NAFEMS UK Regional Conference 2018 - Abstract Submission

Submission Date	2018-02-02 12:46:35
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Please identify the event for which your submitting?	NAFEMS UK Conference 2018
Will you be the presenting author?	Yes
Presentation Title	An Integrated Overview for Aero-acoustic Testing in Automotive Design
Relevant Themes / Keywords	Environmental, NVH, Aero-acoustic, CFD, 3D Acoustic, Acoustic Camera

Abstract (plain text)	To address the increasing demand for vehicles with advance technologies and environmental performances, manufactures are working towards attaining better vehicle designs whilst speeding up the design process and keeping the total investment cost at a reasonable level. However, engineers and researchers are continuously being confronted with the challenges involved in understanding and predicting the Noise, Vibration and Harshness (NVH) performances. Aside from reducing the noise and vibration problems experienced by components (engine, gearbox and exhaust) of a vehicle, current regulations have made the reduction of other noise sources such as aero-acoustic and aerodynamically generated noise a priority for vehicle manufacturers. Till date, Computational Fluid Dynamics (CFD) methods are often used to model and gain useful insight into the reduction of aero-acoustic and other flow-induced noise. Nonetheless, verifying and validating these computational models with experimental results is still of major importance. Hence, the investment in aero-acoustic wind tunnels is increasing. Whilst a wind tunnel can provide capabilities for the isolation of wind noise from other noise sources and testing the vehicle under the required wind conditions, the cost of constructing and operating a wind tunnel is very expensive, limited and often not affordable. As a result, there is a need to develop more advanced and cost efficient aero-acoustic testing approaches and technologies, where more detailed information can be acquired from a single test campaign, more data can be provided to the simulation team for design validation and most importantly noise sources can be detected and eliminated in the early design stage. This presentation gives an integrated approach to aero-acoustic testing in an automotive application. It provides an overview of all measurement technologies that are required to gain useful insight into the aero-acoustic properties of a vehicle design. The proposed testing approach is divided into two parts namely external pressure loading identification and interior noise localisation. The presentation will also demonstrate the process of obtaining sound pressure information around the vehicle surface using latest technology equipment and most importantly how these measurement can be useful for correlation with CFD models. In addition, the use of 3D acoustic camera to identify and localise noise sources around a vehicle will be illustrated with the advantage how simulation teams can such information for comparison of different vehicle configuration. Finally, the presentation will emphasise the importance of combining these technologies together within one integrated solution to create additional value most especially at the early design stage.
abstract id	UK18-42