

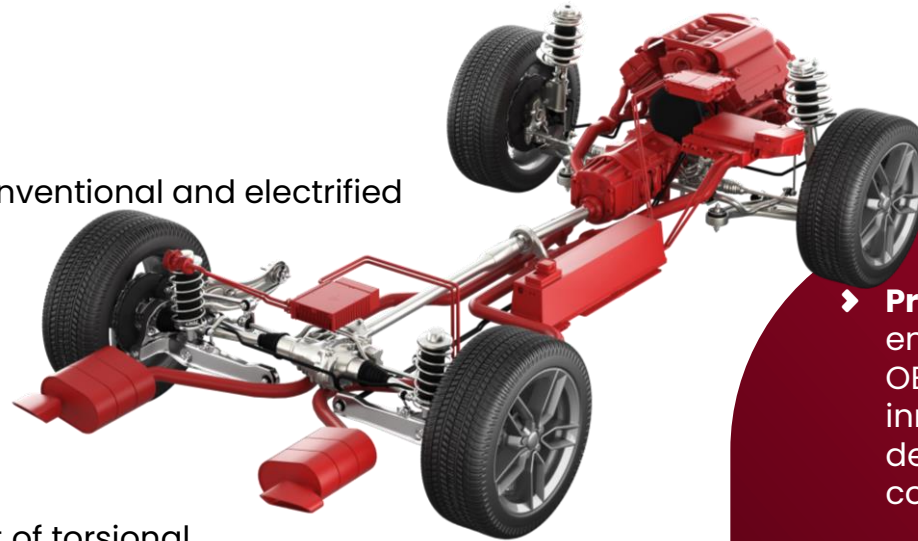
Virtual Powertrain Development

FEV SIGNATURE SOLUTIONS

Speed up and enhance your powertrain development in NVH and durability with our CAE toolchain

FEV offers

- ▶ Tailored 3D multibody simulations for conventional and electrified powertrain topologies including a wide range of hybrid and emerging concepts
- ▶ Inhouse co-simulation approach for sophisticated analysis of interaction between controls and mechanics for high quality results
- ▶ Acoustic/NVH and durability assessment of torsional vibrations and component loads under all operation conditions including engine start, shifting, speed and load ramp-up
- ▶ Automated optimization utilizing machine learning assisted system exploration to enhance controlling and design parameters
- ▶ Fast and experienced troubleshooting support to resolve acoustic or mechanical durability issues



Why FEV

- ▶ **Proven expertise:** 45+ years of automotive engineering excellence, trusted by global OEMs and Tier-X suppliers to deliver innovative, production-ready solutions with deep domain expertise in electrified and conventional powertrains
- ▶ **Complete lifecycle support:** From concept to series maturity and post-series support, including design, simulation, prototyping, testing, industrialization, and implementation
- ▶ **Customer-centric solutions:** Tailored simulation approach aligned to customer targets, constraints, and validation needs

Selected reference projects

VIRTUAL POWERTRAIN DEVELOPMENT

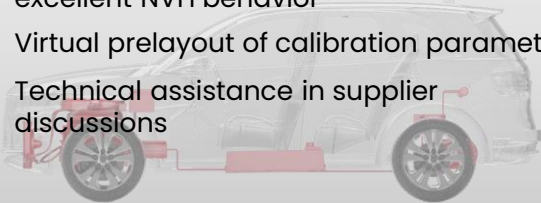
German OEM

Prototype vehicle development with ultra-low vibration hybrid powertrain

- Complete development and built-up of enhanced ultra-low vibration hybrid powertrain

FEV responsibility

- 3D flexible multibody simulation of the combined hybrid powertrain
- Virtual system parameter optimization for excellent NVH behavior
- Virtual prelayout of calibration parameters
- Technical assistance in supplier discussions



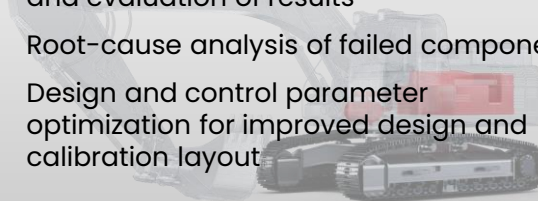
Japanese OEM

Troubleshooting of dynamic component failure

- Virtual analysis of heavy-duty hybrid powertrain under transient conditions to assess durability

FEV responsibility

- Built up of dynamic simulation model including controlling functions
- Simulation of highly dynamic load cycle and evaluation of results
- Root-cause analysis of failed component
- Design and control parameter optimization for improved design and calibration layout



