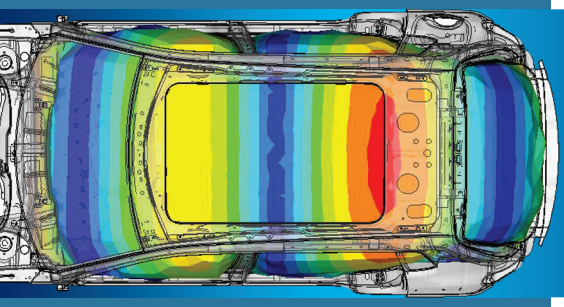
ROUSH®



CAE: Case Studies

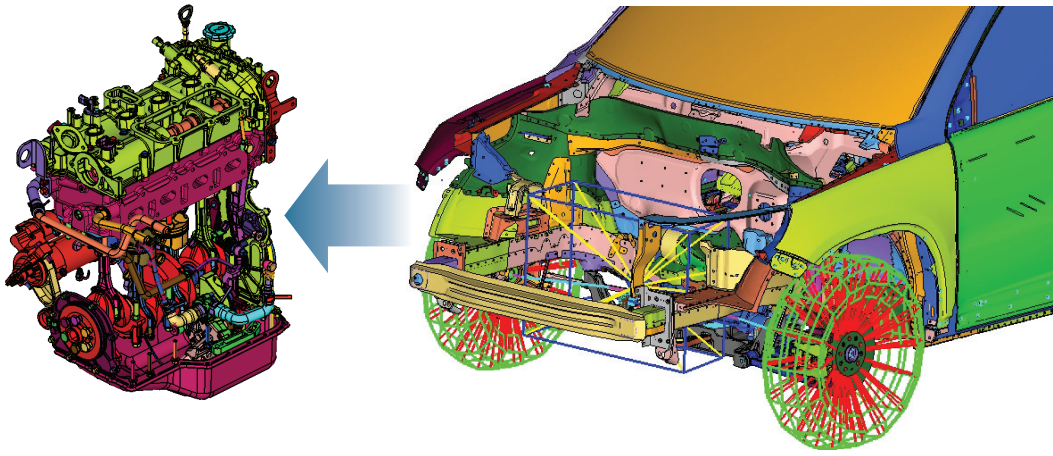
Noise and Vibration Engineering

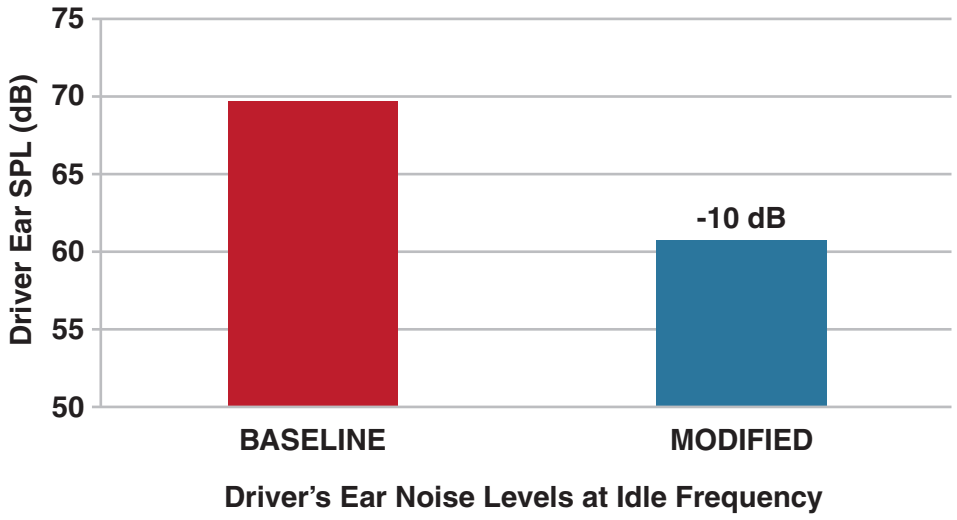
We have one goal — improving the noise and vibration quality of our customers' products. Roush delivers innovative, effective noise and vibration control solutions. By combining advanced analysis capabilities, comprehensive engineering services, and state-of-the-art facilities, Roush has become a proven partner in identifying and resolving challenging noise and vibration issues. Backed by the diverse capabilities of the Roush family of companies, we are uniquely equipped to provide turnkey noise and vibration solutions.

