LOHR Industry
Ensuring product quality and integrity

Accelerating analysis for large welded assemblies

- **Successfully entered new target market**
- **Realized 60 percent time savings in model preparation**
- **Accelerated workflows through real-time design and approval**
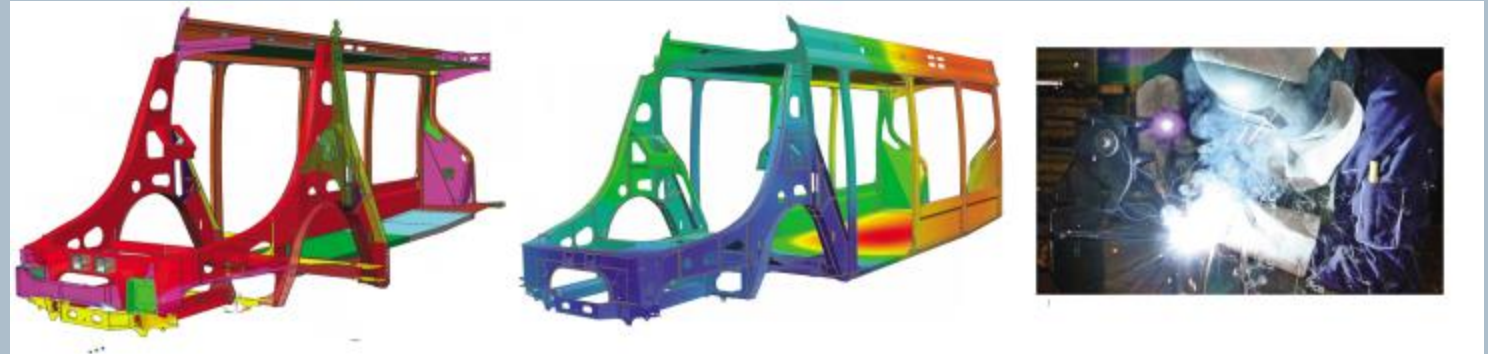
- Integrated NX and Simcenter environment for design and simulation
- Full 3D mathematical modeling and wider use of CAE to ensure product integrity

"We spend about 75 percent of the simulation time in model preparation. Using the automated process enabled by NX and Simcenter 3D, we cut about 60 percent of the model preparation time."

Patrice Klein, Simulation Manager, LOHR

SIEMENS

Services Précicad
## New aluminum electric utility transport

- **First prototype ready in six months**
- **Lower weight contributing to longer operation time per battery charge**
- **60 percent fewer welds means lower production costs**
- **1,500-pound carrying capacity exceeded original requirements**

Optimized for strength, weight, production costs and ease of recycling
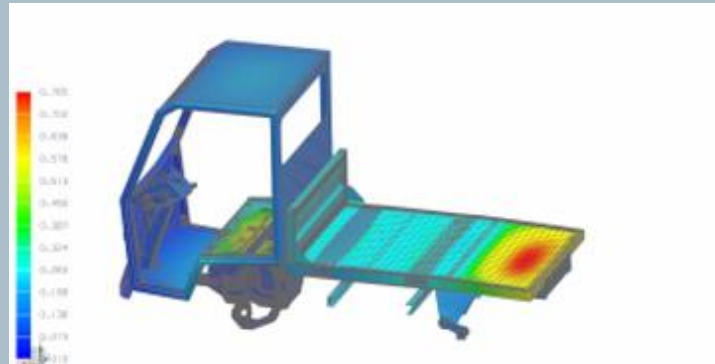
Cargo deflection analysis
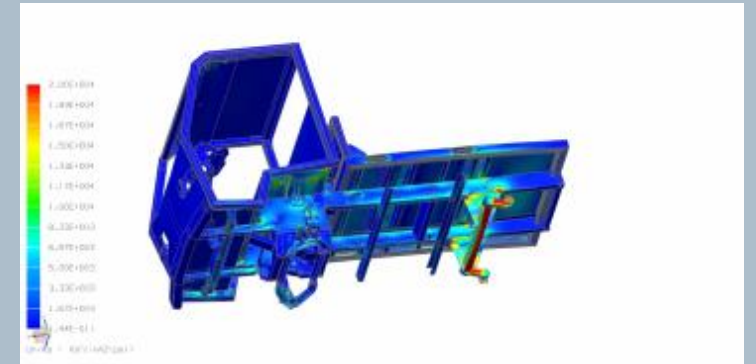
Cargo stress contour

- Ability to import SolidWorks geometry into Simcenter 3D
- Rapid FEA pre-processing

"Simcenter 3D is really fast and, in the same day, we could do many iterations."

Stephane Arsenault, Head of FEA Department

SIEMENS

Honda R&D Co., Ltd.
Innovation for progressive damage analysis in composite design

Target: reaching 50 percent weight reduction by 2020 or 2030

Damage of a specimen after test

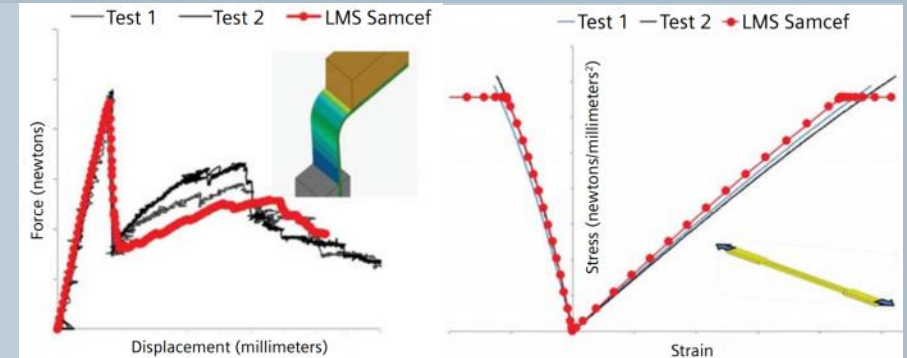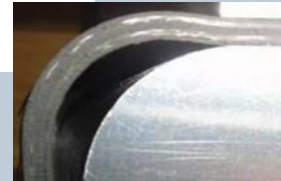**Innovative methodology for progressive damage analysis of composites**

