CADFEM

JOURNAL

2026 EDITION

DIGITAL ENGINEERING | SIMULATION

SIMULATION 5.0 WITH AI AGENTS & HIGH SPEED

WELCOME TO THE OMNIVERSE

Krones AG has revolutionized beverage production.
One of the keys to this success:
Ultra-fast CFD simulations using Ansys Fluent.

Kraftblock
CLEAN ENERGY
A Digital Twin for Cost-Effective and Green Process Heat.

Vantablack®
BLACKEST BLACK
Reflections Near Zero Through Simulation with Ansys Speos

ClearSpace
FOR A SAFE ORBIT
The Goal: Removal of Space Debris. The Tool: Ansys STK.

»

Simulation enables us to precisely anticipate our products' performance and design the prototypes optimally right from the start.

MORITZ NOVAK
CEO and Founder of GATE Space,
a Space Startup from Austria
https://gate.space

Innovation Requires Change

For more than 40 years, CADFEM has supported its customers in turning ideas into innovative products. For more than two decades, I have accompanied this journey from the Ansys Germany side – nearly half my life. During this phase, our shared customers have always been at the center of my work. Understanding their goals and identifying their challenges early on is the foundation for applying solutions precisely where they create real value.

This mindset is more relevant today than ever. Markets are evolving rapidly, requirements are increasing, and products are becoming ever more complex. And there is no getting around AI anymore. In my experience, the companies that continuously evolve – that are willing to change and refine their processes – are the ones that sustain their ability to innovate.

Speaking of change: it also affects me personally, as I continued my journey at CADFEM earlier of this year. In my new role, I bring together my experience in technology, market understanding, and customer engagement to help our customers benefit from the full breadth of the Ansys/Synopsys portfolio. Innovation thrives where we remain curious and actively shape change – a conviction that has guided me for many years. In this sense, my new role is part of a broader transformation with one clear objective: creating even greater value for our customers.
The combination of Synopsys and Ansys creates a portfolio that enables a more holistic view of engineering – from "silicon to systems." To translate this breadth into tangible customer value, CADFEM is also evolving: with clearer structures and stronger international collaboration that connect the expanded solution portfolio more closely with market and customer insights, enabling support across the entire development process.

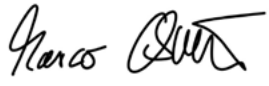
This issue also provides compelling examples of how innovation

Marco Oswald
Head of Solution Adoption & Expansion, CADFEM Europe

is driven by change. For instance, you can read how Krones has reduced the optimization time for complex filling and sloshing processes – key and particularly demanding operations in the beverage and bottling industry – from hours to minutes by rethinking its development processes.

Krones will also share its experience live at the CADFEM World Conference from October 20 – 22 in Darmstadt, to which I would like to extend a warm invitation. There, you can expect more than 120 additional examples of how digital engineering enables change – and how this, in turn, fuels the innovation that drives our customers forward.

I hope you enjoy reading this issue and look forward to meeting many of you in person in Darmstadt.



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PUBLISHER CADFEM Germany GmbH | Am Schammacher Feld 37 | 85567 Grafing b. München | **COMMERCIAL REGISTER NUMBER** (Munich Local Court) HRB München Nr. 75979 | T +49 (0)8092 70 05-0 | info@cadfem.de | www.cadfem.net **MANAGING DIRECTORS** Dr.-Ing. Matthias Hörmann | Josef Overberg | EDITOR Alexander Kunz | Address as Publisher | akunz@cadfem.de (responsible according to the press law), Elle Clarke, Thomas Iberer, Prachi Mardia, Dr.-Ing. Marold Moosrainer, Christophe Ozier-Lafontaine, Dr.-Ing. Roger Schlegel, Rajrhita Sen **CONCEPTION, LAYOUT** Be:Lateral | www.belateral.io | **PRINT** K. Schmidle Druck und Medien GmbH | Semptstraße 6-10 | 85560 Ebersberg | Germany | www.ks-druck.com

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SIMULATION & DIGITALE TRANSFORMATION

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SUCCESS STORIES

CADFEM

INNOVATIVE BEVERAGE PRODUCTION

Krones AG has dramatically improved the efficiency of its beverage filling lines in NVIDIA Omniverse: Intelligent AI agents, data integration, and cloud computing ensure that process steps such as filling and sloshing are simulated with minute-level precision and optimized virtually in real time.

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CADFEM IN ASIA-PACIFIC

What began in 2006 as a small entrepreneurial venture in India gradually evolved into CADFEM APAC. Today, the name is synonymous throughout the Asia-Pacific region with reliability and expertise in engineering and simulation.

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SIMULATION WITH PASSION

Dr.-Ing. Heinz Waltermann has headed the Simulation Department at Barmag for over 30 years. In 1993, he introduced Ansys there and established a close partnership with CADFEM. Both continue to this day. In this interview, he looks back - and ahead.

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SIMULATION IS EVERYWHERE

Frequently asked questions from users, challenges they encounter in exercises, feedback from customer surveys, and everyday phenomena - all of these serve as inspiration for the TechArticles that CADFEM employees publish on our blog. A look behind the scenes.

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LOW REFLECTIONS, CLEARER OBSERVATIONS

More space missions mean more stray light in space. Innovative materials such as Vantablack® improve optical systems, enabling humans to continue observing the universe. Simulations using Ansys Speos help make this possible.

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GREEN HEAT AS A SERVICE

Through innovation, Kraftblock is helping to decarbonize industry. The thermal storage systems for green process heat were developed using simulation, and digital twins will soon provide enhanced service and transparency.

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Welcome to the Omniverse

Krones AG has drastically improved the efficiency of its beverage filling systems using NVIDIA Omniverse. Intelligent AI agents, data integration, and cloud computing enable process steps such as filling and sloshing to be simulated with Ansys Fluent with high accuracy in just minutes and optimized in near real time.

↑ CFD experts from Krones's simulation partner, CADFEM, analyzed and optimized filling and sloshing effects of various bottle and liquid configurations in Ansys Fluent. | © Krones

Before a Krones filling line goes into operation, every process step is tailored to the customer's individual requirements. Precision is essential for the smooth processes, maximum throughput, and minimal losses that Krones guarantees its customers. This promise is delivered through detailed physics-based simulations that examine every aspect of the customer's production process.

To ensure, for example, that bottles are filled with exactly the required amount of product or that contents do not spill during transport, these operations are calculated and analyzed by Krones using flow simulations. Once the ideal configuration has been identified in the digital twin, it is transferred by the process engineers to the real system.

The one drawback: because the models are highly detailed and therefore computationally demanding, and because the process relied on many isolated, proprietary, sequential simulations and the results often required around four hours of compute time. Only then could they be linked with further factors and used to derive and implement optimization measures.

Integrated Instead of Sequential: Simulation in NVIDIA Omniverse

With increasing competitive pressure and rising costs, such waiting times were increasingly scrutinized, especially as new technologies promise entirely new capabilities. One of these is NVIDIA Omniverse. More a platform than tool, NVIDIA Omniverse creates a continuous, open, and interconnected engineering environment that brings together simulation, AI, visualization, automation, and real data sources in a single digital space.

Krones embraced this approach. Together with its partner ecosystem, they developed within two months an omniverse-based solution that

- compresses simulation times from four hours to just minutes,
- enables near-real-time system optimization, and
- uses a new GPU-based simulation method for Ansys Fluent implemented by CADFEM to precisely map filling and sloshing processes. AI agents are used that learn and independently make data-driven optimization decisions.

Technologies from NVIDIA, Synopsys, and Microsoft

The technological foundation is the combination of NVIDIA Omniverse with Ansys Fluent from Synopsys, and the Microsoft Azure cloud. Beyond the key technologies used, the service providers SoftServe and CADFEM are part of Krones's partner ecosystem.

Filling and Sloshing Simulations With Ansys Fluent by CADFEM

Not only is every bottle different, but the beverages also vary in consistency, density, and viscosity. This results in a wide range of machine configurations that must be represented in the computational setup. Managing all these variables to cover the full spectrum of customer and system-specific aspects was the task of CADFEM's CFD experts as they prepared the baseline simulations for training Physics AI models for subsequent automation. Another key aspect was the final visualization and full integration into Omniverse to ensure seamless and appealing representation of the calculated field data, such as free surfaces.

Simulation 5.0 with AI Agents and High Speed

Omniverse, as an overarching platform that unites all data, models, AI mechanisms, and workflows into a coherent, interactive, automated engineering ecosystem, is the link between simulation, AI, and real operations. It enables a new, highly detailed generation of digital twins that map not only products and systems but also environmental and operational parameters.

This allows Krones to guarantee its customers system performance for different requirements even before commissioning. For this achievement Krones has been honoured as the Overall Winner of the Microsoft Intelligent Manufacturing Award (MIMA) 2026.

↑ The digital twin was also used for the development and optimization of Krones's new Ingeniq line concept, presented at drinktec 2025. | © Krones

MORE INFORMATION

Extended version of this article
cadfem.net/krones-omniverse

Krones AG
krones.com

Platform for the Future

Ansys SimAI and NVIDIA Omniverse complement each other to form a powerful platform for the development, optimization, and operation of digital twins: Ansys SimAI enables AI-based predictive models for engineering simulations, which realize their full potential in the colla borative, real-time 3D environment of Omniverse.

Ansys SimAI uses machine learning to encapsulate the physical behavior of components, systems, and processes, making it the key to rapid predictions across many contexts and design variants. Large design spaces can be explored, parameter studies conducted, and optimization potential identified without having to run a full simulation repeatedly for each variant. Prediction times are reduced from hours to seconds.

NVIDIA Omniverse is based on the OpenUSD standard and serves as an integration and collaboration platform for digital twins. Omniverse brings together CAD data, simulation models, sensor data, and operational information from various sources into a photorealistic 3D environment. It provides users with a holistic view of products, plants, factories, or complex systems.

The combination of Ansys SimAI and NVIDIA Omniverse opens up entirely new possibilities, as companies benefit from this blend of physical accuracy, AI-driven speed, and immersive real-time visualization. Isolated simulation processes are transformed into intelligent, interactive, and scalable digital twin solutions.

Here are some examples:

- **Accelerated product development:** SimAI provides instant performance predictions for design changes, while Omniverse immediately visualizes the impact on the entire system.
- **Simplified customer communication:** Interactive digital twins and photorealistic renderings enable users to quickly understand new configurations and, when integrated into AR/VR systems, bridge the gap between the virtual and real worlds.
- **Virtual commissioning:** Plant and manufacturing concepts integrated into Omniverse can be simulated with high physical accuracy in near real time using Ansys SimAI. The effects of changes in operating parameters on temperature, stress, energy consumption, or flow behavior become immediately apparent.
- **Continuous operational optimization:** Linking real-time sensor data with digital models reveals anomalies, maintenance needs, and opportunities for process optimization.

Physics AI and Physical AI – The Industrial AI Duo of the Next Generation

Artificial intelligence has emerged as the key technology driving industrial transformation. In this context, the concepts of Physics AI and Physical AI are attracting increasing attention. Although they are often mentioned together, they represent different layers of industrial intelligence - and deliver their greatest value when combined.

Physics AI: When AI Understands Physics

Physics AI combines modern AI techniques with established engineering principles. Unlike purely data-driven models, it incorporates physical behavior - such as thermodynamics, fluid dynamics, material properties, and energy balances - directly into the learning process.

This is particularly important in industrial applications. Critical operating conditions often occur only rarely and are therefore poorly represented in historical datasets. Physics AI models can nevertheless remain reliable because they use physical laws and relationships as a foundation for training. Key technologies in this field include Physics-Informed Neural Networks (PINNs), hybrid modeling approaches, and simulation-based digital twins.

