講演番号 139 文献番号 20225139

Tire Test Stand Measurements for Blocked Forces Identification and Tire Noise Auralization

Rabah Hadjit[1)] **Markus Brandstetter**[2)] **Athanasios Poulos**[2)] **Bret Engels**[1)] **Yumiko Sakamoto**[3)]

1) HBK North America Inc.
6855 Commerce Blvd, Canton, MI 48187, USA email (rabah.hadjit@hbkworld.com)
2) Hexagon
9 rue Emile Francqui, 1435, Mont-Saint-Guibert, Belgium
3) HBK - Hottinger Bruel & Kjaer Division of Spectris Co., Ltd
Nichitochi Kameido Bldg.,6F, 6-26-5 Kameido, Koto-Ku, Tokyo 136-0071, Japan

KEY WORDS: vibration, noise, and ridecomfort, road noise/pattern noise, sound quality evaluation/ridecomfort evaluation (B3)

Automotive OEMs and tire manufacturers allocate significant resources to tire noise engineering with the objective to improve the noise and vibration performance of future cars. This is driven by the customer expectations constantly trending towards quieter vehicle. This trend is even accelerating with the switch towards new energies as electric vehicles (EVs) are quieter at low speed than vehicles with internal combustion engines. Customers are getting used to a quieter vehicle cabin at low speed and expect similar performance when cruising at higher speed when road or wind noise becomes dominant.

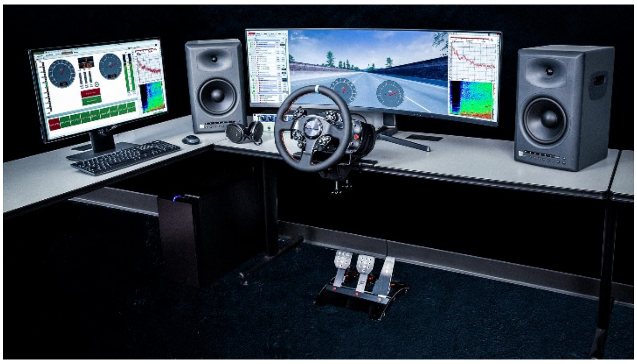

Fig. 1: driving simulator for NVH

We present in this paper the process we developed to support automotive OEMs and tire manufacturers with road noise engineering during vehicle design and development. We focus on structure-borne road noise, a process for airborne noise has already been proposed in a previous paper. The process uses blocked forces identified from measurements performed on a single tire installed on a test stand (Fig. 2) in a chassis dynamometer. The forces are then combined with vehicle level transfer functions calculated using a CAE simulation model to predict the noise at the driver ears. The results are imported in a driving simulator for NVH (Fig. 1) for auralization and sound quality evaluations.

The key benefit of this process is to be able to perform all this long before any prototype is available. It really allows to identify risks of NVH issues very early on leaving plenty of development time to define design countermeasures if necessary and perform a multi-attribute optimization.

In our current work, we are developing a library of tires, each tire is tested on our test stand to identify the blocked forces at the wheel center for different inflation pressures, preloads, road profiles and vehicle speeds. This library will be used to support future vehicle programs. We are also working on extending the process to include vibration feedback at tactile points using a driving simulator for sound and vibration.

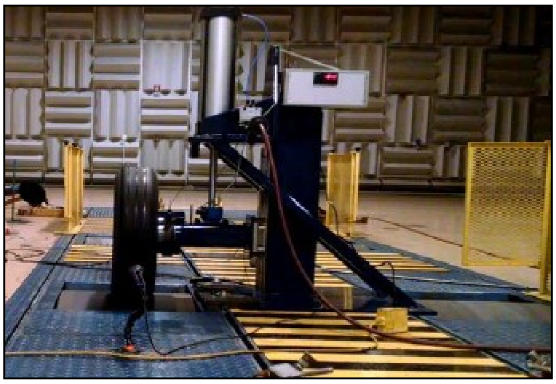

Fig. 2: tire test stand