- Predictive damage models at the coupon level and at composite subsystem design concept level
- Development of the parameter identification procedure, based on a limited amount of physical tests on coupons

- Simcenter Samcef non-linear finite element solver for accurate modelling
- Simcenter Engineering Services for composite damage model identification

"Not only at Honda, but many engineers in this field think that we can still make vehicles that have a 50 percent lighter body structure using composites while maintaining the mechanical properties of the replaced metallic parts."

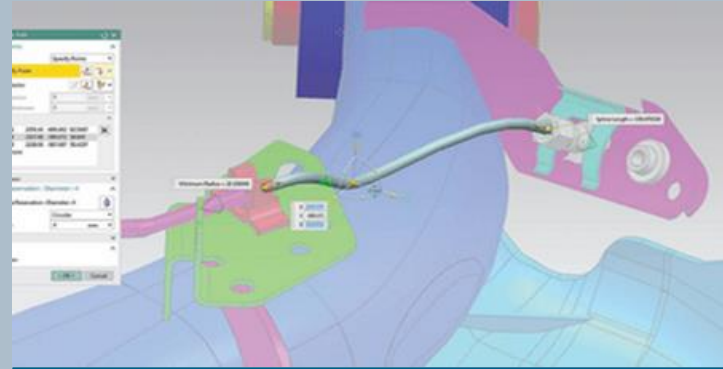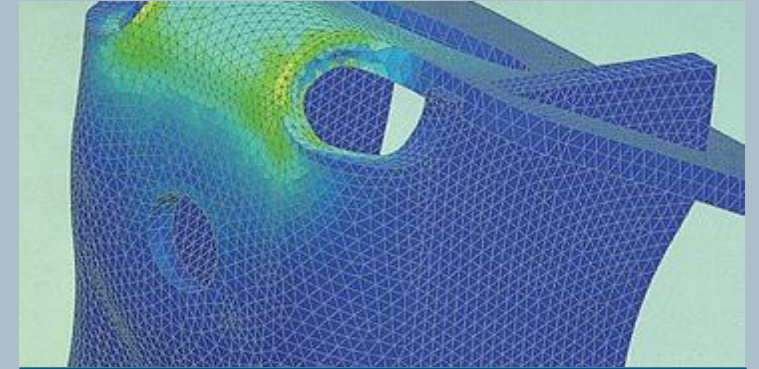Yuta Urushiyama, Composite body innovation programs Honda R&D Co., Ltd.

SIEMENS

Nissan
Creating an award winning vehicle in record time

Mechanism geometry update

Structural simulation

- **New emission targets achieved**
- **No need for expensive and time-consuming prototypes**
- **Development time cut from six years to three years**
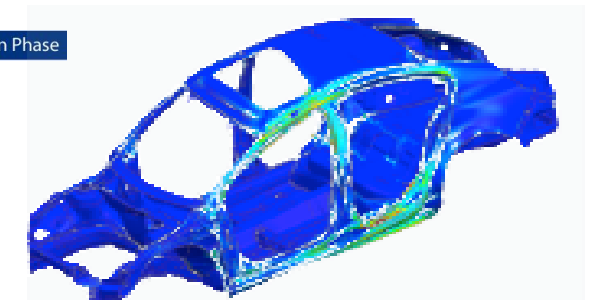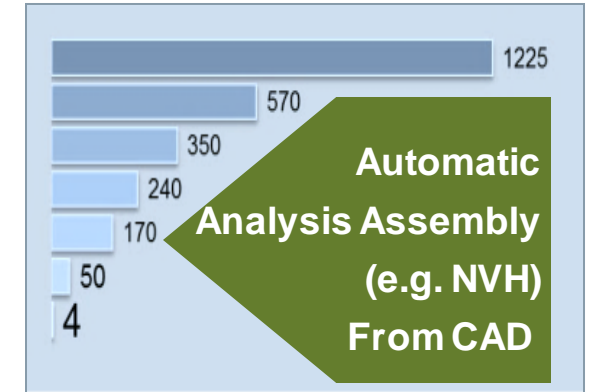- **Created an award winning model**
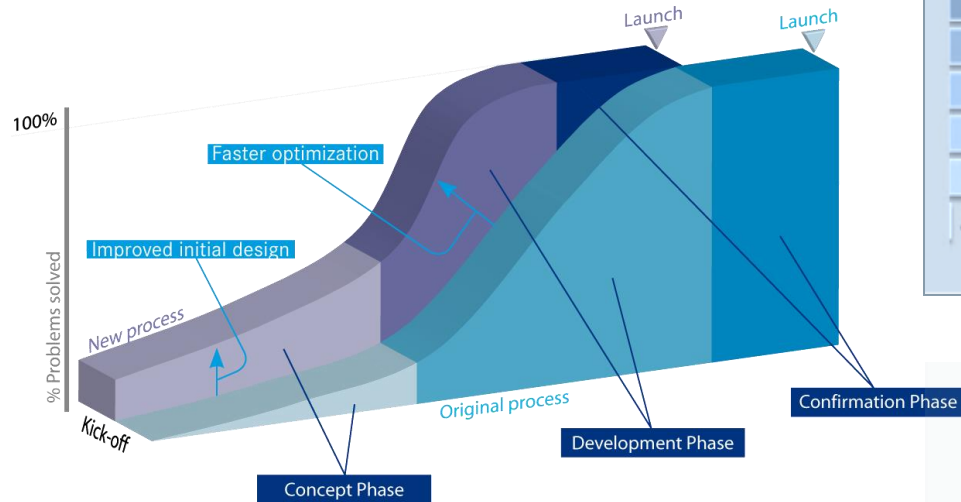
- Use Simcenter 3D to optimize weight and performance
- Use Teamcenter for effective control of all engineering data

