Workshop at Bausim2026

COMSOL Multiphysics Simulations in Architecture, Engineering, and Construction

This workshop will demonstrate how COMSOL Multiphysics® can be used to develop, validate, and deploy computational models for challenging problems across the Architecture, Engineering, and Construction (AEC) sector.

ABSTRACT

The analysis and design of modern buildings and infrastructure involve a wide range of physical phenomena, including structural mechanics, heat and moisture transport, fluid flow, acoustics, soil–structure interaction, and environmental effects.

COMSOL Multiphysics® provides a unified simulation environment for addressing this diversity of engineering problems. It enables strongly coupled Multiphysics simulations when interactions between physical phenomena must be resolved simultaneously, while providing a consistent modeling workflow including geometry and CAD handling, materials, meshing, numerical solvers, postprocessing, and visualization if AEC analyses independent.

Importantly, computational models need not remain tools exclusively for simulation specialists. Using the Application Builder and COMSOL Compiler™, validated models can be transformed into purpose-built, standalone simulation apps with customized user interfaces. These apps enable architects, designers, project engineers, consultants, and other stakeholders without extensive simulation expertise to investigate design alternatives and access physics-based predictions without interacting with the complexity of the underlying computational model.

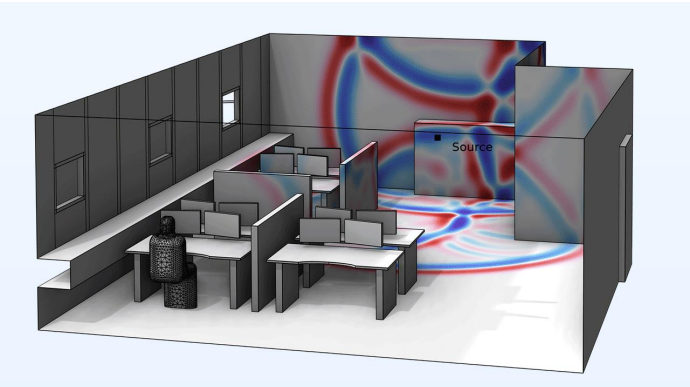
Workshop participants will be introduced to a unified modeling workflow based on the finite element method (FEM) and related numerical techniques. Representative applications will include structural mechanics; thermal bridges and building-envelope performance; coupled heat and moisture transport; natural and forced ventilation; HVAC and indoor thermal environments; wind and airflow around structures; corrosion; sound propagation; and acoustic–structure interaction. Real-world success stories from the AEC industry will demonstrate how these capabilities are applied to practical engineering and design challenges.

The workshop will cover the key stages of developing reliable computational models, including CAD and building-model import, geometry preparation, material definition, boundary conditions, Multiphysics coupling, meshing, solver configuration, and quantitative postprocessing. Parametric sweeps, sensitivity studies, and optimization will illustrate how simulation can explore design spaces, compare alternatives, and identify improved engineering solutions.

A major focus will be extending simulation beyond the specialist using the Application Builder by which experts can transform validated models into purpose-built simulation apps with customized interfaces.

The workshop will also address deployment of simulation apps, from sharing applications across teams with COMSOL Server™ to distributing standalone applications with COMSOL Compiler™. This model-to-app-to-deployment workflow helps organizations capture specialist knowledge, standardize analyses, and make validated simulation models accessible to a broader community.

By combining high-fidelity Multiphysics modeling, simulation apps, and flexible deployment, COMSOL provides a pathway from advanced computational analysis to practical engineering tools that support collaborative, simulation-driven decision-making throughout the AEC design process.



Transient wave acoustic simulation in a room.

