CADFEM

JOURNAL

EDITION —— 2025

DIGITAL ENGINEERING | SIMULATION

CADFEM IN EUROPE

A FUTURE BUILT ON TRADITION

Cambridge is a hotspot for new and emerging technologies such as semiconductor technology, quantum computers, and photonics. The local CADFEM team is a trusted partner in simulation and digital engineering.

Innovation

MORE COMFORT, LESS RISK

Medical devices from Sefam: Simulations to benefit patients.

Automation

RAPID INNOVATION, SMARTER SIMULATIONS

Automated simulations as a response to increasingly competitive conditions.

Transformation

CAE, AI, CADFEM

Artificial intelligence is fundamentally transforming engineering. CADFEM is here to support you.

Ansys part of SYNOPSYS® APEX CHANNEL PARTNER

»

With Ansys, we have an established and leading software, and with CADFEM, a partner who supports us in a way that ensures we benefit from this investment in both the short and long term.

DR.-ING. ULRICH MICHELS
Team Lead Simulation, CMBlu Energy AG

Matthias Alberts
Director Ansys Channel Partner Business Europe
CADFEM International GmbH

Innovation made in Europe: If you ever get the chance to visit Cambridge, I suggest you take it. Even in English weather, the city is magnificent. When my wife and I first visited our new offices in Cambridge, we were astonished by the beauty of the historic colleges. It was the energy of the city however, which impressed us most.

Cambridge is a centre of excellence for high-tech, electronics and new technologies from artificial intelligence and semiconductors to quantum computing. You will feel it once you are there. It was also in our Cambridge offices that we started building expertise in photonics and semiconductor engineering. Technologies that will now be part of CADFEM following Synopsys' acquisition of Ansys, creating a leader in silicon design, IP, and simulation & analysis.

And Cambridge is by no means the only place in Europe driving innovation and new technologies. A few weeks ago, Ana Luiza Pinto Queiroz from our customer APC Ltd. flew from Dublin to Munich to talk with us about APC's use of artificial intelligence in biomedical engineering. I knew her and APC from previous meetings, but while listening to her I understood that some of the world's most advanced research and development in biomedicine and pharmaceuticals is coming from Ireland, from Europe.

We are excited about the developments in technologies, at our partners Synopsys and Ansys, and at our customers. To better support our customers on this journey, we decided to bring our teams in Europe together, sharing market expertise and technical resources.

I have worked with CADFEM in different positions and countries for almost two decades now. I am looking forward to many more years of working with our new partner Synopsys, with my European colleagues, and all our customers who drive innovation.

CADFEM in Europe: CADFEM France is one of the newest entities in the CADFEM Group, bringing together around twenty employees in Paris and Lyon. Managing Director Yvain Ballini outlines how the company benefits from the growing internationalization of CADFEM.

Yvain Ballini Managing Director CADFEM France

"Driven by a passion for engineering and building long-term partnerships with our clients and partners, our team has always been able to rely on the group's support whenever needed. This enabled us to quickly become the the leading Ansys Channel Partner in France, as well as the country's main Ansys training centre in the country and organizer of the main national user conference dedicated to the challenges of digital simulation and digitalization, just like the other CADFEM companies in their respective countries.

The creation of the CADFEM Europe entity is now a unique opportunity for our team to enter a new phase of growth, scaling up on every level: through deep synergies within the group that are fundamental to understanding the emergence of new technologies, professionalization of our organization, and through inspiring, multicultural collaboration with all our colleagues and new perspectives for personal development within this large family."

40 Years of CADFEM

When Günter Müller founded his company CADFEM in **1985**, he was well prepared. The Finite Element Method (FEM), on which modern simulation technology is based, had always fascinated him. As a student and doctoral candidate at the University of Stuttgart and as a Visiting Scholar at the University of California, Berkeley - both strongholds of modern FEM applications - he worked intensively with the ideas of its pioneers.

These pioneers are still present at CADFEM today. Some of them, such as Ray Clough, Richard Courant, Gottfried Wilhelm Leibniz, Isaac Newton and Walter Ritz, have even inspired the names of conference rooms at the CADFEM headquarters in Grafing, which opened in **2022**. The largest room there bears the name „Swanson", named after John Swanson, who founded Ansys. Günter Müller got to know John Swanson during the early stages of his career. Of course, it was already about FEM. In **1982,** they began working together on the marketing of Ansys – today part of Synopsys - which led to the founding of CADFEM in **1985**.

Touring together as friends and business partners: Günter and Margaretha Müller with Sue Batt and John Swanson from SASI, the company that later became ANSYS, Inc.

40 years after CADFEM was founded, what today would be regarded as a simulation start-up has become a globally active and successful group of companies in the field of digital engineering.

Such a development could not have been anticipated at the time. But it was inevitable, because Ansys (which has been part of Synopsys since July 2025), simulation and the way products are created have changed fundamentally – just like the products themselves. The innovations are becoming increasingly fascinating at ever shorter intervals - innovations that were initiated by digital engineering.

However, not everything has changed. Some things have remained the same. This includes the philosophy that the family-owned company CADFEM has lived by for 40 years: passion, openness and competence for technology combined with friendly and respectful collaboration.

40 Years of CADFEM Booklet

Embark on a journey of discovery with us through 40 years of CADFEM! From our pioneering beginnings in the 1980s, through decades of growth and international expansion, to today's strong and connected CADFEM Group. It is a path we have taken as a family-owned company and a steadily evolving ecosystem – together with Ansys and many valued partners. And the journey is far from over!

→ **cadfem.net/40**

IMPRINT

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 | Adress as Publisher | akunz@cadfem.de (responsible according to the press law), Elle Clarke; Steven Jones; Alexander Shalaby **CONCEPTION, LAYOUT** Be:Lateral | www.blateral.io | **PRINT** K. Schmidle Druck und Medien GmbH | Semptstraße 6-10 | 85560 Ebersberg | Germany | www.ks-druck.com

The publication was also released as an ePaper.

COVER image collage: Various images © Adobe Stock

© Adobe Stock

CADFEM IN CAMBRIDGE

Cambridge is synonymous with science and technology, making CADFEM UK's move there a logical step. From this location, we can provide optimal support to young companies, in developing their innovations through simulation and digital engineering.

26

SYNOPSYS & ANSYS

Matthias Alberts from CADFEM answers questions about the acquisition of Ansys by Synopsys.

14

BEHIND THE SCENES

CADFEM's eLearning courses contain a wealth of simulation knowledge and comprehensive preparation. In this interview, Dr. Markus Kellermeyer provides insights into the Digital Learning Lab, which he played a key role in establishing and continues to develop with new ideas.

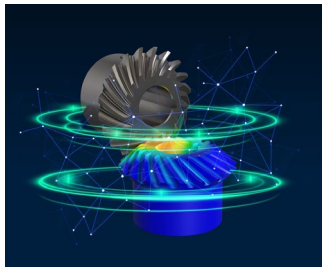
20

© Adobe Stock

SAFE PRODUCTS

The CE mark is going digital. The new rules coming into effect in 2027 also include the new Machinery Regulation (MVO) and the Cyber Resilience Act (CRA). Here's what you need to know and how CADFEM can help you comply.

34



AI IN ENGINEERING

Artificial intelligence is becoming an increasingly important factor for competitiveness in engineering. Time to act: Learn how CADFEM supports its customers in making their simulation and engineering processes faster, more precise, and more efficient with AI.

08

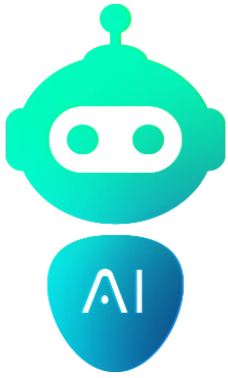
© Sefam

RESTFUL SLEEP

Better for patients: therapies that offer greater comfort and lower risk. This example from medical technology manufacturer Sefam in Villers-lès-Nancy, shows how simulations help medium-sized companies compete globally through innovation

18

Artificial Intelligence, Digital Engineering and CADFEM



Artificial intelligence (AI) is the latest evolutionary step in digital engineering. It is gaining momentum and is well on its way to becoming a factor in competitiveness. Now is the time to act: CADFEM supports you in using AI to make your engineering processes faster, more precise, and more efficient.

As in many areas of life, the potential of AI in product development is enormous. There is no question that AI will improve future products and massively accelerate their development processes. Every day, we hear about impressive results achieved with AI: from real-time applications in digital twins to rapid design optimizations and autonomous processes to workflow control and routine task completion.

Are you still exploring...

These examples all have one thing in common: they are exceptions, because the reality is different. Representative surveys, such as one conducted by bitkom-research in early 2025, show that the vast majority of companies (64%) see themselves as latecomers and are, at best, in the process of gaining an overview of the opportunities offered by AI. According to a Blueprint survey in July, AI is only used by 12% of companies. This is not surprising, as a new, disruptive technology cannot be understood and implemented overnight.

The fact that AI is still in its infancy also means that there is little long-term experience and best practice to draw on. Moreover, AI does not (yet?) work out of the box outside of popular applications such as ChatGPT. In engineering in particular, those who want to use AI in a targeted manner in engineering processes need solutions that are precisely tailored to individual applications and requirements. According to a CADFEM survey conducted at the Blueprint Event, 85% are still uncertain about this.

... or are you already implementing it?

At CADFEM, we are committed to leading the way in finding and developing such solutions together with and for our customers and implementing these solutions in existing infrastructures.
We achieve this through practical expertise that has grown through exchange with our customers, with Ansys, and with specialized partners. We also do this through internal projects, further training, and the recruitment of new experts. Last but not least, our expertise in simulation process and data management (SPDM) is another important building block, as structured processes and data are essential for efficient AI.

We invite you to join us in implementing AI in your product development.

MORE INFORMATION

cadfem.net/ai

Information on AI: The free eBook from CADFEM

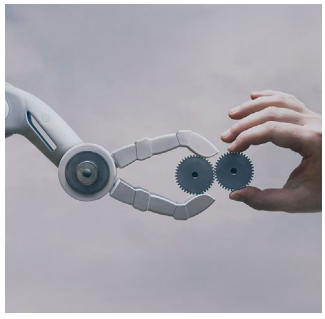
The eBook "AI in Product Development" is more than just a recommended read. It is a practical update for anyone who not only wants to understand AI, but also wants to use it intelligently right from the start. It is written in an easy-to-understand style, with examples from everyday engineering and packed with valuable tips. Furthermore, the eBook is constantly being expanded. Four of the five sections of the book are already available, each dedicated to a specific AI-related topic. Get your free AI knowledge now.

Download the eBook
cadfem.net/ai-ebook

Inspiration on AI: The Digital Engineering Talk from CADFEM

Over 1,000 registrations – twice! When Blueprint focuses on AI, interest is particularly high, and the number of participants reaches into the four digits. In the live format, decision-makers from industry comment on digitalization and development topics, including "AI in digital engineering – ready for the revolution?" and "AI without hype – how engineers successfully implement AI projects". The recordings are available free of charge.

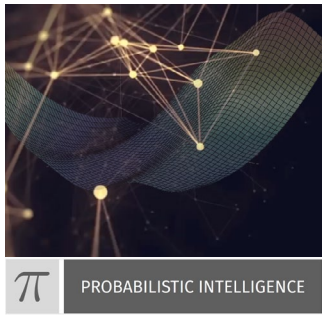
More about Blueprint
cadfem.net/blueprint



Further training on AI: training and e-learning courses from CADFEM

From building and training neural networks to sensitivity analyses and probabilistic machine learning models, this two-day training prepares you on how to apply AI tools in Ansys. Learn how trained AI models can replace simulations and make predictions for new designs in a fraction of the time with comparable accuracy. The training is also available as an eLearning, and Module 1 can be requested and tested free of charge. We also offer in-depth courses as well as the "Let's Simulate" series.