"We were able to use advanced simulation to optimize our design; for instance, our engineers were able to take out every unnecessary gram of weight in the vehicle."

David Moss, Vice President of Vehicle Design and Development, Nissan Technical Center Europe.

SIEMENS

Siemens 3D Simulation
Mitsubishi Motors Corporation (MMC): Record Model Build Times

1225
570
350
240
170
50
4

Automatic Analysis Assembly (e.g. NVH) From CAD

100%

% Problems solved

Launch   Launch

Faster optimization

Improved initial design

New process

Kick-off

Original process

Confirmation Phase

Development Phase

Concept Phase

- **Creation of Vehicle "Digital Twin"**
- Minimize time required for model creation
- Automate CAE model creation from CAD
- Accelerate design improvement process
- Increase model quality and reliability

"Mitsubishi compressed the development cycle and realized a major leap forward in shortening time to market and lowering cost & managed to save a full prototype cycle, without a single compromise on the final vehicle quality"

Hirotaka Shiozaki - Mitsubishi Motors Corporation
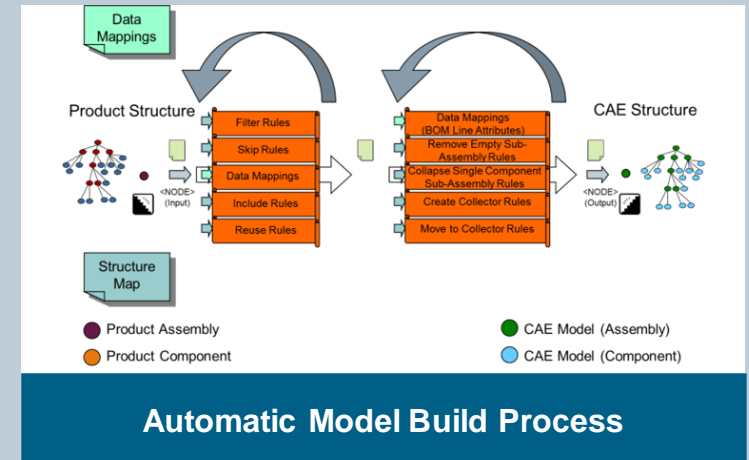
SIEMENS

Ford Motor Company
Automating the Model Build Process

Efficient, Global CAE Simulation Management Implementation in Place

Concept and Application Examples for CAE Data and Process Management with Teamcenter for Simulation at Ford Motor Company

Ulrich Fox
Ford Motor Company

Automatic Model Build Process

- Full integration with PDM solution, minimal extra IT effort
- Use of out-of-the-box un-customized solutions wherever possible
- CAE Software integration provides user efficiency gains compared to original solution

8X Performance increase of key steps:

- Initial "overhead" for CAE simulation management of BIW CAE model became close to zero
- Overhead costs was more than offset by downstream benefits

"…Siemens … was a natural choice as the vendor of our PDM system. We had the idea of full integration from the start… [Siemens] gave us the benefit we expect from this integrated, enterprise solution."

Dr. Ulrich Fox, Manager Mesh Development Group
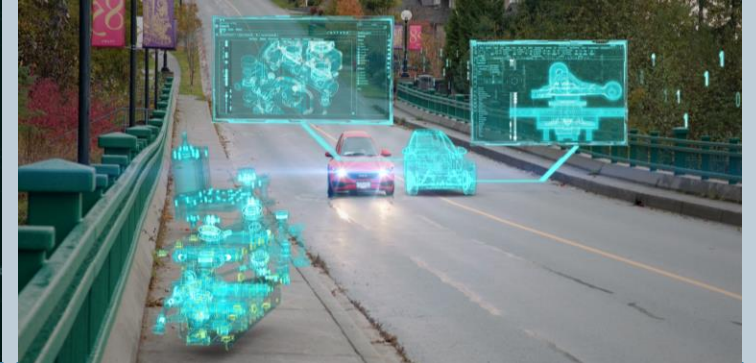
SIEMENS

Electra Meccanica
An electric vehicle in 18 months through Digitalization

- **Moved from concept to finished product in 18 months**
- **Agreed to work with Chinese manufacturer Zongshen to supply 75,000 cars over the next three years**
- **Shortened iterations and time-to-market**

Digital twin

Physical components' replica

- Use NX and Simcenter 3D to design, optimize and validate the SOLO
- Perform design and simulation work all in a single interface
- Use Siemens tools to quickly test concepts

"The key benefit is having the design and simulation all inside one environment, and being able to modify a design and automatically update a simulation result to see the cause and effect"

