TEC INFO

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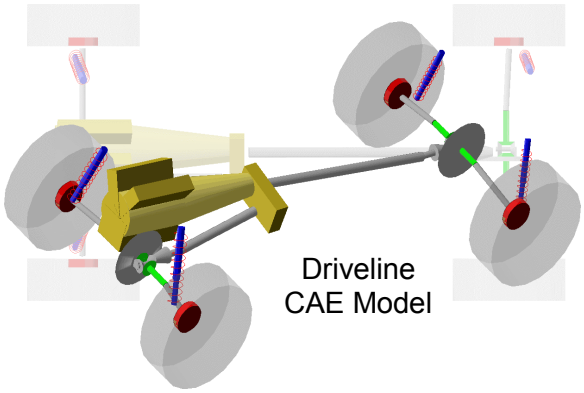
Powertrain NVH Development
Driveline Optimization

Integrating the powertrain into a vehicle chassis involves the drivetrain as an important interface between engine, road, and vehicle. While consumers like to drive vehicles that respond immediately and smoothly to pedal input, they do not expect unusual noise and vibration issues associated with such maneuvers. Recognizing the challenges associated with driveline integration FEV has developed a suite of CAE and measurement based tools to support these tasks.

FEV supports driveline **target setting** efforts by comparing different driveline layouts with FEV's proprietary driveline database. Various concepts can be evaluated with respect to torsional and bending resonances by using CAE tools. As part of driveline development attention is focused on transient events as well as on harmonic behavior.

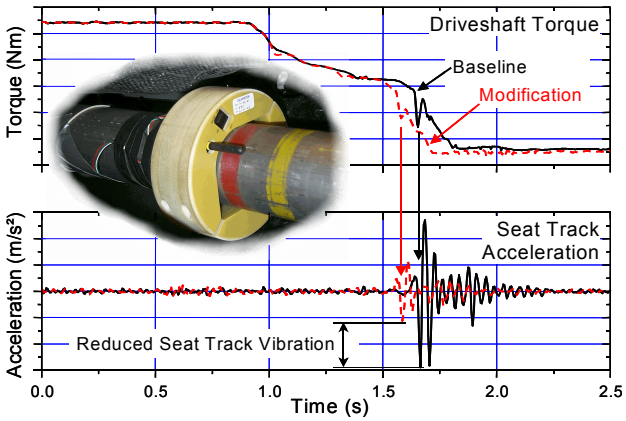

Driveline
CAE Model

CAE tools are used in the early development stage as well as in parallel with testing to quickly identify problems and provide recommendations for solutions. Besides Finite Element Analysis, FEV uses Multi Body Analysis tools to understand the mechanism behind transient and highly nonlinear problems. This includes, for example, the lash distribution in a differential/axle assembly and its influence on the response to the driveline torque excitation.

FEV is capable of performing a variety of **measurements** to support the driveline development. Techniques such as modal analysis and operation deflection shapes analysis (including suspension, frame, and body) in combination with key transient measurements are routinely used during the vehicle development process. Driveshaft torque, interior noise, and vibration can be monitored under operating conditions in a chassis roll dynamometer as well as on test tracks.

- **Target Setting and Development Support**
  - Concept definition based on benchmarking data
  - CAE and testing support
  - 2-wheel and 4-wheel/all-wheel drivelines
- **Driveline Issues**
  - Torsional and bending system resonances
  - Tip-in / Let-off shock
  - Gear rattling
  - Axle whine
- **Shift Quality**
  - Transient driveline/vehicle response caused by shift events
  - Clunk issues
  - Engine calibration

In addition to the driveline development, FEV routinely provides **troubleshooting** support. This includes developing short-term solutions as well as conducting root cause analysis to provide a cost efficient long-term solution using a systematic approach.



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