



SIEMENS

Ingenuity for life

Chassis design optimization

LMS Engineering services strike the right balance between road noise and vehicle handling

Benefits

- Analyze the root causes of road noise
- Combine test and simulation to build accurate and efficient models for mount optimization
- Reduce complex finite element models to fast running, accurate and equivalent models
- Optimize the chassis design for low road noise levels
- Balance road noise with vehicle handling

Summary

LMS™ Engineering services optimize chassis designs to achieve lower road-noise levels. By using substructuring techniques and combining test and simulation, LMS Engineering experts are able to build accurate and efficient full-vehicle models, investigate the root cause of problems and explore countermeasures.

By using lightweight materials and producing hybrid and electrical vehicles, automotive manufacturers are aiming to reduce fuel consumption and unwanted emissions. But using advanced materials and producing a new breed of automobile presents

complex challenges for noise, vibration and harshness (NVH) engineers. In lighter vehicles without low-frequency noise of the internal combustion engine (ICE), road noise becomes an important contributor to the overall sound and comfort experience. By optimizing the chassis design and connections between chassis and body, road noise can be lowered and balanced with vehicle-handling performance.

Chassis design optimization starts by creating different component models and assembling them in a full-vehicle model. The components are described by a matrix of transfer functions between input, output and connection locations. They can be measured if the component physically exists, or calculated from a finite element model (FEM). After defining the connection properties, transfer functions for the entire vehicle are calculated using frequency response function-based substructuring (FBS), an efficient calculation technology perfectly suitable for what-if analysis and optimization. The combined impact of suspension and connection modifications on both road noise and vehicle handling can be investigated.

Chassis design optimization

A typical chassis design optimization project is comprised of the following phases:

Creating frequency response function-based component models

LMS Engineering experts employ their testing experience to measure the full transfer function matrix between input, output and connection locations on physically available components. For the other components, transfer functions are calculated using finite element analysis (FEA). If required, some finite element models are first reduced for calculation efficiency during later optimization loops.

Model assembly and FBS

In the next phase, finite element and tested components are assembled in a full-vehicle model. After defining the point-to-point connections and connection properties, vibro-acoustic transfer

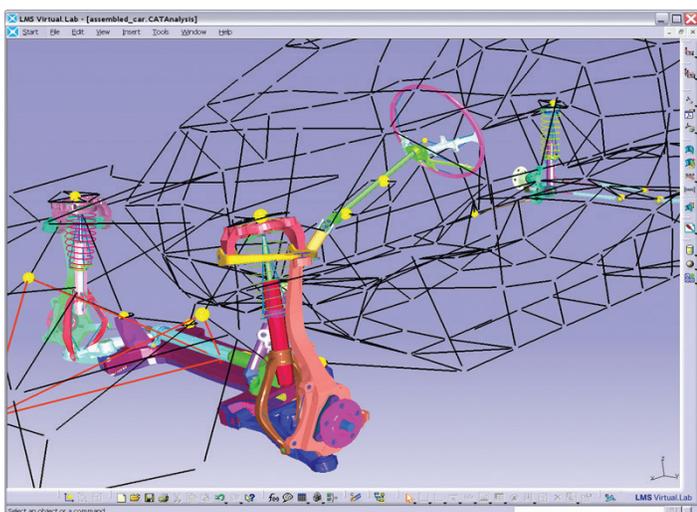
functions for the entire vehicle can be calculated using frequency-based substructuring (FBS). This technology allows cascaded contribution analysis, providing good insight into the relation between input, connection forces, local and global stiffness and responses. The accurate and efficient calculations are especially suitable for what-if analysis. Within minutes, the effect of changing connection stiffness or component transfer functions can be evaluated.

Multi-attribute optimization

LMS Engineering experts help you understand the reasons behind road noise and define countermeasures. The physical properties of the suspension can be optimized for better road noise performance. At the same time, the impact on the vehicle handling behavior can be investigated and limited by multi-attribute optimization.



Transfer function measurement.



FBS model.

Siemens PLM Software
www.siemens.com/plm

Americas +1 314 264 8499
 Europe +44 (0) 1276 413200
 Asia-Pacific +852 2230 3308

© 2016 Siemens Product Lifecycle Management Software Inc. Siemens and the Siemens logo are registered trademarks of Siemens AG. LMS, LMS Imagine.Lab, LMS Imagine.Lab Amesim, LMS Virtual.Lab, LMS Samtech, LMS Samtech Caesam, LMS Samtech Samcef, LMS Test.Lab, LMS Soundbrush, LMS Smart, and LMS SCADAS are trademarks or registered trademarks of Siemens Industry Software NV or any of its affiliates. All other trademarks, registered trademarks or service marks belong to their respective holders.
 44347-A11 7/16 P