

Preface

The constant pressure towards the realization of environmentally friendly “green” vehicles is dramatically changing vehicle concepts and architectures. Examples are the growing importance of lightweight materials, the downsizing of internal combustion engines, and the introduction of more advanced after-treatment and combustion strategies including the use of alternative fuels and control strategies like “idle stop.” We are witnessing continuous evolutions in automotive transmission technology characterized by a steadily increasing number of gear ratios combined with reduction of friction losses and dual clutch technology. And of course there is the “revolution” of alternative propulsion systems including pure electric (BEV) applications, gasoline or diesel-based hybrids (HEV), and plug-in hybrids (PHEV), each of them featuring many possible architectures and introducing new components like electric motors, power electronics modules, batteries, regenerative braking technology, integrated starter generator technology and additional gearsets.

This new scenario poses overwhelming challenges to the Noise, Vibration, Harshness (NVH) engineers, who are faced with systems of exponentially growing complexity exhibiting new multidisciplinary features with huge impact on NVH performances. Still, apart from being price-wise competitive, these new cars must also be appealing and meet the customers’ taste and expectations with respect to comfort, fun to drive, and brand sound signature. There is consequently a growing demand for more advanced numerical prediction tools which can further support the NVH engineers during the concept and development phases of new vehicle design projects. Along with these powerful numerical tools, experimental analysis and diagnostics remain of paramount importance for a successful vehicle optimization.

The topics within the field of vehicle NVH are so numerous and diverse that it is practically impossible to give a complete survey within the framework of this book. In the next chapters a few selected topics will consequently be presented, which, although far from exhaustive, give a flavor of the diversity and complexity of the problems and solutions which characterize the field of vehicle NVH.

This book is structured into seven chapters, each of them authored by NVH experts from automotive industry and academia. These seven chapters are composed to give profound insights into many current vehicle development topics in the field of NVH. They focus on aeroacoustics, acoustics of geared systems, noise characterization and reduction of downsized engines, noise of electrified powertrains, lightweight exhaust systems and a substructuring method allowing to account for the dynamic interaction between the car body structure, the poroelastic trim material, and the interior cavity.

The topics addressed in the book also reflect the predominant trends in vehicle development towards reducing the number of hardware prototypes and “front-loading” by means of numerical simulation and enhanced physical component testing.

The majority of chapter contributions for this book are based on scientific papers presented at the 8th International Styrian Noise, Vibration, Harshness Congress (ISNVH 2014) in Graz, Austria and have been extended and refined for this book recently. The ISNVH congress itself is organized by VIRTUAL VEHICLE Research Center in cooperation with SAE International and supported by Magna Steyr and AVL List. The next ISNVH congress will be held from June 22 to 24, 2016 in Graz.

All paper contributions for the ISNVH congress and many more technical papers in the field of automotive NVH are published with SAE International and are available online from SAE International.

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Anton Fuchs
Eugenius Nijman
Hans-Herwig Priebsch

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Fuchs, A.; Nijman, E.; Pribsch, H.-H. (Eds.)

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