Realistic Driving Experience of New Vehicle Concepts on the BMW Ride Simulator Using MBS Complete Vehicle Models

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Realistic driving Experience on the Ride Simulator.

Contents.

1. What is riding comfort?

2. MBS as an important method in the phase of definition and the phase of monitoring the riding comfort

3. Realistic Driving Experience of New Vehicle Concepts on the BMW Ride Simulator
Riding Comfort - Overview.
Basis of an efficient concept development through all ranges.

- Wheel induced vibrations
  - Wheel imbalance
  - ...

- Road induced vibrations
  - Stuckern
  - Seat riding
  - Hobble
  - ...

- Drive train induced vibrations
  - Engine idle
  - Bonanza effect
  - ...

Introduction of the MBS-method in the product development process.
MBS-simulation in riding comfort.

MBS-modelling & fitting using real measurements show an universal applicability

- elimination fitting

- validation potential MBS-method

- fixing modelling method

- general MBS modular design

- agreement of data delivery with all developer of subsystems

- fast modelling with high quality

- steadily process

- MBS-simulation as accepted partner in development
Implementation of a MBS modular design for enhancement of quality and efficiency.
Reduction of failures within the process of modelling.

Beladung

Karosserie (Standard: flexible Karosserie)
Anchoring in process of development with standardized analysis of development status. Review of riding comfort with alternative excitations.
Anchoring in process of development with standardized analysis of development status.
Extension of review up to simulated road ride.

Test track – „good“ road

Test track – „bad“ road

Test track – …
Experience of riding comfort using a simulator as an advanced method of analysis.

MBS-simulation at riding comfort.

**Setting system of aims**

- Dimensioning of components

**Validation of full vehicle**

- Validation of subsystems

- **Dyn. Steifigkeit [N/mm]**
  - Motorhydrolager

- **Frequenz [Hz]**

- **Phase [°]**
  - 0.1 mm
  - 0.3 mm
  - 1.0 mm
Experience of riding comfort using a simulator.
The NVH-simulator at BMW.

Optimisation for NVH

Movement: +/- 0.3 m, +/- 24°
Acceleration: +/- 0.8 g
Moved mass: ca. 1200 kg
Load capacity: ca. 700 kg
Drive train: elektrisch
Cutoff frequency: 35 Hz
Experience of riding comfort using a simulator.
The NVH-simulator at BMW.
Using the simulator to analyse new vehicle concepts. The validated MBS-process as basis.

Positioning of riding comfort

Setting system of aims

Dimensioning of components

Validation of full vehicle

Validation of subsystems

Development without prototyps – Vision?!
Analysis of new vehicle concepts.
As an example the joining technique of Life and Drive at the new BMWi.

Very early decision of the joining technique by analysis of different scenarios.
Analysis of new vehicle concepts.

Positioning of riding comfort by quick and efficient virtual variation of chassis suspension.

- Dimensioning chassis suspension
- MBS-full vehicle road driving simulation
- Review at the simulator by dimensioning experts

Variation of chassis parameters

Phänomen:
- Aufbauanbindung
- Sitzreiten
- Stuckern
- Stößigkeit
- Zittern

Release of development status
Analysis of new vehicle concepts.

Conclusion & Marks.

- For realistic driving experience of new vehicle concepts on the ride simulator a validated MBS-method is essential.

- The realistic driving experience at the ride simulator enables a more complex review of existing virtual concepts.

- The validation with measurements shows a precise correlation to the MBS-simulation. This gives a very high quality of forecasts in reviews.

- In the future the transfer to the real time simulation within the ride simulator is planned, to be enabled to detect phenomenons of riding comfort with an uncertain excitation speed of the vehicle.
Thanks for your attention