More about the seminar and free-of-charge testing
cadfem.net/training



Expert knowledge on AI: PI Probaligence, a spin-off from the CADFEM Group

"Probaligence" is a combination of the words "probabilistic" and "intelligence" and describes what PI Probaligence GmbH stands for. It was founded in 2018 as a spin-off of the Niederrhein University of Applied Sciences for the transfer of research results into industry by Prof. Dr.-Ing. Dirk Roos and Dr.-Ing. Kevin Cremanns. Since 2024, PI Probaligence has been the AI partner within the CADFEM Group and is involved in many activities, such as the eBook, the Blueprint, and the AI training.

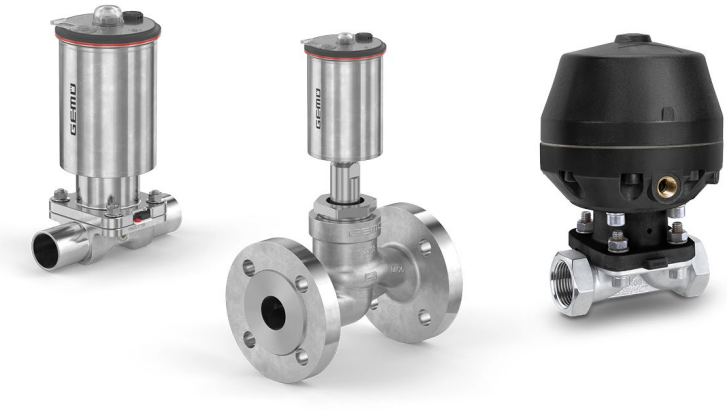
Visit PI Probaligence
probaligence.de

Verification of 2,000 Valve Bodies: A Case for Automation and AI

GEMÜ has over 2,000 metal valve bodies in its portfolio, and its pool of CAD geometries is correspondingly large. Each individual valve must be simulated to verify its load-bearing capacity in accordance with the Pressure Equipment Directive – a case for automation and AI, since it is faster and frees up employees from monotonous tasks..

GEMÜ Gebr. Müller Apparatebau GmbH & Co. KG is a leading manufacturer of valves, measuring and control systems for liquids, vapors, and gases. The family-owned company from Ingelfingen in Hohenlohe is active worldwide and stands for innovation and digitalization, and its commitment to providing its customers with exceptional added value.

↓ Für metallische Ventilkörper ist ein Tragfestigkeitsnachweis erforderlich. © GEMÜ



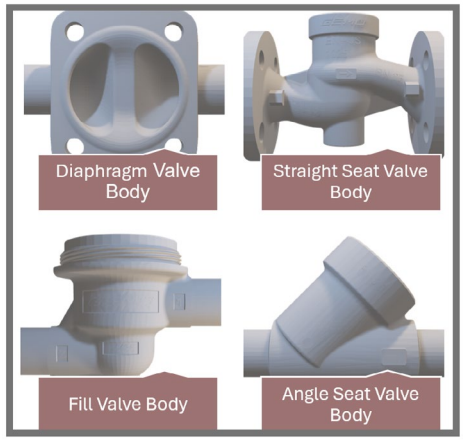
Simulations have been an integral part of the development processes at GEMÜ for many years. Simulations are carried out using Ansys, and CADFEM is the partner for everything related to simulation. Since its introduction, the range of applications has grown continuously – both in terms of the physical domains and the way in which simulation is used.

The benefits of automation

A few years ago, GEMÜ began working with CADFEM to explore simulation automation with PyAnsys. The goal was to make processes more efficient, faster, and better. This is particularly suitable for recurring and standardizable tasks that simulation engineers see as a necessary evil because they leave them with less time for their demanding creative development tasks. That is why automation at GEMÜ is also seen as a contribution to greater employee satisfaction.

Automated stress analysis of valve bodies

Metal valve bodies are pressure-bearing components for which a strength analysis must be performed. GEMÜ offers customized solutions and has well over 2,000 variants in its product range, which is constantly growing. The required verification is performed using Ansys simulation software based on each individual CAD geometry, which is a tedious and repetitive process when done manually. However, these are ideal conditions for automation.



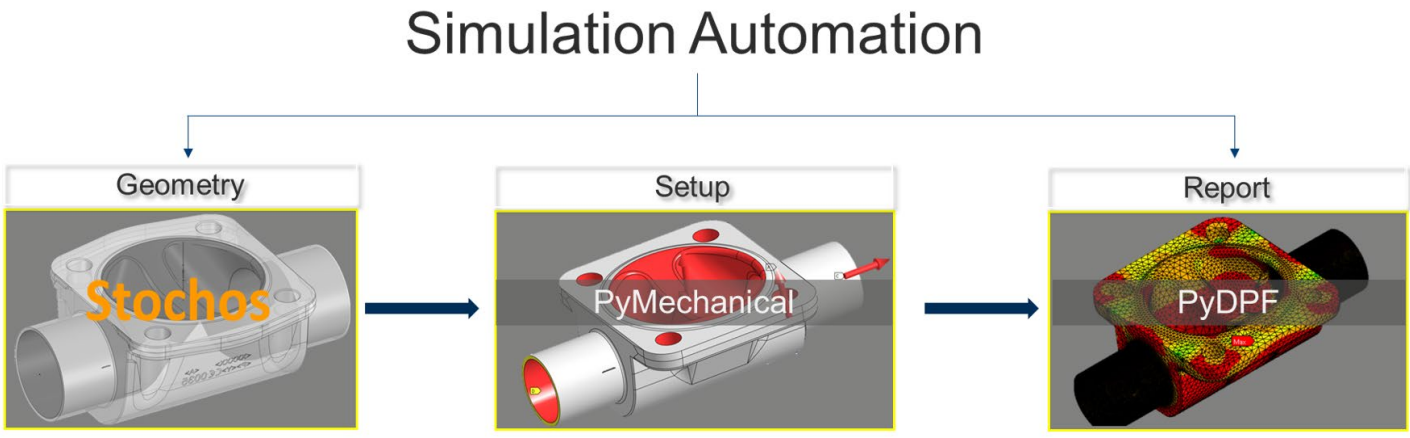
← A load-bearing capacity test is required for metal valve bodies. © GEMÜ

No sooner said than done: the development of an automated workflow was undertaken with CADFEM. In addition to the implementation of this specific project, the goal for GEMÜ in this collaboration was to transfer knowledge for future applications. One of the challenges with the valve bodies was that surface components and other metadata important for automation were not stored natively in the CAD data. Instead, they had to be derived from the valve body type, nominal diameter, and connection type. Their variance and lack of standardization are a particularly complex constellation, which meant that the purely script-based automation approach with PyAnsys ultimately delivered merely satisfactory results. Although these required considerably less effort than before, they still had to be manually post-processed.

↑ GEMÜ is a leading manufacturer of valves and measurement and control systems for liquids, vapors, and gases. © GEMÜ

» **I believe that anything that can be sensibly automated should be automated. This allows experts to concentrate on exciting cases and explore new fields of application.**

MARCO WISSINGER
Team Leader Simulation Engineering at GEMÜ



↑ It is important for simulation automation that surfaces can be classified using the STOCHOS AI solution and clearly assigned to functional faces.

Workflow optimization with AI

This example shows how AI can complement and optimize simulation automation, especially for complex tasks. With the STOCHOS AI solution from CADFEM partner PI Probaligence, it was subsequently possible to completely automate the entire workflow – geometry preparation, modeling, standard-compliant evaluation according to the Pressure Equipment Directive, and reporting – and, most importantly, to significantly improve the quality of the results. The decisive factor was a machine learning model trained by STOCHOS using geometry-based metadata, which reliably processes the most diverse properties of CAD geometries and recognizes pressurized surfaces as well as inlet and outlet surfaces with almost 100% accuracy. These surfaces then serve directly as the basis for the further automated model construction of the non-parametric ("dead") geometries with PyAnsys.

Scaling

The automation solution is already in use at GEMÜ and is reducing the workload of the simulation engineers. However, development is far from complete. In fact, this is just the beginning. In addition to the newly acquired expertise, individual modules can also be used in other automation applications.

MORE INFORMATION

Automation and CADFEM
cadfem.net/customization
AI and CADFEM
cadfem.net/ai
GEMÜ
gemu-group.com

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. The name CADFEM has been synonymous with simulation since 1985 and has been supporting companies, researchers, and universities in the successful use of Ansys and other simulation products ever since.

This is made possible by the CADFEM team of over 600 employees in Europe, India and Southeast Asia (APAC). Through training offers, 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.

Ansys & CADFEM

Ever since CADFEM was founded in 1985, it has been a close sales and technology partner of **Ansys**, the world's largest developer of simulation software. In July 2025, **Synopsys**, the market leader in EDA and chip design, acquired Ansys. Ansys is now part of Synopsys, Inc., and together they will shape the digital development of increasingly complex product generations in many areas of application and industries.

The ecosystem of this new technology leader also includes the CADFEM companies: As an **Ansys Apex Channel Partner** in Europe and an **Ansys Elite Channel Partner** in APAC, CADFEM remains the proven center of excellence for all sales and technical matters relating to Ansys: from the procurement of licenses and the training and further education of users to support and supplementary services.

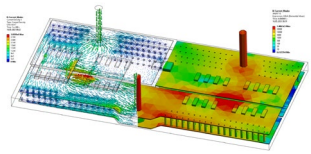
Furthermore, as an **Ansys Services Partner** for Digital Engineering, CADFEM is certified to support customers in the digitalization of their engineering processes. Last but not least: As an **Ansys Systems Integrator Partner,** CADFEM meets all the requirements to implement and operate complex IT environments for HPC applications for customers. This ranges from local hardware as a private cloud to public cloud solutions from Ansys based on AWS or Azure

cadfem.net

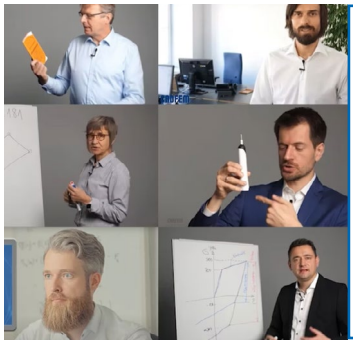
Ansys part of SYNOPSYS® | APEX CHANNEL PARTNER

600+
EMPLOYEES

300+
ANSYS EXPERTS



5.000+
CUSTOMERS

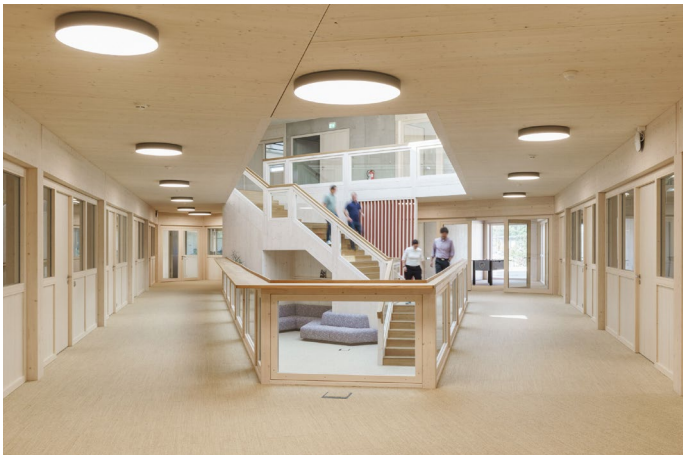


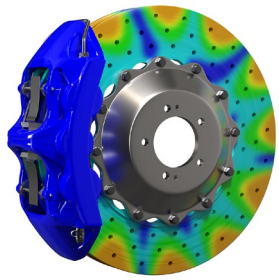
110+
SEMINAR TITLES

500+
UNIVERSITY SITES

9.000+
SEMINAR PARTICIPANTS 2024

35
LOCATIONS





1.000+
SIMULATION PROJECTS 2024

all further images: © CADFEM

From Silicon to Systems: Synopsys, Ansys & CADFEM

Ansys part of SYNOPSYS® | APEX CHANNEL PARTNER

In mid-July 2025, Synopsys, Inc. acquired Ansys, Inc.. The merger of the leading providers in the field of chip design and simulation software has created a new, broadly based technology group: From Silicon to Systems. What is the background to this development and why is it good news for CADFEM and CADFEM customers? We spoke to Matthias Alberts, Director CADFEM Europe, about this.

