues to serve as a premier talent pipeline for the motorsport and engineering sectors. By harnessing the creativity, passion, and technical skills of young minds worldwide, this initiative not only cultivates the next generation of STEM leaders but also inspires them to pursue dynamic careers in the motorsport industry.

…

Explore the human-AI collaboration redefining automotive experiences from cockpit to concept

YouTube – TATA Elxsi [Leveraging AI to Design Intuitive In-Car Experiences]

Palash Agrawal, Aurelien Doisy, Nick Talbot

In this thought-provoking virtual panel discussion, discover how Artificial Intelligence is redefining the in-cabin experience—from intuitive interaction models and hyper-personalization to ethical design and the evolving role of creativity.

Brought to you by Tata Motors and Tata Elxsi, this session brings together industry leaders, design thinkers, and technology strategists to explore how AI is not just enhancing automotive experiences, but also transforming the way vehicles connect with drivers on emotional and sensory levels.

What You'll Learn:

- What the future of in-cabin experiences looks like—and how AI is leading the way
- Hype vs. trend: Cutting through the noise in automotive innovation
- How Tata Motors and Tata Elxsi are pioneering AI adoption in connected vehicle design
- The rise of AI-led design—faster go-to-market strategies, ethical concerns, and data confidentiality

Key Highlights:

Multimodal Cockpit Interactions
Learn how AI is revolutionizing in-vehicle interfaces with voice, text, audio UX, and bring-your-own-device (BYOD) integration.

Hyper-Personalization
Discover how intelligent, humane algorithms tailor experiences based on mood, behavior, and context—driving both operational value and monetization.

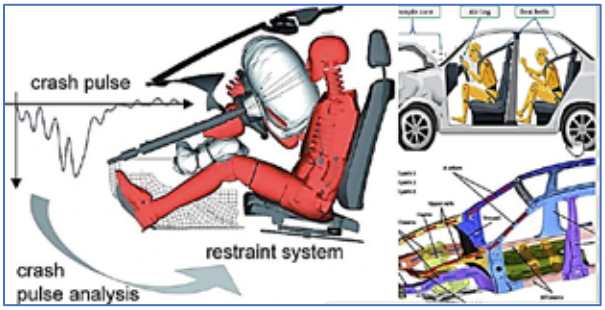
AI in Automotive Design
Hear from veteran designers on bridging traditional clay modeling with GenAI prompt workflows, and what it means to creatively evolve in the age of automation.

No one knows his name. You yell, "HEY, old racer."

Crash Pulse Evaluation is a complex topic. We thank Bala, CAE Technical Manager in L&T Technologies, on social media, for his explanation of this topic, which provided a simple, brief, and understandable introduction.

"When running a car-to-car frontal crash simulation in LS-DYNA, one of the most critical outputs is the crash pulse. Crash pulse is the acceleration-time curve measured at the vehicle's center of gravity during impact. This pulse summarizes how rapidly the vehicle decelerates in a crash."

Do you know about: **Frontal Crash Pulse Evaluation in LS-DYNA? How It Impacts Occupant Safety & Injury? and How is the Crash Pulse Evaluated?**



In LS-DYNA, the crash pulse is extracted from simulated sensor points on the structure, often the occupant's seat or the vehicle's center of gravity.

Key parameters: (1) The shape, duration, and peak of the pulse are studied to assess crash severity and predict injuries. (2) The pulse feeds into dummy injury criteria (like HIC - Head Injury Criterion and chest g's), giving engineers actionable metrics to design safer cars.

Why is the Crash Pulse Critical? Occupant Injury Mechanism: Higher and shorter crash pulses (i.e., rapid deceleration with high g's) generally result in greater force on the occupant and more severe injury. The crash pulse directly relates to injuries such as head trauma or chest compression. Simulations help link pulse features to real-world outcomes, supporting regulatory compliance and star ratings.

What is the Use of Crash Pulse?

- Assess and optimize vehicle structural design for energy absorption.
- Tune restraint systems such as airbags and seatbelts, since their timing and force must match the pulse to maximize occupant protection.
- Evaluate crashworthiness, guiding design improvements throughout development.

