

# SIEMENS

*Ingenuity for life*

Automotive and transportation

## SsangYong Motor

SsangYong Motor uses Simcenter to save over \$200,000 in vehicle production

### Product

Simcenter

### Business challenges

Preference for quieter, smoother rides

Optimize NVH testing of SUV engines and other components

Find a partner to identify and mitigate torsional vibrations in the company's new SUV

### Keys to success

Partner with Simcenter Engineering to objectively quantify root cause of NVH issues

Combine physical testing with system simulation to increase insight into full vehicle behavior

Redesign workflow so issues

### South Korean automaker partners with Siemens to redesign its approach to vehicle assessment

#### Overcoming today's SUV engineering challenges

SsangYong Motor (SsangYong) accepts only the best design and performance for its world-renowned sports utility vehicles (SUVs). Founded in 1954, the company immediately recognized noise, vibration, and harshness (NVH) analysis would be crucial to maintain an optimal user experience.

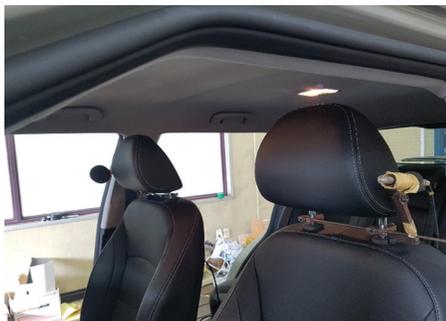
Torsional vibrations are one of the main sources of noise and vibration in a vehicle. The torsional parts of a vehicle include all components that are rotating, such as shafts or couplings. When these vibrations get too high, they cause the entire vehicle to vibrate and make more noise. The larger engines in trucks and SUVs exacerbate this problem.

As vehicles evolve, consumer preferences are shifting to quieter, smoother rides. This not only provides a more comfortable experience for the driver and passengers but also reduces noise created by cars.

In addition to NVH, many automakers struggle with the prototyping phase during the product development lifecycle. It is difficult to objectively define and measure data points, particularly when it comes to noise.

#### Finding the right partner

SsangYong partnered with Siemens Digital Industries Software's Simcenter™ Engineering team to identify and mitigate torsional vibrations in its new SUV. Simcenter is a part of the Xcelerator™ portfolio, a comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software.



Target microphones



Knuckle accelerometers



Differential accelerometers

### Keys to success *(continued)*

can be addressed in collaboration with design team

### Results

Improved testing outcome with the addition of system simulation models

Reduced time to solve driveline NVH integration issues

Increased collaboration between engineering and design teams

Saved over \$200,000 in vehicle production

“We needed a partner who would not only help us reduce the amount of noise and vibrations in our vehicles, but also someone who would work with us to implement a process to measure and reduce noise. Simcenter Engineering was a perfect fit,” says Jaeyong Seo, principal research engineer, SsangYong.

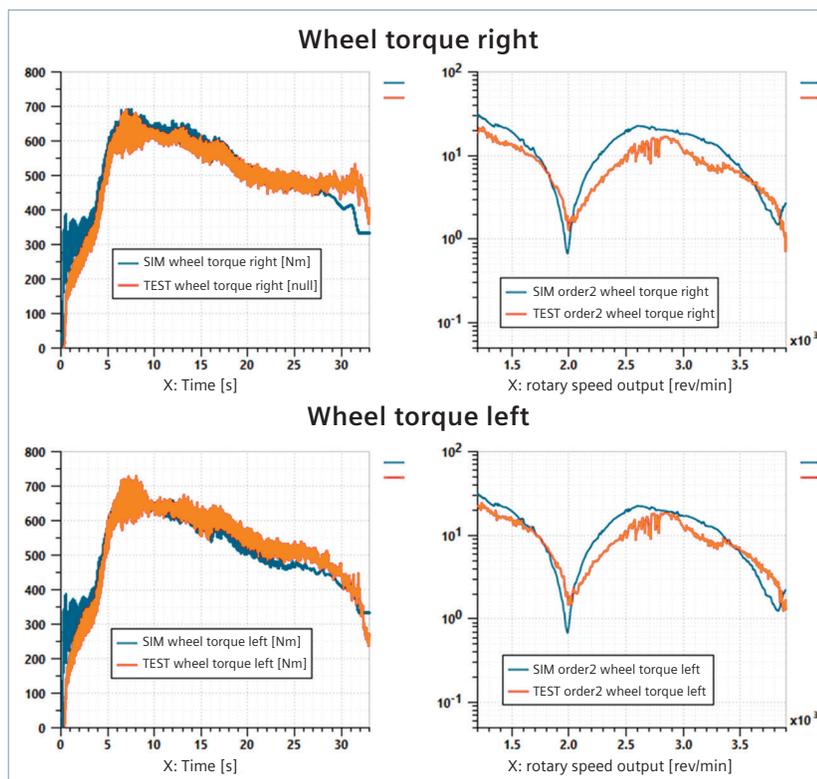
The Simcenter Engineering team immediately realized the physical testing process at SsangYong could be optimized. The team developed a strategy to support SsangYong in its overall implementation process, including the correct steps to take to validate and measure the changes they were making to the vehicle.