Matthias, Ansys has been part of Synopsys, Inc. since July 2025. What does this merger mean?

Synopsys and Ansys are two successful companies in the chip design and simulation market joining forces. Synopsys calls this "From Silicon to Systems." "With Synopsys, alongside our customers, we now have a partner for the future at the forefront of technological development." Synopsys is headquartered in Silicon Valley and is thus directly involved in the rapid developments surrounding artificial intelligence and quantum computers. The merger puts Ansys in a future-proof position, while Synopsys strengthens its access to markets outside of chip design. Both areas are moving closer and closer together, which we are also seeing in the development of many of our customers.

CADFEM has enjoyed a partnership with Ansys for over 40 years. How does CADFEM view the takeover by Synopsys?

Many new technologies have been added through acquisitions in recent decades. Our partnership with Ansys has been so successful because we at CADFEM have embraced these technologies, from flow simulations to electronics and optical simulations, invested in them, and supported our customers in their implementation and use. Synopsys is now also bringing new technologies to the partnership. We are looking forward to this and are prepared.

↑ On July 17, 2025, Synopsys, Inc. completed itsacquisition of Ansys. © 2025 Synopsys, Inc. All rights reserved.

What does this new situation mean for CADFEM?

Synopsys gives us the opportunity to establish simulation in new areas and markets. “To support this, we are familiarizing ourselves with new solutions and markets, a process we began over a year ago. In the near future, we will increase our investments in this area in close coordination with Synopsys, and our AI expertise will also be strengthened through this partnership. At the same time, we will continue to develop the classic Ansys business, where we see many opportunities to expand the application of simulation and support our customers on their journey to digitalization. This also aligns with Synopsys’s strategy and interests.”

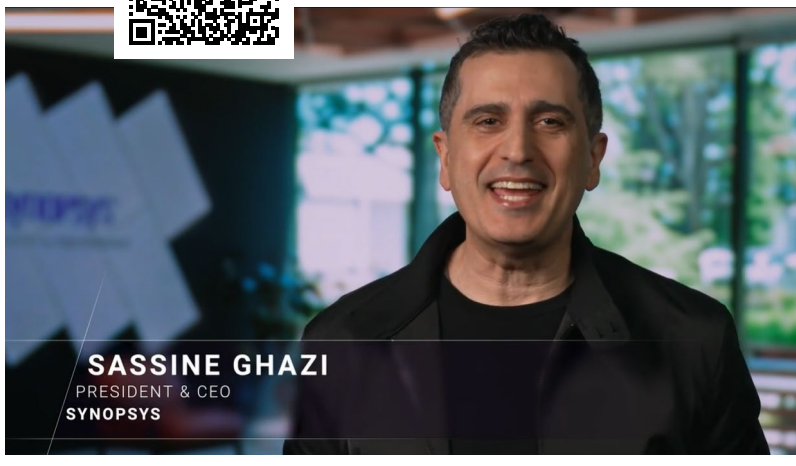
What are the advantages for CADFEM customers?

In my view, the acquisition of Ansys by Synopsys will primarily benefit our customers through a strong and forward-looking partnership. Synopsys will continue to develop and establish simulation as a whole. At CADFEM, we will expand direct customer support and related services. With this goal in mind, we are investing in simulation expertise, improved collaboration between all CADFEM companies, and new technologies. By expanding our expertise in chip design and electronics, “we can empower our customers to bring these two areas of development closer together.

MORE INFORMATION

synopsys.com

↙ Video message from Sassine Ghazi, President and CEO of Synopsys, Inc., regarding the acquisition of Ansys. © 2025 Synopsys, Inc. All rights reserved.



CADFEM Group: Digital. Engineering, Network.

The CADFEM Group connects the largest group of Ansys Channel Partners from different regions. It also supports (and challenges) specialized companies with digital solutions for current megatrends and invests in start-ups working on the technologies of tomorrow. Insights into a dynamic ecosystem of competencies, technologies and visions.

Together, the CADFEM companies in Germany, Austria and Switzerland, France, the UK and Ireland, as well as many countries in India and South East Asia, form the CADFEM Group.

Ansys Experts
Apart from the CADFEM name, these group of companies shares a common philosophy when it comes to selling Ansys solutions in their respective markets: To ensure that customers benefit optimally from the software, a comprehensive and individualized range of consulting, training, support and services is part of the overall package.
Other members of the CADFEM Group in Eastern and South Eastern Europe do exactly the same. The only difference is that they are not called CADFEM, but operate under their regionally known company names, SVS FEM, MESco, INAS, and SIMTEC.

Added Value for Megatrends
Other companies in the CADFEM Group are not referred to as CADFEM, nor is their core business the marketing of Ansys products. In these companies, highly specialized interdisciplinary teams develop innovative products and digital technologies with great added value for current megatrends such as AI, energy, mobility, medicine or energy-saving air conditioning of buildings:

BCE Dynamics
Digital twins for the analysis and optimization of climate systems in buildings and neighborhoods.
bce-dynamics.de

inuTech
Development of software and algorithms for special simulation tasks
inutech.de

INYO Mobility
Autonomous shuttles for the last mile.
inyo-mobility.com

ITficient
Smart factory applications and development of digital twins.
itficient.com

PI Probaligence
Probabilistic AI/ML solutions that are especially suitable for simulative applications
probaligence.com

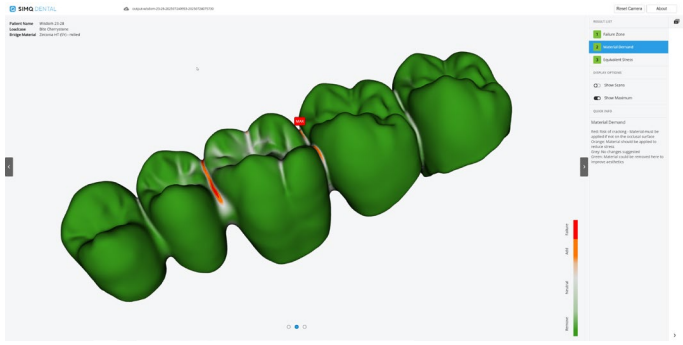
SIMQ
Personalizing patient care with Digital Twins
simq.com

3D Mapping
Digital twins of high-precision road maps and infrastructure
3d-mapping.de

Virtual City Systems
Digital twins of cities and landscapes
vc.systems

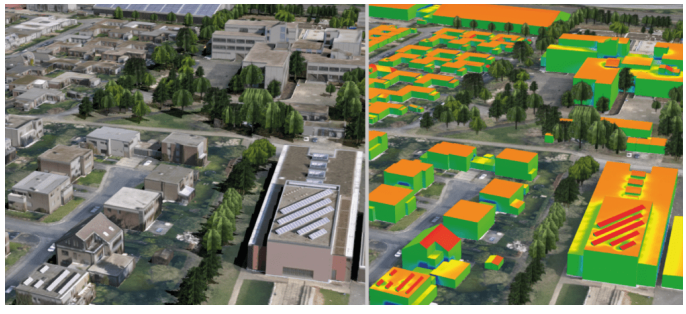
These companies with their unique expertise mostly cooperate actively with other CADFEM Group member companies, depending on the requirements of customers or projects. In addition, each partner also operates independently outside the CADFEM Group ecosystem.

← BCE Dynamics: Building simulation to assess the air conditioning requirements of rooms at the University of Lübeck. (Image: GM.SH, Grawunder Design)



← Simq DENTAL: Software for reviewing and optimizing the design of patient-specific implants (Image: Simq).

← INYO Mobility: The INYO CAB is the electric self-driving lightweight vehicle for new mobility (Image: INYO).



← Virtual City Systems: Visualization of the potential of Koblenzer Street in Duesseldorf for solar energy (Image: VCS).

The world of tomorrow

As a mentor and investor of young DeepTech start-ups, the CADFEM Group promotes the development of promising technologies for the future. The creators behind the innovative solutions thus also benefit from the extensive network of the CADFEM Group family and can be integrated into the ecosystem at an early stage.

MORE INFORMATION

cadfemgroup.com

BCE Dynamics
Building Climate Energy

initTech

INYO

ITficient

PROBABILISTIC INTELLIGENCE

SIMQ

3D MAPPING SOLUTIONS

virtual city systems

More Comfort, less Risk

Néa® is the only CPAP device for treating sleep apnea that operates silently without artificial dampening material. For patients, this innovation means greater comfort and less risk. This example shows how simulations help medium-sized companies to compete globally through innovation.

CPAP stands for "Continuous Positive Airway Pressure." In the treatment of sleep-related breathing disorders (sleep apnea), CPAP is supported, controlled, and monitored by medical devices. This allows those affected to enjoy a safe and restful night's sleep. The family-owned company Sefam ("Société d'étude et de fabrication d'appareillage médical") from Nancy is not only one of the leading suppliers in this field, but they also invented the CPAP device.

That was in 1984. Today, Sefam employs 130 people and makes life easier for patients in more than 70 countries with its diagnostic and therapeutic solutions. Its customers are mainly nursing services and medical institutions.

The latest product is Néa®, which is equipped with Sefam's patented Néalvéole® technology. It is the first, and so far, only CPAP device that does not use potentially risky foams to dampen compressor noise. Instead, a hexagonal honeycomb structure made of biocompatible materials ensures safe and quiet operation. The highlight: Néa® is more powerful, more ergonomic, and cheaper to manufacture than comparable devices. Simulations were key to the innovations and improvements that led to greater wearing comfort.

Simulation in product development: Make or buy?

Sefam began using simulation technologies in product development in 2016. After initially outsourcing this work to external service providers, the company decided in 2020 to build up the necessary infrastructure and expertise in-house. The reasons for this decision were shorter response times, greater independence, and a better understanding of physical relationships. In addition, it was possible to demonstrate that the investments would pay for themselves after just a few months thanks to the large number of simulation projects.

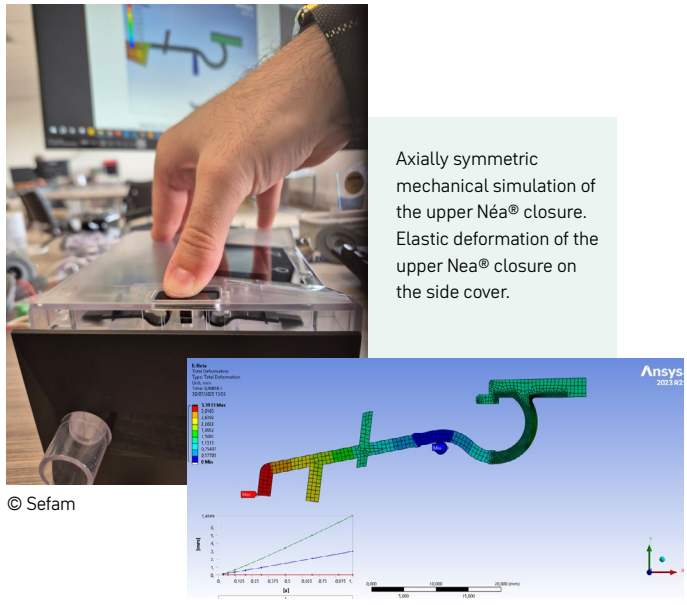
The development team, led by Nicolas Clerc, decided to use software from Ansys (Mechanical, CFD, HPC Packs) and consulting and services (training, project support, hotline support) from CADFEM France. To make the best use of the licenses, the company also invested in a high-performance workstation with 18 CPUs and 256 GB RAM as part of a partnership with FRA-SYS.