Rich Hoyle, Principal Engineer

SIEMENS

Volvo
New body concept development for NVH and vehicle dynamics

- **Analysed body flexibility for vehicle dynamics to understand how body is deforming during handling maneuvers**
- **Defined links between BiG performance and full vehicle using multi-attribute beam concept optimization**

Multi-attribute analysis
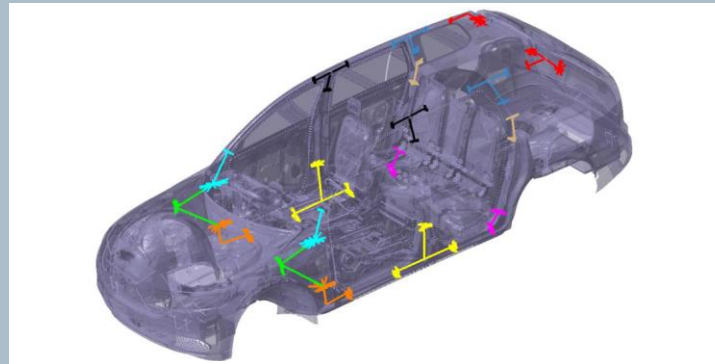
NVH optimization – beam / joints concept model
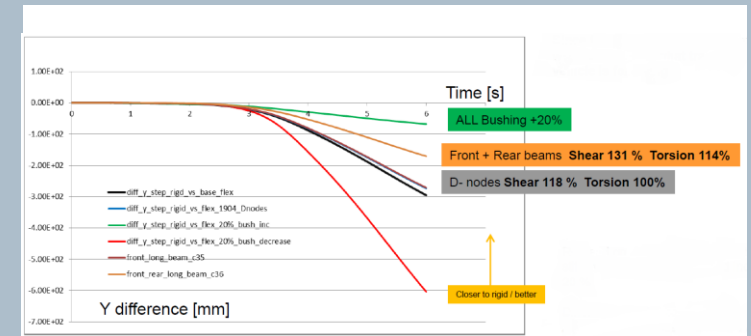
Vehicle dynamic – step steer trajectory

- Use multi-attribute analysis methods for better optimization of vehicle performances
- Improve front end lateral bending stiffness as well as shear mode frequencies as highly sensitive parameters so to improve both handling and acoustic comfort
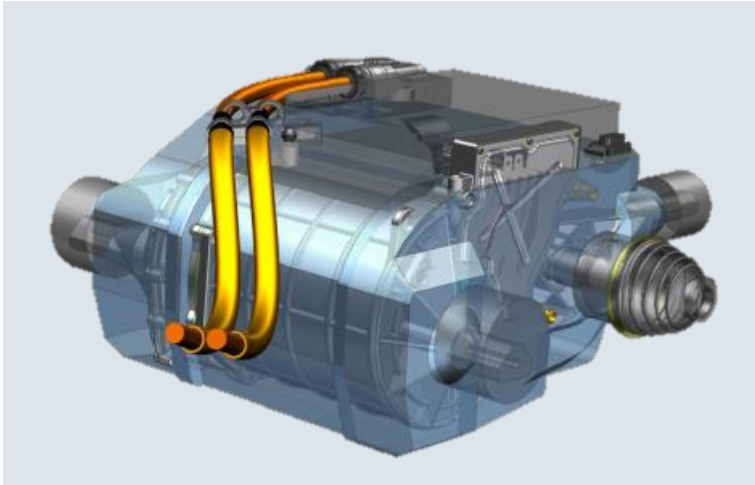
"*New xc90 body concept development for NVH and vehicle dynamics*", Magnus Olsson, Volvo

2015 LMS European Vehicle Performance Engineering Conference

SIEMENS

Valeo eAutomotive
## Simcenter Engineering enables digital twin for NVH performance

- **Simulate NVH from electro-magnetic loads to casing vibration and radiated noise**
- **Share application knowhow and transfer of advanced NVH test and simulation techniques**
- **Integrate latest simulation and test technologies in Valeo's standard development process**
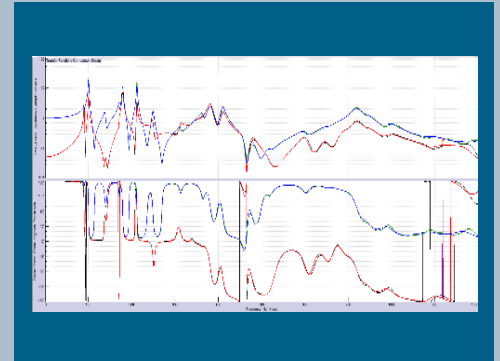
Deployment of driveline simulation process
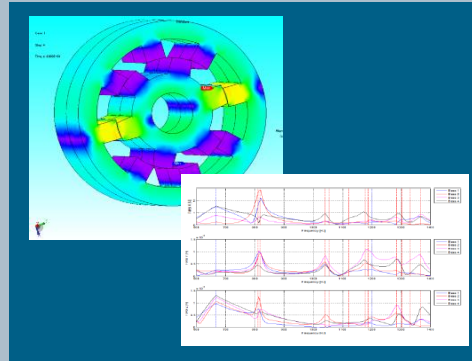
Electro-magnetic Forces
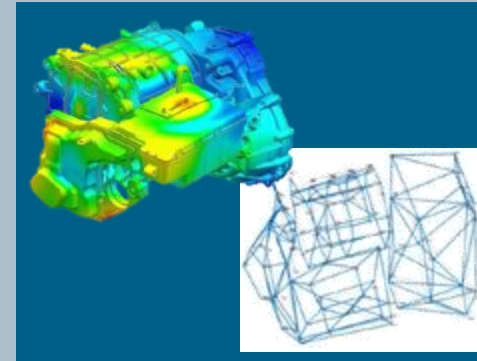
Casing and Gearbox Modelling