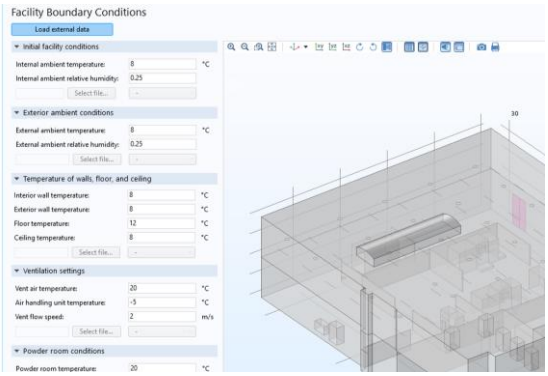
COMSOL

INNOVATION AT Manufacturing Technology Centre (MTC)

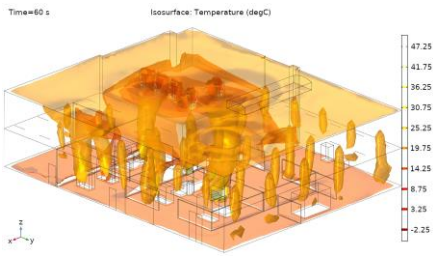
Optimizing Factory Conditions

To fulfill its promise of rapid, precise, and customizable production, additive manufacturing (AM) calls for new approaches to factory operation. MTC's National Centre for Additive Manufacturing (NCAM) developed a simulation model and app to help factory staff make informed decisions about its operation.

The Digital Reconfigurable Additive Manufacturing for Aerospace (DRAMA) project at NCAM created a model of their powder bed fusion facility using CFD to study how environmental conditions would be affected by multiple variables, from the weather outside to the number of machines operating, the positioning of machines, and more.



"The model helps predict how heat and humidity inside a powder bed fusion factory may affect product quality and worker safety," says Adam Holloway, a technology manager within the MTC's modeling team. "When combined with data feeds from our facility, the app helps us integrate predictive modeling into day-to-day decision-making."



"We want to integrate our predictive model into a feedback loop that includes the actual factory and its staff. The goal is to have a holistic system that responds to current factory conditions, uses simulation to make predictions about future conditions, and seamlessly makes self-optimizing adjustments based on those predictions," Holloway says

By pairing its production line with a dynamic simulation model, the DRAMA project has made the entire operation safer, more productive, and more efficient.

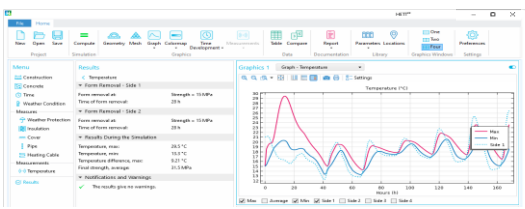
INNOVATION AT Heidelberg Materials and Deflexional

Concrete Casting for Buildings

To help its customers make informed decisions during their projects, Heidelberg Materials provides access to predictive multiphysics modeling capabilities with a compiled simulation application, HETT^{22}.

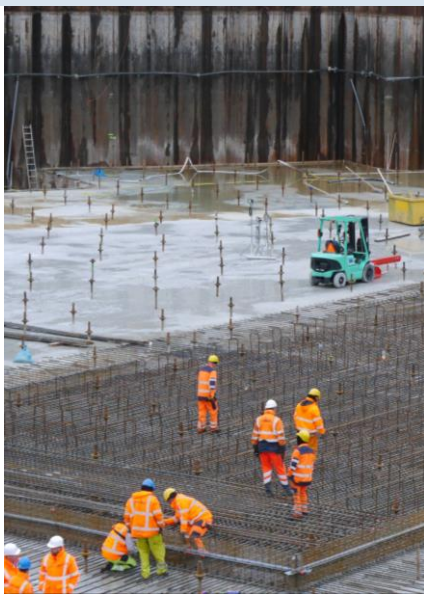
Heidelberg Materials offers its customers hundreds of potential concrete recipes to complement a potentially daunting array of options. To help users make informed decisions more efficiently, they engaged Deflexional to create the latest version of HETT^{22} as a simulation app.

"New features enable our customers to consider real-world conditions in more detail," said Fredvik.



Before selecting materials and committing to a thermal management strategy, contractors can use HETT^{22} to account for the variation in temperature levels throughout the concrete casting, which affects how the strength develops.

The app provides timely access to forecasts based on multiphysics models that account for site conditions, ambient temperatures, material selections, and other relevant variables.



By predicting the effects of choices related to physical conditions, a construction team can use a compiled simulation app to better manage the economics and carbon footprint of each project.

Since its launch, HETT^{22} has been downloaded more than 1,500 times.

Bringing Multiphysics Simulation to Construction Sites
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