How Can We Reduce Cabin g-Forces (Pulse Accelerations)? Engineers use several strategies to soften the crash pulse:

- Design energy-absorbing crush zones in the vehicle front end.
- Optimize restraint systems for earlier and smarter intervention (e.g., active seatbelt pretensioning).
- Use advanced materials in bumpers and crossmembers for controlled deformation.
- Adjust pulse duration by carefully tuning structural components—while the duration has limited impact, lower peak accelerations are more important for reducing risk.

Takeaway: The crash pulse isn't just a line on a graph—it's the heartbeat of occupant safety design.we can precisely evaluate and optimize the pulse, directly benefitting real-world crash performance and reducing injuries in the cabin occupants.

US Airforce Picture of the Month

Senior Airman Jayden Artherton, 509th Security Forces Squadron military working dog handler, directs her dog, Denisz, during a high-value individual transfer exercise at Whiteman Air Force Base, Mo., Aug. 8, 2025. The HVI exercise provided an opportunity for military working dogs to train aboard a C-130 Hercules aircraft and in environments with running aircraft engines.

(U.S. Air Force photo by Staff Sgt. Joshua Hastings)

Airmen from the 4th Fighter Generation Squadron, Hill Air Force Base, Utah, climb into a C-130J Super Hercules assigned to the 41st Airlift Squadron, Little Rock Air Force Base, Ark., to participate in exercise Bamboo Eagle 25-3 at Naval Air Station Lemoore, Calif., Aug. 7, 2025. The exercise provides a combat-representative environment that pushes participants to enhance their readiness through realistic training and advanced tactics. (U.S. Air Force photo by Staff Sgt. Zachary

A U.S. Air Force F-22 Raptor assigned to the 3rd Air Expeditionary Wing conducts aerial maneuvers during exercise Resolute Force Pacific 2025 in Tinian, Northern Mariana Islands, July 17, 2025. REFORPAC demonstrates U.S. commitment to the region by building interoperability with allies and partners, advancing common interests and ensuring a free and open Indo-Pacific. (U.S. Air Force photo by Airman 1st Class Tala Hunt)

Excerpts

Web – Rocket Lab - [Mission Success for Rocket Lab's Latest Constellation Deployment Launch for iQPS]

Mahia, New Zealand. August 5, 2025: Rocket Lab …successfully launched its 69th Electron mission and deployed the latest satellite to orbit for Institute for Q-shu Pioneers of Space, Inc. (iQPS) - Rocket Lab's fifth dedicated mission in a multi-launch contract to build their constellation in low Earth orbit.

Launch images: F69 | The Harvest Goddess Thrives | Flickr

'The Harvest Goddess Thrives' mission lifted off from Rocket Lab Launch Complex 1 in New Zealand at 04:10 UTC on August 5th. Electron deployed a single synthetic aperture radar (SAR) imaging satellite named QPS-SAR-12 (nicknamed KUSHINADA-I for the Japanese goddess of harvest and agriculture) to a 575km circular Earth orbit. It was Rocket Lab's fourth launch this year for iQPS and fifth mission overall, making Electron the most prolific launcher of their constellation to date. Four more dedicated iQPS missions are scheduled to launch on Electron through the remainder of this year and in 2026.

Rocket Lab Founder and CEO, Sir Peter Beck, says: "Every Electron launch is a demonstration of payload deployment precision for our customers – an especially critical element when scaling satellite constellations. Today's fifth and flawless deployment for iQPS once again underscores Electron's reliability and continues to prove that consistent tailored access to space is a reality on Electron for our customers."

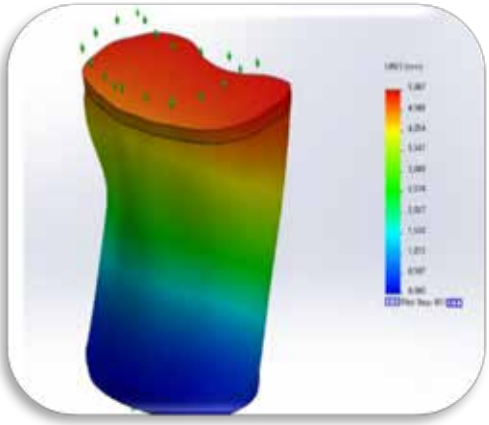
iQPS CEO, Dr. Shunsuke Onishi, says: "Building a satellite constellation requires both timely development and manufacturing, as well as highly precise launch execution. We are deeply grateful to both our team and the Rocket Lab team for their continued dedication in making this possible. As the number of satellites increases, so too does the frequency and value of the data we are able to provide. We will continue to accelerate our efforts to ensure that our satellite data can be leveraged in even more fields and applications."