Vibration Prediction and Optimization

- Couple the electromagnetic model to the vibro-acoustic model of motor and gearbox
- Combine test and simulation for the creation of validated simulation models

Strategic partnership between Simcenter Engineering services and Valeo ensures system and integration targets are met while strengthening Valeo's position with automotive OEMs.
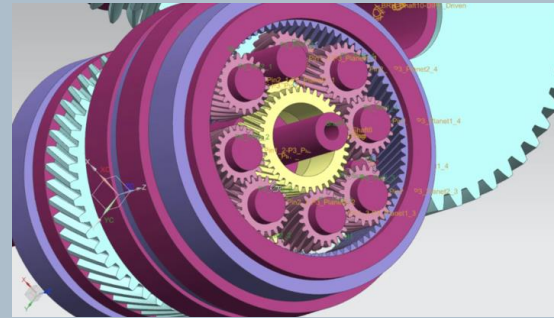
SIEMENS

Hyundai Motor Company
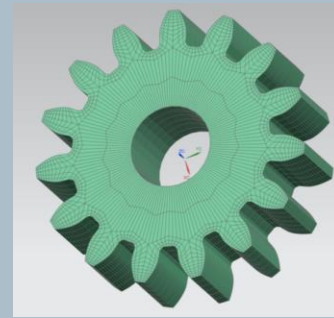## Gear whine analysis of drivetrains

- **Predictive simulation for system level NVH and gear whine**
- **Bring 3D simulation to the next level of usability, towards an holistic generative approach for drivetrain design and NVH**
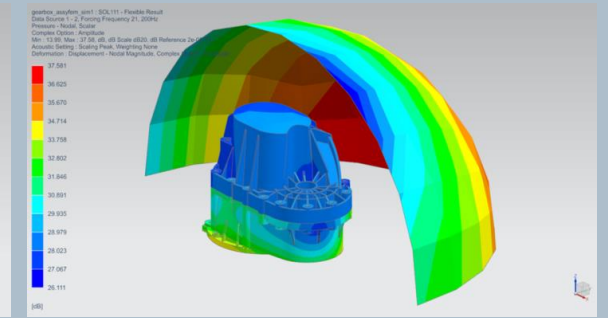
Easy workflow from design specifications to NVH analysis

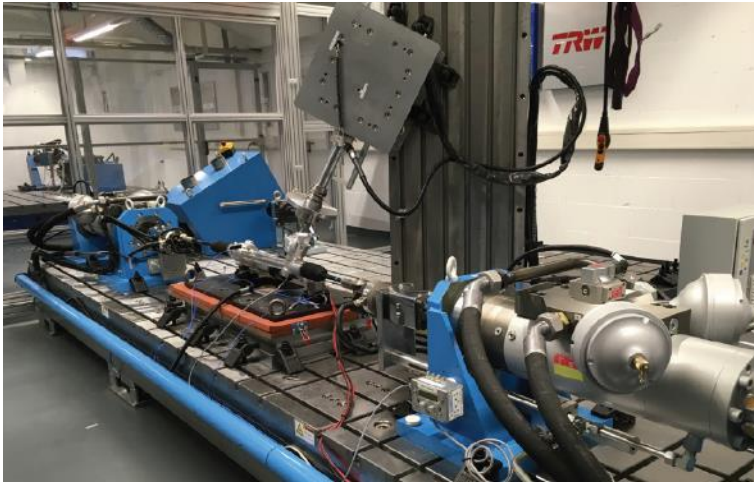| Automatic CAD and multibody creation	FE-based gear elements	Multi-disciplinary Multibody- Acoustic

- Simcenter 3D Motion and Transmission Builder for system level NVH in multibody
- Simcenter Engineering and Consulting for solving complex engineering issues

"Simcenter Engineering and Consulting services helped us use the right analysis tools to cover the entire gear transmission analysis […] The Simcenter 3D Transmission Builder software tool is well suited for our engineering purposes"
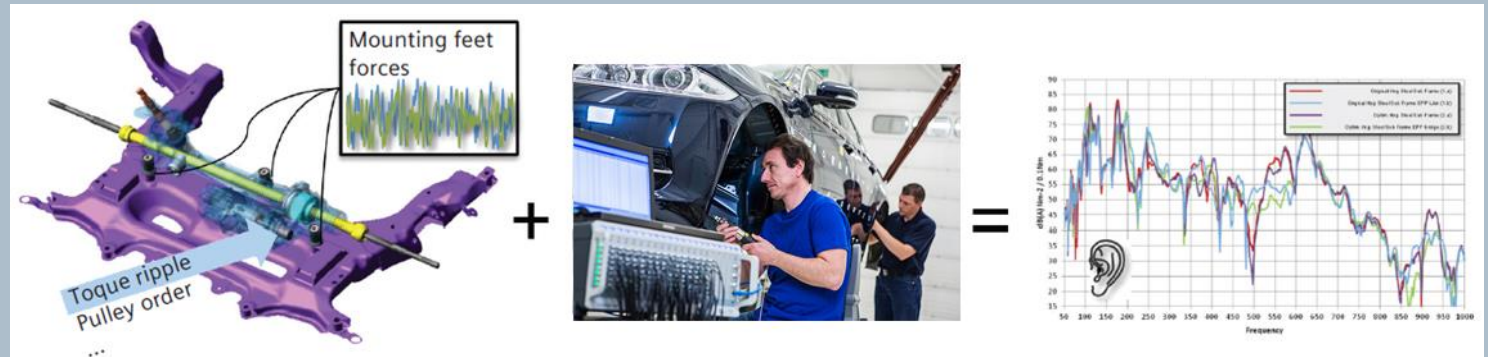Horim Yang   Senior Research Engineer

