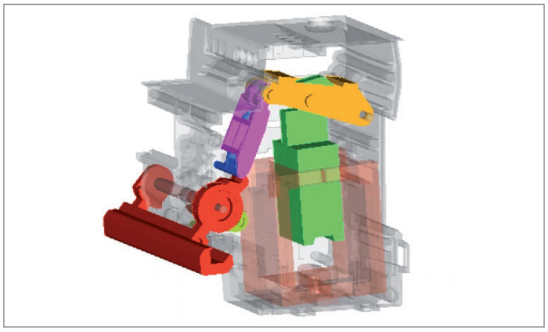
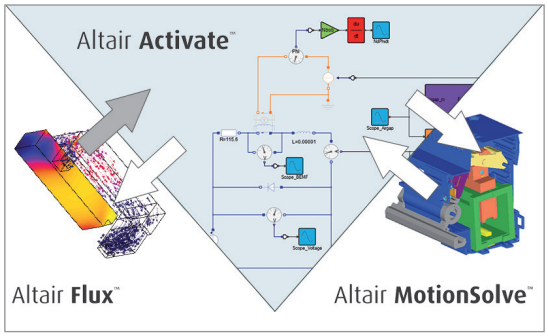
Schneider Electric

Developing Miniature Circuit Breakers with a Multi-Disciplinary System Design Approach





Schneider Electric is leading the digital transformation of energy management and automation in homes, buildings, data centers, infrastructure, and industries. With 150,000 employees worldwide and a global presence in over 100 countries, Schneider is the undisputed leader in power management and automation systems. In addition, Schneider Electric offers IoT-enabled solutions to seamlessly connect, collect, analyze and act on data in real-time. Providing integrated solutions, Schneider Electric helps customers better manage their energy systems to achieve higher energy efficiency and sustainability.

An Altair customer for many years, Schneider Electric at first used only Altair Flux™; now the company has extended their usage to several more software products in the Altair HyperWorks™ suite, including solutions such as Activate, MotionSolve, OptiStruct, and others to apply co-simulation in their development processes. Schneider feels their collaboration with Altair is more like a partnership than the standard supplier-OEM relationship. “Our technical feedback is truly heard and promptly acted upon,” said Stephane Follic, Actuator team leader at Schneider Electric. “Beyond the pure technical value we obtain by using the Altair tools, we also derive significant business value from working with Altair. Their tools and support help us improve product quality, accelerate our development cycle, and reduce risk pertaining to product performance.”

Realizing new market opportunities with an ultra-short time-to-market goal

Recently, Schneider Electric had the opportunity to pursue a new circuit breaker business in a geographic market in which they were not yet present. For this, they had to develop a product variant that would meet all-new specifications, including operating conditions which differed from the standard operation, involving different voltage levels and types (DC rather than AC). Since the window of opportunity was short, the challenge was to develop a viable product within only four months. Schneider Electric turned to simulation technology to speed the process and meet the development deadline.

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Industry
Energy

Challenge
Adapt an existing standard design for a circuit breaker’s automatic recloser to be used in a new region under different operating conditions (i.e., voltages and temperatures) – with an ultra-short time-to-market.

Altair Solution
Altair Activate™, Altair Flux™, Altair MotionSolve™

Benefits
- Early identification of technical risks
- Find solution to meet all requirements
- Meet tight time constraints

Multi-disciplinary design approach with the Altair HyperWorks suite

For this circuit breaker project, Altair's flexible access to a wider range of CAE tools came in very handy, as electromagnetic, mechanic, control strategy, and other requirements needed to be considered at the same time. This multi-disciplinary design approach – based on use of Flux, MotionSolve and Activate together, including through co-simulation – allowed Schneider Electric engineers to evaluate numerous variants and identify the optimal design parameters for the various operating conditions.

