

ENHANCED E-MOTOR COOLING SOLUTIONS

ALTAIR TOOLS OPTIMIZED FOR NVIDIA® GPUS
ACHIEVE MORE ACCURATE RESULTS 20x FASTER

About the Customer

For more than 75 years, the [Schaeffler Group](#) has been driving groundbreaking inventions and developments in the field of motion technology. Offering innovative technologies, products, and services for electric mobility, carbon dioxide (CO₂)-efficient drives, chassis solutions, Industry 4.0, digitalization, and renewable energy, the company is making motion more efficient, intelligent, and sustainable over the entire life cycle.



Altair® nanoFluidX® running on NVIDIA GPUs helped us reduce solve time while improving accuracy in our results. The support provided by Altair's engineering experts was excellent and ensured we had the most up-to-date methods and hardware to keep up with our customers' demands.

Kelly Nelson, CFD team leader,
Schaeffler



Try Altair nanoFluidX
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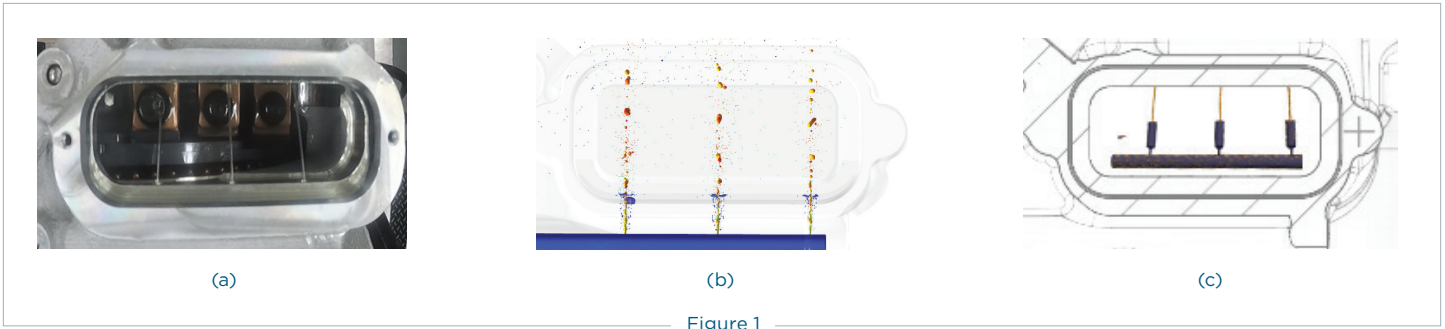


Figure 1

To meet the growing demand for less carbon-intensive transportation, Schaeffler develops and manufactures highly efficient and reliable e-motors for the electrification of powertrains. Additionally, the company produces high-precision components and systems for drivetrain and chassis applications, as well as rolling and plain bearing solutions for industrial applications.

Their Challenge

To ensure electric drivetrains' reliability, it's essential to cool e-motors with oil spray to avoid overheating and efficiency loss. To assess the efficiency of cooling systems, companies perform physical testing inside climate-controlled laboratories. Since this physical testing is needed for each design variation, it can be expensive and time-consuming. However, computational methods such as smooth particle hydrodynamics (SPH) can accurately mimic lab tests, allowing organizations to minimize the need for physical testing. When comparing test results with a competitor SPH software, Schaeffler's fluids and thermal team saw opportunities to improve the accuracy. This led them to evaluate alternatives, primarily Altair's leading SPH solver, [Altair® nanoFluidX®](#), part of [Altair CFD™](#). nanoFluidX is available as part of the [Altair Unlimited Virtual Appliance](#) SaaS solution. See Figure 1.

Our Solution

Based on Altair's experience, Schaeffler's flow behavior challenge was easily identified. Altair's solution involved setting up the model using [Altair® SimLab®](#) as the pre-processor and solving using nanoFluidX.

Altair performed a detailed benchmark by simulating Schaeffler's e-motor model using nanoFluidX, a powerful GPU-based SPH code optimized for NVIDIA® GPUs. Among data center GPUs, the NVIDIA [L40S GPU](#) is the most powerful universal GPU, delivering end-to-end acceleration for rendering, visualization, simulation, high-performance computing (HPC), and artificial intelligence (AI). Schaeffler's e-motor model was simulated on different GPUs – see Figure 2 – and all outcomes matched the results from the physical test.

With this solution, Schaeffler was able to accurately simulate the flow behavior of the e-motor while drastically reducing the solve time on the GPUs. By running the model tests with Altair software and NVIDIA data center GPUs, Schaeffler was able to obtain simulation results that correlated with the physical test. Remarkably, the customer had results within just two weeks, covering the entire life cycle including work plan, design, and development.

Results

Altair's solution, including its tools and the development of a customized workflow – along with NVIDIA GPUs – provided the customer with a more accurate correlation between flow stream profile and flow rate simulations and the test results. Additionally, using Altair's SPH software (nanoFluidX), Schaeffler's e-motor model ran 20x faster when compared with the competitor's solution, slashing run times from five days to under six hours.

As such, Schaeffler realized significant cost savings for compute and licensing, improved accuracy, and reduced turnaround time thanks to faster solving times and less physical testing. These benefits have empowered Schaeffler to deliver more optimized, more reliable e-motor products to market faster.

Figure 1a shows the test sample, Figure 1b the competitor simulation, and Figure 1c the nanoFluidX results. Comparing results in (a) and (c), the stream profile is well represented.

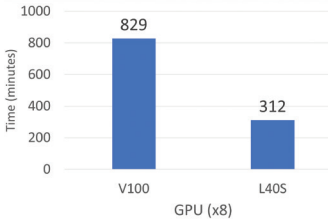


Figure 2

Figure 2 compares the nanoFluidX runtime comparison on different GPUs.