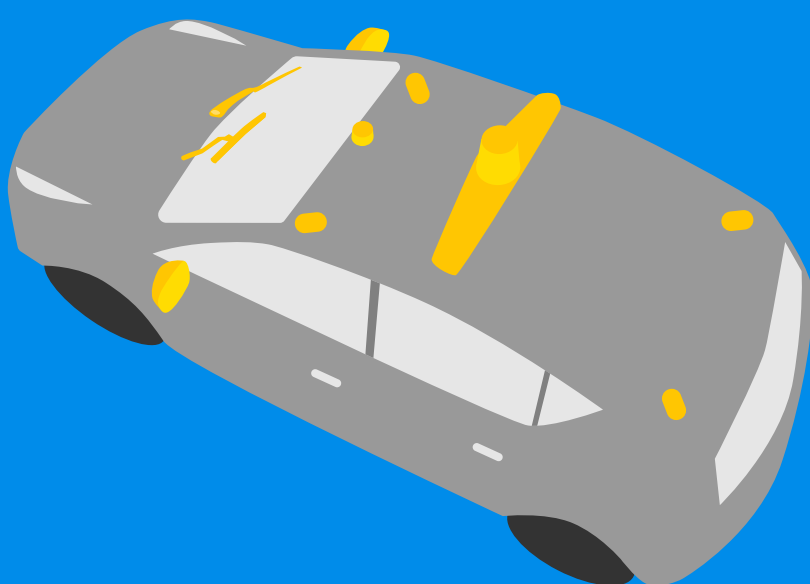


REDUCING AUTOMOTIVE NOISE FOR A QUIET AND COMFORTABLE RIDE



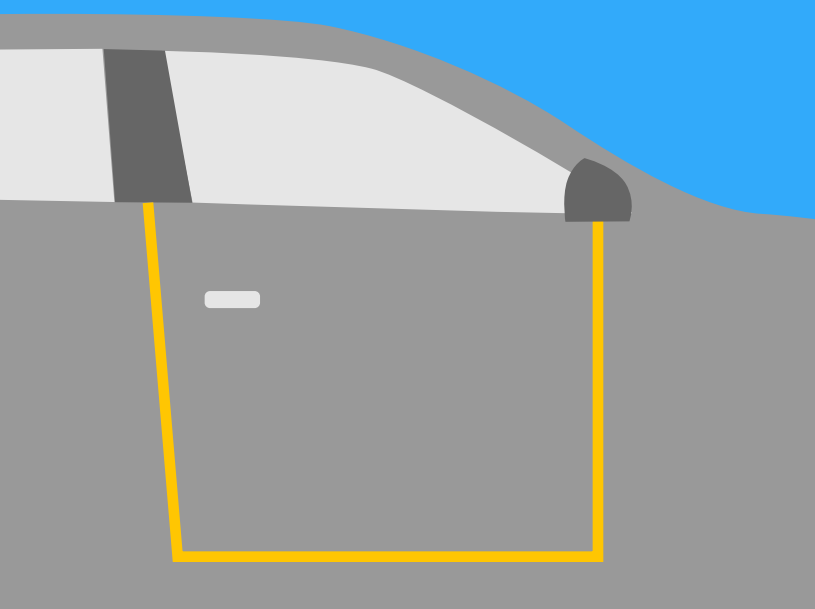
Greenhouse Wind Noise

Vehicles are designed in wind conditions that are very unlikely on the road, often leading to sub-par on-road performance. Simulation allows engineers to design and optimize shapes for real on-road conditions, leading to better noise mitigation and passenger comfort.



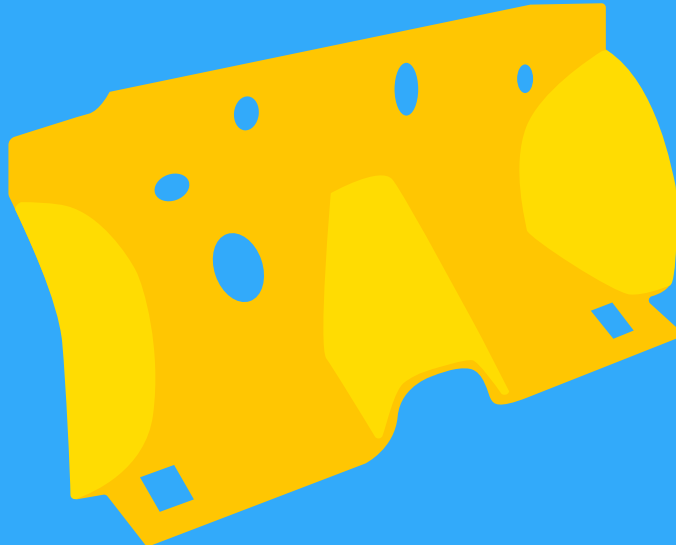
Component Wind Noise

Component wind noise is greatly affected by interactions between component and vehicle shapes. Screening designs early through simulation can help identify and fix issues, optimizing these shapes for better noise performance before the design is frozen.