← Néa®, the only CPAP device without noise-reducing foam.

Application examples

Greater robustness through optimized components

A new directive stipulates that CPAP devices must be designed for a service life of at least five years. A key factor is the mechanical interaction of the components made of thermoplastics and elastomers. The Sefam team used Ansys Mechanical to examine design variants on the digital model of Néa® and thus determine the optimal configuration. This task was particularly challenging for the upper closure, which connects the side cover and the heated humidifier without springs. This component must be designed for at least 1,800 pressure contacts with 25 N.



© Sefam

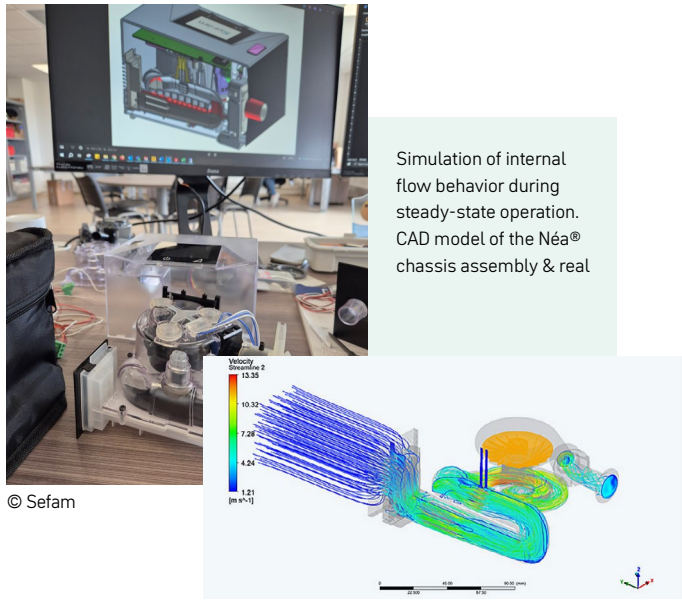
Axially symmetric mechanical simulation of the upper Néa® closure. Elastic deformation of the upper Nea® closure on the side cover.

» **The decision to perform simulations ourselves has made us more agile and innovative. Ansys and CADFEM were the right choice. The investment quickly paid off. Simulations help engineers shape the future of safe sleeping**

NICOLAS CLERC
Mechanical & Simulation Engineer at Sefam

Noise reduction through improved airflow path

Quiet operation is an important criterion for patients. By simulating the airflow in and around the compressor using Ansys CFD, Sefam was able to identify ways to make it more efficient and quieter. The flow patterns were optimized by adjusting the flow paths for each angle and pipe. This reduced noise without compromising performance or breathing comfort. It was particularly important to accurately predict the behavior at each design point based on the volume flow and pressure. The hardware configuration also paid off here, with each application case being simulated from a few minutes to 140 hours.



© Sefam

Simulation of internal flow behavior during steady-state operation. CAD model of the Néa® chassis assembly & real

Identification of foam alternatives

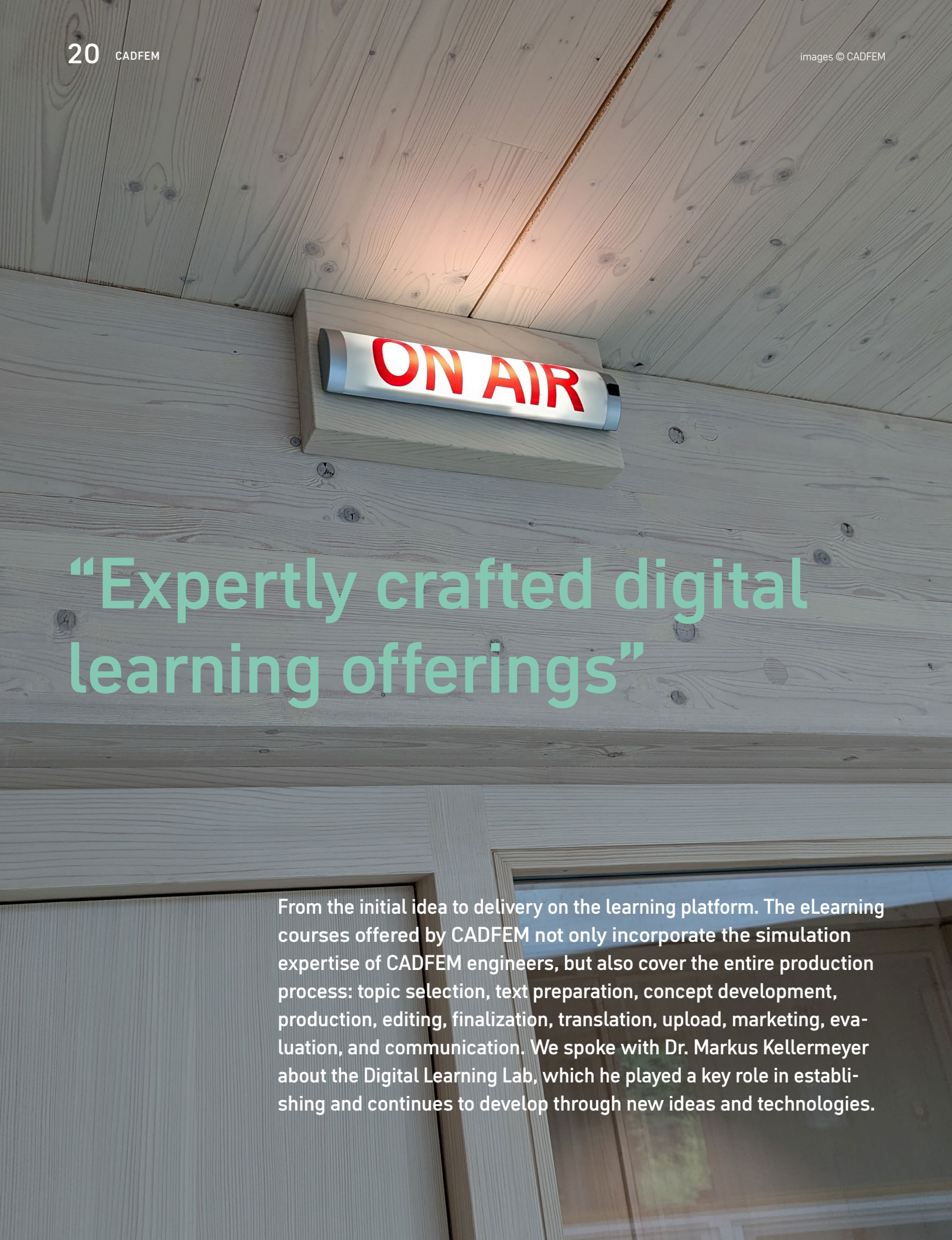
Basic acoustic simulations, combined with measurements, empirical values, and prototype tests, have also contributed to the development of the patented Néalveole® technology. A honeycomb structure made of biocompatible materials not only reduces compressor vibrations but also reduces noise caused by airflow more effectively than the foams otherwise used in CPAP devices for noise reduction. Sefam plans to intensify its acoustic simulations in order to further optimize noise emissions.

MORE INFORMATION

Ansys Mechanical
cadfem.net/mech

Ansys CFD
cadfem.net/cfd

Sefam
sefam-medical.com



“Expertly crafted digital learning offerings”

From the initial idea to delivery on the learning platform. The eLearning courses offered by CADFEM not only incorporate the simulation expertise of CADFEM engineers, but also cover the entire production process: topic selection, text preparation, concept development, production, editing, finalization, translation, upload, marketing, evaluation, and communication. We spoke with Dr. Markus Kellermeyer about the Digital Learning Lab, which he played a key role in establishing and continues to develop through new ideas and technologies.

Markus, what brought you to CADFEM?

I studied civil engineering, and, thanks to my department and my thesis, I was introduced to Ansys and CADFEM at an early stage, which I really appreciated. Once I knew that I wanted to work 100% in simulation, the move to CADFEM was an obvious one. That was in 2008.

So, like most people at CADFEM, you started out as a computational engineer. How did you end up as head of the Digital Learning Lab?

As is so often the case in life, things just fall into place. But looking back, this development was perhaps somewhat inevitable, because training and new technologies are topics that have always fascinated me. This is reflected in a five-year cycle: during my first five years at CADFEM, I conducted many Ansys training courses, and during the next five years, I was able to work on my doctorate alongside my job, which involved research. The five years since 2018 have been all about the Digital Learning Lab, which I developed with start-up support from the ZEIT Akademie.

That means you've been there from the start. What have been some important milestones and highlights for you along the way?

The first thing that comes to mind is our collaboration with ZEIT Akademie. This is still a valuable resource for us today. Then there was the move to our current building with two professional studios, which we planned and furnished entirely ourselves. This is where the magic happens, so to speak. The speakers are always in good spirits, and our team is outstanding. It was also important to bring Brian Morris, a native speaker, on board to translate our knowledge products into English in the best possible quality and offer them internationally. One of the most recent highlights is the ChatGPT moment, which everyone is probably familiar with, because suddenly things became possible that we had never even thought of before. Another great feeling was when we noticed how well our self-developed "Let's Simulate" format was received by people.

Speaking of "Let's Simulate", what is it and how did it come about?

What we and our customers were still missing, apart from e-learning courses and training, was a format that focused on shared experience. Let me explain briefly: I myself have diligently attended training courses, but I have also learned a lot by watching colleagues during simulations. How do they approach a project, how do they narrow down a problem, how do they identify potential errors, and so on. This is exactly what "Let's Simulate" represents.

How does it work?

It's quite simple: two experts work together on a simulation task in front of the camera. Making mistakes is allowed, and controversial discussions about the task and personal opinions are explicitly

»

In terms of content and didactics, the eLearning courses from CADFEM are worlds better than anything we have come across in this format before.

DR. ULRICH BÖHLE
Simulation Engineer at Festo

DR.-ING. MARKUS KELLERMEYER

— studied civil engineering at the Technical University of Munich and immediately began his professional career at CADFEM in Grafing. At CADFEM, his tasks have included designing and conducting training and working in customer support. He earned his doctorate in data-driven optimization concepts for composites at FAU while working full-time. Since 2018, Markus has been head of the Digital Learning Lab, where he is responsible for digital learning offerings at CADFEM. He also coordinates the use of AI in various CADFEM business processes.

50+
eLearning courses

>100
eLearning days

> 6.000
eLearning knowledge units

20
Let's Simulate seasons

> 200
Let's Simulate episodes

> 50.000 Minutes
of video material produced in total

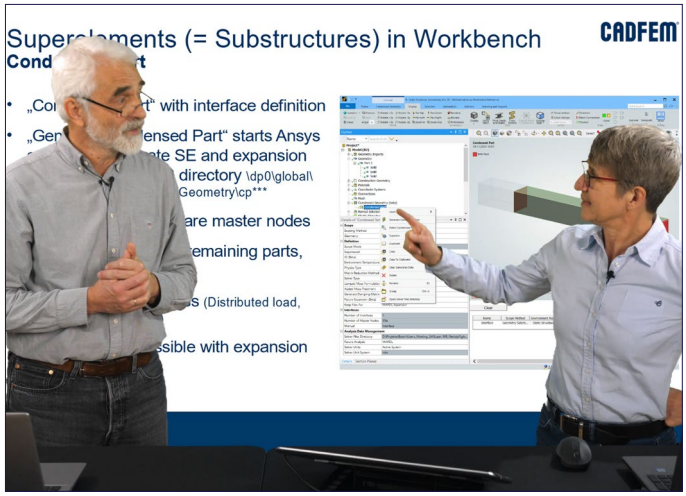
As of: August 2025

encouraged. This is very well received by our customers and reinforces existing knowledge. The format is genuinely enjoyable for both the viewers and the experts, as it is relaxed and entertaining.

