

Opening New Doors

Brose uses simulation to drive product quality, reduce testing and minimize cost.

The Brose Group, headquartered in Coburg, Germany, is a tier-one supplier specializing in developing and manufacturing mechatronic systems and electric drives for body and interior of automobiles: components such as door systems, seat adjusters, closure systems and electric drives in particular — to more than 40 automobile manufacturers and suppliers worldwide. The company has 52 locations worldwide and a global staff of more than 14,000 people.

ANSYS *Advantage* staff recently interviewed Sandro Wartzack, a simulation and knowledge-based engineering manager at Brose. Dr. Wartzack completed one of the first PhDs in Germany for the integration of finite element analysis (FEA) methods in combination with knowledge-based engineering into design processes.

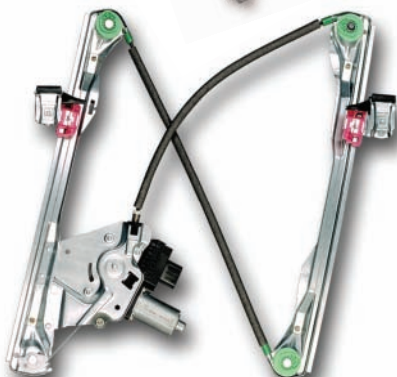
Can you describe the simulation strategy at Brose?

At Brose, we consider how our computer-aided engineering (CAE) usage impacts each area in product development. We try to optimize our CAE approach to maximize product quality, reduce testing and minimize cost. Brose had one simulation engineer using software from ANSYS in the 1990s. Today Brose has around 45 simulation engineers across the company. When integrating simulation into our development efforts, we often find that savings or improvements in our product designs trickle on to client savings, which can be significant.

Our door system design effort is a great example: By using simulation, we have been able to reduce one specific door system's mass by approximately 50 percent compared with its design 10 years ago. Because the new designs use less material, original equipment manufacturers (OEMs) that install these components in their vehicles ultimately produce a lighter and, therefore, more fuel-efficient and cheaper automobile. These cost savings get passed on to the car vendor and buyer too.

How does the ANSYS vision for multiphysics tools, virtual prototyping and a single simulation environment like ANSYS Workbench fit in at Brose?

We have a lot of CAE specialists around the world who need to work closely together. The multiphysics products



A selection of Brose door system designs

“A typical door assembly from the Brose Door Systems Business Unit consists of at least 20 to 30 components. By automating portions of our FEA processes within the ANSYS Workbench environment, our engineers have shortened their simulation times, for both static and transient analyses of these complex designs, by as much as a factor of five.”

— Sandro Wartzack
The Brose Group

and ANSYS Workbench environment allow us to do this. Being able to perform structural and fluid simulations in one environment is a great benefit, and the continuous improvements that ANSYS makes to its solvers — really the foundation level for these technologies — can only improve things.

We typically take more than 1,000 hours for testing of new components today, but we want to reduce prototype testing, replacing it with more virtual testing. I believe that development processes tightly integrated with simulation are the future. For example, if we were devising a new plastic part with a certain fiber orientation, ideally the engineers would feed designs into an automated production-like analysis environment for optimization and virtual testing.

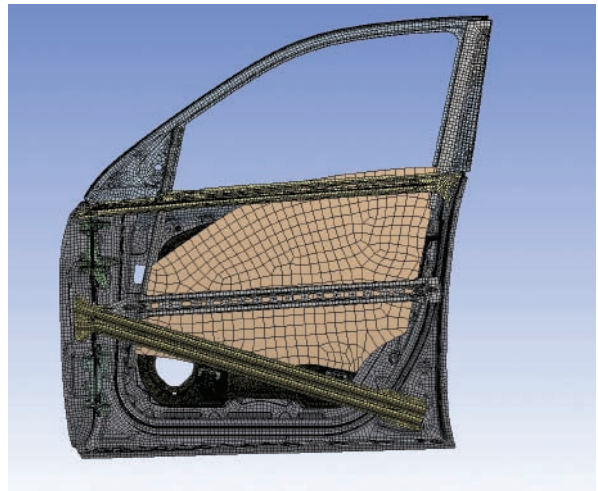
How has the growth in the high-performance computing sector affected your simulation approach?

We invariably target a typical nonlinear simulation cycle of 12 hours to 20 hours per simulation so that we can run structural simulation cases to get overnight results. Our simulation model sizes and complexities increase every week, and the need for powerful hardware is a never-ending process. By using this approach, our CAE engineer productivity is much higher now than it was 10 years ago. We typically had one or two processors available per engineer a decade ago, whereas we now have a supercomputing cluster.

We incentivize our CAE engineers financially to find innovative ways to streamline their CAE design processes, targeting changes that might, for example, reduce a typical 250-hour CAE design process down to 80 hours or less. This allows us to introduce capture and use of our best practices and experience to our benefit.

Where do you see Brose technology going in the next 20 years?

With regard to environmental issues, we are looking at more lightweight products to minimize carbon dioxide emissions. I also see acceleration in continuing trends for automotive safety feature improvements. More and more, we need to produce products that are automatically “presafe” electronically. From my viewpoint in the



Typical finite element model for a Brose transient dynamic door analysis in ANSYS Mechanical software, consisting of 35 components and 4 million degrees of freedom

automotive door and seat system sector, I see customization and implementation of modular components as a focus for the automotive industry of the future. For Brose, this means moving to develop “plug and play” modular door concepts, with separate outer panels and colors to match different day-to-day situations.

Where do you feel engineering simulation will move over that time?

We are literally growing our CAE usage by 50 percent every year now, because it is so central to our business. The increased usage of simulation at Brose today has resulted in the development of products with lower mass and, consequently, lower costs. In 10 years’ time, I could foresee that we will do significantly fewer physical prototyping but, rather, focus on full and accurate single-environment multiphysics simulations and virtual prototyping.

I also think the area of visualization is very important. We are already seeing 3-D co-operative visualization work with virtual meeting rooms. The ability to use simulation results to convey design and development choices together with worldwide distributed teams is going to be vital. ■