Physical AI: When Machines Act Autonomously

While Physics AI focuses on understanding physical processes, Physical AI describes the ability of machines to operate autonomously in the real world. Examples include autonomous robots, collaborative robotic systems, intelligent inspection solutions, and AI-powered manufacturing equipment capable of perceiving, interpreting, and responding to their environment.

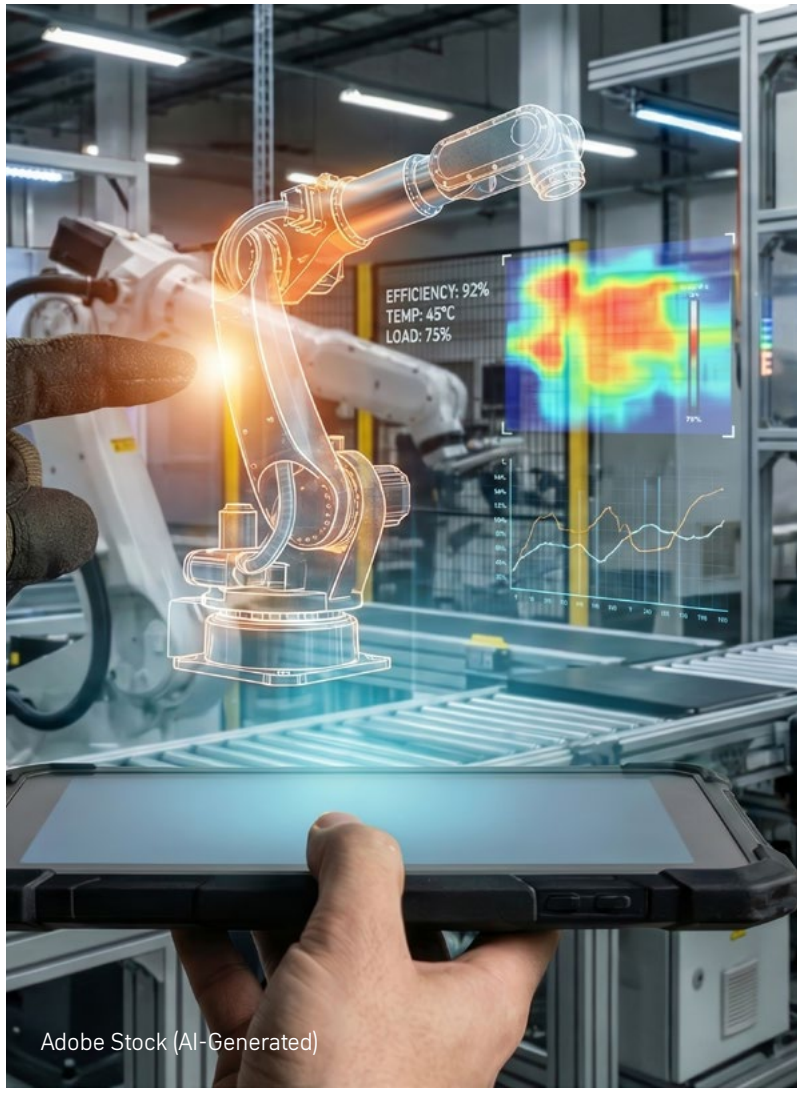
The CADFEM Added Value

At CADFEM, we provide our customers with personalized and comprehensive consulting and support for combining Ansys, Ansys SimAI, and NVIDIA Omniverse: from selecting appropriate simulation methods and creating validated models to integrating and implementing simulation-based solutions into all relevant business processes.

The goal is to provide a customized technology platform and the expertise needed to use it successfully. This is where CADFEM's proven suite of services—including pilot integrations, training, consulting, and support—comes into play. In addition to sustainable and collaborative implementation, a quick return on investment for the customer is the top priority.

CADFEM combines technology with industrial applications: turning Ansys SimAI and Omniverse into integrated, future-proof digital engineering solutions based on fast, flexible, and insightful AI-powered digital twins.

Author and Contact:
THOMAS IBERER
Head of Emerging Technologies, CADFEM Europe
tiberer@cadfem.de



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NVIDIA Omniverse
nvidia.com/omniverse

NVIDIA Omniverse as Platform for Collaborative Engineering
cadfem.net/simulation-omniverse

The adoption of such systems is accelerating across industries. In particular, the automotive, aerospace, and general manufacturing sectors are driving the deployment of autonomous solutions to meet growing demands for flexibility, productivity, and quality.

An Industrial Perspective: The Power of Integration

The real innovation emerges when these two approaches are combined. Autonomous systems become significantly more robust and safer when their decisions are based on a sound understanding of physics. A robot can perform assembly tasks more precisely when it takes material properties and force limits into account. Likewise, inspection systems benefit from not only observing process behavior but also interpreting and predicting it through physical principles.

This creates the foundation for intelligent systems that do not merely react to events but are capable of making informed and reliable decisions.

Conclusion

Today, Physics AI is primarily used for process optimization and digital twins, while Physical AI is paving the way toward autonomous production systems. In the long term, a convergence of these technologies is becoming evident: factories in which autonomous systems operate within physically grounded digital models, enabling both flexibility and safety.

The potential of the next stage of digital industrial evolution therefore lies not in choosing between Physics AI and Physical AI, but in understanding how both technologies can be integrated into a seamless AI architecture.

This article is a condensed version of a piece by Sarah Lee, Senior Research Director "Manufacturing | AI, Platforms & Technology", IDC

Source: https://www.linkedin.com/pulse/physics-ai-vs-physical-two-sides-industrial-stack-sarah-lee-gzvgc/

Making Space Safe & Sustainable

↑ ClearSpace-1: Removal of an ESA object on behalf of the European Space Agency (ESA) With support from the mission's elite partner, Omega © ESA

Space is becoming increasingly crowded. As the number of missions grows, so does the "traffic" in orbit, which means more risks, uncertainties, and costs for every project. This is where the solutions from the startup ClearSpace come in: they are designed to enable the maintenance of spacecraft in orbit and the active removal of space debris, thereby improving safety and sustainability. This creates a strong case for digital mission simulations with Ansys STK.

An estimated 40,000 objects* were orbiting in space in 2025, many of them inactive or out of control, all launched by humans. The trend: rapidly increasing. However, the growing amount of space debris, coupled with the exponential increase in satellite mega constellations, increases the likelihood of collisions, creating new risks and significant costs. In the space industry, such risks are identified, assessed, and mitigated through mission engineering.

ClearSpace: Contributing to a Safe and Sustainable Space

ClearSpace was founded in 2018 as a spin-off of the École Polytechnique Fédérale de Lausanne (EPFL) to refine and commercialize technologies developed as part of the "CleanSpace-1" project. The company focuses on solutions to the challenges posed by the growing use of space, such as in-orbit maintenance and the removal of space debris. Today, ClearSpace has an international presence and is a pioneer in operational solutions for space sustainability. As early as 2019, the European Space Agency (ESA) entrusted ClearSpace with leading the ClearSpace-1 mission. The goal: the first-ever targeted removal of a piece of space debris.

Why High-Precision Simulations Are Important for Space Missions

Every type of service in orbit is complex and requires a high degree of precision right from the planning stage, a level of precision that can realistically only be achieved using simulation tools based on sound physics. For the ClearSpace team, the digital modeling and analysis of parameters includes, among other things:

- Long-term orbital evolution under varying solar cycle conditions
- Approach maneuvers with strict alignment requirements
- Limitations on power generation due to shading

↑ Ansys STK: Software for digital mission engineering and the analysis of complex systems © Ansys, part of Synopsys

Reliable simulations of a wide variety of scenarios reduce the likelihood of critical situations arising as a result of incorrect assumptions or unexpected operational disruptions.
This is where Ansys STK comes in. STK stands for "Systems Toolkit" and helps engineers model and simulate complex systems in detail, realistically, and in real time. This allows them to analyze and evaluate the effects of a wide variety of parameters on orbital propagation across thousands of scenarios.

Modeling complex systems with Ansys STK, CADFEM, and tukom
ClearSpace has adopted Ansys STK as its central digital platform for mission engineering to address these challenges. The team includes tukom GmbH, a specialist in telemetry, aerospace, and defense technologies, as well as CADFEM, with its experts in the simulation of various physical phenomena.

Technical improvements, risk reduction, and cost savings
There are currently few quantified metrics or comparative benchmarks available. Nevertheless, ClearSpace has already achieved encouraging technical and economic successes, including:

- More accurate predictions of orbital variations.
- Estimating orbital deviations under fluctuating solar activity.
- Modeling limiting factors during approach maneuvers.
- A better understanding of the impact of shading on energy production

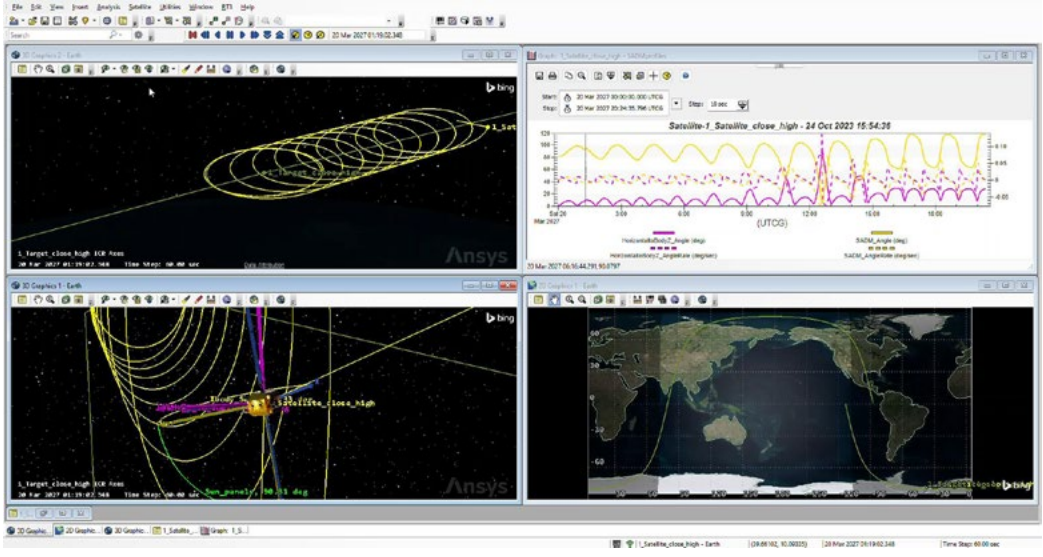
A Look into the Future
ClearSpace's goal is to solidify its leading role as a contributor to a safe and sustainable space environment while expanding its portfolio to include multi-mission service platforms for other applications.