The main format is e-learning courses. Their advantages, such as flexibility, are well known. What else makes them so valuable?
The e-learning courses have a strong engineering focus, which includes how to use software functions. But above all, they demonstrate how to resolve engineering problems. Lots of exercises and quizzes ensure that they are entertaining and never boring. Another important factor for us is that with every e-learning course, customers can rely 100% on the usual CADFEM quality in terms of content and craftsmanship. How do we do this? Once our production team has decided on a topic, it is discussed in depth with experts. There is a lot of discussion to ensure that the course meets or exceeds expectations. Only then does the implementation take place in the Digital Learning Lab, following a clear and proven concept. We have the infrastructure and a well-coordinated team to support our instructors during the filming days. The entire process is rounded off by professional editing.

One disadvantage of video formats is that they are static and may become outdated. How do you deal with this?
Fortunately, we have many experts at CADFEM who keep the content up to date. We have developed good strategies, whereby videos are either corrected or re-produced. Customer feedback is also very helpful in this regard. When issues are reported to us, we follow-up on them and make the necessary corrections.

↑ A well-coordinated team, supported by AI agents, handles the professional creation of the CADFEM digital learning formats CADFEM.



↑ Let's Simulate: Look over the shoulders of experts as they discuss and solve simulation tasks.

How do you keep track of 50 courses?

With 20 courses, this wasn't a problem, but today we rely on AI. It helps that we have created the content in a modular way from the very beginning, with fixed structures. This allows context stores and various agents to support us in our daily work. And yet, the editorial team and the Digital Learning Lab still coordinate on a daily basis. Ultimately, common sense must prevail in order to make the right decisions when it comes to further developing knowledge products.

Does AI play a role for you in other areas as well?

Yes, we also rely heavily on AI in another area: translations. All of our e-learning courses feature English voice-overs. As I mentioned earlier, our translator Brian plays a key role here and is supported by several agents who, for example, help prepare the speakers' freely spoken texts or produce voice-overs that are fairly lip-synced.

Does this mean that the digital learning offerings from CADFEM are very AI-heavy?

Definitely not. We do use AI as a tool for many tasks, but the result is not AI-generated. We see ourselves much more as a manufacturer of digital learning formats, of. After all, it is our CADFEM employees who stand in front of the camera, sharing their expertise, examples, and personal opinions. Behind our expertly crafted digital learning offerings are people, a culture of feedback, a double- and triple-check principle for reviewing content, and a strong penchant for perfection. This is something we work on every day with our colleagues in the Digital Learning Lab. We could employ AI much more rigorously in translation, but we don't want to do that. The content must be 100% accurate, which is why we continue to have a person review it.

Training at CADFEM

Engineering expertise, theory, and a strong practical focus on more than 110 topics related to Ansys, simulation, and digital engineering—that's what the CADFEM training program offers. This includes:

- **Trainings**
- **eLearning**
- **Intensive Workshops**
- **Let's Simulate**

The recipe for success: constant exchange with customers, years of experience in engineering practice, and the vision to always drive simulation forward in an ambitious and ground-breaking way.

Learn more:
cadfem.net/weiterbildung

All you can learn: The CADFEM Learning Subscription

Your easy access to all training, eLearning courses, and "Let's Simulate" episodes. With the "Pro," "Premium," and "Enterprise" options, you can choose the package that best suits your needs.

Learn more:
cadfem.net/seminar-flatrate

Particle Simulations for Alpine Disaster Management

As a side effect of climate change, gravitational mass movements, including rockfalls, are becoming more frequent in the Alpine region. Scientists at the Department of Geotechnical Engineering at the University of Innsbruck are researching how settlements can be best protected by protective structures. To do this, they rely on laboratory experiments and numerical simulations.

Heavy rainfall, rising temperatures, and extreme weather conditions are effects of climate change that promote rockfalls and debris flows in the Alpine region. This increases the risk to residential areas and infrastructure facilities in their run-off areas. Scientists at the Department of Geotechnical Engineering at the University of Innsbruck are conducting research into preventive protective measures.

In addition to geotechnical conditions, these scientists are primarily concerned with the energy released during rockfalls. The focus is on interactions, the effects on protective dams of various designs, and the spread and deposition patterns of debris after impact. The findings will help to ensure that dams are built to withstand the locally expected loads and provide maximum protection.

Experimentation and simulation instead of empiricism

With this research work, the Innsbruck team has broken new ground. This is because there is hardly any known empirical preliminary work, nor are there any documented events on which to rely as a pillar. As a result, a better understanding of these powerful processes must be gained through experiments on models and simulations, as well as through the interaction of both methods. The Innsbruck research team has examined various questions relating to flow and impact properties on the basis of around 200 model experiments and extracted formulas from the measurement results. Calibrated simulations using the discrete element method (DEM) are then used to check the plausibility of the data and correlations obtained. In addition, influencing parameters are analyzed, sensitivities are extracted, and the findings are scaled to other scenarios.

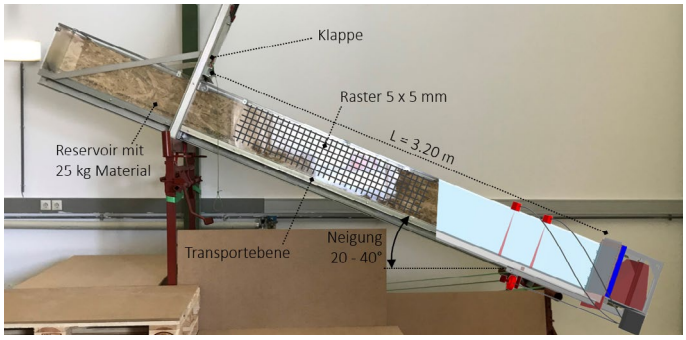
Model tests in the laboratory

Using model structures, data and formulas were determined in the geotechnical engineering laboratory to describe gravitational mass movements and their impact on various protective dams. Since every rockfall is unique, the researchers defined representative variants with material types that differ in properties such as grain size, grain roughness, grain distribution, and friction. Other factors such as angle of inclination and subsoil were also varied in order to analyze the influence of velocities and flow depths. To describe the mass movement from the moment of impact on the protective structure, four phases were identified:

Particle simulations briefly explained

Particle simulations are based on a numerical method called the discrete element method (DEM). They are widely used in various areas of industry and research to analyze and improve particle flows—from dust to bulk materials to debris. Ansys Rocky is a software program that implements DEM for practical use by engineers and process technicians.

- Phase 1, the impact of the material,
- followed by phase 2, the upward surge after impact ("run-up effect"),
- before it flows along the dam in phase 3 and a wedge of material ("dead zone") is created,
- which redirects subsequent material to the side in phase 4 ("pile-up effect").



↑ Image 1: Experimental setup in the laboratory. © University of Innsbruck

Simulations with Ansys Rocky

Based on the findings from the experiments, numerical modeling was carried out using discrete elements. These were modeled using Ansys Rocky software, with the sum of all discrete elements resulting in the rockfall mass. The interaction of the particles with the environment was represented using a linear spring-damping model. Since DEM simulations are very computationally intensive, the simulation model was simplified and discrete particles with perfect spherical geometry and an additional rolling friction model were used.

Retrospective simulation of a real rockfall

The quality of such a model can be determined by recalculating past events. This was done for the massive rockfall that occurred on Christmas Eve 2017 near the village of Vals in Tyrol, fortunately without causing any injuries. With a mass of several 10,000 tons, it buried the road to Vals, cutting off the 130 villagers from the outside world for two days.

Is it possible to use a numerical DEM model to simulate the rockfall process so that the real and simulated run-off areas match with sufficient accuracy? And can the findings from the simulation be used to determine the load on dam structures caused by rockfalls or the required height of the protective structure?

The results indicate a realistic simulation model. Image 2 shows, from left to right...

- ... the terrain model with the debris (red) before and the run-off area (blue) after the rockslide. This geometric information forms the basis for calibrating realistic material parameters as boundary conditions for modeling the rock avalanche in Ansys Rocky.
- ... the DEM simulation of the rock avalanche based on information from the terrain model and adapted values from the experiments.
- ... the run-off area and deposition heights from the DEM simulation. These indicate a high degree of conformity with the documented debris distribution.

Together with other process parameters, in particular the phase model, the simulation model can serve as a basis for the planning of suitable protective structures.
The method developed by the Innsbruck scientists, based on experiments and DEM simulations, shows reliable results in the evaluated case and is a major step toward securing endangered locations in the future through the construction of suitable protective structures.

MORE INFORMATION

This article is based on publications by the Geotechnical Engineering Department at the University of Innsbruck.