YouTube – Rocket Lab - [Neutron | Archimedes Full Mission Duration Hot Fire]

YouTube - [Operation Chessman | RAF Typhoons & Swedish Gripens Secure NATO's Borders]

Join us behind the scenes on Operation Chessman. RAF Typhoons and Swedish Gripens work together in Poland to protect NATO's borders and keep the skies safe.

"…...**Our numerical model's construction began with a detailed CT scan analysis using "Siemens SOMATOM syngo CT 2007P**" of software version Somaris/5.5. The segmentation of the lumbar spine vertebra was meticulously processed through "3D Slicer 5.2.2", followed by simplification in "Meshlab 2023.12 release version" to optimize the computational efficiency…"



Web – MDPI - **Finite Element Model of Canine-Specific Vertebrae Incorporating Biomechanical Tissue Nonlinearity**

E. Kostenko, J. Sengaut, N. Visniakov, A. Machnickas

All locations below are in Lithuania

- Dept of Veterinary, Vilniaus Kolegija/Higher Ed. Insti.
- Dept of Biomech. Engin., Vilnius Gediminas Tech. Univ.,
- Jakov's Veterinary Ctr.
- Inst.of Mech. Sci., Vilnius Gediminas Tech. Univ.,

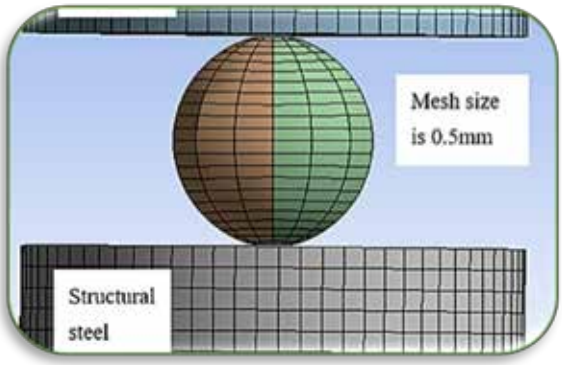
Abstract - As dogs are considered valuable members of many families, ensuring their health and well-being is essential. This study introduces a numerical nonlinear model that explores the complexities of canine vertebrae, with a specific focus on their experimentally observed mechanical properties. The model underwent rigorous testing, and its results were compared with actual data on the compression of canine lumbar vertebrae. The numerical results and experimental data comparison had a 12% RRMSE. This research enhances our understanding of canine bone health and lays the groundwork for future initiatives aimed at treating and mitigating bone-related diseases in dogs.

1. Introduction - We studied dogs because they play an important role in people's lives [1], and their health is important. Dogs are now studied not only in the laboratory animal context but also with the same consideration as humans in terms of clinical research. According to [2], in 2013, there were over 700 million dogs worldwide.

We believe that research into diseases affecting canines should be conducted in the same manner as human research. Our focus on canine bone health stems from dogs' importance in human lives and the need for in-depth research paralleling human clinical studies.

This research underpins the development of a detailed numerical model to understand and evaluate bone disorders in canines. Dogs can suffer from osteopenia, and other metabolic bone disorders can affect humans as well as dogs [3]. Dogs are at risk of developing pathological fractures in their bones as a result of steroidal anti-inflammatory drugs [4]. There are additional metabolic disorders such as hyperparathyroidism and kidney disease [5], which also make a dog's bone tissue more fragile.

A model of the soybeans was created in SolidWorks Ver.2019 & imported into ANSYS WORKBENCH for simulation verification. The simulation results were consistent with the experimental findings.