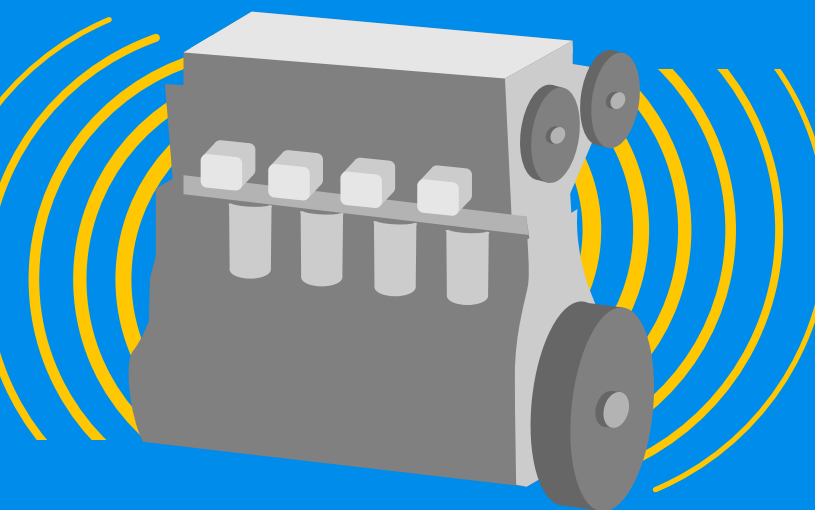
Gap/Seal Noise

Simulation allows early assessment of design impact on seals so shape changes can move noise sources away from the seals. Solutions also include multi-layer seal selection for regions near high noise sources. Assessment of different sealing strategies before tooling enables proper design the first time.



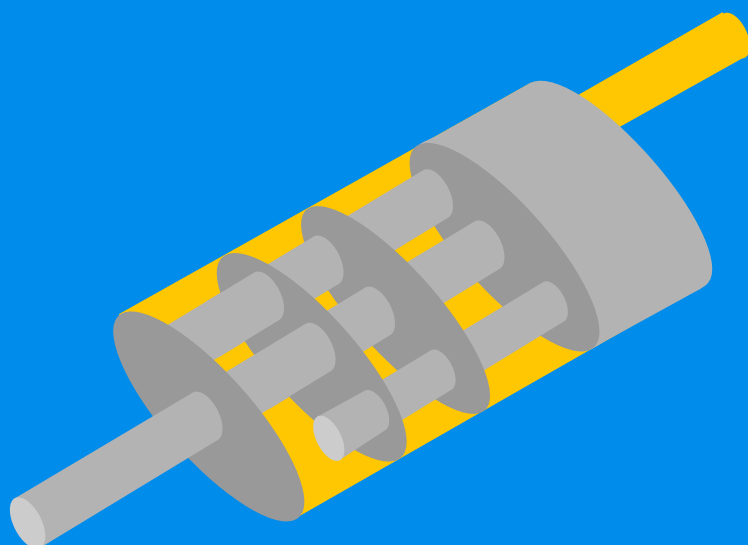
Sound Package Optimization

Optimal sound package design reduces noise inside the cabin, reduces weight and improves fuel economy. Designing for these features requires a strong understanding of the loads and noise paths needed in order to engineer a pleasant and economical driving experience.



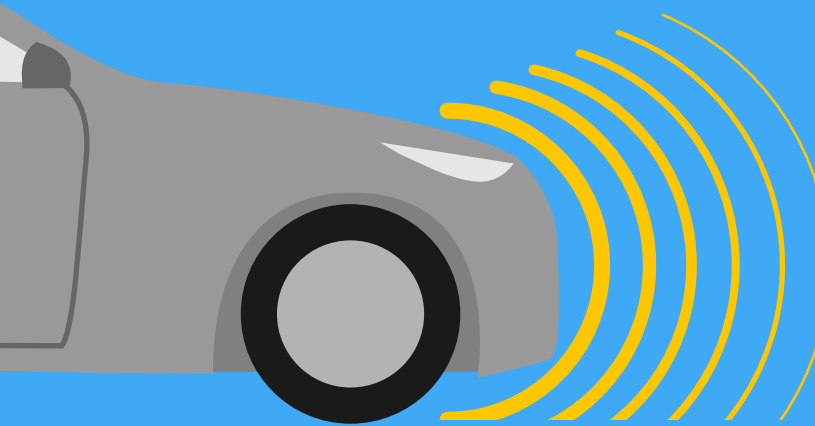
Engine Radiated Noise

Engine radiated noise is managed by the overall sound package design, and is one of the major contributors to general noise within a vehicle. These sounds have some benefit, however, by masking other noises, which become more audible in electric vehicles.



