

# Cloud-based simulation of ultra-high-temperature furnaces

## COMPANIES

**XERION** is a German SME, specializing in the development and production of ultra-high-temperature furnaces, and producing new materials for high-tech industry applications.

**NAVASTO**, based in Germany, is the application expert for the experiment, responsible for the development of the method for the simulation of a high-temperature industry furnace.

## THE PROBLEM

Knowing the temperature distribution and flow inside a furnace is very important, e.g. to manufacture electronic components. However, performing physical measurements is extremely difficult and costly (temperatures of up to 3,000°C).

## SUCCESS STORY DETAILS

HPC provider: HLRS  
Domain Expert: NAVASTO  
Country: Germany

[Link](#)

## THE HPC PROBLEM DOMAIN

Simulations offer considerable potential to provide the required data (temperature distribution and flow) and thus improve the design process of furnaces. These simulations have to deal with the interdependencies of convection, conduction, radiation, joule heating and a complex multi-material geometry. This requires **significant computing power** and, on the other hand, the validation of the numerical model and material properties at very high temperatures.

## THE SOLUTION

**NAVASTO** set up a furnace simulation using the open-source software OpenFOAM on cloud-based HPC.  
**XERION** designed and manufactured a prototype furnace and conducted tests to acquire pressure and temperature data, and thus validate the simulation results.

## THE BENEFITS

Based on the results of the validated model, the companies identified areas where the furnace design could be improved.

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## THE BENEFITS

With an improved furnace design process, XERION could

- ... save resources associated to modifications both prior to delivery and after installation (up to €25,000 for on-site repairs).
- ... reduce the price of a (large) furnace by about 20% (€40,000):  
The precise knowledge of the thermal conditions leads to a reduced oversizing of various components.
- ... expect to triple the return on investment by 2023.