SIEMENS

ZF TRW
Positioning steering systems NVH at the front of the development cycle

Development of the world's first NVH steering system bench

Developing a powerful partnership

- Translate NVH recommendations into real and objective requirements and targets
- Integrate test and simulation to determine and resolve the root causes of problems

- **Reduced overall resources to solve NVH-related issues**
- **Accurately estimated resources for NVH resolution upfront**
- **Received positive feedback from customers, who appreciate the output data as well as the approach used to gather it**

"**We can establish exactly how much force we are allowed to introduce to a particular car to stay below a given NVH target, and we find that our customers appreciate this approach a lot.**"

Christian Landsberg, Global Chief Engineer NVH

SIEMENS

Fiat Group Automobiles S.P.A.
## Using Simcenter CAE simulation solutions & Simcenter Tecware to verify and validate durability virtually

- **Reduced margin of error in real loads between 8 and 15 percent**
- **Reduced overdesign by performing simulation prior to building a prototype**
- **Diminished costs by developing equivalency between two proving grounds**

Conducting complete fatigue analysis

Proving grounds in Turin, Italy
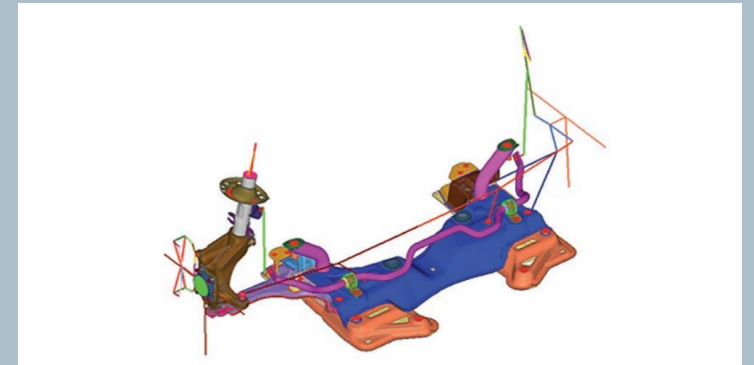
Virtual prediction and use experimental data for model validation

- Long-term partnership between Fiat and Siemens PLM Software
- The ability of Siemens PLM Software to deliver customized solutions

"**Although we can't measure the improvement because we previously didn't use virtual data, the results that we have received by using both Simcenter products are absolutely excellent.**"

Marco Spinelli, Head of the Chassis CAE Department

SIEMENS

American Axle and Manufacturing
Tier one automotive supplier to reduce warranty costs

Finite element simulation

Rear beam axle simulation

- **Reduced warranty costs**
- **Provided ability to go from detailed CAD model to simulation results in one day**
- **Enabled confident prediction of real-world performance**
- **Reduced over-design by performing simulation prior to building a prototype**

- Standardize on Simcenter 3D and NX Nastran for driveline NVH simulation
- Leverage integrated CAD and CAE Processes
- Correlation of analysis results with physical testing using Simcenter Test.Lab

"Since we began using Simcenter 3D, we are able to go from CAD design to the FE model to simulation results all within a day."

Alex Sandstrom, Senior NVH Engineer

SIEMENS

MANN+HUMMEL GmbH
Fast prediction of automotive intake noise performance

Simcenter 3D design and simulation tools to guarantee product meets expectations
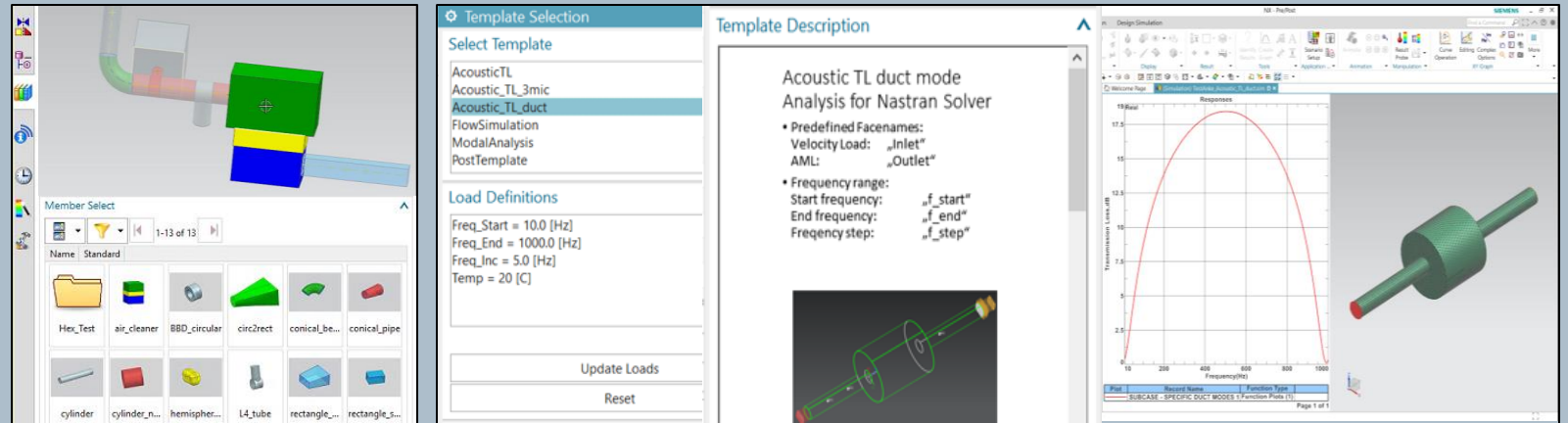
An intake component library in (NX) Product Template Studio is used for quick design creation

