EDITORIAL

Automotive NVH: A Vibrant Research Area

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Welcome to the inter•noise 2002 issue of *Sound & Vibration*. This is the 31st International Congress and Exposition on Noise Control Engineering, and it will be held in Dearborn, MI, on August 19-21, 2002, www.internoise2002.org. Sponsored by the International Institute of Noise Control Engineering, it is being organized by the Institute of Noise Control Engineering of the USA (INCE/USA) and The Ohio State University's Center for Automotive Research (CAR) in cooperation with SAE International, the Canadian Acoustical Association, and *Sound & Vibration* magazine. The inter•noise 2002 secretariat is at The Ohio State University. Moreover, I serve as the Congress' President. (Yes, I do wear several hats and, as usual, it takes a village to organize such an event.)

Automotive Noise, Vibration and Harshness (NVH) has become a vibrant area for basic and applied research. It remains a fertile ground for developing new and innovative methods, products and materials. I will introduce some aspects of the problem and then invite you to join us at inter•noise 2002 for an in-depth presentation and discussion of many specialized topics.

The automotive noise, vibration and harshness technology has changed considerably over the last decade. Based on my research and teaching activities in this area, I have seen the development of new analytical and experimental paradigms that may begin to explain some of the complexities observed in real-life problems. Often, NVH phenomena are closely tied to mechanical or vehicle design, manufacturing, material, performance and economic as well as subjective human considerations. Consequently, essential concepts of mechanical or vehicle system dynamics, vibrations and nonlinear dynamics, structural acoustics and aero-acoustics, digital signal processing and control, and psychoacoustics must be understood and integrated in diagnosing and solving contemporary problems in the NVH field.

Today, very elaborate experimental facilities are needed and, in fact, most corporations are investing tens of millions of dollars in new instrumentation and idealized acoustic rooms. One automotive company recently built a new laboratory facility (at a cost of over 100 million dollars) where the noise pass-by test may be performed indoors. Another firm developed a new and unmatched driveline NVH facility, at a cost of about 10 million dollars. Additionally, there is strong demand for mathematical simulation models, mathematical methods and computer-aided engineering tools that may predict the dynamic and acoustic behavior of vehicle components and systems. R&D activities are being driven by the ultimate need to reduce the vehicle developmental time, as well as costs incurred in producing prototypes. Nonetheless, there remains a strong demand to understand the basic noise sources and airborne or structure-borne paths. In fact, the automotive area seems to be attracting some of the best and brightest people and many important and difficult problems are being addressed by a variety of researchers from industry, consulting companies, universities and software manufacturers, often working together.

This special issue presents a glimpse of some vehicle NVH problems via four articles. Three of these were first presented at the 2001 SAE Noise and Vibration conference, a very well attended meeting. The fourth one by Singh, et. al., will be presented at inter•noise 2002 this August. The first article by Genuit and Bray proposes a concurrent engineering approach that is based on a virtual car concept. It would allow engineers to feel or hear the results of noise and vibration control solutions. However, it implies that we must understand the multiple path problems. Then, Gérard, et. al., outlines an efficient method of calculating sound radiation from vibrating structures, based on the modal acoustic transfer vector approach. Subsequently, Schroeder presents a semi-empirical method to calculate the sound pressures within a cab of a heavy duty truck. Finally, Singh, et. al., discuss the dynamic response of hydraulic engine mounts to step or pulse inputs. Analytical and experimental studies clearly illustrate the nonlinear behavior of the device. More work is needed to fully grasp the transient responses of powertrains supported by one or more hydraulic mounts.

The theme of inter•noise 2002 is Transportation Noise as it relates to automobiles, trucks, motorcycles, off-road vehicles, trains, aircraft and recreational vehicles. Special sessions on the following vehicle NVH issues have been developed: brake noise, powertrain noise, gear & driveline noise, motorcycle noise, squeak & rattle, tire noise, tire-road interaction; damping materials, acoustic materials, mufflers & silencers, mounts & shock absorbers; boundary elements, computational methods in structural acoustics, mid-frequency range vibro-acoustic methods, sea application to vehicle noise control; acoustic facilities, vehicle measurements, exterior and interior facilities for pass-by noise, localization of sources using intensity and NAH type methods; sound quality & perception, and sound & vibration comfort in vehicles. Technical papers cover other important areas of noise control engineering: aircraft noise, railroad noise, product noise emissions, classroom acoustics, sound insulation of buildings against transportation noise, community noise, environmental noise criteria and a national (U.S.) noise policy. Over 420 papers have been accepted for presentation at inter•noise 2002. There will also be a state of the art exposition with over 50 booths showing products and services for NVH control.

Finally, I would like to invite you to join us at inter•noise 2002, meet your colleagues and make some new friends.

More information on inter•noise 2002 is available at website www.internoise2002.org.

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