Department of Geotechnical Engineering at the University of Innsbruck

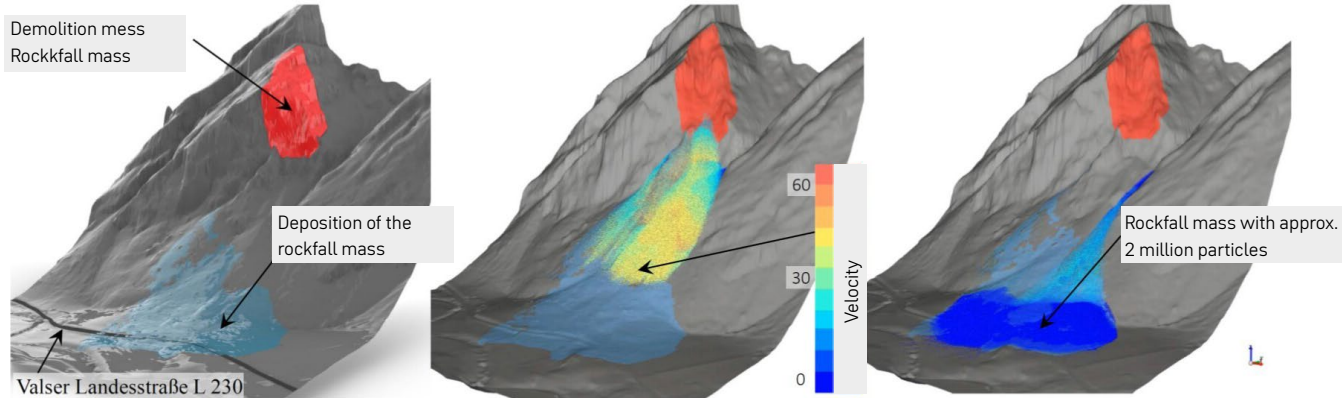
uibk.ac.at/geotechnik/

Ansys Rocky

cadfem.net/rocky

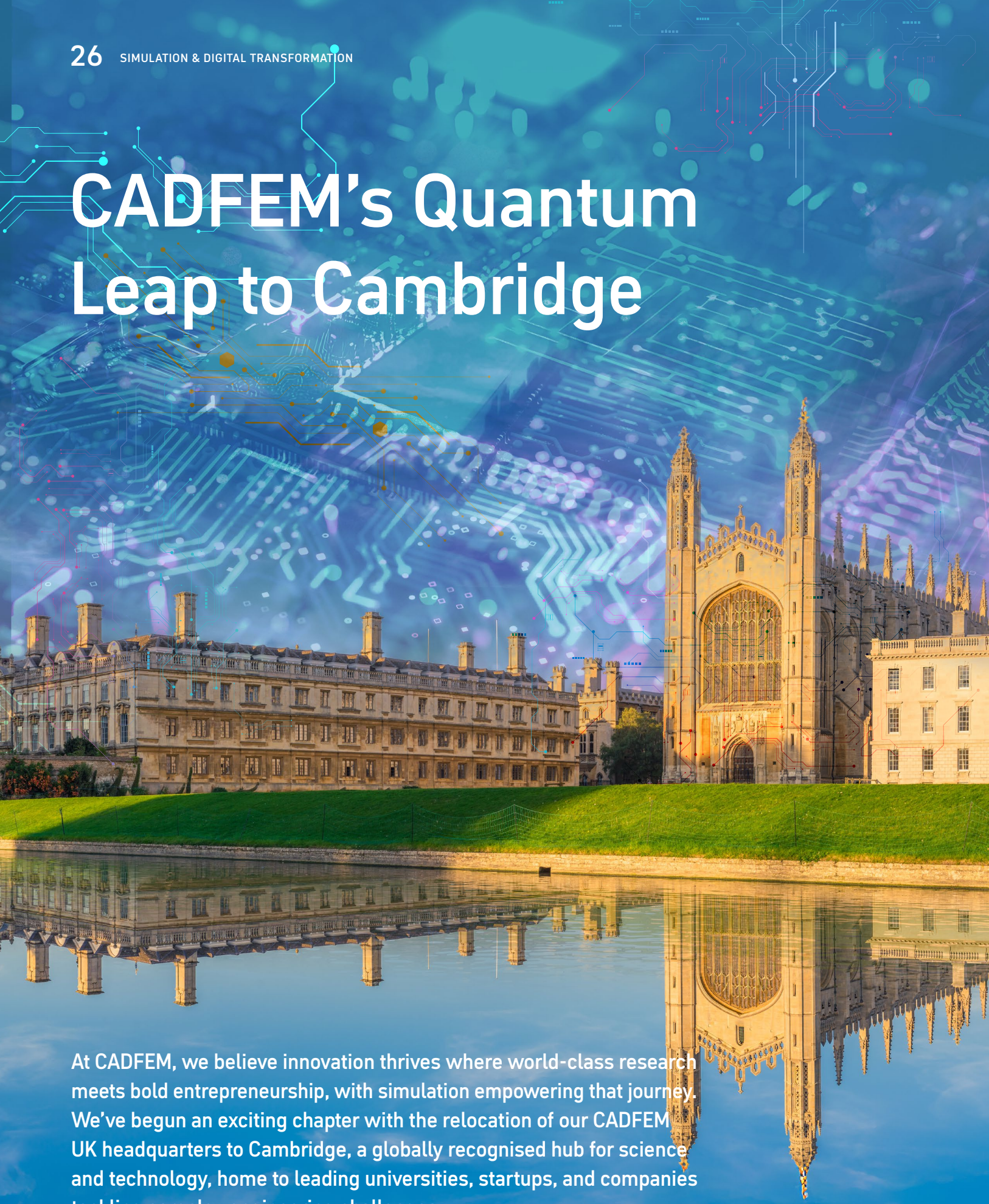
CADFEM and Universities

cadfem.net/acad



↓ Image 2: Recalculation of the rockslide © University of Innsbruck

CADFEM's Quantum Leap to Cambridge



At CADFEM, we believe innovation thrives where world-class research meets bold entrepreneurship, with simulation empowering that journey. We've begun an exciting chapter with the relocation of our CADFEM UK headquarters to Cambridge, a globally recognised hub for science and technology, home to leading universities, startups, and companies tackling complex engineering challenges.

Cambridge innovation in numbers

From pioneering research labs to fast-scaling technology companies, Cambridge attracts innovation, and simulation plays a pivotal role turning ideas into reality. With Ansys solutions and CADFEM expertise, startups and scale-ups accelerate development, reduce risk, and bring disruptive technologies to market faster.
We are privileged to collaborate with Cambridge-based companies pushing the boundaries of their fields. The city's close links between academia and industry create an environment where research quickly evolves into practical engineering solutions.

CADFEM UK in Cambridge: A Hub for Innovation and Collaboration

CADFEM UK's relocation to Cambridge positions us at the centre of this dynamic ecosystem, where world-class research, entrepreneurship, and digital engineering converge. Here, collaboration and expertise intersect to accelerate innovation, and CADFEM UK is proud to support engineers and innovators at every step of their journey. As technology advances, simulation will remain a key driver of success - and we are excited to help shape the breakthroughs of tomorrow.

26 — billion-dollar businesses born in Cambridge

#1 — world's leading science and technology cluster by intensity

£25 bn — in total annual turnover generated by knowledge-intensive firms

4.700+ — knowledge-intensive firms

75.000+ — people work for knowledge-intensive firms

6,2% — year-on-year increase in knowledge-intensive jobs in Cambridge City region over last 6 years

£7 bn — spent over 3 years on R&D by companies on 40 key business parks around Cambridge.

560+ — life sciences companies

840+ — knowledge-intensive services companies

610+ — high-tech manufacturing companies

2.700+ — IT and telecoms companies

(Source: https://www.cam.ac.uk/stories/innovation-in-numbers-2025) Numbers are based on information available in May 2025

CADFEM UK's Max Vanoli, born in and recently returned to Cambridge, shared his perspective on why the city is such an inspiring home for us.

"Cambridge is often called the 'British Silicon Valley', home to exciting Quantum Computing startups, Biomedical campuses, varied culture, and of course the world-renowned University Colleges. It is a privilege to work in this city."

He highlighted the collaborative opportunities available right on our doorstep:

"Working in the Mantle Office Space provides a friendly, collaborative culture where like-minds connect and share ideas. Across the city, every exciting new engineering project or 'idea space' is within easy reach. The opportunities for collaboration, learning, and events are unending."

From a business perspective, the location strengthens CADFEM's ability to connect with customers and partners.

"Meeting with clients is an enjoyable experience being so close in proximity to many headquarters. Cambridge's unique mix of history, beauty, and innovation creates a professional environment full of promise."

Summing up, Max reflected on CADFEM's strategic move:

"CADFEM UKI's strategic relocation of the UK office in Cambridge truly feels like the ideal location - bringing together customers, partners, and colleagues in a world-class hub for technology and innovation."

CADFEM UK and Ireland at a glance

CADFEM UK, based in Cambridge, and CADFEM Ireland, based in Dublin, have been in business since the 1990's initially operating as IDAC Ltd. and IDAC Ireland Ltd., respectively. In 2015 they joined the CADFEM Group, to be able to provide additional breadth and depth of simulation services to our growing list of British, Irish and international clients.
Collectively, the ever increasing group of skilled staff has more than 150 years of experience in providing and supporting simulation led engineering solutions. The expertise is spread across a wide range of engineering sectors: optics and photonics, medical devices, renewable energy, pharmaceutical, aerospace, automotive, civil engineering, mechanical engineering and power engineering, amongst others.

Member of Cambridge Wireless & Sponsor of Cambridge Tech Week

Cambridge Wireless is the leading international community for companies involved in the research, development and application of wireless and mobile, internet, semiconductor and software technologies.
CADFEM UK's journey to Cambridge was inspired by the strength of its technology ecosystem. After attending **Cambridge Tech Week** 2024 and joining **Cambridge Wireless**, the CADFEM team experienced first-hand the value of being part of such a forward-looking community, which strongly influenced the decision to relocate our UK office here.

For CADFEM, Cambridge represents technology, collaboration, and growth. Through our involvement with Cambridge Wireless, CADFEM experts continue to connect with leading organisations and early-stage startups and engage with the brightest minds shaping the future of technology.

Since their first visit to Cambridge Tech Week in 2024, CADFEM has thoroughly embraced the region's thriving innovation ecosystem. They've since opened an office in Cambridge, becoming a valued member of Cambridge Wireless.

SALLY FIELD
Head of Business Development,
Cambridge Wireless

In 2025, CADFEM was proud to return to Cambridge Tech Week as sponsors of Innovation Alley, supporting startups and encouraging the next wave of innovation. The event was inspiring, filled with energy, collaboration, and opportunities to build connections that matter. It reinforced why "Silicon Fen" remains one of Europe's best technology ecosystems.

Cambridge Wireless
cambridgewireless.co.uk

MEMBER OF CW CONNECTING THE DIGITAL WORLD

Cambridge Tech Week
cambridgetechweek.co.uk

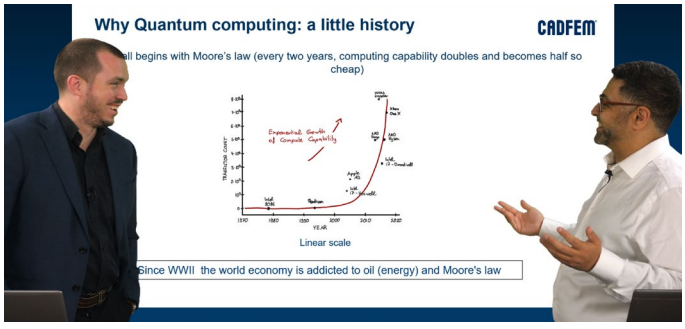
CAM TECH WEEK

↑ Managing Directors Elena Vallejo (CADFEM UK) and Derek Sweeney (CADFEM Ireland) and their teams with Matthias Alberts from CADFEM International.

CADFEM experts in Action: Let's Simulate

Quantum Computing and Photonics: Exploring the Future of High-Speed Simulation

In this season, CADFEM experts Alexander Shalaby and Steven Jones dive into the intersection of quantum computing and photonics. Discover how advancements in RF and photonics influence modern simulation techniques and how quantum effects come into play. The series covers key topics such as quantum-enhanced photonic circuits, RF signal interactions, and high-precision computational approaches. Gain insights from real-world case studies, expert discussions, and the latest research trends that could shape the future of engineering simulations. Whether you're new to quantum computing or an experienced RF engineer, this season offers a deep dive into cutting-edge innovations.



About "Let's Simulate": Based on the "Let's Play" approach - known from the world of video games - you can experience simulation software in action in the Let's Simulate format. You look over the shoulders of experts as they work on the simulation model. In-depth engineering. Practical tips from years of experience. Each series with its own thematic focus.

cadfem.net/lets-simulate-quantum

CADFEM Experts in Action (II): Podcast

"Rays and Waves": A podcast hosted by CADFEM's Steven Jones and his friend Daniel Jimmerskog

Steven and Daniel are longtime friends and colleagues who first crossed paths during their PhD studies in optics and photonics at Chalmers University of Technology in Sweden. Their shared passion for the science of light and their complementary personalities laid the foundation for a lasting friendship and professional collaboration. Over the years, both have pursued diverse and dynamic careers, applying their expertise in optics and photonics to a range of commercial and research-driven projects across the globe.

About "Rays and Waves": In 2024, Steven and Daniel launched the "Rays and Waves" podcast as a way to keep their enthusiasm for optics and photonics alive outside of their day jobs. The podcast is not formally affiliated with CADFEM and began as a personal non-profit project. As of 16 September 2025, they have released seven episodes, each delving into a different aspect of the field.