Custom Simcenter 3D templates for Intake Acoustic analysis: automated meshing and analysis setup for Simcenter Nastran, prescribed post-processing scenarios to evaluate noise performance

- **Design for optimal acoustic performance**

- **Gain engineering insight**

- **Optimize the product without physical prototype**

"'Thanks to an easy-to-use and dependable simulation tool, our local acoustic experts are able to respond quickly to any customers request"

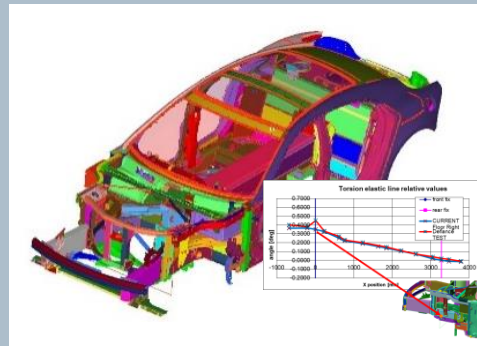Matthias Alex, Head of Center of Competence

SIEMENS

Karma Automotive
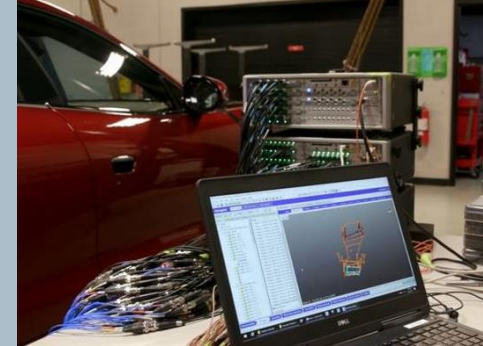*Relentless pursuit of excellent NVH performance*

- **Meet NVH performance expectations for the new Revero GT**
- **Embedded NVH team**
- **Full scope of TEST and CAE based NVH Engineering**
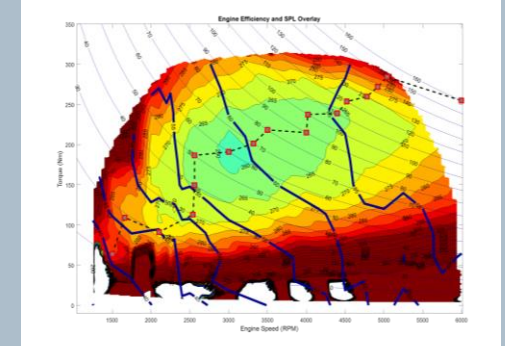- **Transfer technology and deployment of tools & processes**

Full NVH co-development of Karma Revero and Revero GT2.0

| **Body NVH Simulation** | **Correlate test & simulation** | **Attribute balancing** |

- Simcenter Engineering provides NVH project management as well as manpower
- Combined benefits for Karma: project results and NVH tech transfer

"We established the strategic partnership with Simcenter Engineering and Consulting services to meet NVH performance targets and implement state-of-the-art NVH testing and simulation processes."

Bob Kruse, Chief Technology Officer, Karma Automotive

SIEMENS

BYD Auto Company Limited
## Boosting NVH performance of plug-in hybrid vehicle fleet

- **Reduced noise and vibration levels in hybrid vehicles and other NVH-related problems, such as wind and cooling pump noise**

- **Optimized overall hybrid vehicle structure for NVH performance without compromising other quality parameters, such as drivability and handling**

Improving the NVH development and control process
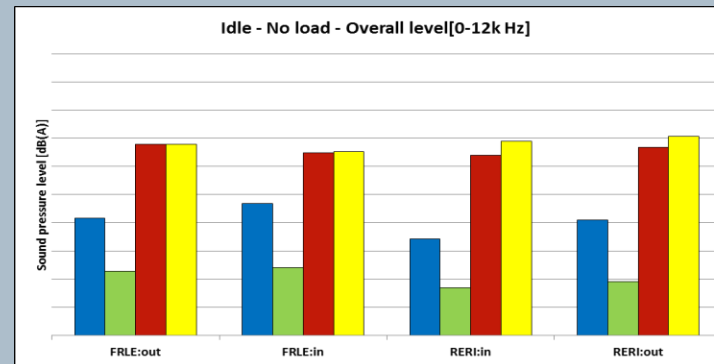
Target setting and benchmarking
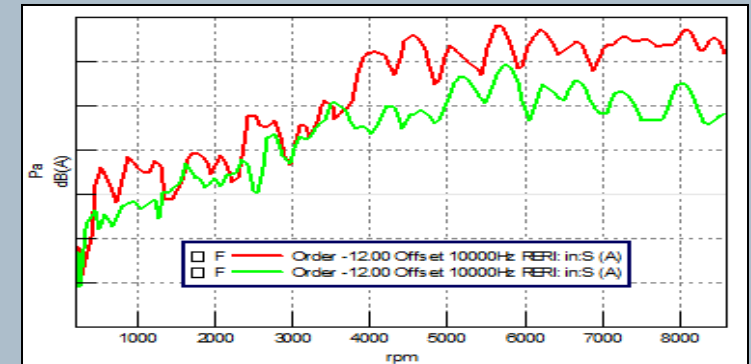
NVH optimization