About ESA-Mission ClearSpace-1
ClearSpace-1 is a planned space mission commissioned by the ESA and to be carried out by the German company OHB and the Swiss company ClearSpace, designed to test a method for removing space debris. A space tug equipped with four gripper arms is intended to transport a decommissioned satellite back into Earth's atmosphere. The mission is scheduled to take place in 2029. Along with Hera and Vigil, it is one of the three main projects of ESA's new "Space Safety" division. (Source: Wikipedia)

clearspace.today/missions/clearspace-1

ClearSpace and CADFEM – More Than Just Simulation
Through CADFEM International AG, the CADFEM Group has been investing in promising deep tech startups for many years. CADFEM also took an early interest in ClearSpace and its technology, meaning that the Swiss company had already established close ties with CADFEM even before it began using Ansys simulation tools.

cadfemgroup.com



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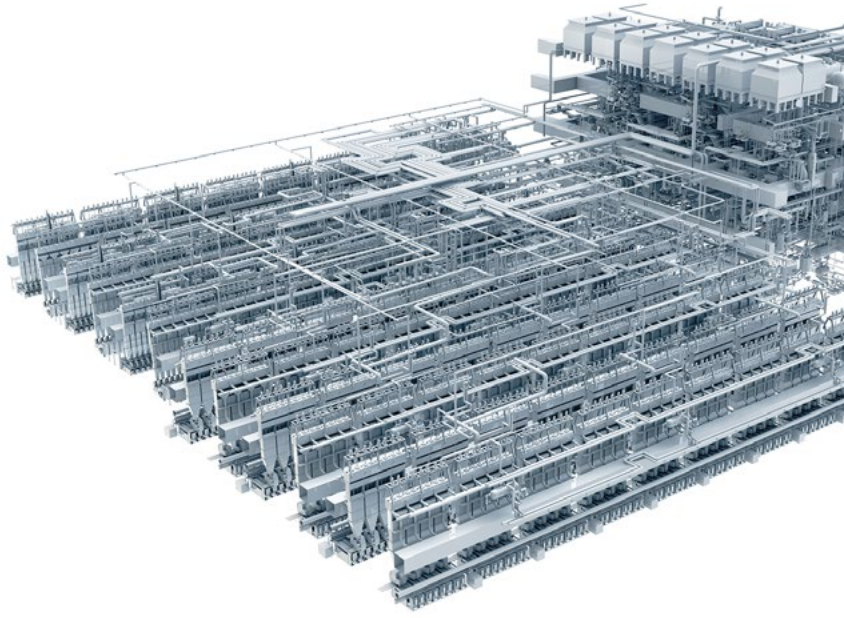
*Source: ESA Space Environment Report 2025



We do pure high-tech.

Barmag, based in Remscheid, is a pioneer in the field of plastic fiber technology. Founded over 100 years ago as a machine shop, the company - part of the Rieter Group - has evolved into a globally successful solutions provider. Dr.-Ing. Heinz Waltermann has headed the Simulation Department for over 30 years. He introduced Ansys at Barmag in 1993 and established a close partnership with CADFEM. Both relationships continue to this day. In this interview, he looks back - and ahead.

Mr. Waltermann, what does Barmag do?
Barmag was founded in 1922 in the Ruhr region as one of the world's first mechanical engineering companies for the chemical fiber industry. Since the 1960s, we have been a globally active provider of turnkey plant solutions, in some cases with an 80% share of the world market.

A synthetic fiber spinning line is pure high-tech: Pumps force molten plastic through microfine nozzles under high pressure, creating filaments that are bundled into yarns, heated as they pass over heating plates, stretched, and wound by a winding head. Our WINGS winding head can handle up to 16 threads simultaneously. A typical yarn for microfiber cloths is made up of 72 filaments. In just under eight hours, 165,000 km of polyester filaments are wound onto each yarn spool - equivalent to 43% of the distance between Earth and the Moon. Each filament has a diameter of just 6.5 µm and races through the machine at 300 km/h, day and night, without interruption or waste. And everything is done with ultra-precision, because spinning errors cannot be corrected.

That is indeed impressive and sounds like some sophisticated simulation work. Since when has Barmag been doing simulations?
When I joined Barmag in 1993, the Technical Calculations department already existed as a central department with two employees. They used in-house routines programmed in BASIC, a transfer matrix program for rotor dynamics, and the FEM program TPS10. Calculations were often outsourced.

One of my first tasks was to implement a future-proof FEM program. Following a market analysis, we chose Ansys, which opened up entirely new possibilities for us: from deformation calculations and strength analyses to solutions for a wide range of machine and rotor dynamics problems. We have been working successfully with CADFEM ever since. In addition, we developed our own software to simulate filament formation - that is, solidification, crystallization, stress, temperature, and diameter. This was complemented by analytical flow calculations and heat transfer analyses.

Can you use an example to illustrate what was simulated at the beginning?
In 1994, we analyzed a cooling roll in a flat film production line using ANSYS 5.0 with full APDL. The problem was that the thickness of the flat film in the gap between the cooling roll and the counter roll was not uniform due to elastic deformations - a serious quality defect. To make matters worse, different operating conditions led to varying thickness profiles. We investigated whether it was possible to reduce these thickness variations by "inflating" the hollow cooling roll with a constant internal pressure and determined what the longitudinal profile of the wall thickness needed to be to achieve this. We were able to solve this problem, and the results matched the thickness profile measured on the prototype well.

← Typical Complete Production Line from Barmag © Barmag

Simulations are firmly integrated into our development process.

When you compare the early use of simulation at Barmag with today, what is the first thing that comes to mind?
Acceptance. At first, we were an internal service provider whose working hours were billed. As a result, FEM analyses incurred costs for the line departments. Decision-makers sometimes wanted to cut those costs because they didn't always see the value in them. Now, we are firmly integrated into the development process and included in the budget, just like development, design, and testing. My former colleague in the calculations department, Jochen Adler - now our CTO and CIO - and I brought about this shift in thinking by demonstrating the value of simulations through clear figures and actionable results.

What other significant changes have there been?
As acceptance has grown, so has usage - both in breadth and depth. Let's start with depth. Our products, such as the winding head described above, are becoming increasingly complex; innovation is key, and time and cost pressures are rising in our market as well. We are able to manage all of this thanks in large part to our simulation expertise - and by that I mean our ever-growing specialized knowledge, as well as the continuous development of Ansys software and the support provided by CADFEM. For our day-to-day work, we now have access to a state-of-the-art HPC center designed and commissioned by CADFEM.

We also worked with CADFEM on the planning, configuration, and commissioning of our HPC center.

ABOUT DR.-ING. HEINZ WALTERMANN

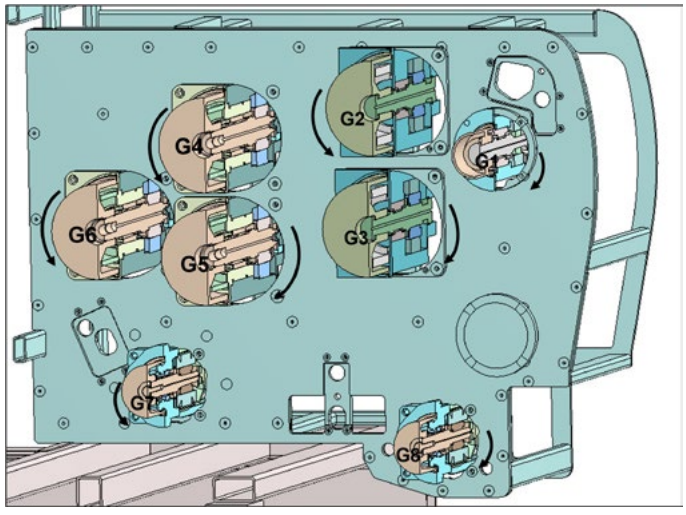
Even as a mechanical engineering student at RWTH Aachen University, Heinz Waltermann was introduced to the finite element method, which shaped his entire professional career. He served as a developer of pre- and post-processors, solvers, and algorithms, as well as a user, manager, and driving force behind new initiatives at Barmag, where he joined in 1993 immediately after earning his doctorate. He will retire at the end of 2026. Among other roles, Heinz Waltermann is a member of the editorial board for the FKM guideline "Computational Strength Verification for Mechanical Components."

© Barmag

And what about the width?
The first attempt to expand the use of FEM calculations - in this case, into the design department - dates back many years. At that time, we trained several design engineers with a background in calculations on how to use Ansys Mechanical when designing similar component variants. Step by step, we guided them toward becoming self-sufficient in performing these calculations. But there were only a few of them, so it hadn't really taken off on a broad scale yet. Later, some designers began using the FEM tool available in the CAD system without consulting us. However, they underestimated the fact that even simulations done "on the side" with supposedly easy-to-use CAD-integrated tools require a certain level of expertise and coaching from us. And that was missing.

We have learned from these experiences: Our HPC Center has been equipped accordingly and has paved the way for the specialist departments to conduct comprehensive, independent, GPU-based simulations using Ansys Discovery - including in-depth training and, above all, coaching from us. However, it's also true that many colleagues are often working at full capacity and still don't get around to running simulations often enough.

You've already spoken highly of CADFEM. Could you elaborate on that?
To use a powerful tool like Ansys effectively, I consider support like that provided by CADFEM to be essential. By that, I mean not only the hotline but also the seminars. The seminar flat rate is extremely useful, especially now during this generational transition. I'm currently introducing two young employees - who have mainly worked on CFD so far - to structural mechanics. The flat rate is a huge help in this regard. It also has a positive impact on employee motivation in general, because they see that their employer is investing in them.



CADFEM also carries out simulation projects for us on a contract basis when we are at full capacity or - including knowledge transfer - when we want to tap into new areas of application and broaden our expertise. One example is the analysis of the sealing performance of a metal gasket at just under 300°C, including the creep of the plastic melt under the gasket.

How has your personal role changed?
In recent years, the focus has increasingly shifted to developing tools that allow us - and our colleagues in the specialized departments - to perform recurring analyses quickly, reliably, and effectively. It's been a real advantage for me that I learned FEM practically from the ground up. A good example is a simulation tool for designing inductive wafer heaters, which is based on Ansys and utilizes an APDL demonstrator from CADFEM.

»

With SPDM, we are laying the foundation for further automation, efficient processes, and the consistent use of AI in engineering."

What's next? Where is Barmag's simulation journey headed?
I think we're well-positioned. Our close relationship with CADFEM allows us to identify new trends and technologies and evaluate them for our own use. The groundwork for the next steps is in place - and my successors will take them.
One current project is the implementation of a simulation data and process management system. With a structured SPDM system, we'll save a lot of time compared with managing data in Windows directory structures.It will also provide us with the foundation for further automation, efficient processes, and ultimately, the consistent use of AI in engineering.

Does AI already play a role in product development at Barmag?
We take AI very seriously; it's currently managed by our IT department. In our calculations, we frequently use AI in our programming. The integrated Copilot works wonderfully in Python. You enter a prompt - for example, "create a time-series chart from this data" - and receive the complete, usually executable code. AnsysGPT also works very well; it's a huge leap forward in help functionality - a help system you can actually have a conversation with. But like many others, we're just getting started.

← A model for calculating harmonic response to determine the mutual excitation of eight galettes, from which the bearing forces of selected rolling bearings can be determined as a function of the speed of the strands after stretching. © Barmag.

Mr. Waltermann, after decades of driving and pioneering simulation at Barmag, you will be retiring at the end of 2026. It seems you've made good arrangements for your succession. But what will happen to the immense body of expertise you've accumulated over all these years?

I'm working on that right now. By the way, not with AI, but with common sense and a genuine desire to ensure that the simulation department can continue to effectively contribute to the development process even without me. One of our most important design tools is DOBAS - "Dimensioning and Optimization of Barmag Chucks" (Note: „Chucks" in German is Spannfutter). It has served us very well for more than 20 years. However, as a 100% APDL application, it no longer reflects the state of the art. We have therefore launched the newDOBAS project in collaboration with CADFEM, in which we are converting APDL-DOBAS
into a modern Python- and/or ACT-based tool. This will allow our colleagues to continue using and further developing this tool, which is very important for Barmag.

But we also gain knowledge from our more experienced colleagues in the traditional way: through handbooks, workshops, and coaching sessions. We invest a lot of time in person-to-person knowledge transfer, and this is very well received by our younger colleagues. I notice this during our weekly meeting, where I teach them the ins and outs of strength verification according to the FKM guideline. It feels great to sense so much enthusiasm and curiosity.

Thank you very much for sharing so many insights into your impressive career and for your trust in CADFEM. All the best for the future.

