

qpunkt Improves its Development Cycle with the Thermolib Toolbox

qpunkt conceptualizes, designs, models and tests solutions and new products, both via simulations and numerical analysis, in thermal management engineering in the automotive branch.

To develop and optimize systems such as cell cooling for hybrid vehicles or alternative engines, they selected Simulink and the Thermolib toolbox to aid them with thermodynamic calculations and speed up the development and simulation process.

Challenge

To maintain its competitive edge, there is intense pressure on qpunkt's engineers to design and develop thermal management products that reach the market on time, all the while maintaining their high quality standard. They have very strict deadlines to meet; the design-to-prototype cycle must happen in a few months time.

The development process would start by creating a concept that takes into consideration the client's requirements, then developing simultaneously a simulation model and a control design based on that concept. Both the model and controller are evaluated via numerical analysis and improved via software-in-the-loop (SiL) testing. Eventually hardware-in-the-loop tests would follow.

qpunkt sought to accelerate this development process by first trimming both the development time and the simulation time, and second, by unifying their development environment. The choke point was that ther-

modynamic calculations are generally complicated and time consuming. The available tools were either slow or did not integrate well with the development environments used for control design and HiL testing.

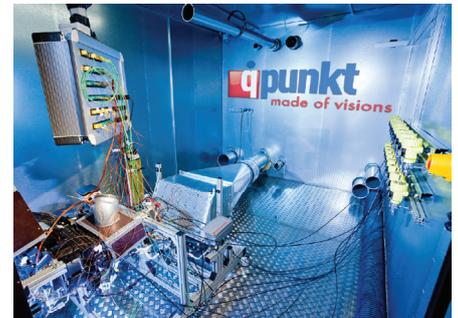
Solution

For qpunkt, the solution was selecting Thermolib to model and simulate thermodynamic behavior in their systems.

qpunkt evaluated several simulation tools for the following criteria: ease of use, model development time, simulation time and results. They also considered cost and flexibility in tool deployment. The results led them to select Thermolib as their tool of choice to design, model and simulate thermodynamic systems.

qpunkt first used Thermolib to develop solutions in air conditioning in alternative engine vehicles. The immediate benefit was that the model development and simulation time was cut down significantly, and potential issues were realized and tested against much earlier. This by itself sped up the development process significantly.

More benefits came when the nature of Simulink and Thermolib made it easier to reuse older models to test potential new features and next generation products. Without significant costs, new ideas could be easily tested by simply adapting the model or the Thermolib components. Having well-defined interfaces between the Thermolib components made it easier to also reuse parts of the models in other projects.



qpunkt Test Bench

Challenge

To design, develop and produce thermal management components for the automotive industry, all while meeting strict deadline and high standards.

Solution

Use Thermolib for thermodynamic simulations and to unify the development environment.

Results

- Reduced simulation time by a factor of ten.
- Time-to-market significantly reduced.
- Higher quality of products.

"Applying Thermolib to our design process has significantly reduced the length of the product development cycle without compromising the level of accuracy required or product quality. With Thermolib we identified the best simulation choice, because the model ran much faster than competitive models and we detected implementation errors much quicker. On account of this we shortened our time-to-market."

Sebastian Jagsch, Branch Manager, qpunkt GmbH

qpunkt were able to finally unify their development environment, by developing both their control systems and the process model in Simulink. The product design and development were carried out by several teams of engineers, both from qpunkt and their clients. The unified development environment enabled each member to work on their own part and integrate it seamlessly in the whole system.

SiL tests became simple and free from additional integration steps. As soon as a first working model was available, the control team immediately started testing their design against the model. With the compiler tools from Simulink, the move into Hardware-in-the-Loop tests followed without significant hurdles.

In less than a year of using Thermolib, a hybrid car prototype is now running with an air conditioning component, designed and developed with the aid of Thermolib.

Results

Reduced simulation time by a factor of ten

With Thermolib, simulations are three times faster than real time versus their previous a third-of-real-time speed. "With Thermolib, the simulation time [...] takes

only a few minutes, with other tools this simulation took us several hours," says Jagsch, Branch Manager, qpunkt GmbH.

Time-to-market significantly trimmed

Both by Thermolib's modeling approach and by unifying their development environment, the process of modeling, control design and eventually SiL and HiL testing, became significantly more efficient. "Using Thermolib, it took us only eight months to develop, simulate, and finish a final model to implement," explains Jagsch. As a result, they can set and meet stringent product deadlines and bring new products to the market faster.

Higher quality of products

"With Thermolib we realized amazing benefits, for example we can reuse previously created models for other projects or for next generation products. Furthermore we achieve a unified development environment, common standards, shorter cycles and higher quality of our products," says Jagsch.

Application Areas

- Automotive
- Model-based-Design
- Simulation

Products Used

- MATLAB
- Simulink
- Thermolib