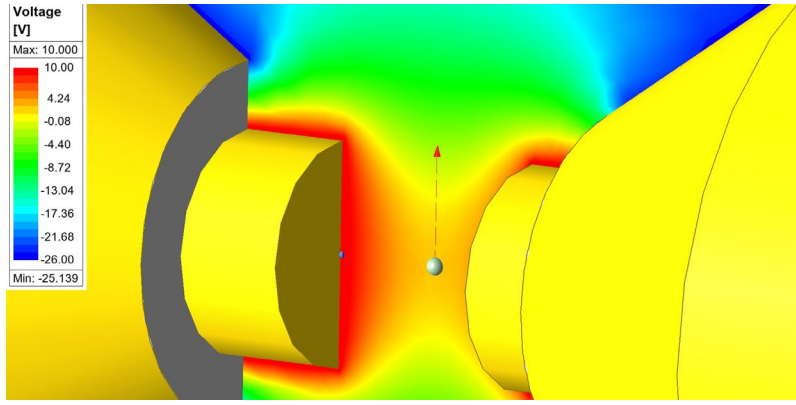
Rays and Waves Podcast on Spotify

Technical Spotlight:

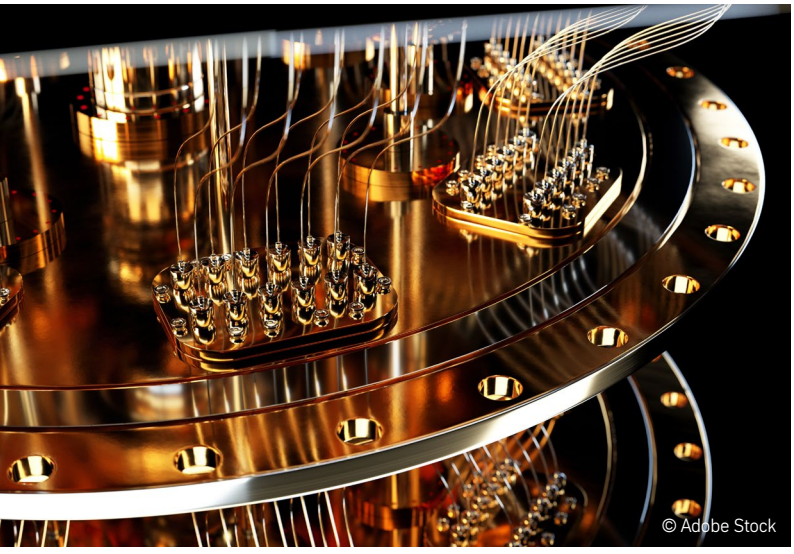
Electrostatic Simulation with Ansys Maxwell in Quantum Technology

Several results from an Ansys Maxwell electrostatic field simulation of a Paul ion trap used in a trapped ion quantum computer. Electromagnetic fields are used to confine a single ion, suspending it in a vacuum, where lasers are then used to initialize & control the ions quantum states, thus forming the basis of a qubit. The first image shows voltage contours, with a representation of the location of the ion.

[This ion trap geometry used here is based on a paper published in Nature-Scientific Reports by Xavier Fernandez-Gonzalvo and Matthias Keller, 13, Article Number: 523 (2023)].



How Engineers Are Enabling Quantum Computing by Simulation



While much of the world's attention is focused on the energy transition, there's another transformation underway—one that's shaping the future of computation. The demand for computing power is skyrocketing, driven by AI, digital transformation, and simulation technologies. But as Moore's Law approaches its physical limits, we're forced to explore radically new paradigms. One of the most promising among them is quantum.

For decades, Moore's Law has driven exponential growth in computing performance. But as transistor features shrink below 1 nm, quantum effects like tunneling and leakage disrupt classical behavior. Engineers now face two options: either develop new packaging and scaling methods like 3D integration—or harness quantum mechanics itself.

Quantum computing doesn't just represent a new kind of processor. It demands an entirely new engineering approach. The quantum bits (qubits) that power these machines require extreme precision and environmental control. While the core physics often gets the spotlight, it's the engineering of interconnects, control electronics, signal fidelity, and packaging that will determine whether quantum computers can scale.

A Hybrid Approach: Classical Meets Quantum

Quantum computers will not replace classical ones but augment them—similar to how GPUs support CPUs today. This means quantum systems must interface seamlessly with classical electronics, often operating at vastly different frequencies, temperature regimes, and design paradigms.

Control, signal delivery, readout systems, and error correction are all handled by classical components. These must be designed with exquisite care to preserve quantum coherence, minimize noise, and ensure high-fidelity qubit operation.

Simulation tools like **Ansys HFSS** and **Ansys Lumerical** play a critical role in this intersection. They allow engineers to design, optimize, and validate microwave, photonic, and electronic subsystems before fabrication—saving time, cost, and reducing risk.

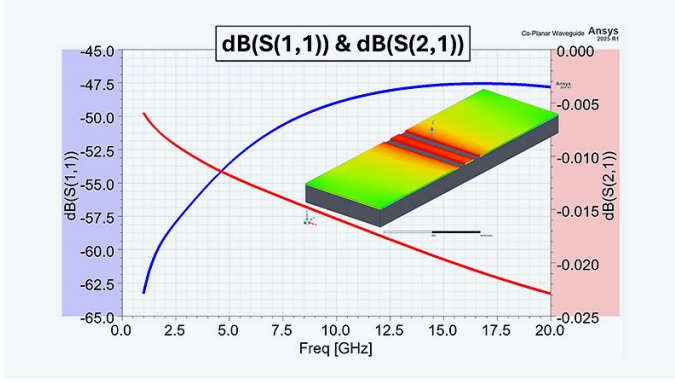
Engineering Challenges in Quantum Hardware

Microwave and RF Design

Quantum processors are driven by precisely timed microwave pulses. These signals are delivered through structures such as **coplanar waveguides (CPW)** and bonding wires. Even slight mismatches in impedance or parasitic coupling can introduce noise or signal reflections that degrade qubit fidelity.

Simulation with tools like **Ansys HFSS** allows engineers to:
- Model full 3D electromagnetic fields
- Optimize transmission lines, bond wires, and connectors
- Analyze resonances and parasitic effects
- Evaluate S-parameters for signal integrity

These simulations are not abstract. Small design decisions—pad shapes, bond wire lengths, trace gaps—can have system-level consequences. Full-wave modeling provides insights that traditional formula-based design methods can't capture.



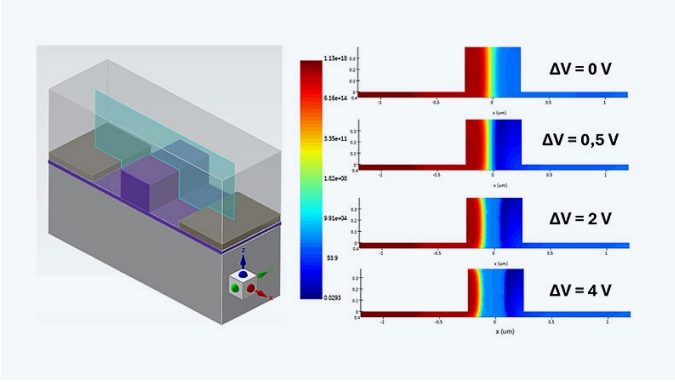
↑ Co-Planar Waveguide - S11 (Reflection), S12 (transmission) & Current Density

Photonics for Quantum Networking

Photons are ideal carriers for quantum information, whether used for:
- On-chip photonic qubits
- Interconnects between distant quantum nodes
- Readout mechanisms in hybrid architectures

Designing such photonic systems requires modeling of:
- Waveguides, cavities, and beam splitters
- Coupling efficiency between fiber and chip
- Scattering, loss, and mode mismatch
- Quantum fidelity and gate errors

Ansys Lumerical tools enable photonic circuit simulation with quantum-aware modeling. Engineers can simulate the complete optical path and evaluate how imperfections impact quantum state transfer or entanglement distribution.



↑ Lumerical-Simulation to evaluate the charge distribution at a phase shifter.

Simulation as a Design Accelerator

Why is simulation indispensable for quantum engineering?
1. **Cost and Time Savings:** Fabricating quantum chips is slow and expensive. Simulation allows designers to test many iterations virtually.
2. **Precision:** Quantum systems are extremely sensitive to small perturbations—every design parameter matters.
3. **Multiphysics Coupling:** From cryogenics to electromagnetics, simulation connects multiple domains into one workflow.
4. **Scalability:** As quantum computers grow, so do design complexities. Simulation tools allow scalable architectural planning.

Simulation platforms act as a common language across disciplines. Quantum physicists, microwave engineers, and photonics specialists can collaborate using shared digital models.

A Real-World Workflow: From Idea to Optimized Design

Let's consider a common challenge: delivering a clean microwave signal to a qubit.
1. **Start with an analytical design**
   using analytical methods to estimate geometry.
2. **Model in HFSS,**
   including bond wires, pads, and the surrounding environment.
3. **Analyze EM fields,**
   S-parameters, and impedance over frequency.
4. **Optimize geometry**
   to minimize reflections and suppress unwanted resonances.
5. **Repeat iteratively,**
   tuning for fabrication constraints and quantum performance.

These steps can be completed in hours, even on modest hardware—empowering engineers to move quickly from concept to production-ready design.

Looking Ahead: Quantum at Scale

The future of quantum computing depends not only on better qubits, but on better engineering:

- **More scalable interconnects**
- **Cryo-compatible packaging**
- **Low-loss photonic links**
- **Hybrid classical/quantum control systems**

As quantum systems scale from dozens to millions of qubits, these challenges will only grow. Modular architectures, quantum networks, and photonic interfaces will all play key roles—and they all demand simulation-first design strategies.
Simulation is not just a supporting tool—it's a foundational enabler for the quantum revolution.

Conclusion

Quantum computing holds transformative potential, but unlocking it requires deep engineering integration. From RF signal delivery to photonic interconnects, simulation tools are helping engineers design the invisible infrastructure that makes quantum work. Whether you're developing quantum processors, control electronics, or photonic links, simulation accelerates your path from idea to innovation. It's how we translate the promise of quantum mechanics into practical, scalable computing systems.

MORE INFORMATION

This article is a summary of a detailed CADFEM blog TechArticle from CADFEM UK's Alexander Shalaby and Steven Jones.

Discover the full version:

Reinventing the Wheel through Automation

Swiss engineering company Radiate Engineering & Design AG is dedicated to developing innovative and lightweight bikes. Using its "Digital Bike Lab," Radiate relies on automated, Ansys-based structural analyses to design highly efficient and consistent bicycle frames.

What to do when a workflow that has proven itself over many years reaches its limits? That was the question asked by the team at Radiate Engineering & Design AG in Zurich, which specializes in the structural design and optimization of bicycle frames, among other things. The bicycle experts observed that the traditional manual process for performing safety-critical structural analyses was becoming increasingly time-consuming, error-prone, and inconsistent, inevitably leading to longer response times and costly delays. The reasons for this lie in the growing complexity of modern bicycle frames – especially e-bikes – the ever-shorter development and iteration cycles of the market, and the resulting increased need for cross-functional collaboration between designers and simulation experts.

Overcoming new challenges

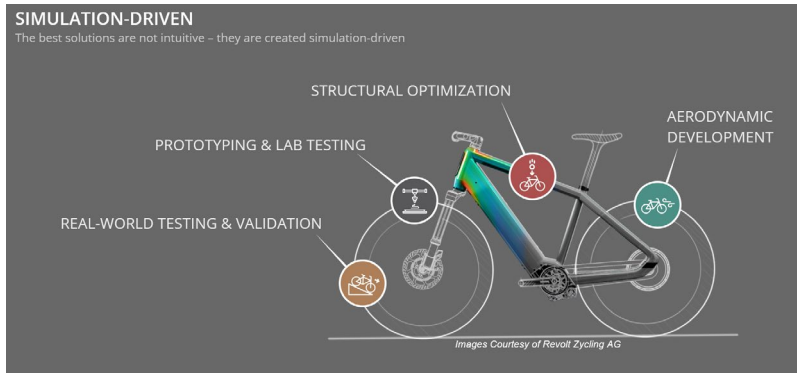
The Radiate team responded to this new situation with an innovative and highly digitalized workflow. The goal: Compared to the previous approach, structural analyses based on the finite element method (FEM) were to be streamlined without any loss of quality, the probability of human error reduced, and the time between design and validation significantly shortened.

