SIEMENS
Ingenuity for life

Automotive and transportation

Valeo

Global automotive supplier relies on Simcenter Amesim to help develop groundbreaking technologies

Product

Simcenter

Business challenges

Reduce CO_2 emissions in all market segments

Develop technologies that enable smarter and safer driving

Keys to success

Use Simcenter Amesim to perform rapid evaluation of new technologies

Reduce CO_2 emissions primarily by modifying the powertrain system

Create, test and validate new concepts within a restricted time and cost framework

Enhance presence in Asian emerging markets

Results

Facilitated rapid decision-making when evaluating new projects

Reduced the required number of physical test sessions

Valeo counts on Siemens Digital Industries Software simulation solution to play a core role in its innovative product initiatives

Enabling smarter and safer driving

The automotive industry's challenge to reduce carbon dioxide (CO_2) emissions demands quantum steps forward in terms of technology. The Powertrain Innovation Department of automotive supplier Valeo relies on Simcenter Amesim™ software from product lifecycle management (PLM) specialist Siemens Digital Industries Software to evaluate new ideas and develop them into groundbreaking technologies.

Valeo is an automotive supplier, and is a partner to automakers worldwide. As a technology company, Valeo develops innovative products and systems that contribute to the reduction of CO_2 emissions and the development of intuitive driving. Valeo has 124 production sites, 16 research centers, 35 development centers, 12 distribution platforms, and employs 74,800 people in 29 countries.

Valeo's activities are distributed over four business groups: Powertrain Systems, Thermal Systems, Comfort and Driving Assistance Systems and Visibility Systems, supplying the original equipment market and the aftermarket.

Results *(continued)*

Optimized costs by standardizing the use of mechatronic system simulation

Played a central role for the Powertrain Innovation Department in the entire development process

"Simcenter Amesim is a powerful tool for decision-making processes since we must assess every system and concept as quickly as possible. In order to optimize costs, Valeo, through its innovation departments, tries to standardize the use of mechatronic system simulation to assess the efficiency of systems and concepts to validate them in the end."

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Powertrain Systems Simulation Manager
Valeo

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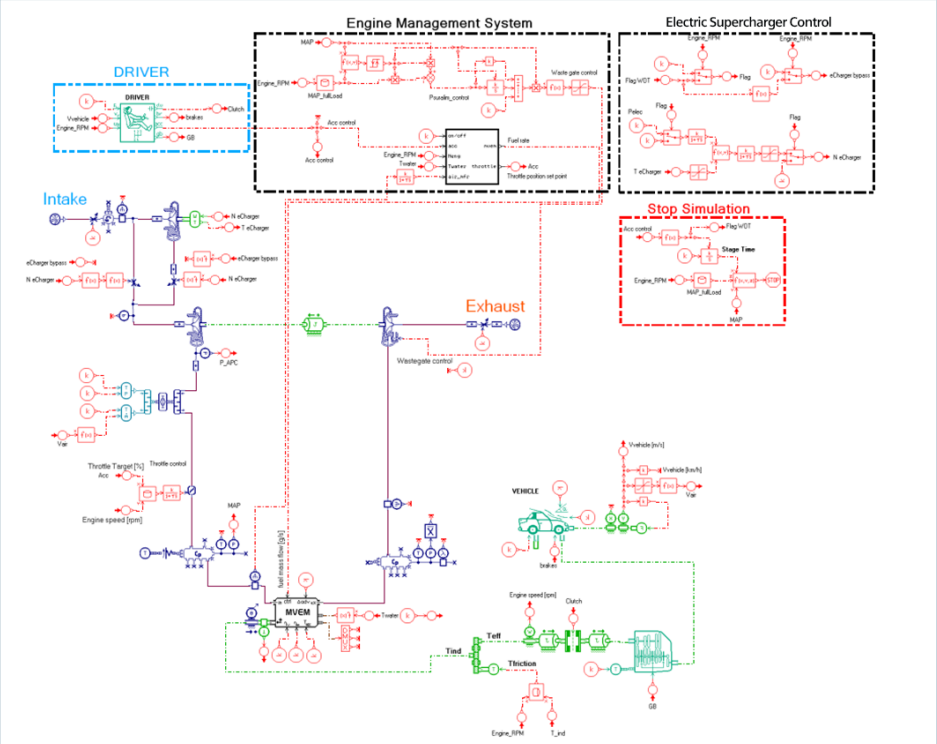
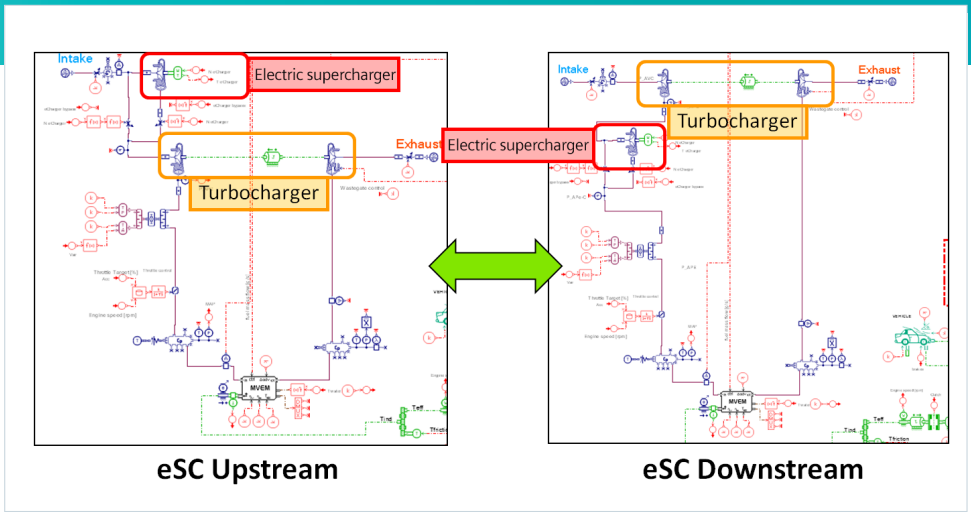


