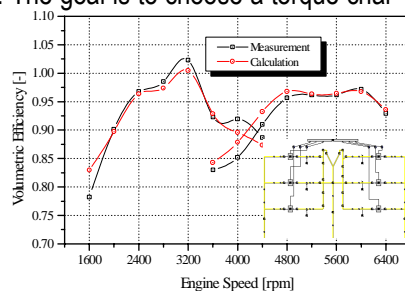


Vehicle NVH Development Air-to-Air System Refinement

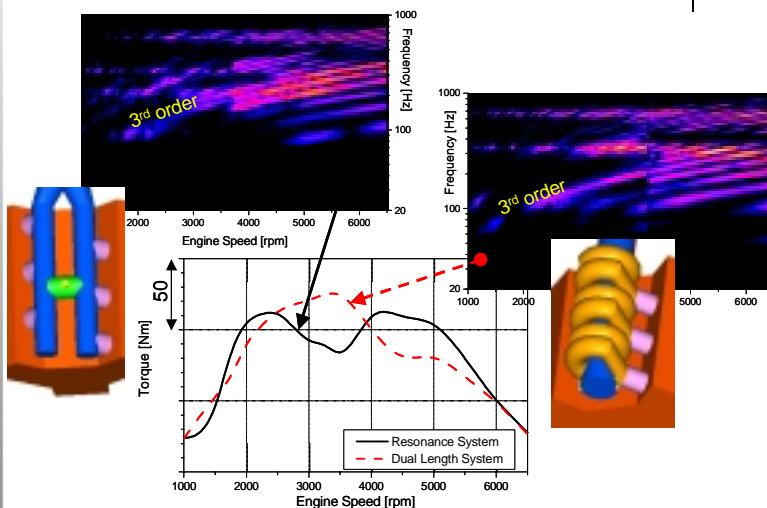
Measures for exhaust and intake noise optimization also influence the engine performance and vice versa. Therefore, an "Air-to-Air" system approach is necessary to optimize engine performance and sound quality simultaneously.

Corporate sound design is becoming increasingly important for brand differentiation and customer acceptance of today's vehicles. Specific sound targets in terms of overall noise level and order content can be obtained by modifying the intake and the exhaust system components. However, these changes can significantly influence the engine's performance.

As an example, the influence of two different intake systems (dual-length and resonator type) is shown in the following figure. Both systems have different torque and sound characteristics. The goal is to choose a torque characteristic based on engine performance targets, after which the sound characteristics can be optimized for sound quality utilizing the system approach.



The exhaust system can be optimized to increase the engine performance by carefully tuning the exhaust manifold and minimizing the backpressure. It is also an important component to tune the sound characteristics of the vehicle by adjusting pipe lengths and choosing the right concept.



■ Engine Performance

- Engine Torque Curve and Power Output
- Volumetric Efficiency and Fuel Consumption
- Boosting System Optimization
- Intake and Exhaust Manifolds Tuning
- EGR Strategy Study

■ Intake and Exhaust System Noise

- Overall Noise Level
- Order Content (Corporate Sound Design)
- Muffler and Resonator Volume
- Backpressure
- Cross-Over Pipes

FEV uses Air-to-Air System Refinement to carefully balance

- Engine performance and sound characteristics
- Overall levels and engine order content of vehicle noise
- Airborne noise share of intake and exhaust systems

Using this CAE system approach helps to improve the first prototype as well as fine-tuning after the first measurements are performed.

This methodology can be combined with FEV's interior noise simulation to get a fingerprint of the vehicle's interior noise.

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