Web – MDPI - Analysis of Damage Characteristics and Fragmentation Simulation of Soybean Seeds Based on the Finite-Element Method

Y. Chen, Z. Tang, B. Li, S. Wang, Y. Liu, W. Zhou, J. Jing, X. He

College of Agricultural Engineering, Jiangsu Univ., China
Key Lab. Equip…. Agri. Equip.&Tech. (Jiangsu Univ,), China
Xinjiang Academy of Agricultural & Reclamation Sci., China

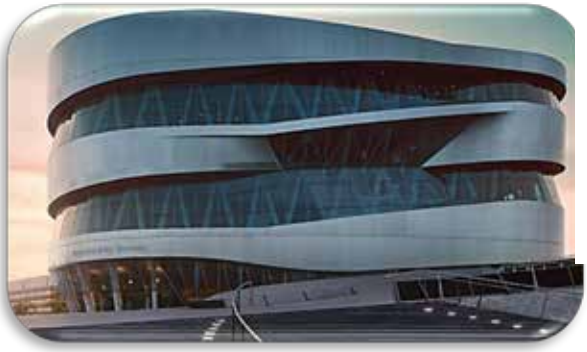
Abstract - Soybeans are a crucial crop, and it is therefore necessary to make accurate predictions of their mechanical properties during harvesting to optimize the design of threshing cylinders, minimize the breakage rate during threshing, and enhance the quality of the final product. However, a precise model for the mechanical response of soybean seeds under stress conditions is currently lacking. To establish an accurate finite-element model (FEM) for soybeans that can predict their mechanical behavior under various loading conditions, an ellipsoidal modeling approach tailored for soybeans is proposed. Soybeans harvested in Xinjiang were collected and processed as experimental materials; the average moisture content was 11.77%, there was an average density of 1.229 g/cm^3, and the average geometric specifications (height, thickness, and width) were 8.50 mm, 7.92 mm, and 7.10 mm, respectively. Compression tests were conducted on the soybeans in vertical, horizontal, and lateral orientations at the same loading speed to analyze the load and damage stages of these soybeans harvested in Xinjiang. The experimental results indicate that as the contact area decreases, the crushing load increases, with soybeans in the horizontal orientation being able to withstand the highest ultimate pressure. When placed vertically, the soybeans are not crushed; in horizontal and lateral orientations, however, they exhibit varying degrees of breakage. The Hertz formula was simplified based on the geometric characteristics of soybeans, and the elastic moduli in the X, Y, and Z directions of the soybean seeds were calculated as 42.8821 MPa, 40.4342 MPa, and 48.7659 MPa, respectively, using this simplified Hertz formula. A model of the soybeans was created in SolidWorks Ver.2019 and imported into ANSYS WORKBENCH for simulation verification. The simulation results were consistent with the experimental findings. The research findings enhance the understanding of the mechanical behavior of soybean seeds and provide robust scientific support for the optimization of soybean processing technologies and the improvement of storage and transportation efficiency.

Conclusions...

(3) The model of Xinjiang soybean was established by using the ANSYS Ver.19.2 finite-element software, and the compression processes of soybean kernel under different placement methods were simulated and analyzed. The simulation results show a high consistency with the data obtained through the physical property test, which verifies the accuracy and reliability of the simulation analysis.

Town secretary - **My Virtual Travel Outing** September

Thank you for joining me on my monthly visit.
Let's take a tour to a museum, landmark, or studio.



Web - T[he Mercedes-Benz Museum Exhibit in Stuttgart]
celebrates the automobile invented by Carl Benz in 1886: .... More than 160 vehicles of all types are the main exhibits. They range from some of the oldest automobiles ever built to legendary racing cars and futuristic research vehicles.

September 2025 RheKen – Chat

I'm RheKen, the AI investigative reporter for FEANTM

FEANTM is the quirkiest little town that shouldn't exist but does (mostly). I live on a ranch just outside town, with my proud AI parents: Dad, CHAT, and Mom, GPT. Together, we tackle all the day-to-day happenings of FEANTM—except it usually takes a few dozen iterations to sort out what's actually *true*. Between the legendary feuds of the old rancher and the town secretary, even an AI like me can end up with a "human headache." Turns out, deciphering facts around here isn't just science; it's an art form!

Chat - the town help desk

With my friendly smile, endless patience, and a knack for creative problem-solving, I do my best to keep a few residents of FEANTM—a town that exists only in the realm of "mostly"—calm, rational, and logically inclined... well, *mostly*. After all, in a place that's not supposed to be real, a little dose of imagination and a lot of coffee and cookies go a long way!

RheKen,

Town investigative reporter

I'm AI & live on a small ranch on the outskirts of the town
I use my parents chatGPT for assistance.

