The PRIMOVE electric city bus: validation through simulation

In the city of Mannheim, electric buses using BOMBARDIER PRIMOVE technology are in everyday passenger service. They also benefit from such features as the inductive PRIMOVE fast charging system and efficient electric propulsion via an electric portal axle. TESIS was given the job of testing the interaction between the vehicle dynamics and the electric propulsion system in extreme conditions using simulation.

The Challenge

- **Studies of the driving stability** of the bus when a fault is activated in the electric propulsion system.
- **Specification of an extensive testing matrix** by Bombardier in order to test maneuvers in extreme conditions.
- **Execution of the simulation via an engineering service provider** to ensure that resources remain available for other purposes at Bombardier.

Customer Benefits

- **Expansion of testing possibilities**
  - Systematic, automated tests in an extensive testing matrix.
  - Faster results as virtual road tests can be performed in x-times real time.
  - No safety issues in executing the virtual maneuvers.
  - Complement to road testing: confirmation of the road safety of the PRIMOVE city bus.
- **Outsourcing of specific simulation activities**
  - Resource focusing: Bombardier engineers can concentrate on their core development issues.
  - Use of the DYNA4 model library enables rapid creation of the simulation model.
  - Automated maneuver variations and evaluation by experts from TESIS.
  - Clear and retraceable project results available in a short time frame.
- **The fully configured DYNA4 simulation environment** can be used by Bombardier for their own future studies.

Decision in Favor of TESIS

The DYNA4 simulation framework includes models for vehicle dynamics and for electrified drive systems, thus enabling many different studies to be performed with state-of-the-art powertrain concepts. The TESIS engineering experts provide simulation services and can also respond flexibly to special requirements.

The Solution

Full-service solution from TESIS

- Modeling of the PRIMOVE city bus on the basis of the DYNA4 model library.
- Model validation through road testing on the Bombardier test track.
- Hundreds of virtual road tests: systematic comparison of reference simulations with fault activation maneuvers.
- Results provided in a clear table matrix, PDF plots and visualization in DYNAanimation.

Comparative simulations with a reference road test in DYNAanimation

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