Roush... your silent partner in developing smoother, quieter products.

Improving Engine Idle Noise Levels for a Small SUV

When analytical load data is unavailable, engine mount acceleration data is frequently used as input in full vehicle CAE models. In the example outlined below, Higher Sound Pressure Level (SPL) was identified at driver's ear in engine idle simulations. Structural changes were devised in the CAE model to change the local front end and global torsion modes which led to a reduction in SPL at driver's ear by 10 dB at idle frequency. All the changes were validated in the physical vehicle.



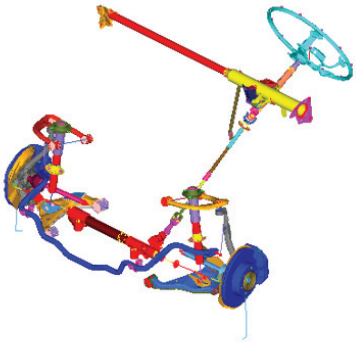


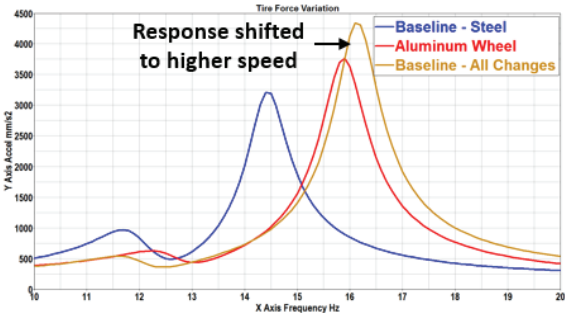
Driver's Ear Noise Levels at Idle Frequency

We're ***focused, efficient*** *and we* ***deliver.***

Root Causing Steering Wheel Nibble in a Pick Up Truck

Nibble phenomenon was captured in the FEA and MBD models. Multiple solutions were provided to the customer. Testing was conducted on the vehicle and the final recommendation and results were verified. Trade off studies were done to ensure the ride and handling attributes were not negatively affected.

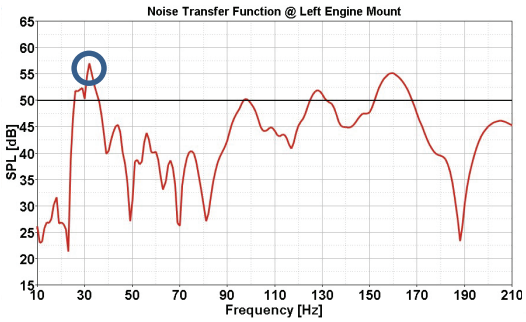


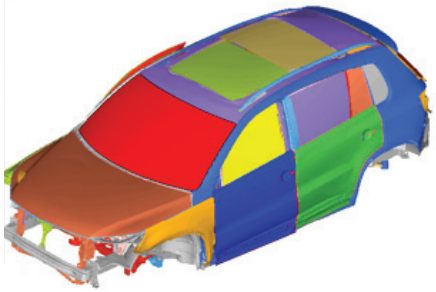


Baseline Response and Iterations to Reduce Nibble Response

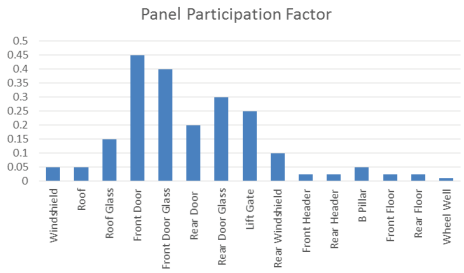
Reducing Panel Participation and Equivalent Radiated Power

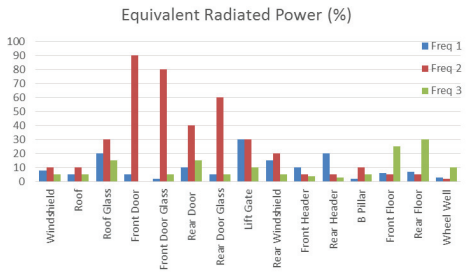
Panel Participation Factor and Equivalent Radiated Power were used to find the contributions of the panels to vibration and noise response at critical frequencies. Based on sensitivity studies, only specific panels were targeted for design changes.





Panel Participation Factors and Equivalent Radiated Power of Various Panels





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