TEC INFO

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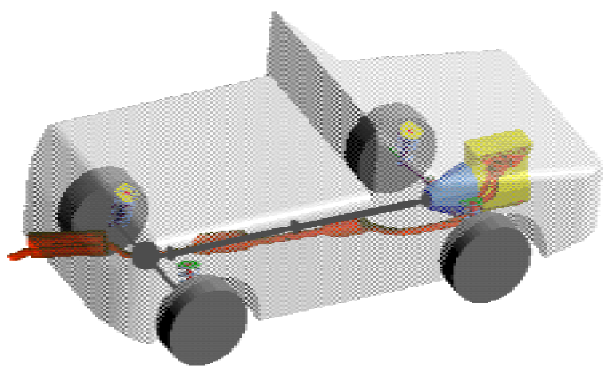
Vehicle NVH Development

Powertrain Mount Optimization

Powertrain integration is a key task, which influences the noise and vibration characteristics of the vehicle significantly. Beginning with target setting based on benchmarking and extensive development experience, FEV uses proprietary CAE and experimental methodologies to support powertrain integration. Issues such as packaging and powertrain calibration are also supported by FEV.

Powertrain mounts have to support the weight and load of the powertrain. This includes reacting the powertrain output torque, torque fluctuations, inertial forces during vehicle acceleration, and road impacts. For good vehicle NVH, the mounts should also isolate the vehicle interior from powertrain vibration and damp rigid body powertrain modes.

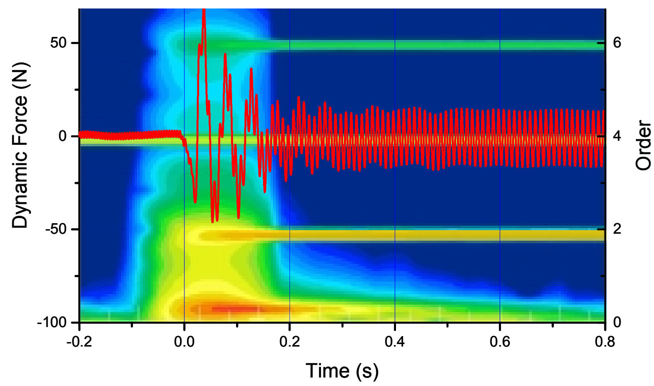
The demands on powertrain mounts are conflicting; high stiffness for load support and low stiffness for vibration isolation. Hydromounts (passive, switchable or active) can be used to satisfy the conflicting demands placed on powertrain mounts. **FEV uses advanced measurement and CAE methodologies** to optimize mount design, locations, and properties for improved static, harmonic and transient behavior.



On the **experimental** side, FEV uses tools like modal analysis, power flow analysis, and interior noise synthesis to aid the optimization of the powertrain mounting system. Typically, the measurements are performed on a vehicle chassis dynamometer to guarantee a controlled test environment.

As an example, the **Figure** above shows an engine mount force (CAE result) for a V8 engine with cylinder deactivation. The red line is the time trace of the dynamic mount force and the spectrogram shows the results of time-frequency analysis. High force levels (low frequency content) occur during the deactivation while the 2nd and 6th engine orders appear under 4-cylinder operation.

- **Mount design to meet targets**
  - Specification of mounting concept, e.g., hydromounts, switchable mounts etc
  - Optimal mount locations
  - Optimal dynamic mount properties
- **Transient vibration analysis**
  - Key-on / Key-off
  - Tip-in / Left-off shock
- **Bracket vibration optimization**
  - Target setting for bracket vibration
  - Bracket dynamic stiffness optimization
  - Interior noise share of bracket resonances



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