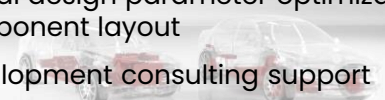
Chinese Start-up

Concept layout of range-extender hybrid powertrain

- Optimization of powertrain design parameters for dynamic operation conditions

FEV responsibility

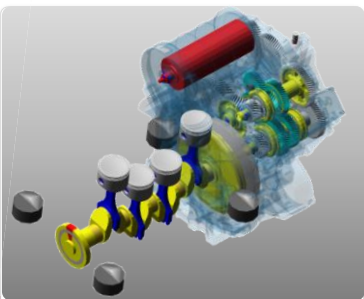
- Built-up of 3D multibody simulation model for highly dynamic boundary conditions
- Virtual design parameter optimization for component layout
- Development consulting support



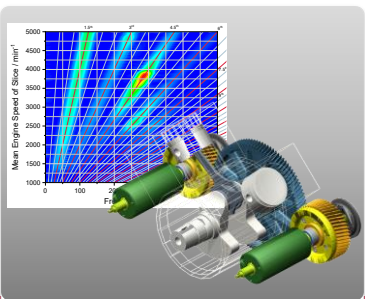
With our CAE toolchain we optimize the design of your components, component groups and complete mechanical systems



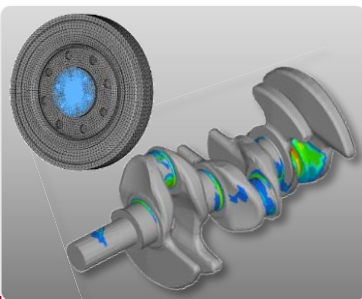
VIRTUAL POWERTRAIN DEVELOPMENT



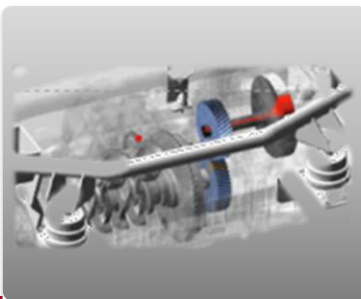
Architecture & Concept Definition



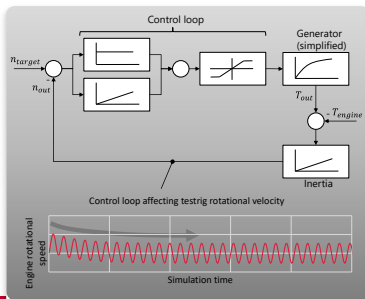
**System Analysis
Powertrain Vibration**



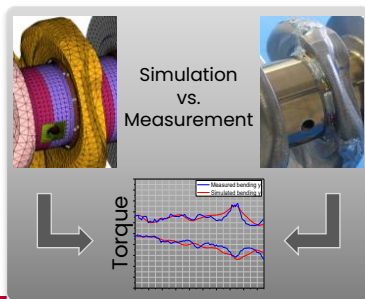
**Component Analysis
Durability**



**Optimization
(e.g., Mount Layout)**



**Control & Calibration
(e.g., ICE & EM)**

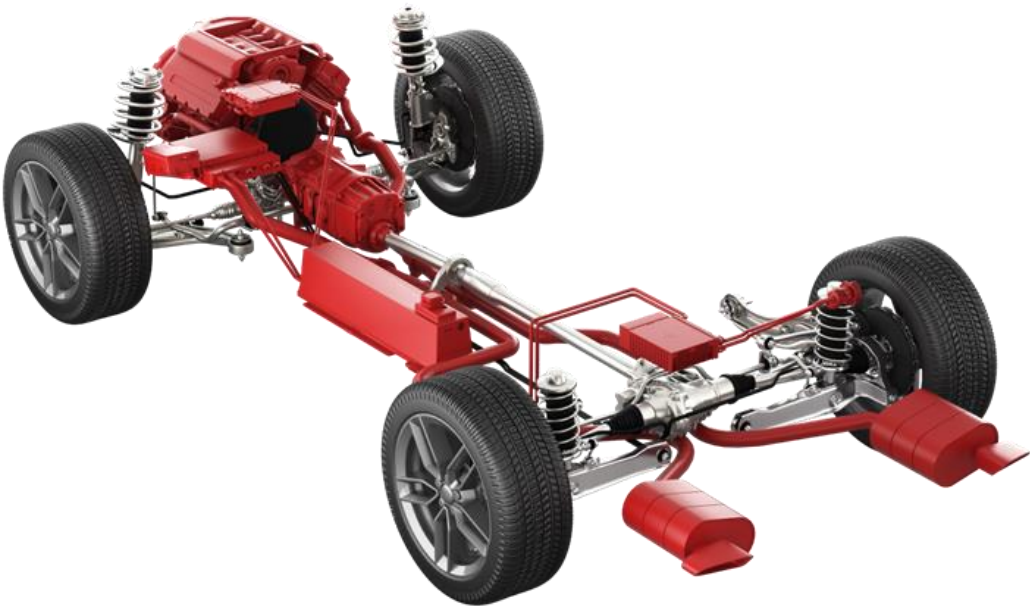


**Troubleshooting
(incl. CAE Validation)**

FEV offers independent engineering services from concept to SOP for solutions that are tailored to every application including