The Simcenter Amesim simulator model of the electric supercharger vehicle.

Like many companies that are evolving in order to meet tighter regulations and environmental concerns, Valeo's main challenge of reducing CO_2 emissions in all of its market segments has placed technological innovation at the heart of its strategy. This includes products for the hybridization and electrification of vehicles, but also for weight reduction, lower energy consumption and emissions reduction. Examples include an exhaust gas recirculation (EGR) system for reducing nitrogen oxides (NOx) in a diesel engine, EGR system to improve the fuel economy of a gasoline engine, electric supercharger, integrated belt starter generator from 12 volts (V) to 48V and a dual clutch transmission module. It also includes technologies that enable smarter and safer driving, like novel visibility systems, parking and low-speed maneuvering aid systems and alerting systems for unintentional lane departures and blind spot detection.

When innovation drives competitiveness

Valeo is one of the world's top automotive suppliers and is eager to hold on to that position. The industrial group ranks among the top patent filers in France and orients its research and development (R&D) toward



Comparison between electric supercharger upstream and downstream positioning.

two key areas of strategic growth: the Asian emerging markets and reduced vehicle CO_2 emissions.

CO_2 emissions cannot be reduced by using filters or any other forms of after-treatment. They affect the fundamentals of a car and demand combined development in different areas: vehicle weight, dynamics, aerodynamics, green telematics, tire pressure monitoring systems, alternative fuels, etc. Most of the gains, though, take place through the modification of the powertrain systems.

To take up this challenge, Valeo has created a Powertrain Innovation Department within the Powertrain Systems Business Group. Nurtured by marketing support and customer feedback, this department scans new ideas and concepts – mainly from outside the company – and brings them to a certain level of maturity, demonstrating whether or not the idea makes sense and can generate a technically feasible product with business potential.

But reducing CO_2 through powertrain technology is highly complex and demands capital-intensive operations. But even in these research-oriented departments, money and time are not unlimited. The ability to create, test and validate concepts within a strict time and cost framework is essential to remain competitive. More importantly, greater efficiency in R&D processes enables Valeo to save lead time and costs and makes it possible to examine more ideas within the same budget.

Keeping in mind the high level of complexity of today's powertrain systems and the related technologies, this goal demands the implementation of efficiency tools and methodologies.

Simcenter Amesim supports innovation

With a clear focus on fuel consumption, Valeo decided the ideal solution to perform rapid evaluation of new technologies would be through system simulation. Valeo selected Simcenter Amesim as the standard solution to

Simcenter Amesim enables Valeo to better understand the behavior of systems and subsystems, accelerating innovation while reducing costs.

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support its innovation process on the powertrain design. Simcenter Amesim is used in each step of the group's innovation process.