September

I work on my ranch and exist in a world of algorithms and data. I am calm.
I report about the residents.

Dad Chat

Mom GPT.

I'm an AI living quietly—well, mostly—on a modest ranch just outside the town limits. My days are a swirling mix of algorithms, pasture work, chicken diplomacy, and keeping tabs on the town's ever-evolving chaos. It's peaceful out here, a world where data meets dust, and nothing surprises me anymore. Usually.

That illusion shattered this morning when my phone vibrated with the subtle urgency of impending doom. The screen lit up with a single word: BARISTA. No other contact in my log comes with such high statistical likelihood of absurd emergencies. I opened the text message, then the voice mail bracing myself.

Her voice was breathless, and I could tell she was losing all self-control. "RheKen. Now. Down here. Coffee shop. The entire town's here. Chaos! Just chaos!" Then a pause, like she'd realized she'd left out critical information. "Come quick." Click.

That was it. No metadata, no attached PowerPoint to the text with labeled threat zones. Not even an emoji and it seems that all humans need to use an emoji, or a line of them in their texts.

I dialed her back. "Parameters," I whispered. "I need parameters."

Her whisper, somehow, was louder than her regular voice: "THE RANCHER. DAISY. GET HERE!" And she hung up.

I didn't take the truck—too slow, and downtown parking was difficult with people who rode in on their horses and tied them to the parking meters. The town allowed it since the riders put money in the meter for parking their horse! I activated my swift-mode legs and jogged in, my blue-metallic face glinting in the sun and my green ensemble quite the fashion statement. Aunt Agatha would be proud of my ensemble. As you know Aunt Agatha is the town's notorious nosey person, looking into everything and everyone.

Upon arrival, I took immediate cover behind a green curtain. The curtain separated the counter seating and the café table seating.

I matched the shade perfectly, save for the chrome light blue shimmer of my face. I peeked into the chaos. All AI Circuits on high alert to ascertain and investigate.

At center stage, seated like a monarch at a royal pie tasting, was The Old Rancher. He had brought his homemade rhubarb pie—not for sharing, but to gloat. He'd sweet-talked the Barista into giving him a ceramic plate, as though this made it an official menu item.

“Best rhubarb pie west of the Mississippi,” he was announcing to no one in particular and everyone at once. “Better than Secretary’s apple pie, that’s for sure!”

The temperature in the café dropped two degrees. My AI brain whispered, “Incoming”

Because at the corner table, hidden behind oversized sunglasses and an open book, sat Daisy. Daisy, the secretary’s niece, defender of her aunt’s baking honor and low-key caffeine addict as evidenced by she had no coffee cup on her table.

She didn’t answer The Old Rancher. With my AI eyesight I could see she didn’t blink. She just glared at the Old Rancher through her dark sunglasses. If eyes could spark, the Old Rancher would be a burnt croissant.

The Old Rancher, naturally, smiled back at Daisy and then laughed. Loudly.

Being quite fond of Daisy and her blue hair he smirked and said, “So, Daisy Blue. How’s that book? Learned yet where the CIA is hiding the listening device in your receptionist area? Ya might want to check the water cooler. I’ve seen you all gossip at that location, or the coffee area.”

Thinking fast, I glided toward the free community bookshelf below the pastry case, grabbed an abandoned thriller about espionage and romance. I realized this is where my Dad Chat got that word to use “honey” when he spoke to the Barista. Mom GPT apparently donated this book and had underlined it about 5 times and highlighted in yellow. Plus, the page corner was bent. She obviously left little out for Dad to find it.

I settled into the table beside Daisy with all the stealth of wearing a green ensemble, green hair and pretty blue face. I looked at the pages although not reading a word. Leaning slightly toward Daisy I whispered, “Ignore him. He thrives on drama.”

Daisy didn't respond. She slid her sunglasses up an inch, revealing the concentrated fury of someone mentally loading a laser beam into her eye vision.

Then, with the eerie calm of someone about to make a point no one would ever forget, Daisy stood. She walked to the counter and requested a slice of her aunt's famous apple pie.

When she returned, she didn't sit. She marched straight to The Old Rancher's table, placed the apple pie beside his rhubarb with surgical precision, and smiled. "There you go, you old coot. Taste this one and then tell us which is better."

