

Introduction

Area C - NVH & Friction covers the field of noise, vibration and harshness (NVH) and friction loss analysis. The research seeks to develop methods and technologies that reduce vibration, noise, and friction loss in structural contacts.

The aim is to make vehicles more environmentally friendly by minimizing friction losses, thereby reducing both CO₂ and noise emissions. To this end, the combination of light-weight vehicle body with hybrid and electric drive trains is essential. The group calculates and develops simulation methods and models and conducts measurements analyses and validation using in-house test facilities.

NVH Material & Technology

- Cellular metal foam for engine components
- Rail and wheel vibrations absorber

Vehicle Noise Reduction

- Vibro-acoustic analysis for light weight design of vehicle structures
- Vehicle interior noise reduction methods

Friction Loss & Vibration Reduction

- Tribologic analysis of power train components and transmission
- Advanced drive train models for vibration simulation (off line, HIL)

Flow Acoustics

- NVH Sensitivity analysis and stochastic optimisation

Testing Center & Measurement Lab

- Intake and exhaust system noise analysis
- Simulation of Turbo Charge noise

virtual  vehicle

Kompetenzzentrum
Das virtuelle Fahrzeug
Forschungs-GmbH.

RESEARCH ■ TECHNOLOGY ■ INNOVATION

Innovative technologies

VIRTUAL VEHICLE is a leading research and development center with over 170 employees that is dedicated to vehicle innovations. Our worldwide network of partners in research and industry provides us with a strong foundation.

Comprehensive services

Our comprehensive know-how and network of partners in numerous fields of automotive engineering research make us an attractive cooperation and research platform in the automotive sector.

Simulation technology opens up new avenues

Enhanced simulation techniques can lead to early product design, the evaluation of alternatives, and new optimization opportunities. A much more efficient vehicle development can be achieved.

Individual aspects and Overall System

Our main focus is on virtual vehicle development. This includes innovative simulation models, effective integration with test procedures, and dealing with complex overall systems.

Contact:

virtual  vehicle

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virtual  vehicle
NVH & Friction

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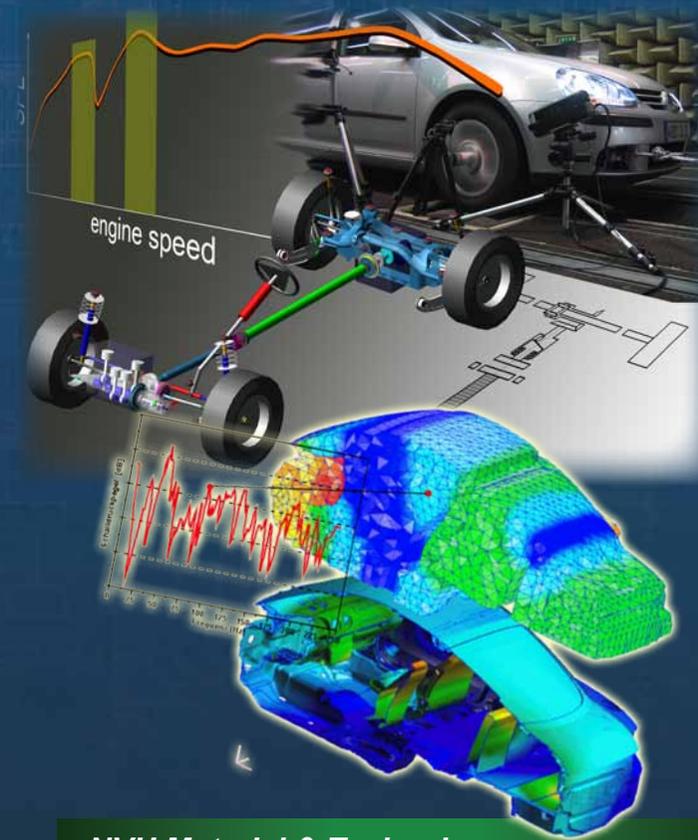


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virtual  vehicle

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NVH Material & Technology

The use of special materials with high damping for drive train and vehicles offers a still untapped potential for noise reduction.