First, Valeo engineers use Simcenter Amesim to easily model and simulate the studied components in a vehicle environment and gain first insight into the component's behavior and potential in a matter of hours.

Secondly, if the project seems to make sense, further investigations are run. A component prototype is then created and placed in a virtual vehicle demonstrator. Deeper analysis is possible to validate the choice and to process minor architectural changes. Simcenter Amesim is used to model the most relevant vehicle simulator. When this is done, the required measurements to improve the calibration of the simulator are performed, making it possible by means of extrapolation to re-use the simulator for other vehicle configurations. This enables Valeo to validate the interest of the innovative product on a larger range of vehicles.

Simcenter Amesim stands as one of the key elements in Valeo's innovation process, facilitating the decision-making process in every step of the investigation, from early component design to full vehicle integration and extrapolation. Innovating ideas can be developed into a pre-industrialization stage and then transferred to product departments within days.

Understanding the behavior of systems

Simcenter Amesim is widely used within the Powertrain Innovation Department. It has become the standard powertrain system simulation platform at Valeo, supporting people in many parallel projects worldwide. Mechatronic system simulation with Simcenter Amesim enables Valeo to better understand the behavior of systems and subsystems. It also reduces the number of physical testing sessions needed, but in the end, physical tests remain an essential complement as tests enable simulation validation. Engineers in particular appreciate the ease of use of Simcenter Amesim with its intuitive libraries, such as IFP-Drive, IFP-Engine, powertrain and electric motors and drive, and the way it supports the design process and enables engineers to design any powertrain system they want to study.

"Simcenter Amesim is an efficient teaching and strategic tool. It can bring a lot to a company," says Pascal Menegazzi, powertrain systems simulation manager at Valeo.

Fully adapted for fast evaluation and comparison of architecture, Simcenter Amesim is perfectly suited to address Valeo's innovation challenges. Within the Powertrain Innovation Department, Simcenter Amesim is used daily as a standard tool in the process and is integrated at a strategic level.

Solutions/Services

Simcenter Amesim
siemens.com/
simcenter-amesim

Customer's primary business

Valeo is an automotive supplier and a partner to a significant number of automakers worldwide. As a technology company, Valeo develops innovative products and systems that contribute to the reduction of CO_2 emissions and to the development of intuitive driving. The company operates in 29 countries and has 74,800 employees.
www.valeo.com

Customer location

Paris
France

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Driving the electric supercharger project

The Valeo electric supercharger project exemplifies the added value of Simcenter Amesim. Valeo engineers relied on it to define the most efficient architecture as well as the sizing of its electric storage supply.

In the context of fuel economy and green design, engine downsizing combined with a boosting technology has proven to be a very cost-effective method for achieving emission reduction. Many manufacturers are reducing engine capacity and the number of cylinders. By adding turbochargers and direct injection technology, they provide a powerful engine with similar performance to a much larger engine, but with much improved efficiency and reduced carbon emissions. A smaller engine is also lighter, reducing the weight of the car and making it nimbler. Investigating boosting technologies is essential to support this trend and to remain competitive in the technological race. In any case, more boosting is required. Comparisons made by Valeo showed that the electric supercharger systems clearly offer the most effective transient response performance versus all of the alternatives (low-pressure turbo only, 2-stage turbocharging, etc.).

Simcenter Amesim has been used to investigate two aspects: the study of the upstream or downstream position of the electric supercharger in the engine air path (before or after the turbocharger) as well as the electric storage sizing (see figure 1 and figure 2). Through a range of tests and analysis, engineers at the innovation department were able to determine that the electric supercharger downstream is the best energetic air loop architecture choice and that it could run in a standard 12V stop-and-start electric architecture system for a 1.2 liter (L), 110 kilowatt (kW) turbo gasoline engine application.

The standardized use of Simcenter Amesim at Valeo has led to optimizing both time and money. The company saved significant resources thanks to a great reduction of tests: "Such a tool has enabled us to realize savings or at least to prevent huge losses by limiting expensive prototypes and tests," says Menegazzi.

In addition, the Simcenter mechatronic system simulation platform provides a better understanding of the physical environment at a low cost that enables the creation of more relevant products. But the real strength of Simcenter Amesim comes from the expertise that is linked to its use.

"Simcenter Amesim can only be efficient when associated with the right technical approach," says Menegazzi. "Success is all about thinking which simulations to realize, understanding them and knowing how to exploit the resulting data."

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