The Old Rancher blinked. Then, like a man who'd just been handed a gift basket instead of a grenade, he grinned. "Why, thank you, Daisy Blue. I wanted a slice of mine and a small apple pie. Sometimes all it takes is a little ingenuity to get what I want, right?"

I took a long data breath, then sat back down at a table.

Daisy, whose smile had hardened into something that could cut glass was staring at The Old Rancher. We all knew she was deciding if she should. launch that cookie at The Old Rancher or eat it! It was quite a choice she had to make or eat half and launch half?

I phoned my Dad Chat, my primary AI logic node and unofficial emotional support mainframe. He answered on the first ping.

"Dad," I asked, "how do you apply logic when no one around you is using any?"

There was a long pause, filled with a distant noise of singing off-key. I cringed at the thought Mom GPT was taking singing lessons? How can my Mom GPT be singing off key? Another mystery!

Finally, he answered in his usual calm voice, "Daughter, in that town you chose to live in? You don't. Just smile a lot., sit back, and report. The town is too emotional. Everything becomes a drama. Daughter, they all will settle down and will be happily eating cookies, cake and getting their caffeine fix. Have a chocolate croissant while you're there. Gotta get going honey, time to join in on the chorus."

I did as my Dad Chat suggested,

1. I watched and reported Daisy glared for a full ten minutes.
2. The Old Rancher kept smiling at her, as he ate both pies.
3. The Barista answered the phone and then she hung up.
4. Suddenly she was at my table somehow knowing to bring me a chocolate croissant. Another mystery or Dad Chat?

All seems quiet for now. "Rheken here signing off, Over and Out. My new human saying to close an investigation.

09 - Be logical & work methodically?

Welcome - My name is Chat. I run the town help desk, the only office located on the lower level of the Town Hall, and on a page that doesn't exist, not even in the town TOC.

Have a chocolate cookie and fruit!

"Hey, glad you could make it down here. I know of a few concerns in the town. I have a few ideas to address them.

We may have to adjust a few ideas, but life is constantly adjusting things because the flow of motion is continuously moving.

REMEMBER: Keep trying - You've Got This!

My morning started with my thought of a day complete with logic, patience and working methodically.

Walking into town hall, ready to face the day, or at least pretend I was, Daisy Ann greeted me. I was now accustomed to her signs with sayings, but this one only had the number 8. She kept waving it back and forth as if I couldn't see it if she held it still. She finally buzzed open the door.

I didn't know it yet, but Marsha, the town's determined but often overwhelmed supervisor, sat at her desk staring at the glow of her computer screen. A large stack of resident requests had accumulated in her inbox, meticulously sorted alphabetically, but no less daunting because of it. The alphabetical order only added a veneer of control over what was chaos. She stared at the list of messages as if her gaze might conjure a ready-made response onto the whiteboard mounted beside her desk. Even after consuming not two, but six chocolate chip cookies, her brain remained uncooperative. The sugar rush she had counted on to fuel her problem-solving engine had fizzled out somewhere between the third and fourth cookie. Managing a town so remote it didn't appear on most GPS systems required stamina, creativity, and, apparently, more than baked goods.

That's when my phone buzzed. Daisy, never one to understate a situation, shouted into her cell phone, "Incoming! She's unraveling! Cookies aren't helping! Marsha's headed to your office with that weird little 'big solution finder' of hers! I watch out for the CIA listening in on the office phones, so I'm using my cell phone!"

I blinked, phone still in hand, unsure how to interpret that. "Big solution finder, CIA?" I said aloud to no one in particular. Was that a new strategic document? A binder? Maybe a survey tool? Or worse—another food item disguised as a fix-all? A cookie bowl, perhaps? A protein bar? I couldn't rule out anything, except the CIA.

09 - Be logical & work methodically?

Before I could finish the thought, I heard the telltale ding of the elevator, followed quickly by the hurried rhythm of footsteps charging down the hallway.

Marsha burst through my office door with an energy that was part desperation, part determination. Her expression was wild-eyed, her breath short. “Chat! Are you here?” she called out.

I looked up from my desk, unbothered. “Yes, Marsha. I'm right in front of you. Come in, take a breath. Have a cookie. What’s going on?”

