

## Michigan Engineering Services, LLC Top Use Cases

Energy Finite Element Analysis by MES



Altair

Partner Alliance

# AUTOMOTIVE APPLICATION – INTERIOR NOISE DUE TO EXTERNAL ACOUSTIC SOURCES

## Challenge

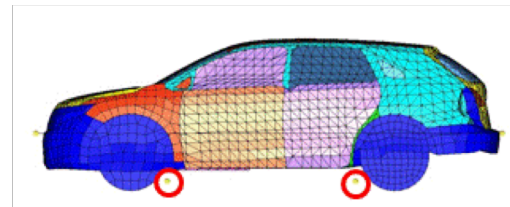
- Compute the noise generated inside a vehicle from external noise sources (i.e. engine, transmission, etc.) over a wide frequency range 200Hz – 10 KHz.

## Solution

- Use the Energy Finite Element Analysis (EFEA) to model the vehicle, the interior acoustic space, along with acoustic, mass, and damping treatments used.

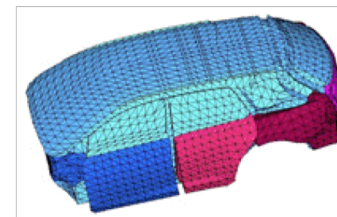
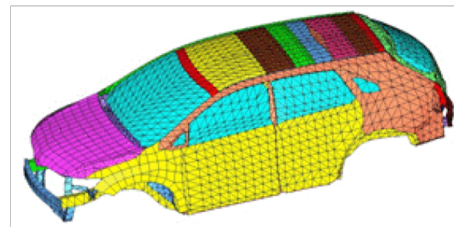
## Results

- Compute the interior noise levels and the most effective utilization of treatment.

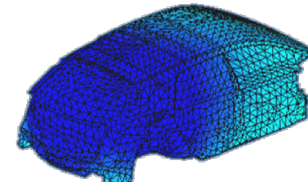
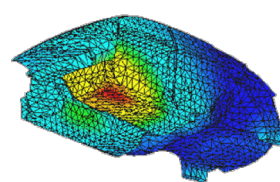


EFEA Vehicle Model

Interior Acoustic Models



Interior SPL due noise source at the front left tire, 1,000Hz



# AIRCRAFT APPLICATION – INTERIOR NOISE DUE TO EXTERNAL SOURCES

## Challenge

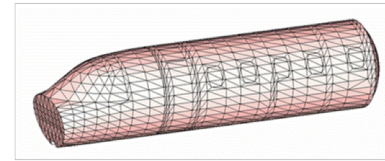
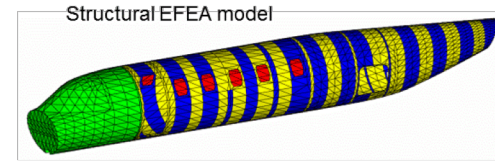
- Assess the noise inside an aircraft that gets generated from sources such as: motors, engines, air flow, etc.

## Solution

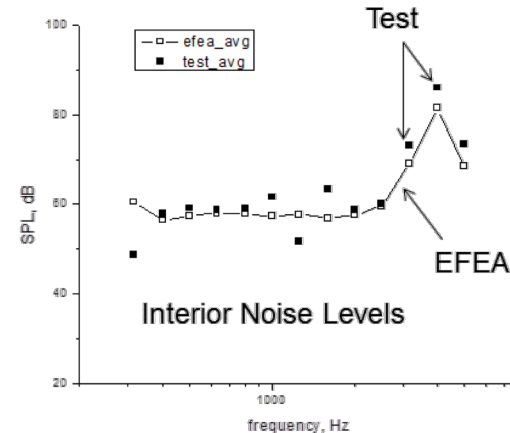
- Use the Energy Finite Element Analysis (EFEA) for modeling the structure, the interior acoustic spaces, the acoustic treatment, and the structural damping. Consider the excitation and compute the induced vibration and the interior noise levels.

## Results

- Interior noise predictions compare well to test data. Composite or metal structures can be analyzed. The placement and the selection of the treatment can be optimized for minimum weight.



Acoustic EFEA model



# NOISE RADIATED FROM A COPY MACHINE

## Challenge

- Compute the noise emitted in the field from a copy machine due to the operating interior components (i.e. motors, rotors, etc.) in the 200Hz – 10kHz frequency range.

## Solution

- Use the Energy Finite Element Method (EFEA) to compute the interior noise and the structural vibration on the outer surface. Use the Energy Boundary Element Analysis (EBEA) to compute the radiated noise from the vibration of the outer surface.

## Results

- Evaluate the Noise Reduction (NR) (difference between interior and exterior noise); the higher the NR the better the performance. Identify the main paths transmitting the noise to the exterior and increase the NR.