- Dedicated and comprehensive troubleshooting methodology
- Integrated simulation and testing to determine and resolve the root causes of problems

"15 versions of the Qin were praised for NVH performance by our customers.
Working together with LMS Engineering for NVH optimization has helped us position ourselves as the top seller in plug-in new energy vehicles"
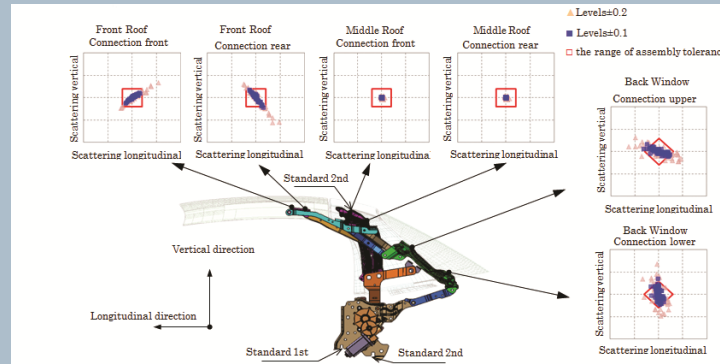
Zhang Rongrong, Manager NVH performance research division

SIEMENS

Mazda Motor Corporation
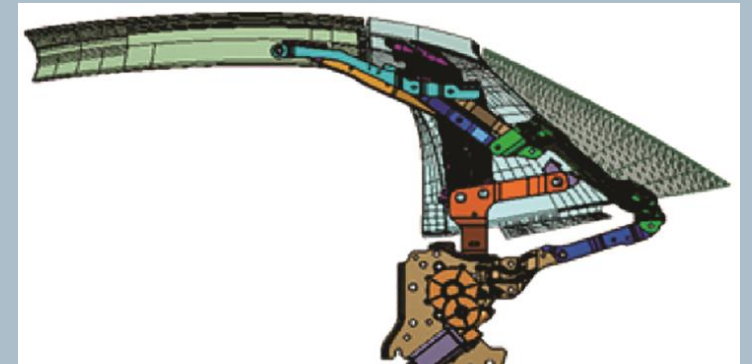## *Develop intricate mechatronic control systems*

- **Improved model reliability and accuracy**

Unified design and simulation environment to optimize performance

The scattering at the connection parts

Roof Top Mechanism

- Integration with CAD
- Integration with 1D tools
- Best-in-class multibody solver for fast and reliable simulation results

"It is important that each engineer can explain the value of their inspiration and ideas in a quantitative manner"

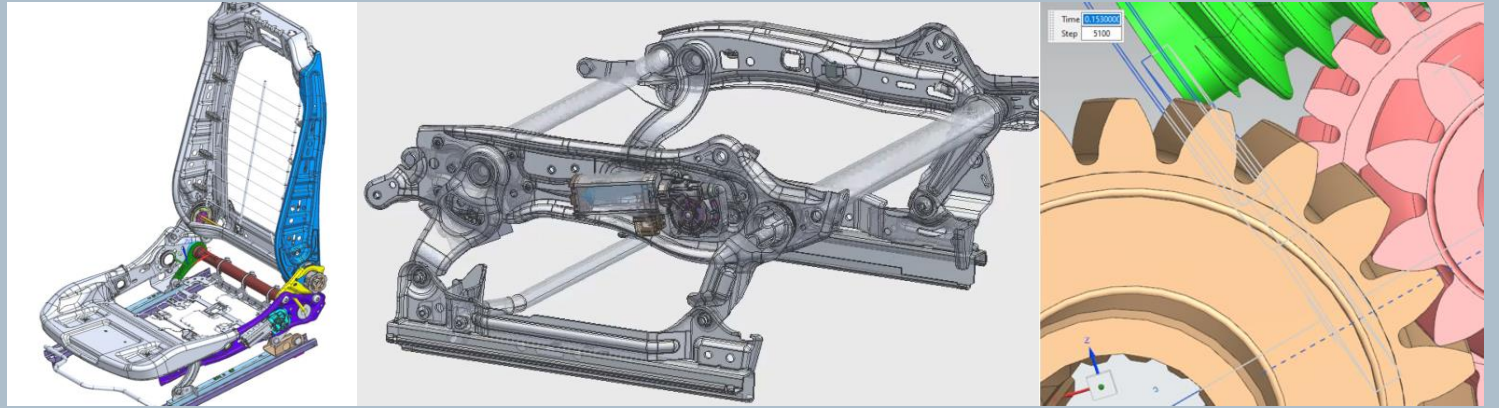Fumihiro Tokumitsu, Specialist, Integrated Control System Development Division

SIEMENS

Faurecia
Accurately calculate mechanical behavior of seats for Cockpit of the Future

Faurecia integrates motion, vibration and acoustics simulation for Cockpit of the Future

Associativity with CAD data

Performance prediction and quick optimization

- Simulation process time reduced by 90% thanks to Automation
- Accurately calculated mechanical behavior of seats mechanisms
- Reduced time to develop seat model by 75%

- Use Simcenter 3D Motion for mechanisms simulation
- Leverage geometry parameterization to quickly run multiple simulations
- Collaborate with Simcenter 3D customer support, including dedicated Simcenter 3D support engineer

"Our goal is to expand the use of Simcenter 3D at Faurecia targeting systematic use of functional simulation in the design process for any new products, such as recliner, tracks etc."

Mohamed Ben-Tkaya, Functional Simulation Expert at Faurecia

SIEMENS