

POWERFLOW FOR PANEL DEFORMATION



3DEXPERIENCE®

1. Optimizing Quality Through Simulation

To maximize fuel efficiency and performance, vehicles are designed with minimum weight, which can reduce the cost of parts and directly reduces the engine power required for vehicle acceleration. However, the reduction of material from structural parts and body panels leads to reduced stiffness and increases the susceptibility of the parts to vibration, which might transmit noise to the vehicle interior. These vibrations can occur due to dynamic loads produced by the vehicle's aerodynamics. Reduced stiffness can also cause panels to deform under static loading conditions and might lead to air leakage through door and window seals, which creates significant internal noise transmission to the vehicle interior. Static load conditions can occur due to aerodynamic load distributions under normal driving conditions or under strong crosswind.

Technical Challenges

It is challenging for vehicle engineers to meet structural requirements while avoiding vibration and panel deformation due to the unique coupling of structural performance with aerodynamic loading. Typically, testing for panel deformation occurs very late in the design process, using fully detailed prototypes. Wind tunnel tests can show static loading conditions, but cannot replicate the transient onset conditions found on the road. Only road tests can detect some panel vibration failures.

Early in the design process, structural requirements are usually met by overdesigning parts, retaining more part weight, and leading to greater parts cost. Door mounts and seals are designed to retain seal contact with the frame. The cost of missing some vibration or door seal problems can be high, because correcting for structural stiffness problems late in the design process greatly increases the cost of retooling and parts.

SIMULIA Solution

PowerFLOW is inherently transient, easily and accurately predicting surface pressure fluctuations that cause vibrations and static loads, thus providing a predictive capability to address panel deformation problems. Static and transient loads are coupled with your choice of structural solver to compute vibration, static deformation, and seal performance.