ABOUT BARMAG

Barmag, a subsidiary of the Swiss Rieter Group, is one of the leading suppliers of filament spinning systems for the production of smooth yarn, textured yarn, carpet yarn, staple fiber yarn, and nonwoven fabrics, and offers engineering services that provide solutions across the entire textile value chain - from monomers to textured, dyed yarn. As a forward-looking company, it is committed to research and development in the areas of energy efficiency and sustainable technologies.

barmag.com

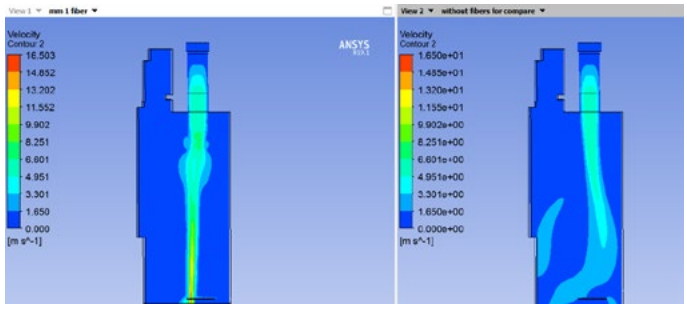
MORE INFORMATION

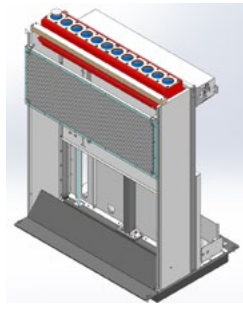
Automatisation from Ansys
cadfem.net/automation

CADFEM Seminar Flatrate
cadfem.net/seminar-flatrate

IT & Hardware-Services from CADFEM
cadfem.net/hardware

40 years CADFEM
cadfem.net/40





↑ CFD with Ansys Fluent: Analysis of air velocity for optimal airflow onto the polymer melt; on the left with 48 filaments, on the right without © Barmag

Empowering Digital Engineering

Better performing and more sustainable - digital engineering involves tapping the full potential of technical creativity, precise data models, and clever workflows. This ensures that a good idea results in an excellent product – for manufacturers, customers, and the environment.

Simulations are a pivotal technology for this. From initial brainstorming, variant comparisons, concept development, and material selection to aspects such as manufacturability, operation, and recycling, simulation quickly, transparently, and reliably provides answers to countless physical questions from the entire life cycle of products and processes.

Since 1985 CADFEM has been supporting companies, research institutions, and universities in the successful use of Ansys and other simulation products. This is made possible by the CADFEM team of over 600 employees in Europe, India, and Southeast Asia (APAC). Through training, support, project work, contract calculations, and IT services, they ensure a seamless implementation of the simulation software.

Moreover, data management solutions, automation, workflows, customization, and AI-integration by CADFEM make simulation an integral part of highly efficient, tailor-made digital engineering.

Synopsys, Ansys & CADFEM

Since 1985, CADFEM has been a close sales and technology partner of Ansys and the world-leading software family of the same name for physics-based simulation. In July 2025, Ansys became part of Synopsys, Inc. (Nasdaq: SPNS) - and the CADFEM companies in Europe and APAC became members of the ecosystem of this new technology leader in the fields of EDA, chip design, and multiphysics simulation.

CADFEM Europe and CADFEM APAC remain

- centers of expertise for all sales and technical matters related to Ansys software products, and
- partners and drivers for Synopsys in the integration and further development of the new, unique technology portfolio,

in line with Synopsys' mission: Powering the Era of Pervasive Intelligence from Silicon to Systems.

cadfem.net

Ansys part of SYNOPSYS® ELITE CHANNEL PARTNER

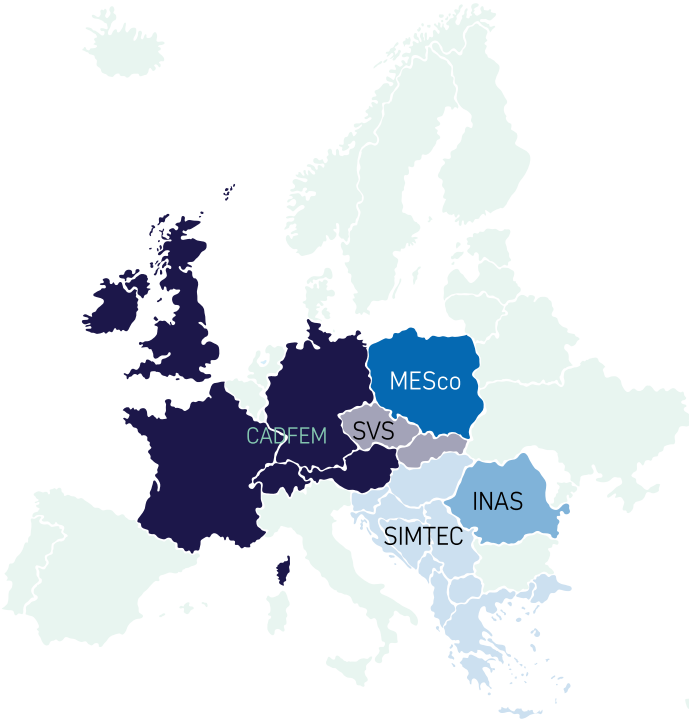
1,000+ SIMULATION PROJECTS

300+ ANSYS EXPERS

5,000+ CUSTOMERS

130+ SEMINAR TITLES

500+ UNIVERSITY SITES



CADFEM Europe

The name CADFEM Europe stands for Ansys and Digital Engineering expertise in Germany, France, the United Kingdom, Ireland, Austria, and Switzerland.

In addition, there are further partners in Eastern and Southeastern Europe - the only difference being that they are not called CADFEM, but rather **SVS FEM** (Czech Republic and Slovakia), **MESco** (Poland), **INAS** (Romania), and **SIMTEC** (including Greece, Croatia, Slovenia, and Hungary).

CADFEM cadfem.net

SVS FEM svsfem.cz

INAS power to change inas.ro

MESco mesco.com.pl

simtec simtec-europe.com

CADFEM APAC

CADFEM APAC is a leading industry and research partner for digital engineering and simulation using Ansys solutions in the Asia-Pacific region: in India, Singapore, Malaysia, Indonesia, Thailand, Vietnam, and the Philippines.

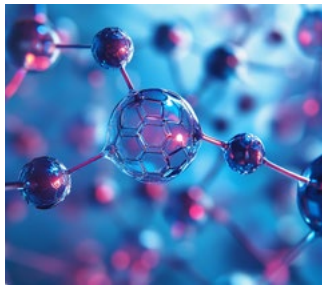
Read more about CADFEM APAC on pages 28–31.

CADFEM cadfem.ai

Images: Adobe Stock (AI-Generated); CADFEM

New Products in CADFEM's Software Solutions Suite

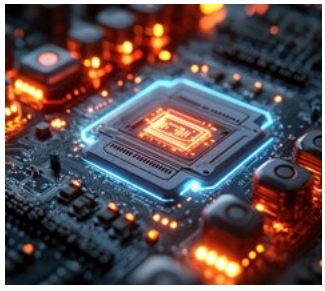
The merger of Synopsys and Ansys expands the range of software solutions that CADFEM can now offer to its customers. In addition to all Ansys products, our portfolio now includes brand new, complementary tools: Here is a first short introduction.



Synopsys QuantumATK:
Develop New Materials Fast and Reliably

QuantumATK enables companies to develop novel materials through atomic-scale simulation. Explore millions of material combinations, understand mechanisms and structure-property relationships, compute a wealth of material properties, and optimize performance without physical testing, accelerating time to market while reducing development costs.

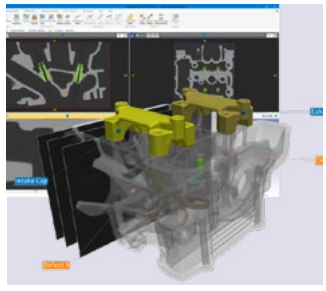
Contact:
Dr. Ervand Kandelaki
CADFEM Europe
ekandelaki@cadfem.de



Ansys Saber:
Tackle Complexity with High Precision Virtual Prototyping

Saber delivers high precision virtual prototyping to tackle rising system complexity and enable earlier, smarter design decisions. Saber also provides an extensive library of ready-to-use models and advanced characterization tools for batteries, power conductors and multi-domain physical systems. Saber helps customers reduce prototypes, cut development costs, and achieve highly accurate multi-domain simulations - giving prospects strong reasons to adopt a faster, more reliable, and cost-efficient workflow.

Contact:
Philipp Siehr
CADFEM Europe
psiehr@cadfem.de



Ansys Simpleware:
Transform 3D Imaging Data into High-Quality, Usable Models

Simpleware Software enables engineers and researchers to convert complex 3D imaging data into accurate, usable models for analysis, design, and validation. Its advanced segmentation, geometry preparation, and automation tools transform real-world parts into high-fidelity digital models, allowing teams to work with true "as-built" geometry, capture material variation, and accelerate image-based modeling workflows across industrial applications.

Contact:
Özcan Öczicek
CADFEM Europe
ooez@cadfem.de

Ansys TPT:
Efficient Test Automation for Complex Embedded Systems

TPT enables model-based testing, automated test case generation, and end-to-end validation of electronic control units (ECUs). Ideal for automotive applications as well as aerospace and industrial systems, it helps reduce development time, increase test coverage, and integrate seamlessly into existing tool chains.

Contact:
Martin Meiler
CADFEM Europe
mmeiler@cadfem.de

All CADFEM Solutions
cadfem.net/products

CADFEM, Ansys and Synopsys
cadfem.net/ansys-synopsys

Welcome to the CADFEM World Conference, Sassine Ghazi!

The entire CADFEM team is proud, to welcome Sassine Ghazi, President & CEO of Synopsys, Inc., for the first time at the CADFEM World Conference.

Sassine Ghazi is President and Chief Executive Officer of Synopsys and serves on the company's board of directors. Since becoming CEO in 2024, he has advanced Synopsys' transformation from a leader in electronic design automation (EDA) to an engineering solutions powerhouse spanning silicon to systems. At the center of this strategy is the $35 billion acquisition of Ansys in 2025 - bringing together leaders in silicon design, IP, and multiphysics simulation and analysis to accelerate innovation and redefine how the world's most complex products are designed and built.

Sassine has held leadership roles across engineering, product development, sales, and operations during his more than 25 years at Synopsys. Prior to becoming CEO, he served as President and Chief Operating Officer, where he steered Synopsys through a period of record revenue growth and profitability while strengthening operational performance.

Earlier in his career, Sassine led Synopsys' EDA business, expanding the company's market reach and advancing its technology leadership, including spearheading early investments in AI-driven design platforms that are now core to modern chip design. Sassine has nearly three decades of experience in the semiconductor industry and began his career as a design engineer at Intel.

He earned a bachelor's degree in business administration from the Lebanese American University, a B.S.E.E. from the Georgia Institute of Technology, and an M.S.E.E. from the University of Tennessee. Sassine serves on the board of the U.S.-China Business Council.

source: synopsys.com

CADFEM WORLD CONFERENCE 2026

Sassine Ghazi

President & CEO of Synopsys, Inc.

Re-engineering the Future of AI

Wednesday, October 21st,
9:30 – 10:00 a.m.

Opening Keynote: We are entering the age of physical AI, where intelligent systems must operate reliably in an unpredictable world. As products become more software-defined, silicon-powered, and AI-enabled, R&D teams face rising complexity, cost, and pressure to move faster. In his keynote, Synopsys President and CEO Sassine Ghazi explains why multi-physics co-design, digital twin simulation, and AI-powered engineering solutions are essential to managing complexity and accelerating the development of these next generation intelligent systems.

MORE INFORMATION

Visit Synopsys
synopsys.com

CADFEM World Conference 2026
cadfem.net/conference

Vantablack® in Space: Applying Simulation to Stray Light Control

As activity in orbit continues to expand, controlling stray light remains essential. Through continued innovation in materials such as Vantablack®, combined with simulation-driven engineering enabled by Ansys simulation tools-, including Ansys Speos, and supported by CADFEM, Surrey NanoSystems is advancing optical system performance while helping to preserve our ability to observe the universe.

The rapid growth of satellite constellations is reshaping the optical environment in Earth orbit. Alongside new capabilities, it introduces a critical challenge for engineers: unwanted reflections that interfere with imaging systems and degrade observational performance.

