

Actran helps Dura Automotive Systems evaluate spare tire tub's NVH performance



The simulation using Actran helped to identify weak regions for the hybrid tub and make necessary design modifications to accomplish an equivalent base tire tub.

DURA Automotive Systems is a global automotive supplier specializing in the design, engineering, and manufacturing of solutions that drive the evolution of mobility.

With a legacy of over 100 years, the company is widely recognised by leading vehicle manufacturers as the preferred supplier partner for innovative, highly integrated, mechatronic systems, and lightweight solutions. DURA is inspired to play a significant role in the evolution of mobility focusing on adoption of disruptive technologies to enable superior performances and value creation for new vehicle architectures.

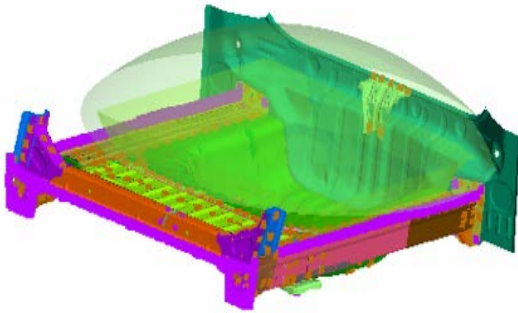


Figure 1: Spare tire tub base design

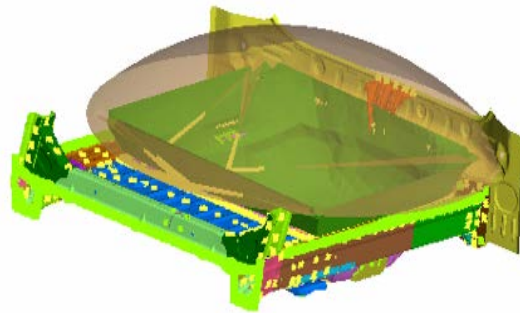


Figure 2: Lightweight hybrid tub

Challenge

For one of its projects, the requirement was to reduce the weight of a vehicle to facilitate better performance. With vehicle OEMs focusing on electrification, light weighting is becoming a primary objective in vehicle design. The Dura Auto team planned to achieve this by replacing the vehicle's existing tire tub with a hybrid tub. However, when the material of the panel was changed, its acoustic performance deteriorated. The team noticed more noise from the road/tire was being generated inside the car cabin through the tire tub panel. The challenge was to ensure that this deterioration was within the prescribed limits.

Solution

MSC Software helped Dura Auto team create a simulation model that would help compare the acoustic transmission loss for the base and hybrid version using Actran. Dura Auto team provided the Finite Element models of the hybrid tubs in MSC Nastran format. Using these models, Actran Vibro-acoustics models consisting of structure coupled to the surrounding air cavities were built to study the sound transmission loss, i.e., the acoustic insulation efficiency of the component. Transmission loss is the logarithmic representation of power ratio where,

$$TL = 10 \cdot \log_{10}(1/\tau) \quad [dB]$$

$$\text{with } \tau(\omega) = \frac{\overline{W}_{transmitted}}{\overline{W}_{incident}}$$

A diffused sound field boundary condition was applied as excitation on the bottom face of both the tire tubs. Infinite elements were used on the other end of the cavity to represent non-reflecting boundary conditions. Incident power was computed on the bottom face of tube & radiated power was computed over the infinite element surface. Then transmission losses by taking the ratio of incident & radiated power for both the configurations. Based on the transmission loss comparison ribbing pattern for the hybrid configuration was modified to improve acoustic performance.

Key highlights:

Product: Actran

Industry: Automotive

Benefits: Actran helps Dura Auto to evaluate effect of different materials on spare tire tub's NVH performance

Benefits

The simulation using Actran helped to identify weak regions for the hybrid tub and make necessary design modifications to accomplish an equivalent base tire tub.

Since the design changes were determined using simulation as opposed to physical experimentation, it resulted in considerable savings in cost and time.

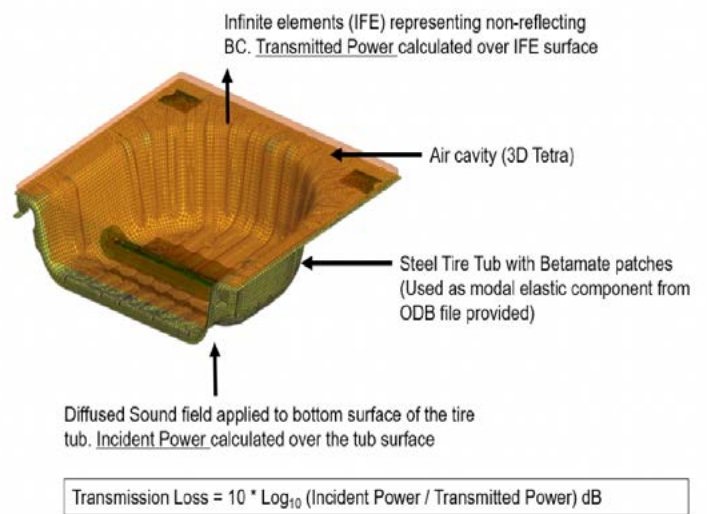


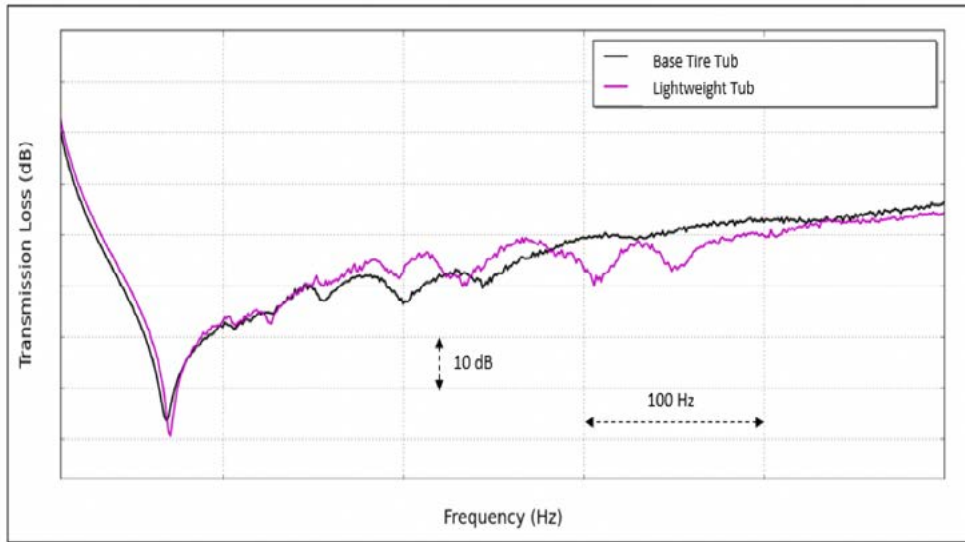
Figure 3: Spare tire tub Dura Lightweight Hybrid Design



Base Tire Tub



Lightweight Tub





Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

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