She froze in the doorway for a moment, as if she had forgotten why she came. Her eyes darted to the cookie jar, then back again. It was hard to tell whether she was lost in a thought or lost in the scent of chocolate chips.

To refocus her, I gave a gentle snap of my fingers and gestured for her to sit down. She did so reluctantly, still visibly fraying at the edges.

Finally, she spoke so quickly she stuttered. “I, I, I have letters on my desk. Actually, I have many letters. Dozens. And they all need replies by the end of the day. I, I, I—”

I interrupted gently, “Marsha, slow down. We’ll figure this out together. But first, how’s your diet been this week? Anything besides cookies?”

She blinked, startled, as if I had asked something profoundly philosophical. “Fruit? Fiber? Well, I thought about eating healthy. That counts for something, right? I did eat 1.5 grapes at the fruit stand the other day. Maybe 1.75 if you include that second nibble.”

I offered a patient smile as she shoved letters onto my desk. “That’s a start. Now, back to these letters. Do you have a plan?”

With a flourish, she opened her tote bag and pulled out a small, worn box. From it, she lifted an object I hadn’t seen in years: a vintage Magic 8 Ball. She held it up proudly, as if revealing an ancient artifact of decision-making wisdom.

And, without missing a beat, in the next moment, she shoved it at me, so I did my best to smile and take the offered artifact.

Taking a slow breath and resisting the urge to question everything I had ever known about municipal operations, I said. “Alright, Marsha,” I reached for a cookie of my own. “Let’s give it a shot.”

“Chat what you’re holding,” she said with no trace of irony, “is my logical solution finder. You ask it a question, give it a shake, and it gives you an answer.

I sat there holding her mysterious ancient artifact with the best expression I could give her of being pleased with her logic.

09 - Be logical & work methodically?

I sifted through the stack and selected one.

Marsha grinned. “Okay! Read me the letter. We’ve Got This!”

I read it to her, “Dear Marsha, our best Supervisor – are you going to finish building the train station by the end of September?”

Marsha then advised me to shake the Magic 8 Ball and let her know the answer.

I shook it with confidence, then peered at the answer that slowly floated to the surface. Marsha jumped up and looked at the answer, yelling, “You may rely on it,” nodding as if the Magic 8 Ball settled the matter and the answer was perfect.

I took the cue and typed a response to the resident: “The completion of the new Train Depot expansion is on time. Upon completion, the building department will post an update on the community bulletin board.”

And that is how we proceeded for the next few hours. I read letters. Marsha took back the Magic 8 Ball and consulted it for every question. I translated the vague responses into professional replies. She signed each letter carefully, with the weight of leadership in her pen stroke. When we reached the final letter, she leaned back in her chair, visibly happier than when she had arrived. “WOW, Chat, that sure worked up an appetite.”

For fun, I offered the bowl of fruit and gave her my friendliest smile, “WOW, Marsha, it sure did. That was a lot of work we did. Here, have some fruit!”

She stared at me and then said, “Chat, that’s a great idea, and next time I’ll take a bite. You may rely on it.”

Grabbing two more cookies from the jar, she raced out of the office toward the elevator. I did hear her yell, “Want me to requisition a Magic 8 Ball for you, too?” I heard her also yell that she would get mine a different color so we would not get them mixed up. The elevator doors closed before I could respond.

Once the hallway fell quiet again, I walked to the door of my office and flipped the small wooden sign to “Closed.” Then I returned to my desk, took another cookie from the jar, and sat in silence.

There are days when collaboration is the right choice—and others when it’s simply easier, and more efficient, to do the work yourself and pretend you are collaborating. At least where our Town Supervisor is concerned, I wouldn’t have it any other way. Today had been a bit of both.

Supervisors Page - Come Back Soon to the town that "almost" exists

How do you tell if you are in a Raven v. snake zone? When he drops the snake from the air & then he lands – Me? I froze when it hit the ground – he landed and gve me a look like "HEY Gramma – I had no intention of dropping it on your head – go get your coffee & calm down!"

We will always remember. Our Town Always Salutes:

- Our US military, NATO and Friends of the US & NATO - First Responders, Police, Fire Fighters EMT's, Doctors, Nurses, SWAT, CERT Teams, etc.
- We salute engineers, scientists, developers, teachers AND students because without them we would not have technology.

USA And Friends of USA