This impact is increasingly measurable. As highlighted by Caty Fairclough from Ansys, part of Synopsys, satellite reflections could affect up to "40% of the images taken by NASA's Hubble Space Telescope and about 96% taken by the SPHEREx observatory." For organisations working at the forefront of optical materials, managing stray light is no longer theoretical, but a practical, system-level engineering requirement.

Vantablack®: Enabling Ultra-Low Reflectance

Surrey NanoSystems has been addressing this challenge through the development of Vantablack®, an ultra-low reflectance coating engineered to absorb up to "99.965% of light." By minimising reflected radiation, Vantablack® enables highly effective stray-light suppression across optical systems, from sensor housings to complex spacecraft assemblies.

In more down-to-earth applications, CADFEM has supported Surrey NanoSystems in demonstrating the relevance of Vantablack® to automotive sensing. Through an Automotive Glare Shield proof-of-concept developed in Ansys Speos, the team was able to visualise and quantify the impact of ultra-low reflectance surfaces on stray-light behaviour in ADAS camera systems, where effective glare management is increasingly important to sensor reliability.

Its continued evolution, including application-ready variants for space environments, reflects a clear focus on delivering deployable solutions rather than purely laboratory performance.

From Material Performance to System Understanding

However, material capability alone does not guarantee system performance. Optical behaviour depends strongly on geometry, surface interaction and operating conditions. Demonstrating the true impact of ultra-low reflectance coatings therefore requires a system-level understanding that extends beyond standalone measurements.

↑ Vantablack® 310 substrate. © Surrey NanoSystems

To address this, Surrey NanoSystems has expanded its approach to include Ansys simulation-led engineering. By applying optical modelling within realistic geometries, it becomes possible to analyse how Vantablack® performs within complete assemblies, identify dominant stray light paths, and quantify performance in application-specific scenarios.

Applying Ansys Simulation to Real Systems

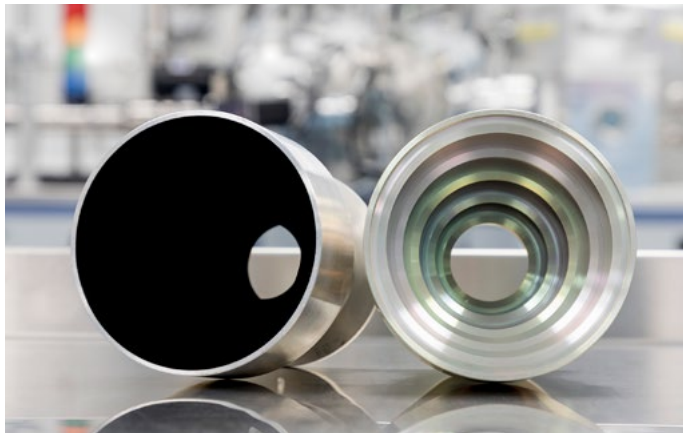
Working with CADFEM, Surrey NanoSystems has developed modelling workflows using Ansys Speos, a CAD-integrated optical and lighting simulation software, to support this process. This enables coating properties to be applied directly to CAD geometries and evaluated under representative conditions, providing a more complete understanding of optical behaviour in real-world use cases.

» To demonstrate just how black Vantablack® is compared to conventional coatings, millions or even billions of rays need to be traced within complex geometries — something ideally suited to Ansys Speos.

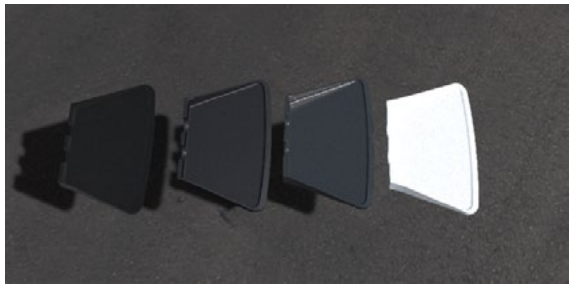
Steven Jones
Technical Consultant: Optics & Photonics, CADFEM

As Steven Jones explains, Surrey NanoSystems had a clear challenge. While Vantablack® is widely recognised for its exceptional absorption, physically demonstrating this performance is often time-consuming and costly, particularly when engaging new markets.

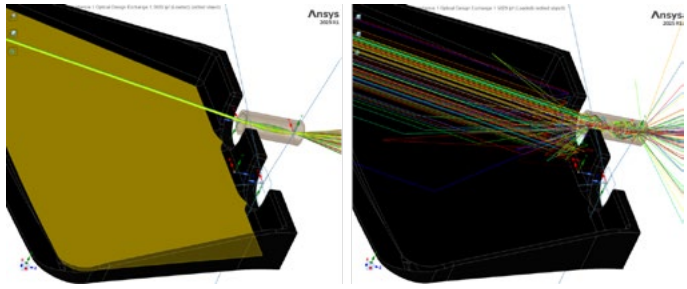
From a simulation perspective, the difficulty lies in the scale of the optical effect. The light reflected or scattered from Vantablack® is several orders of magnitude lower than that of typical black surfaces. Capturing this reliably requires high-fidelity, non-sequential ray tracing capable of handling extremely large numbers of rays within complex, application-representative geometries. →



← Baffles with and without Vantablack. © Surrey NanoSystems



↑ A human eye sensor is setup in Ansys Speos looking at four glare shields with different coatings applied. Left to right coatings are: Vantablack® (measured BSDF), Mescalito Black (measured BSDF), 10% reflection (analytic model), 90% reflection (analytic model). Using the human eye sensor we can clearly see the different reflective properties of these coatings in a realistic environment and with realistic external lighting applied. © Surrey NanoSystems



↑ 3D CAD geometry, as implemented in Ansys Speos, with ray traces overlaid using the Light Expert tool. The light paths have been filtered to show only direct transmission from the source to the sensor (left) or parasitic light paths where unintended reflections or scattering resulted in light reaching the sensor (right). © Surrey NanoSystems

About Vantablack ® and Surrey NanoSystems

Vantablack® was developed specifically to suppress stray or unwanted light. Manufactured by Surrey NanoSystems, it is an ultra-black, spray-applied coating engineered for exceptional performance across the visible and infrared spectrum. Originally created for demanding aerospace and scientific applications, Vantablack® achieves extremely low total hemispherical reflectance (THR), absorbing light from all angles to reduce glare and simplify optical system design.

Designed for durability in extreme environments—from low Earth orbit to high-performance automotive systems - the coating maintains its optical performance throughout the lifetime of the sensor. Whether in space or on the road, Vantablack® helps eliminate glare, ghosting, and reduced signal-to-noise ratios, ensuring consistently high-quality imaging.

vantablack.co.uk

The CAD-integrated environment of Ansys Speos enables these material properties to be applied directly to realistic system models. This allows performance to be evaluated in the context of real customer applications, providing clear, visual and quantitative evidence of how effectively Vantablack® suppresses stray light.

Building Capability Through Partnership

The collaboration has therefore focused not only on simulation capability, but on building a robust engineering approach. A strong technical partnership has been established, supporting optical modelling and stray-light analysis tailored to Vantablack® applications. Through close and collaborative working, both teams have invested significant time in understanding application requirements, ensuring modelling outputs align directly with practical engineering challenges.

A key outcome has been capability development within Surrey NanoSystems. Through hands-on training and structured technical guidance, engineering teams have built confidence in advanced modelling workflows and in representing complex optical and material behaviour. This enables more effective, data-driven engagement with customers, complementing experimental validation.

» **The collaboration with CADFEM has been instrumental in helping us build confidence in our simulation approach.**

James Whitfield
Surrey NanoSystems

"Through hands-on support, close technical engagement, and a deep understanding of our application requirements, we've been able to develop workflows that allow us to model and demonstrate Vantablack® performance in a way that is directly relevant to our customers," explains James Whitfield from Surrey NanoSystems. Continuous engagement has further strengthened this relationship, with CADFEM engineers contributing as an extension of the Surrey NanoSystems team. This supports efficient problem solving and accelerates iteration as new applications are explored.

From Simulation to Strategic Impact

From a strategic perspective, early alignment was equally important. A structured proof-of-concept translated technical uncertainty into measurable insight, supporting confident adoption of **Ansys simulation** across both engineering and management teams.

» **From the very beginning, our focus was to position CADFEM not simply as a software reseller, but as a long-term engineering solutions partner. The proof-of-concept played a key role in guiding the customer through technical uncertainty and building confidence in the simulation approach and final solution.**

Hitesh Mirchandani
Account Manager, CADFEM

More broadly, this reflects a shift in how advanced materials are applied in engineering contexts. For Surrey NanoSystems, Ansys simulation enables earlier involvement in customer design processes, supporting a transition from material supplier to solution partner. For the wider industry, the implication is clear: those who can bring materials, modelling, and system-level thinking together will define how increasingly complex optical challenges are solved.

Author
ELLE CLARKE
Marketing Specialist, CADFEM UK Ltd.

MORE INFORMATION

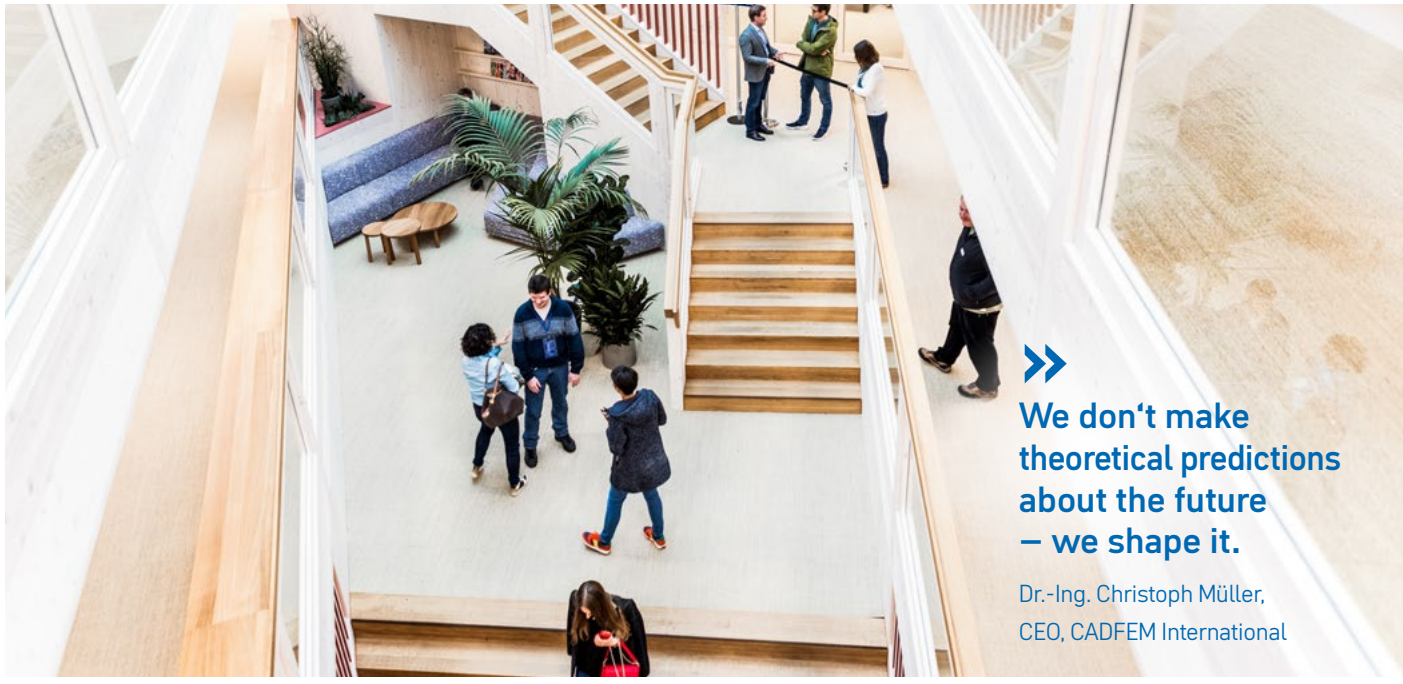
This content is based on the article "How Vantablack Can Reduce Light Pollution and Pioneer the Space Sector" published on the Ansys blog. ansys.com/blog

Ansys Speos
cadfem.net/speos

One Group – Infinite Possibilities

CADFEM GROUP

The CADFEM Group fosters a vibrant ecosystem where technology, innovation, and openness give rise to new ideas. In this way, it creates an environment where groundbreaking, outstanding, and forward-looking ideas can flourish: with expertise, enthusiasm, and as a team.