“The test results could be used to identify where the torsional vibrations were coming from,” says Seo. “Using the test data, we could analyze the torsional behavior of several components, including powertrain and the internal combustion engine.”



Flywheel tachometers

After the physical testing process was defined, the Simcenter Engineering team helped SsangYong build and validate simulation models of relevant driveline components to be used in combination with the test data. With the developed models, SsangYong could easily complement and enhance their testing activities to gain more insight in the torsional vibration behavior of the full vehicle. This allowed SsangYong to easily understand which component modifications could help mitigate the noise issues, with the advantage of an easy interaction back to the design team.



*“The Simcenter Engineering team not only built the models but showed us how to do it ourselves.”*

Jaeyong Seo  
Principal Research Engineer  
SsangYong Motor

The model can now predict torsional vibrations of the powertrain chain.

“The Simcenter Engineering team not only built the models but showed us how to do it ourselves,” says Seo. “I can now understand the torsional behavior of driveline components, such as inertia and stiffness, and how these will effect the full system behavior. Siemens helped me build the powertrain model perfectly.”

The simulation results for individual components correlated well with physical testing results, so the team moved into the next phase – building a full model of the SUV SsangYong wanted to analyze.

SsangYong’s primary goal was to perform specific measurements on vibrations from the driveline and connect that to the

feeling a driver or passenger would have in the vehicle. “We wanted to objectively measure and quantify which part was causing trouble and fix it,” says Seo. “This was another advantage of partnering with Simcenter Engineering.”

#### Rethinking the workflow

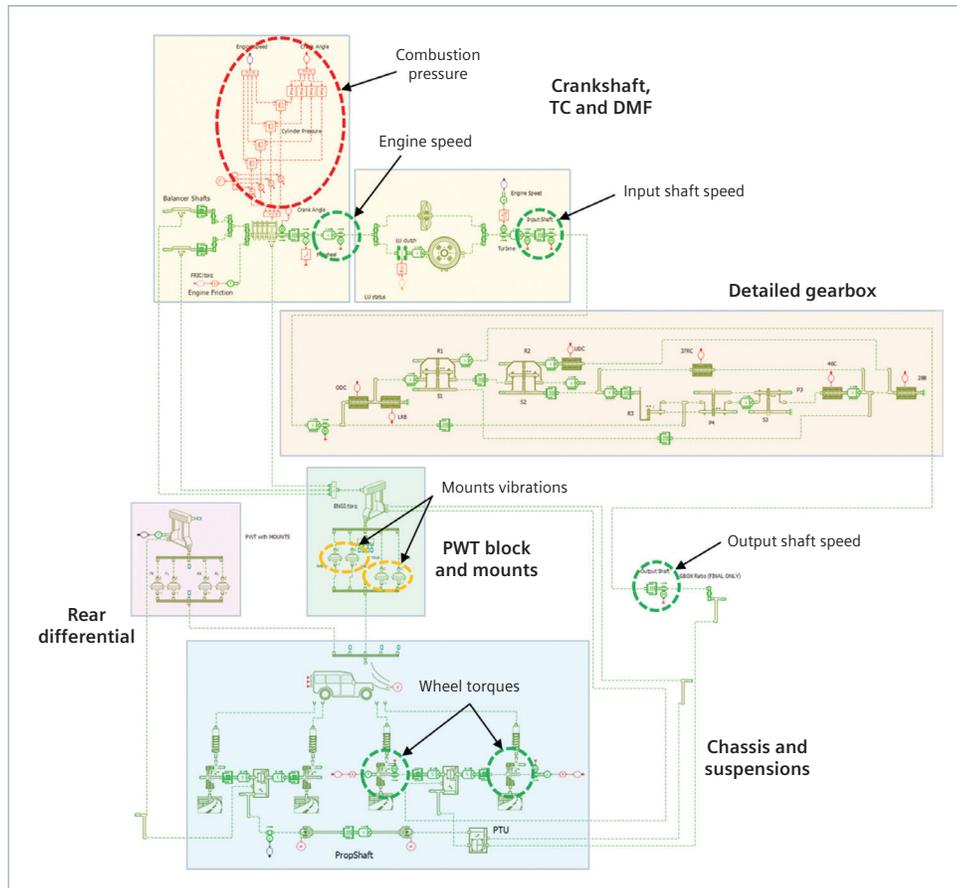
Simcenter Engineering also specializes in introducing methodology into the engineering workflow. This addresses issues such as where the problem is coming from and what additional technologies can be added both in the troubleshooting and in the design phase to better understand which part is causing the issue and needs to be fixed.

