

Numerical Modeling on the Vehicle Interior Noise Produced by Rain-the-Roof Excitation

Authors : Zilong Peng, Jun Fan

Abstract : With the improvement of the living standards, the requirement on the acoustic comfort of the vehicle interior environment is becoming higher. The rain-the-roof producing interior noise is a common phenomenon for the vehicle, which usually discourages the conversation, especially for the heavy rain. This paper presents some numerical results about the rain-the-roof noise. The impact of each water drop is modeled as a short pulse, and the excitation locations on the roof are generated randomly. The vehicle body is simplified to a box closed with some certain-thickness shells. According to the main frequency components of the rain excitation, the analyzing frequency range is divided as low, high and middle frequency domains, which makes the vehicle body are modeled using finite element method (FEM), statistical energy analysis (SEA) and hybrid FE-SEA method, respectively. Furthermore, the effect of spatial distribution density and size of the rain on the sound pressure level are also discussed. These results may provide a guide for designing a more silent vehicle in the special weather.

Keywords : rain-the-roof noise, vehicle, finite element method, statistical energy analysis

Conference Title : ICAME 2018 : International Conference on Automotive and Mechanical Engineering

Conference Location : New York, United States

Conference Dates : June 03-04, 2018