Area NVH & Friction is investigating the application of cellular metal foams for engine components. These foams transpose vibration energy into heat due to their damping properties.

Future research projects will investigate the use of smart materials for noise reduction. These materials use electronic control to help reduce vibrations, thereby increasing vehicle comfort.

For rail application, Area NVH & Friction is optimizing vibration absorbers to reduce the vibration and noise emission of rail car wheels.

Vehicle Noise Reduction

Lightweight vehicle bodies can contribute significantly to CO₂ reduction. Area NVH & Friction has already conducted the initial research for space frame design. However, the reduction of vehicle weight also results in additional general requirements for acoustic measures.

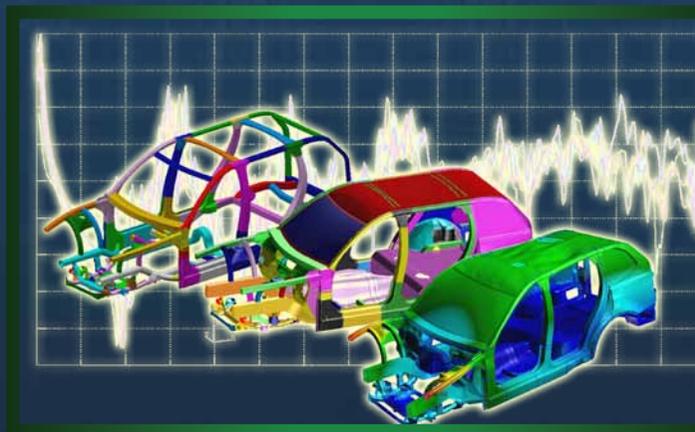
Due to these conflicting objectives, thorough knowledge of the transfer paths of vibrations and noise in the vehicle is needed to facilitate measures designed to improve interior noise. Methods have been developed to meet these demands and are being enhanced for future applications. A specific target is to simulate rolling noise excitation with precise models.

In order to predict vibro-acoustic behavior in the early vehicle design phase, specific concept models are being developed



Friction Loss & Vibration Reduction

Friction reduction in engines and drive trains leads directly to lower fuel consumption and emissions. Modeling the physical behavior in frictional contacts is very challenging, since microscopic surface information and macroscopic vibration behavior must be taken into account.



using model reduction and rules of similarity. With this technology, it will be possible to make initial decisions about vehicle comfort before a detailed vehicle model is available.

Area NVH & Friction is also developing new calculation methods. Currently, the wave-based technique is being enhanced for noise radiation prediction. A major research challenge is the simulation of interior noise caused by airflow around the vehicle (wind noise). Research projects on this topic are being developed.

Flow Acoustics

Down-sizing is an effective measure for CO₂ reduction in the automotive industry. This is causing an increase in the use of turbo charging, and the requirements for the acoustic simulation of exhaust systems are becoming more complex. Area NVH & Friction is conducting research for the precise prediction of orifice noise and developing methods to enhance and improve the relevant simulation models.

Testing Center & Measurement Lab

Area NVH & Friction utilizes highly specialized test beds:

- ▶ Acoustic engine test bed (anechoic chamber acc. to DIN 45635), 400 kW
- ▶ Acoustic powertrain test bed (semi anechoic chamber acc. to DIN 45635), 400 kW
- ▶ Modal analysis test bed

In addition, a specific reverberant room (Alfa cabin) is available for investigating the sound absorption of trim materials for the vehicle interior, for example. For investigating vibro-acoustic characteristics of different components (e.g. of vehicles), the testing equipment can handle objects up to a maximum of 4 tons (car body, power train, railway bogie,...). In addition to modern standard measurement and evaluation equipment for modal and running mode analysis, specific testing with Laser Vibrometer, Acoustic Holography, TPA etc. is also available.