"Altair's global Licensing system makes a big difference for us. With other current vendors, we need to request trial licenses for their different tools to evaluate if our desired computations and workflows will indeed be suitable. In which case, normally, we would need to pay for these tools. With Altair's Licensing approach, based on non-consumable tokens, we can test and use different products or workflows with low or no additional cost," said

"Connecting models between Altair products is easy to set up. This coupling fills an important gap, enabling us to simulate the system in a way that we couldn't do otherwise."

Remy Orban, Mechatronic Engineer, Schneider Electric

Leopoldo Martinez Garrido, CAE and 3D simulation manager at Schneider Electric.
By combining 1D and 3D models, Schneider was able to successfully simulate their circuit breaker as the complete system-of-systems that it is. Activate enabled the engineers to model their control strategy and electronics disciplines. These results were then combined with the 3D models from Flux and MotionSolve.

Promising results and early findings

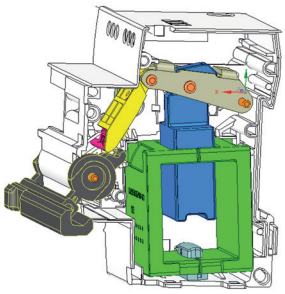
With valuable engineering support and thought leadership provided by Altair, Schneider Electric set up the complete multi-disciplinary simulation model and started conducting simulations for various configurations. The multi-disciplinary approach revealed some interesting findings. The good news was the very close correlation between simulation results and test data, but the engineers also realized that only two of the three sets of operating conditions they tested (at different voltages and temperatures) provided satisfactory performance.

The simulation showed that the third operating condition would require a new coil for the circuit breaker to perform as expected at the intended voltage and temperature points. But even this bad news, in this case, was actually good news. Obtaining these results so early in the development process saved Schneider Electric from pursuing the development of a product that would not have worked robustly under all anticipated operating conditions. Instead, they were able to focus on a new development path which helped them maintain their high product standards, superior customer satisfaction, and an excellent corporate reputation for providing products that perform with high reliability.

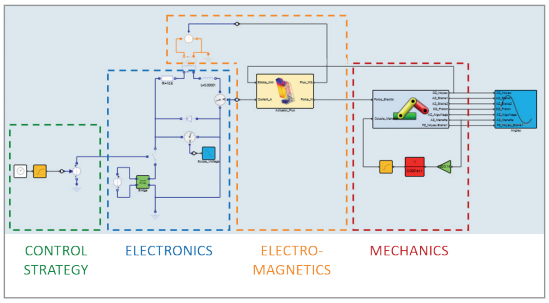
Meeting time to market – benefits of a multi-disciplinary simulation approach

Schneider Electric was able to meet the ambitious time-to-market goal of four months. As this approach was really the only way for them to realize this project on-time, it cannot be estimated how long it would have taken them with traditional methods. They benefited in numerous ways from extending their use of Altair tools to Activate and MotionSolve to perform increasingly complex simulations with Flux. By combining 1D simulation (for controls strategy and electronics) with 3D simulation (for electromagnetics and mechanics), they were able to fully evaluate the intended configurations and identify critical issues at an early stage. Consequently, the multi-disciplinary approach allowed for early risk management, preventing the engineers from moving in the wrong design direction or building prototypes which wouldn't work. In the end, Schneider Electric was very satisfied with Altair's support engineers, who helped their own engineers accelerate their learning curve regarding the new software tools and achieve their goal of using simulation to develop better products, faster.

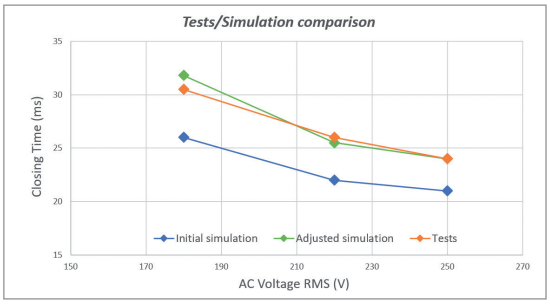
Schneider Electric circuit breaker



3D mechanical plant model in MotionSolve from CAD



Multi-disciplinary system design approach



Circuit breaker performance insight derived from simulation

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