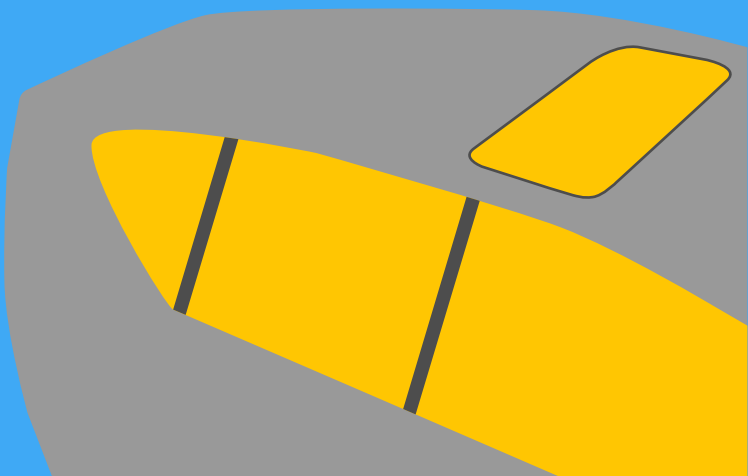
Exhaust Noise

Challenges include difficulty in replicating performance at vehicle-installed conditions during subsystem tests, and vehicle prototypes that are not available until late in the development process. SIMULIA's solutions can identify and fix shell noise and flow noise issues to ensure that noise targets are met.



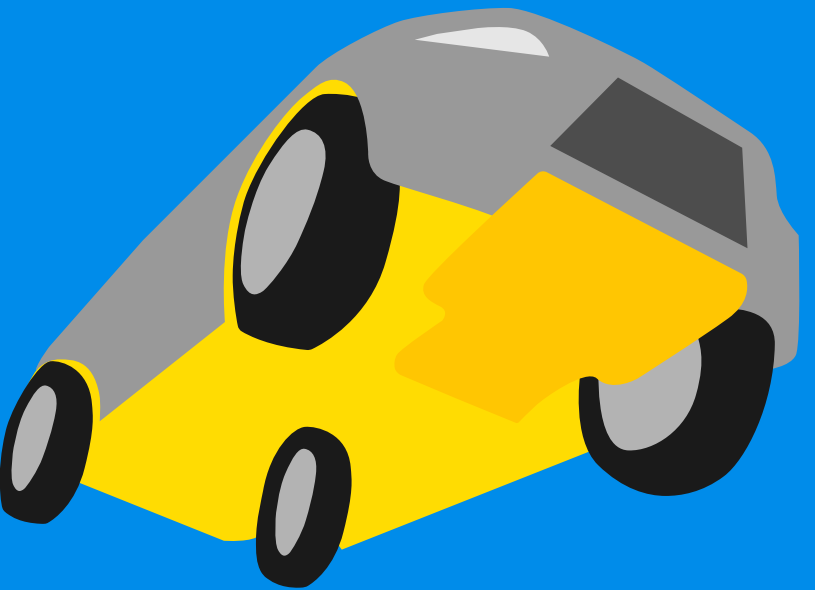
Cooling Fan Noise

Thermal and acoustic requirements compete, particularly in electric vehicles which require fan airflow to cool their batteries and other electronic components. Simulation allows engineers to evaluate and optimize different cooling package and installation options for EV range & passenger comfort.



Sunroof and Side Window Buffeting

This noise issue cannot be reliably assessed in early stage prototypes, and is difficult to fix without affecting other attributes. SIMULIA's solutions can digitally screen designs for buffeting early in the design process and help design sunroofs, deflectors and mirrors to reduce the problem.



Underbody Wind Noise

Underbody noise issues may not be identified until late in the design process, unless they are screened early through simulation. Simulation tools enable the identification of noise paths and the optimization of sound package to reduce noise transmission.



HVAC: Regulating Temperature While Reducing Noise

HVAC systems are vital in keeping vehicles cool in hot weather, or warm in cold weather. They are complex systems that naturally produce noise, but SIMULIA's HVAC solutions effectively simulate the HVAC system's complex details to predict and mitigate noise without compromising temperature for a quiet and comfortable ride.

\$1M
per prototype eliminated

3dB
reduction from early stage changes

2days
turn-around time