Automation of structural analyses in the Digital Bike Lab

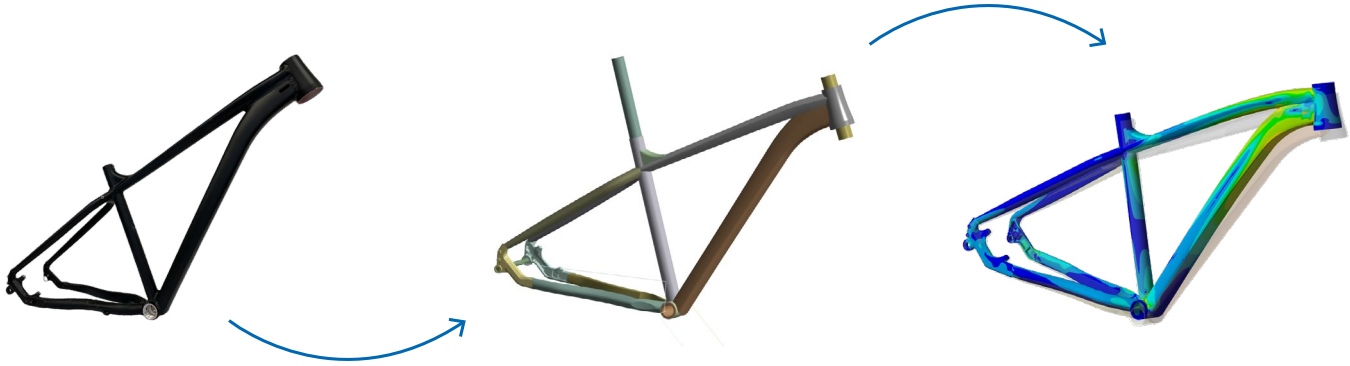
The implementation of the idea into a solution developed by Radiate under the name "Digital Bike Lab" is based on a fully automated simulation workflow that uses Ansys Discovery and Ansys Mechanical. It includes

- parametric geometry preparation,
- load case generation tailored precisely to the individual application,
- automation of the simulation setup – including contact definition, mesh control, boundary conditions, and, above all,
- automation of the post-processing of simulation results based on the latest findings in fatigue analysis.

The result exceeded expectations. Not only were simulations fast and extremely reliable, but the process also proved to be scalable for a wide variety of frame types.



→ The physical prototype of an MTB frame made of aluminum (AL606) served as the basis for the development of the automation process. The new procedure was developed and tested on this prototype | © Radiate Engineering & Design AG



A few hours instead of several days

The Digital Bike Lab has reduced the time required for a complete structural analysis of a frame from the several days that were previously standard to just a few hours. This means that variants can now be analyzed more quickly and consistently, which, in addition to faster response times and significantly shorter throughput times, enables better development decisions and higher-quality results. The significantly improved traceability and visual presentation of the results are also highly valued. Further benefits include reduced dependence on manual work and iterative physical tests, which is reflected in cost savings.

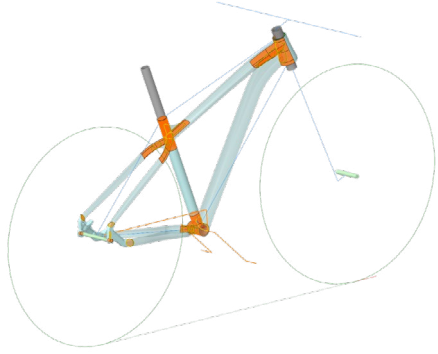
Radiate and CADFEM – a winning team

CADFEM supported Radiate in the implementation of the Digital Bike Lab. The guided work provided by CADFEM throughout the project included technical support for all questions relating to Ansys and joint model testing. The user-defined Python scripts containing the logic for automating the process were refined to ensure ease of maintenance and efficiency. In addition, Radiate benefited from practical guidance on model improvements, setting boundary conditions, optimizing simulation strategies, and feedback on validating model setups and joint review of results by CADFEM experts.

Further steps are planned for the future, including the use of high-performance computing (HPC), additional automation steps, analysis scenarios, and framework configurations.

With Ansys as its central simulation platform, Radiate also wants to tap into all the possibilities for new, data-driven product development processes and business models based on digital twins – in the bicycle sector and beyond.

↑ Juan Navarro, lead engineer at Radiate for conducting structural analyses of bicycle frames | © Radiate Engineering & Design AG



MORE INFORMATION

Automation and CADFEM
cadfem.net/customization

Radiate
radiate.ch

Digital Bike Lab:
https://digitalbikelab.com

RADIATE

Radiate Engineering & Design GmbH

← The Digital Bike Lab: The development approach taken by Radiate could become the gold standard for the bicycle industry. | © Radiate Engineering & Design AG

From 2027: CE Marking with Functional Safety and Cybersecurity

© Adobe Stock

CE Marking is going digital. The updated regulations from 2027 also include the Machinery Regulation (MR) and the Cyber Resilience Act (CRA). Here's what you need to consider and how CADFEM can support you.

Imagine this: In January 2027, you launch your new product, your latest machine. The CE mark is in place, as always. But this time, the inspector doesn't just come with the usual checklist and ask about mechanical safety. He also asks about your cybersecurity concept for the entire product lifecycle, your software documentation, and your incident response plan for the next five years.
Are you prepared?

Products are going digital – and CE marking is following suit

Note: All machines with digital components - e.g. WLAN, Bluetooth, software control or data transmission - will be subject to extended CE marking requirements in the EU from January 20, 2027. This is because they are networked, collect data, communicate with other systems, and are controlled by software. This digitalization introduces two critical aspects:

- **Functional Safety (FuSa)** ensures that your machine operates safely even in the event of a fault. Example: If a sensor in a production system fails, the machine must still be able to stop safely.
- **Cybersecurity** protects against digital attacks. Example: If someone tries to hack into your machine via Wi-Fi, they must not succeed.

Both aspects are closely interconnected and must be considered together: A cyber-attack can compromise functional security, and security gaps can become cyber risks.

Conclusion

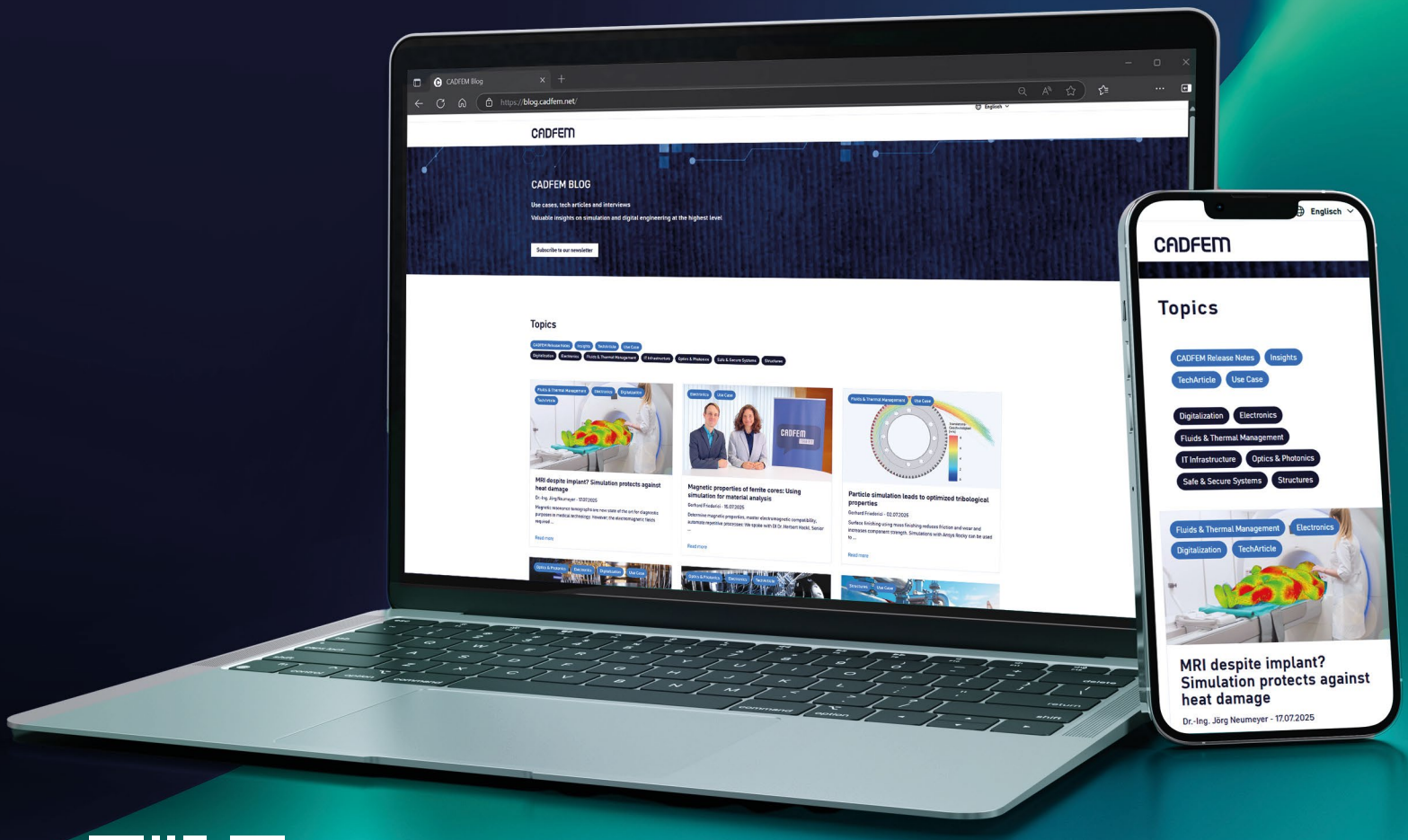
The CE mark will serve as digital proof of competence as early as 2027. Functional safety and cybersecurity will become integral parts of product development processes and must be proven.

Digital engineering is key to this transformation. Ansys provides first-class solutions to support it. CADFEM, together with specialized partners, advises and supports you throughout implementation - turning regulatory challenges into strategic advantages.

MORE INFORMATION
cadfem.net/ce

For more exclusive insights ...

Discover our **CADFEM Blog**!
More than 100 use cases, tech articles and interviews
on simulation and digital engineering.



blog.cadfem.net

CONTACT

CADFEM in Europe

Germany
CADFEM Germany GmbH
cadfem.de

France
CADFEM France SAS
cadfem.fr

United Kingdom
CADFEM UK Ltd
cadfem.co.uk

Ireland
CADFEM Ireland Ltd
cadfem.ie

Austria
CADFEM (Austria) GmbH
cadfem.at

Switzerland
CADFEM (Suisse) AG
cadfem.ch

cadfem.net

cadfem.net/newsletter

Linkedin.com

Greece, Croatia, Romania; Slovenia, Hungary
SIMTEC
simtec-europe.com

Poland
MESco Sp. z o.o.
mesco.com.pl

Romania
INAS S.A.
inas.ro

Slovakia, Czech Republic
SVS FEM s.r.o.
svsfem.cz

Ukraine
CADFEM UA LLC
cadfem.com.ua

CADFEM in India and South East Asia (APAC)

India
CADFEM India Pvt. Ltd.
cadfem.in

Indonesia, Malaysia, Philippines, Singapur, Thailand, Vietnam
CADFEM SEA Pte. Ltd.
cadfem.sg

Worldwide

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