

SIEMENS DIGITAL INDUSTRIES SOFTWARE

Vehicle thermal management

Examining component and system thermal performance with Simcenter Engineering services

Benefits

- Identify thermal management solutions to improve part life and system performance
- Carry out benchmarks and complex drive cycles with reduced physical testing
- Integrate all subsystems from different domains (mechanical, electric, hydraulic and thermal) to develop more realistic and complete vehicle representation
- Provide technology transfer and/or work-flow development and automation

Summary

Simcenter™ Engineering services offer a scalable, all-in-one approach for full vehicle thermal management (VTM) using Simcenter™ STAR-CCM+™ software. By analyzing and optimizing fluid flow and heat transfer throughout the vehicle for steady-state and transient conditions, Simcenter engineers investigate thermal management strategies and performance throughout the vehicle development cycle. They also assist in analyzing problems after vehicles are in production.

To ensure expected part life, efficiency and proper system functioning, it is crucial to have a thorough understanding of a vehicle's thermal performance. By using the Simcenter VTM methodology and carrying out detailed simulations, car manufacturers and suppliers can set and meet their targets for product life, evaluate system performance and troubleshoot issues. Developing a comprehensive simulation-based analysis early in the design stage allows you to compare different vehicle configurations, select the most effective designs and remedy potential problems before production.

VTM solutions are applicable to conventional internal combustion engines (ICE), mild-hybrid, hybrid and electric vehicles. The solution's flexibility and scalability allow you to select the relevant aspects and subsystems based on your requirements.

A typical vehicle thermal management project is comprised of the following stages:

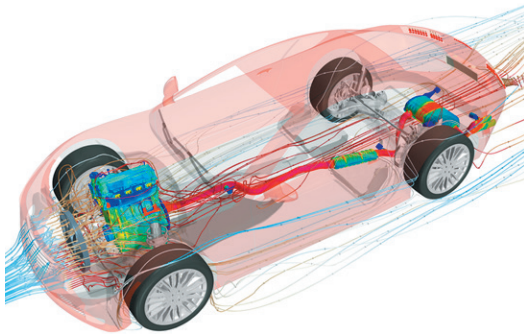
Setting the requirements

Customers can have diverse expectations for managing VTM. Simcenter Engineering services help set and meet realistic targets. Additionally, the team can carry out benchmarks for existing vehicles and develop new, optimized components and systems. To set these targets, Simcenter engineers require a clear definition of the requirements needed to develop short- and long-term goals.

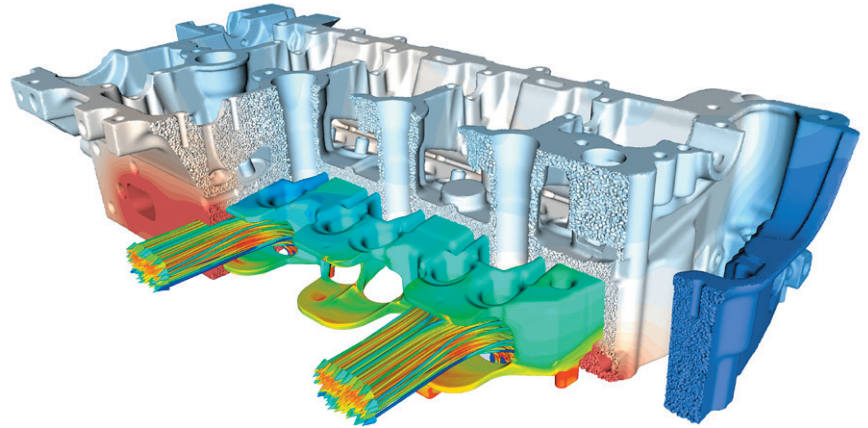
Data acquisition

The next step is to develop the necessary boundary conditions and data set to carry out effective and valuable simulations. Simcenter engineers can walk clients through the process of defining the data needed for successful simulations. Our experts can determine when assumptions can be made or when having data is best.

When further analysis is required because of insufficient available data, Simcenter



Underhood thermal management.



Examining thermal performance down to the component level.

specialists can use advanced testing techniques to gather the necessary test data. These tests are specifically designed to support simulation, which in turn enables the formulation of even more useful tests. By combining test and simulation efforts, the data acquisition phase is fine-tuned and integrated.

Simulation and analysis

By combining test, computer-aided design (CAD) and supplier data, Simcenter engineers can design scalable VTM models that can be validated at the component and vehicle levels. These models provide insight into the energy flow distribution throughout the vehicle and enable OEMs to accurately evaluate system designs and estimate both system and component performance.



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