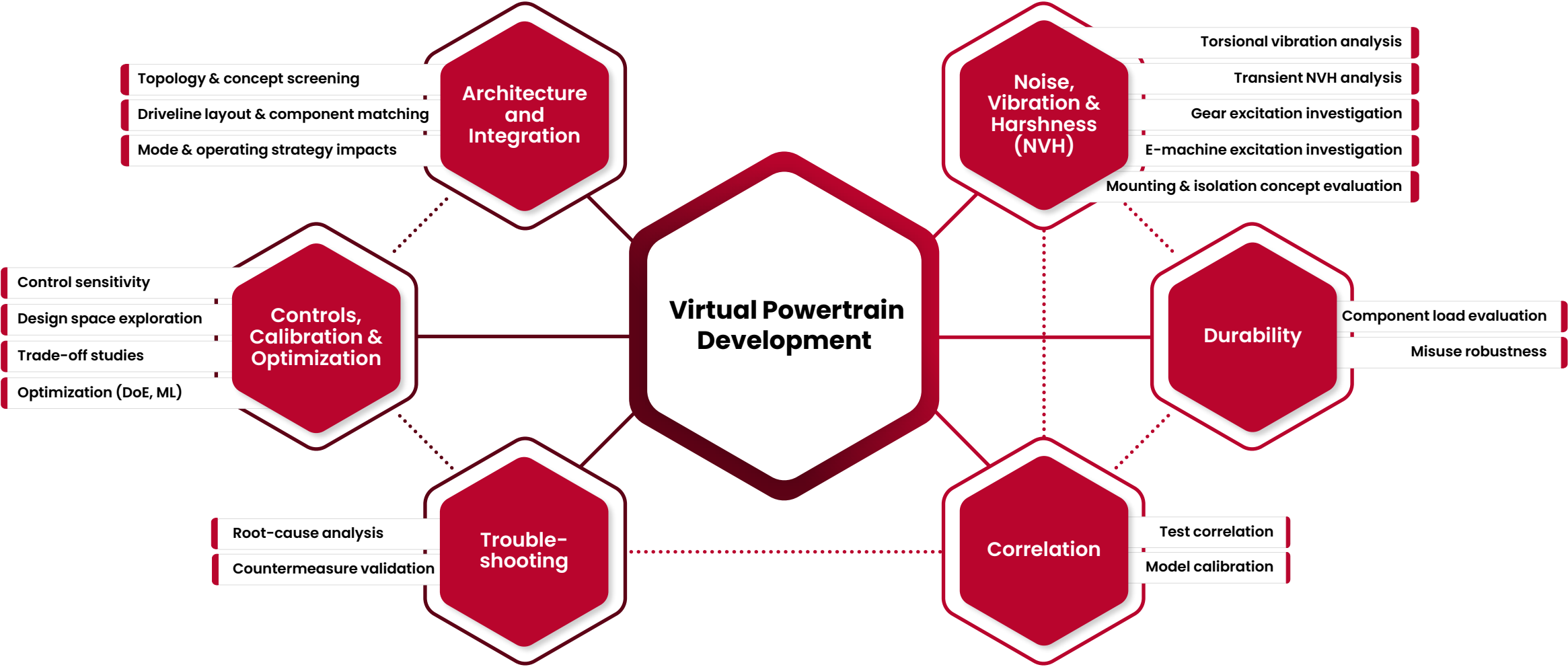


Our CAE team can support you throughout your product's entire lifecycle



Concept	Rapid and flexible virtual assessments to compare architectures and define NVH/durability targets early.
Prototype	Virtual validation and correlation with early hardware to identify root causes and guide design fixes.
Optimization	Automated parameter studies and optimization to converge design and control settings for best NVH and durability results.
SOP	Release-focused simulations to confirm robustness across operating scenarios and support final calibration and sign-off.
Series	Fast virtual troubleshooting and countermeasure development to resolve field issues and support updates.

FEV's Virtual Powertrain Development Process



Get in touch with us for further information



[www.fev.com/en/
signature-solutions](http://www.fev.com/en/signature-solutions)