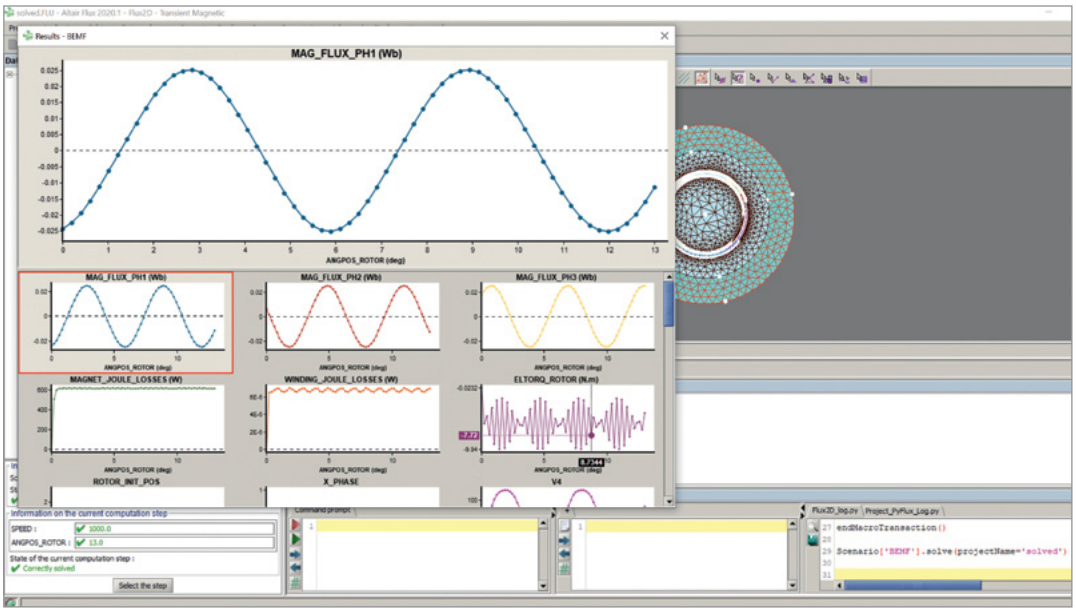
COOL RUNNINGS: E-MOTOR DESIGN AT DEF

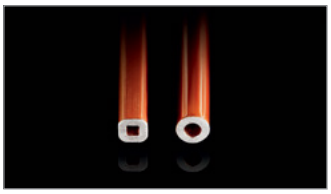
START-UP SOLVES COMPLEX CUSTOMER CHALLENGES FASTER

About the Customer

Dynamic E flow (DEF) is a high-tech start-up company with expertise in electromobility. It specializes in the development and building of special machines, prototypes, and small-scale series for a wide range of industries. The idea for its cooling technology for electric motor systems, capcooltech®, was born when the founders first experienced an overheated engine of an electrical car. Winning three innovation awards already, capcooltech uses hollow copper wires instead of solid wires for the cooling liquid. This avoids overheating and enables its electric motors to deliver twice the power without changing in size.

> “Altair solutions make it easy for us to develop and design individual products for our demanding customers. Thanks to their flexible license system, we are able to use a multitude of programs, test more variants in less time and find the best solution for our customers fast.”
>
> Patrick Gassmann, Engineering, dynamic E flow GmbH





LEFT: The feasibility analysis in Altair FluxMotor™ allows the DEF team to evaluate the basic electromagnetic performance of the design. **TOP:** Dynamic E flow's cooling technology uses hollow wire coils that allow for a direct cooling of their interiors. **BOTTOM:** Hollow capillary copper wires for motors can be cooled from inside rather than on surface.

Their Challenge

The existing development process at DEF used analytical methods and physical testing to confirm results. However, with increasing customization this process was not flexible enough to handle various design possibilities, and was not able to find the optimal design with a given budget and time limits. To meet all customer requirements for DEF's unique motors, test hundreds of variants, and check the feasibility of the customized product, the team needed a solution that would enable them to switch to a simulative design approach. This new approach would need to fit the requirements of a very complex technology involving many components.

Our Solution

To implement a simulation-driven design approach to tackle its multi-physical design challenges, DEF employed Altair software to cover a rich bandwidth of applications. Now, the DEF team first conducts a feasibility analysis in Altair FluxMotor™ to evaluate the basic electromagnetic performance of the design. Subsequently, the engineers build the motor design in a CAD environment and use the resulting geometry as input for Altair HyperMesh™. The team also uses Altair OptiStruct™ and Altair Radioss™ for the mechanical optimization and evaluation. In the final step, the manufacturing tools and materials are defined before the manufacturing shop implements the project.

Before discovering Altair's solutions, DEF tried other software but found them difficult to address the company's needs. When learning about the Altair start-up program, DEF realized that the Altair solutions would be a perfect fit for its requirements. The easy-to-use Altair solutions enabled engineers to test a multitude of variants for customized products, like a project that required them to test more than 1,500 variants for an aerospace engine. As many parameters were involved in building this model, switching between variants initially took an hour, but thanks to Altair's support the team quickly found a time-saving solution.

Results

Using Altair solutions in the development process, DEF was able to replace 30 percent of the physical tests with virtual testing. This reduced the development time of customer-specific e-motors for the automotive and aerospace industry by 30 percent or more. While the team often pushed the limits of their designs before, now the Altair solutions make their daily work a lot easier. It enables them to test more variants in less time and solve customer challenges fast. Thanks to the excellent support provided by the Altair team, DEF was able to quickly implement Altair solutions into its development process.