» We don't make theoretical predictions about the future – we shape it.

Dr.-Ing. Christoph Müller, CEO, CADFEM International

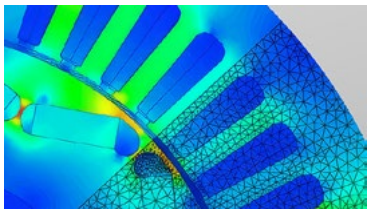
The CADFEM Group is a network of companies that evolved from what is now CADFEM Germany GmbH. Our core business is simulation: We are one of the leading, globally connected providers of simulation solutions for product development. At the same time, we closely monitor industry trends to promote and actively develop forward-looking technologies through collaborative partnerships. In addition, we support emerging startups that share our vision. Through all these activities, we strive to identify opportunities, make targeted investments, and continue to expand.

More than 20 companies, over 750 employees, in 30+ countries

Today, the family-owned CADFEM Group comprises more than 20 companies with over 750 employees in more than 30 countries. We give people the opportunity to realize their potential through their ideas—whether as part of our team or through their own businesses. In this way, we help create and secure jobs while, as a company, contributing to the success of the respective business communities. This is how we live up to our corporate philosophy of „think globally but act locally" in every market we serve.

STRONGER TOGETHER

Synopsys / Ansys Channel Partner: Simplify Complexity

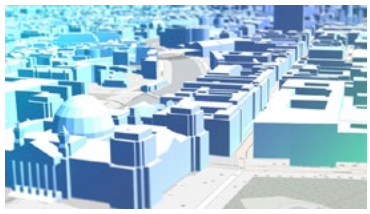


The CADFEM Group is the world's largest partner network for Ansys—a division of Synopsys, Inc., one of the leading developers of EDA and simulation technology. But we don't just sell simulation software: as a distribution partner, we combine technology, services, and expertise to create customized and sustainable digital engineering solutions for our customers.

Ansys part of SYNOPSYS® ELITE CHANNEL PARTNER

Discover more about CADFEM Europe on page 18
Discover more about CADFEM APAC on page 28

Industry Trends: Bridging Vision and Reality



Whether in industry and manufacturing, medicine, architecture, or smart cities: the future belongs to digital twins. The CADFEM Group continuously seeks out exciting new opportunities. That is why we invest in promising areas such as new application fields, innovative simulation technologies, and untapped markets related to our core technology, Ansys.

BCE Dynamics Building Climate Energy
Ti Probaligence
initTech
SIMQ
INYO
3D MAPPING SOLUTIONS
ITficient
virtual city systems

Start-ups: Empowering Ambition

To improve, think ahead, and drive meaningful change, we support more than 50 young entrepreneurs in addressing global challenges and developing innovative solutions. That is why we also invest in new areas that are not directly related to our core business of technical simulation.

Data Analytics & Visualization
Process Engineering
Foodtech
3D Printing
Automotive Software
Medtech & Pharma
Robotics
Sustainability
Space

CADFEMGROUP.COM

CADFEM WORLD CONFERENCE 2026

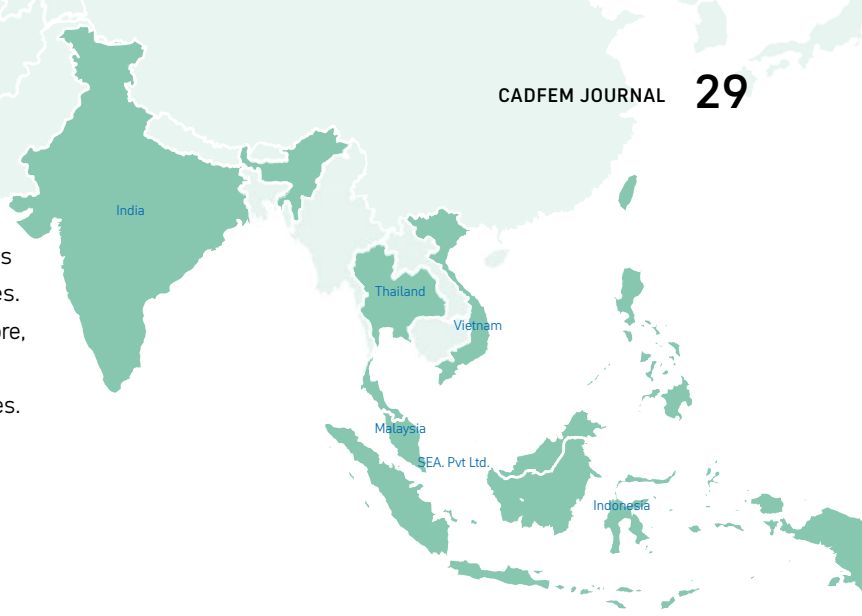
Keynote

Christoph Müller
CEO CADFEM International

CADFEM GROUP – Simulation beyond classical Engineering

Advancing Simulation-Driven Innovation Across Asia-Pacific

Every transformative journey begins with a belief. For CADFEM, that journey began in 1985 as a two-person Ansys consulting startup in Germany - founded on the conviction that engineering challenges could be solved more intelligently through simulation. While the company was already expanding in Europe, CADFEM founder Dr. Günter Müller invited Dr.-Ing. Madhukar Chatiri in 2006 to establish CADFEM India - the foundation for today's CADFEM APAC.



The beginning was modest, a small office in Hyderabad and a team of four engineers. Yet the mission was ambitious: helping manufacturers solve increasingly complex engineering challenges faster and more efficiently through simulation-driven approaches. Over the years, CADFEM APAC expanded its presence across Bangalore, Chennai, Gurgaon, and Pune, while industries throughout the region accelerated their adoption of digital engineering technologies. As organizations faced growing demands for innovation, performance, and reduced time to market, simulation evolved from a specialized engineering tool into a strategic business capability.

Geographic and Technological Expansion

In 2017, the journey extended beyond India. With the establishment of CADFEM SEA in Singapore and footprints across Malaysia, Indonesia, Thailand, Vietnam, and the Philippines, CADFEM APAC grew into a trusted digital engineering partner across the Asia-Pacific region.

Yet the story of CADFEM APAC is not simply one of geographic expansion. It is also a story of significant technological evolution. What initially began with structural and fluid simulation gradually transformed into a far broader digital engineering ecosystem. Recognizing this shift, CADFEM APAC expanded its focus towards enabling organizations to embed simulation throughout the entire product development lifecycle - from concept validation and design optimization to system-level performance evaluation and operational intelligence.

Furthermore, CADFEM APAC is driving the evolution of Digital Twins by integrating Ansys simulation technologies with NVIDIA Omniverse to create immersive, AI-enabled engineering ecosystems. Through scalable, automated workflows and semantic interoperability, CADFEM enables engineering teams to accelerate collaboration, simulation, and lifecycle decision-making. →

Leading with Purpose: The Story of the Man Behind CADFEM APAC

Dr.-Ing. Madhukar Chatiri began his journey with CADFEM in 2005 during his master's thesis in Germany, where he experienced firsthand the importance of strong technical expertise and customer-focused engineering support. When Dr. Günter Müller proposed establishing CADFEM's presence in India in 2006, it became an opportunity to build more than a business, it was the beginning of an organization founded on trust, fairness, respect, and engineering excellence.

What started as a small entrepreneurial venture gradually evolved into CADFEM APAC, now a trusted digital engineering and simulation partner across the Asia-Pacific region. With the support of Bharat, Sekhar, Praveen, and many committed employees, the organization steadily grew into a strong engineering ecosystem serving industries across the region.

CADFEM APAC's strength lies in its people. Every employee - past and present - has contributed to shaping its culture, innovation, and growth. This collective spirit continues to be reflected in the organization's philosophy:

**"ONE VISION.
ONE GOAL.
ONE APAC."**

Partnering with Industry, Research, and Technology Ecosystems Across APAC

The transformation also aligned closely with larger national technology priorities. CADFEM APAC actively collaborates with industry, research institutions, and strategic programs connected to India's National Semiconductor Mission, National Quantum Mission, and aerospace and defense initiatives. Through multiphysics simulation, intelligent system modeling, and digital engineering frameworks, the organization helps advance next-generation technology ecosystems across the region.

Think Global, Act Local: Enabling Digital Engineering Across Continents

As engineering organizations expand globally, innovation is no longer confined to a single location. Development centers, manufacturing plants, and engineering teams increasingly operate across multiple countries, creating new challenges in knowledge sharing, technology adoption, and maintaining consistent engineering practices worldwide.

At CADFEM, we address these challenges through our "Think Global, Act Local" philosophy. By combining the strengths of CADFEM Europe and CADFEM APAC, we provide customers with seamless access to global expertise while ensuring local responsiveness and support tailored to regional needs.

This collaborative approach is reflected in our engagements with global organizations such as Liebherr, Marquardt, and Enercon. While engineering and business objectives are often defined at a global level, successful implementation depends on empowering local teams with the right tools, methodologies, and technical know-how. CADFEM teams across Europe and APAC work together to support simulation adoption, share best practices, and accelerate the deployment of advanced engineering technologies across customer locations.

One of the defining milestones in this journey has been the establishment of the CADFEM APAC Digital Twin Lab, an environment where physical systems are connected to their virtual counterparts in real time. By integrating live operational data with simulation-driven intelligence, engineers can validate designs, monitor system behavior, predict performance, and continuously optimize operations.

Today, CADFEM APAC continues to advance toward a future where simulation, AI, automation, and intelligent workflows operate together within connected digital ecosystems. Guided by its vision of "Silicon to Systems Design," the organization remains focused on enabling industries across Asia-Pacific to innovate faster, solve increasingly complex engineering challenges, and accelerate the transition toward intelligent, simulation-driven product development.

Authors:
PRACHI MARDIA Head of Marketing CADFEM APAC
RAJRHITA SEN Content Writer, CADFEM APAC

CADFEM.AI

Building the Future of Urban Air Mobility: The ePlane Story

One of CADFEM APAC's key strategic customers, The ePlane Company, is rapidly emerging as one of India's most promising deep-tech startups in electric aviation. Founded in 2019 at IIT Madras by Prof. Satya Chakravarthy, ePlane is developing an all-electric VTOL aircraft designed to redefine urban air mobility and future air taxi transportation.

At the heart of ePlane's development philosophy is simulation-driven engineering. From aerodynamics and structural integrity to battery systems and flight controls, the company extensively leverages CFD, FEA, and system-level simulation to accelerate design validation, reduce physical prototyping, and enhance engineering confidence in a highly complex certification environment.

↑ Team

Through close collaboration with CADFEM APAC and the advanced capabilities of Ansys simulation solutions, ePlane has been able to strengthen its multiphysics engineering workflows, optimize product performance, and support faster, data-driven innovation. This integrated engineering approach has played an important role in helping the company progress toward critical development and regulatory milestones.

This journey is now extending into next-generation Digital Twin environments through ePlane's collaboration with NVIDIA. By combining Ansys-powered physics simulation with NVIDIA Omniverse-based Digital Twins, the company is creating immersive virtual testbeds capable of evaluating aerodynamic behavior, sensor interactions, and operational scenarios long before real-world deployment.

eplane.ai

CADFEM WORLD CONFERENCE 2026

Keynote

Satya Chakravarthy

Founder & CTO,
Ubifly Technologies Private Ltd.