“We needed a partner who would not only help us reduce the amount of noise and vibrations in our vehicles, but also someone who would work with us to implement a process to measure and reduce noise. Simcenter Engineering was a perfect fit.”

Jaeyong Seo  
Principal Research Engineer  
SsangYong Motor

“We wanted to objectively measure and quantify which part was causing trouble and fix it. This was one advantage of partnering with Simcenter Engineering.”

Jaeyong Seo  
Principal Research Engineer  
SsangYong Motor



A full vehicle model was assembled with available subcomponents.

## Solutions/Services

Simcenter Engineering  
[siemens.com/simcenter-engineering](https://www.siemens.com/simcenter-engineering)

## Customer's primary business

SsangYong Motor is the fourth largest South Korea-based automotive manufacturer. SsangYong Motor develops and distributes SUVs and full-size luxury sedans. As a premier manufacturer in Korea's automotive industry, SsangYong Motor products are known for their advanced styling and outstanding performance.  
[www.smotor.com](http://www.smotor.com)

## Customer location

Pyeongtaek-si  
South Korea

The Simcenter Engineering team worked with SsangYong to optimize the testing setup to reduce troubleshooting costs. Then they demonstrated how, using simulation, they could evaluate in detail which components were causing issues and understand how to update the design to solve it.

"Siemens made all of our models easy to use. They were very precise and helped us gather the vehicle data needed to reduce vibrations," says Seo. "The correlation of the simulation models with test data matched almost perfectly. Now that the issue of torsional vibration has been solved, we can move our vehicle into mass production."

## Making changes today for a better tomorrow

The project with Siemens provided SsangYong with a blueprint for future products. Now that the models have been created, the team will save time and costs

developing the next generation of vehicles and be better equipped to address the issue of torsional vibrations.

In addition to improving NVH, SsangYong has also realized savings in vehicle weight. "Our work with the Simcenter Engineering team gives us the tools to reduce the weight and material needed to make an internal combustion engine," says Seo. "We anticipate this will save us money and time on future projects."

"The knowledge we gained from working with the Simcenter Engineering team has been invaluable. Being able to optimize our vehicle with this project will have a positive effect on future projects, as we no longer need to build our entire process and models from scratch. We estimate that working with Siemens on this project will help us save over \$200,000 on production of this vehicle."

*"We estimate that working with Siemens on this project will help us save over \$200,000 on production of this vehicle."*

Jaeyong Seo  
Principal Research Engineer  
SsangYong Motor

## Siemens Digital Industries Software

Americas +1 314 264 8499  
Europe +44 (0) 1276 413200  
Asia-Pacific +852 2230 3333

© 2020 Siemens. A list of relevant Siemens trademarks can be found [here](#). Other trademarks belong to their respective owners.  
82343-C4 12/20 KN

[siemens.com/software](https://www.siemens.com/software)