

Brake Grind Noise Reduction Potential on Vehicle Level – a TPA study

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Rust accumulated on disc rotor surfaces causes brake judder and excessive grind noise. This low frequency noise phenomenon is audible especially at low vehicle speed without masking from other noise sources like wind and road noise or power train sound. This often leads to customer complaints resulting in significant warranty costs. Alternative drive systems like hybrid or full electric power trains will emphasize this problem.

Most studies concentrate on optimization of the brake system to reduce low frequency brake noise. In this work, also the potential for optimization on vehicle level was investigated. The most effective NVH optimization can be achieved by improving and matching the acoustic properties of the vehicle and the brake system.

In a first step, the main structure borne noise transfer paths have been identified by means of transfer path analysis. A detailed analysis of the relevant transfer paths shows critical sound transmission of the suspension system and its attachments to the vehicle body. The potential of this approach for brake noise optimization is demonstrated by an example.

As a second step, the radiating body surfaces contributing to the perceived brake noise have been identified using panel contribution analysis. This helps optimizing the vehicle body structure and trim package. The potential for improvements has been predicted virtually using a modified interior noise synthesis model. The results have been verified experimentally by principal modifications to the vehicle.

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