Physics-Based Simulation
in eVTOL Aircraft Design

CADFEM TechArticles: Where Inspiration Meets Innovation

A new TechArticle is published every month on the CADFEM blog. The topics arise from training sessions or the support hotline: the questions users frequently ask, the challenges they encounter during exercises, the feedback from customer surveys – all of these serve as inspiration. Authors from CADFEM Europe transform these topics into engaging technical insights, building a valuable and ever-growing knowledge base.

↑ The Ishtar Gate of Babylon (circa 575 BC) – a magnificent reconstruction made of blue glazed bricks with reliefs of Babylonian deities; now on display in the Pergamon Museum in Berlin. © Adobe Stock

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To spark the viewer's interest, only two ingredients were needed: one that seemed familiar enough to be understood, and one that was unfamiliar enough to capture attention.

This is how Kenah Cusanit portrays the archaeologist Robert Koldewey reflecting in her novel Babel. The glazed shards he uncovered in Babylon in 1897 meant nothing on their own – until Koldewey established the context and recognized them as part of the Ishtar Gate of ancient Babylon.

At first, it existed only as a vision presented to the Royal Museums in Berlin: no ruins, no gate, no wonder of the world – just a few brightly coloured ceramic fragments and a story that allowed an image to emerge that had never existed before. The result of that vision can now be seen in the Pergamon Museum: the Ishtar Gate, with its lions and dragons, 14 meters high and reconstructed in its original colours.

On a smaller scale, CADFEM TechArticles follow the same principle. A steering wheel in the summer sun reaching 70 °C on the surface: everyone who has ever hesitated to touch one can relate. The fact that this can be simulated and analyzed from an engineering perspective is what sparks curiosity. One engineer explains to another what he has discovered himself.


TechArticle by Ulf Friederichs, CADFEM Suisse: Thermal Radiation – Four Myths

What exactly is a TechArticle? It is not a scientific paper, nor a simple step-by-step guide. It is a compact, practical insight from engineers for engineers – built around a strong example and a clear narrative. Its design principle – background knowledge, software, practical task, engineering expertise, and best practice – follows the same approach used in every CADFEM training and eLearning offering. A TechArticle invites you to try things out – to take the first step. Sometimes, all it takes is something as simple as a pretzel stick.

A Pretzel Stick Is All It Takes

A fracture mechanics article illustrates this perfectly: **it begins with a pretzel stick – something everyone has broken before.** Everyone knows the difference between bending and torsional fracture, even if they cannot name it. Behind this lies real engineering content: the K-factor, crack propagation, SMART solver – all centered on a specific task, rather than a general, Wikipedia-style explanation of fracture mechanics. And it ends with a wink: "So Ansys calculates correctly – or perhaps we should say: our pretzel sticks break correctly!" Anyone who has built the model themselves will appreciate the joke.


TechArticle by Klaus Graf, CADFEM Germany: Fracture Mechanics – K-Factor & Damage Analysis

For Humans and Machines

Every TechArticle has two readers: the engineer at the screen – and search algorithms. Anyone who thinks shorter is always better underestimates both. Highly technical, tightly condensed writing may sound impressive, but it provides too little context for readers and for algorithms to recognise its relevance. What matters is density, not brevity for its own sake. This was Koldewey's principle, and it still underpins reader engagement, discoverability, and machine understanding today.

Written by Those with First-Hand Experience

The most common hurdle is not expertise – the authors have that. It is the courage to write from personal experience. "I experienced it myself during a summer in Switzerland: 70 °C on the steering wheel surface" – this single sentence turns a technical text into a story. It triggers vivid imagery, and the reader intuitively transfers the insight to their own simulation task.

But That is Another Story

The TechArticle is the smallest building block in the CADFEM learning ecosystem. Those who want to go deeper will find a growing portfolio of knowledge offerings – from eLearning to intensive workshops. And on the horizon, something new is emerging that re-frames an old question: what if your company's experiential knowledge did not leave with its experts, but remained? Customer expertise × CADFEM eLearning × AI – structured, with every answer backed by "video evidence," securely retained by the customer. Koldewey understood: fragments without context remain fragments. Build the right context, and you unlock something invaluable that was previously invisible. That, however, is another story – though it has already begun.

Author:
DR.-ING.MAROLD MOOSRAINER
Head of Professional Development,
CADFEM Germany GmbH

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Micro Learning	At Your Own Pace	Shoulder Glances	Interactive & Direct	Pure Practice
FREE	PRO	PRO	PREMIUM	PREMIUM

↑ TechArticles are the first step into the CADFEM learning ecosystem.

Clean Process Heat “Out-of-the-Box”

Through innovation, a young company from the Saarland is contributing to the decarbonization of industry: Kraftblock is the name of the scale-up and its product, which uses thermal storage technology for green energy. While the high-temperature heat storage systems were developed and optimized using FEM, CFD, and DEM simulations, digital twins will ensure their smooth and transparent operation in the future and enable new business models.

Kraftblock started small. Very small. That's because chemist Martin Schichtel, who earned his Ph.D. at the Leibniz Institute for New Materials in Saarbruecken, was conducting research at the nanoscale on the storage material used in Kraftblock's high-temperature heat storage systems. In 2014, he founded the company Kraftblock together with economist Dr. Susanne König. Their mission: to advance the decarbonization of industry through the innovative, efficient, and affordable provision of process heat derived primarily from renewable energy sources.

The research findings led to the key component of the heat battery - a granulate that stores energy as heat rather than electricity and is highly sustainable in the process: It requires no rare earth elements and consists of 85% recycled materials such as steel or glass slag, which are found in large quantities in landfills worldwide. This eliminates dependencies and bottlenecks; furthermore, the formula has been tested for up to 40 years.

The granulate is used in a container-like housing. This is the "Kraftblock," the high-temperature heat storage unit, named after its manufacturer. It can absorb energy and store it for up to two weeks before the heat is retrieved "on demand." The advantages: Waste heat from production processes is conserved, and energy from renewable sources is purchased when it is inexpensive. This benefits energy-intensive industrial sectors whose process heat has previously come mainly from fossil fuels.

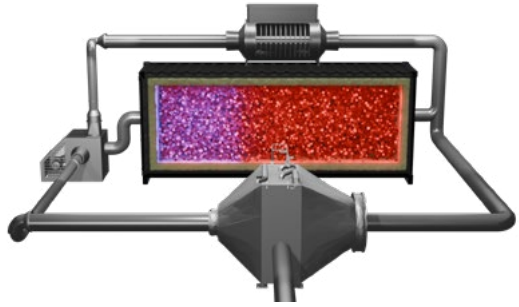
»

Our core model is to respond quickly and accurately to the energy market, thereby securing the most favorable prices for flexible process heat. To operate optimally, we need accurate simulations and predictions of how our storage system will behave in every charging scenario."

Martin Schichtel, CEO & Co-Founder Kraftblock

Maximum Efficiency Through In-Depth Simulation with Ansys and CADFEM

At first glance, the technical process in a Kraftblock is very simple: Heat from waste heat or converted renewable energy is blown into the storage unit, where the granules absorb it. The heat remains stored for hours or even several days until it is needed for production processes. Cold air is then blown into the storage unit; this air heats up as it encounters the material and is fed to the application area in the required form as process heat.

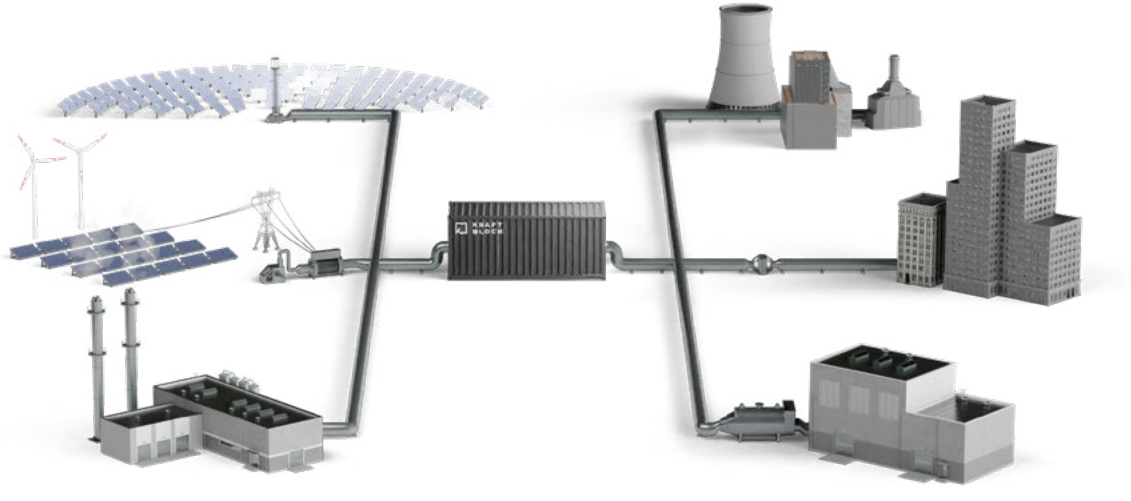


↑ A Look Inside Kraftblock: Charging, Storage, Discharging - these complex physical processes are optimized using Ansys simulations to minimize losses. © Kraftblock

What sounds simple is, from a physical standpoint, a complex interplay of heat transfer with structural and fluid dynamics processes and particle interactions.

To gain a thorough understanding, identify key parameters, and optimize them, Kraftblock uses Ansys tools for simulation. With Dr. Stephan Rother and his team, Kraftblock has highly experienced in-house experts in this field, who are supported by specialists from CADFEM as needed.

Kraftblock also obtains Ansys software from CADFEM. Ansys Mechanical is used for many structural and thermal simulations and optimizations: These range from small and large deformations to contact and buckling analyses, studies of the Kraftblock's behavior

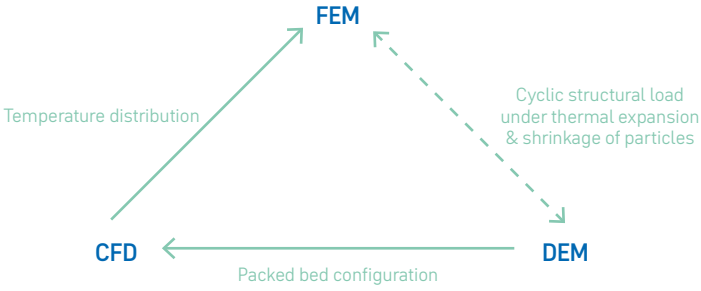


← The Kraftblock principle: Energy is absorbed when it is beneficial to do so and released as process heat when it is needed. © Kraftblock

during earthquakes, and thermal analyses related to insulation. For CFD calculations, Kraftblock relies on Ansys Fluent and Ansys CFX. These calculations typically involve simulating airflow behavior and heat transfer within the porous medium - that is, the interaction with the material and structure. As every detail matters here, the models are very large and are solved using GPU technology and an HPC cluster with 8 cores.

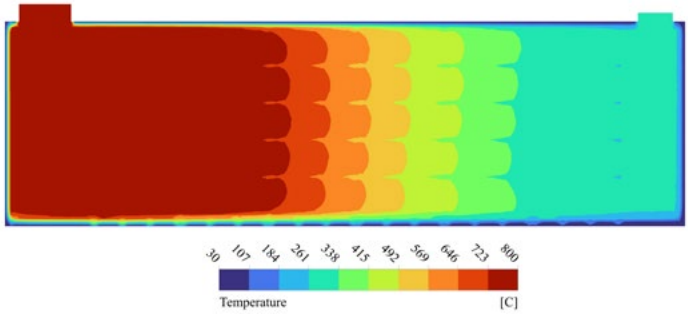
Ansys Rocky is used to simulate the settlement behavior and packing density of the storage granules based on the Discrete Element Method (DEM).

This helps the Kraftblock team analyze the behavior of the storage material and its distribution, and optimize its allocation in relation to flow processes and structural behavior.



↑ Simulations in various physical domains help Kraftblock engineers understand and take advantage of physical relationships and interactions. © Kraftblock

↓ A Look Inside the Digital Kraftblock During the Charging Process: Temperature Rise in the Granules and Flow Behavior. © Kraftblock.



During its simulations in various domains - including interactions during the early years - Kraftblock benefited from the Ansys Startup Program, which provides access to all Ansys tools. CADFEM also provides additional support through seminars, technical support, and consulting services.

In addition, CADFEM serves as a sparring partner for the technical Kraftblock team in evaluating new areas of application - such as simulation-based digital twins.

Transparency for Everyone: Digital Twin Brings Clarity

A new project being led by the Kraftblock team and Stephan Rother in collaboration with CADFEM demonstrates that simulation at Kraftblock now goes beyond the analysis and optimization of physical properties and relationships. The third partner in this collaboration is ITficient AG, the specialist in smart factories and digitized industrial processes within the CADFEM Group.

It focuses on the ongoing operation of the storage system. Its behavior is to be accurately modeled in a virtual environment by integrating data from various sources and IT tools. This digital twin is a fully digitized product system that enables real-time condition monitoring and thus delivers genuine added value for plant operators.

The multi-step approach taken on the path to a digital twin includes improving the accuracy of 3D CFD simulations, AI-based model reduction, and the continuous adaptation of the reduced model based on measurement data. This is intended to enable a highly accurate, real-time representation of system behavior.

Stephan Rother, Simulation Engineer, Kraftblock

Reaching the Goal in Four Steps with CADFEM and ITficient

CADFEM and ITficient have already developed digital twins for and in collaboration with various clients. A four-step approach has proven effective for guiding clients through the entire process, from concept to implementation. Each of the four project steps begins with a workshop that has a clear objective:

1. Analysis of the current state, objectives, and identification of a suitable use case
2. Focus on the technology landscape, processes, and data sources
3. Focus on existing vs. required IT and testing infrastructure
4. Detailed technical concept and roadmap for implementation

A Relevant Use Case: State of Charge

A Kraftblock is a thermal battery and therefore shares a characteristic found in conventional batteries: its exact state of charge is unclear without the use of additional tools. Because this information is essential for operators, sensors are built into the Kraftblock to determine its state of charge.

The crux of the matter: Sensors can only be replaced with considerable effort; if they fail, the information on the state of charge becomes less accurate, and efficient operation is compromised.

It was precisely in this scenario that the specific use case to be implemented in the Volt project was identified: In this project, the Dutch energy provider Eneco is installing a Kraftblock system at PepsiCo to decarbonize food production - for example, potato chips, which are fried at 300°C. For this facility, a prototype of a digital Kraftblock twin is to be developed that reliably displays the current "state of charge." This will be achieved using virtual sensors that supplement or even replace existing physical sensors.

If this is successful, various stakeholders will benefit:
- The operator of the Eneco storage system, in controlling the heat supply for production.
- Eneco's management, in monitoring and optimizing processes.

This use case is also of interest to Kraftblock itself, as it is one of the keys to its own new business models, such as "Heat-as-a-Service."

Digital Twins as the Key to Heat-as-a-Service

"Heat-as-a-Service" is about offering customers an alternative to purchasing energy storage systems. Instead of purchasing a storage system, the customer acquires heat supply contracts tailored to their needs. This model requires knowledge of the exact state of charge. Only then can steam, thermal oil, or hot air be supplied at the specified temperature and with the required mass flow within a defined time window. Responsibility for this lies with Kraftblock as the system supplier, which requires reliable condition monitoring to achieve this.

The technical Kraftblock team is working on the digital twin for this project together with colleagues from the new Energy Services division, as well as with CADFEM and ITficient. Following the roadmap developed during workshops within this group, the sensors' behavior within Kraftblock is modeled based on the available data - much of which comes from previous FEM, CFD, and DEM simulations. The validation, consolidation, and derivation of sensitivities are followed by system simulations, which are then integrated with the appropriate IT infrastructure. Kraftblock expects to complete the first operational twin for Eneco Volt in the spring of 2027.

Once developed for the initial use case, it can be scaled and tailored to accommodate future Heat-as-a-Service contracts and their specific requirements within the framework of the new business model.

↓ Eneco's Volt project, through which PepsiCo is decarbonizing its food production. © Kraftblock

ABOUT KRAFTBLOCK

Kraftblock designs and develops systems for decarbonizing thermal processes in industry and the energy sector. The technology replaces fossil fuels and increases the energy efficiency of process heat. With its proprietary high-temperature energy storage system, Kraftblock provides a key component for the energy transition. Kraftblock GmbH, headquartered in Sulzbach, Germany, was founded in 2014 by chemist Dr. Martin Schichtel and economist Dr. Susanne König.

kraftblock.com

MORE INFORMATION

Digitale Twins at CADFEM
cadfem.net/digital-twin

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Simulate First, Then Renovate

↑ Main Bridge Marktheidenfeld
© Adobe Stock; Be.Lateral, Geodynardo

Infrastructure assets such as bridges are usually safety-critical and exposed to a wide range of loads. Detecting the need for rehabilitation at an early stage and initiating appropriate measures is therefore essential. This requires reliable assessments, especially for older, historic structures. At the same time, resources can be conserved if a structure's functionality can be verified and demolition and reconstruction avoided. Engineers at Geodynardo in Weimar, Germany, carry out such analyses using Ansys.

ABOUT GEODYNARDO

Geodynardo GmbH, based in Weimar, Germany, is an engineering and software development company. Its focus lies on consulting and computational services for complex challenges in geotechnics and structural engineering, as well as stochastic analyses and numerical simulations.

geodynardo.eu

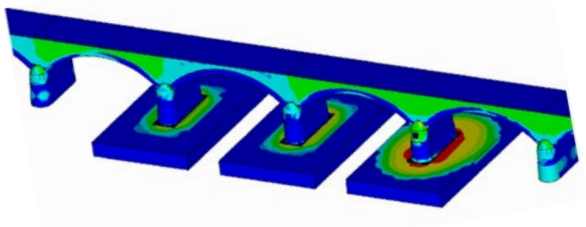
Simulation-based investigations of existing structures regarding load-bearing capacity and serviceability are a core area of expertise at Geodynardo GmbH in Weimar. Compared with traditional engineering models commonly used in structural engineering, these analyses offer significant advantages. Entire structures or representative sub-models can be analyzed, allowing interactions between different structural components as well as dynamic or exceptional loading scenarios - such as earthquakes, impacts, or fire - to be considered.

This enables rehabilitation and strengthening measures to be planned and implemented in a highly targeted manner. Two examples illustrate this approach:

Case Study: Main Bridge in Marktheidenfeld, Germany

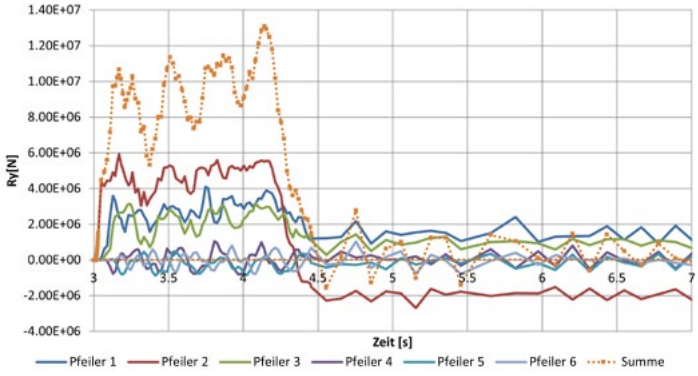
For a realistic assessment of the load-bearing capacity of the Main bridge in Marktheidenfeld under ship impact, it is essential not only to consider the three-dimensional structural behavior but also to simulate the dynamic response of the structure. The first figure shows the complete FE model of the bridge, including its different structural components and materials.

A transient dynamic analysis goes beyond simplified quasi-static calculations and reveals additional load reserves. The chart below shows the temporal evolution of the reaction forces resulting from a frontal ship impact on the second pier of the bridge.



↑ Fig 2: Plastic strains EPPL_EQV at the end of the impact process © Geodynardo

The structural response is clearly visible: the maximum reaction force at pier 2 does not coincide with the peak load amplitude. Instead, it occurs at the end of the first impulse phase, which exhibits a significantly steeper gradient. The simulation also shows the plastic strains at the end of the impact event. It becomes evident that the permanent deformations - approximately 5 mm at pier 2 and 1.5 mm at pier 3 - are primarily caused by plastic strains in the subsoil.



↑ Fig 3: Head-on collision with pier 2: History of the reaction forces on the pier © Geodynardo

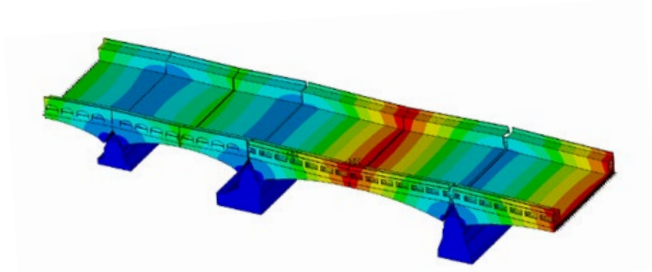
By simulating ship impact dynamically using the full model of the Main bridge in Marktheidenfeld, additional load reserves can be identified, enabling a realistic assessment of the serviceability and load-bearing capacity of the existing structure.

Author:
DR.-ING. ROGER SCHLEGEL Managing Director Geodynardo GmbH

Structural Health Monitoring of a Reinforced Concrete Bridge

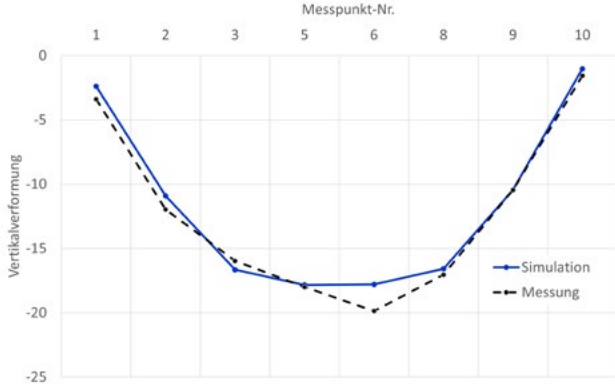
A simulation model developed by Geodynardo enables the condition of a canal bridge with three-hinged reinforced concrete arches, as well as its historic bearings and joints, to be monitored throughout the year.

The image shows the structural deformations based on the three-dimensional simulation model, which has been calibrated using on-site measurement data collected over the course of a year (chart below). In addition to self-weight and water loading, seasonal temperature variations are also incorporated into the model.



↑ Fig 4: Vertical relative displacements caused by the filling of the canal bridge with water © Geodynardo

On the one hand, the model allows new measurement data to be evaluated and their impact on the structural stress state to be determined. On the other hand, the calibrated model makes it possible to predict further seasonal scenarios, analyze appropriate maintenance strategies, and derive targeted strengthening measures for the structure in service.



↑ Fig 5: Model calibration by comparing the deformations of the simulation model with the measured values from the structural monitoring system © Geodynardo

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Roger Schlegel

CEO, Geodynardo GmbH

Simulation-based Assessment of Durability, Load-bearing Capacity, & Reliability of Traffic Infrastructure

CONTACT

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CADFEM Group
CADFEMGROUP.COM

CADFEM International GmbH
Am Schammacher Feld 37
85567 Grafing b. München • GER
+49 (0)80 92 70 05 97
info@cadfem-international.com

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