Husqvarna revving towards the right partner

When world-class motorcycle manufacturer Husqvarna had to address an NVH problem they approached LMS. This proved to be just the beginning.

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Husqvarna Motorcycles is a brand steeped in history. Founded in 1903 in Sweden, the name Husqvarna is woven into the fabric of off-road racing. Specializing in both mass-market road bikes as well as custom-made racing models, the company is currently based in the Italian province of Varese. 'Husky' as it is known in racing circles is a small organization, comprising some 250 employees.

"Because of the size of Husqvarna, the company has a family feel, especially on account of our on-going involvement in motorsports. However, as competition becomes tougher and regulations tighter, Husqvarna has to continue to increase its quality and competitiveness by utilizing everything that comes from the newest technologies. This is why we contacted LMS Engineering Services to help us analyze the sound performance of our motorbikes," stated Alessandro Mantovani, a mechanical engineer at Husqvarna Motorcycles.

Pinpointing a critical noise phenomena

In the summer of 2008, Husqvarna had two bikes they wished to test, both which were struggling to meet new noise regulations. One was the prototype of a specialist racing bike, the other its street equivalent – already in production. To meet noise emission regulations, the racing bike needed to pass the FIM noise test (Federation

Internationale de Motocyclisme), a static test whereby the bike is fixed on a stand in neutral gear and a microphone is placed 50 cm behind the exhaust nozzle. Street bikes, on the other hand, must undergo a 'pass-by noise' test before they can be approved for road use.

"The difficulty is not passing the approval process; it is doing so while maintaining a high engine performance. More especially, it is not satisfactory to solve these problems without first having fully understood the source of the critical noise phenomena," explained Alessandro Mantovani.

Husqvarna shipped both bikes out to LMS' main testing center in Leuven, Belgium, where they were subjected to an acoustic source quantification (ASQ) test. The ASQ comprises of two steps: the operational measurements where the race or pass-by noise tests are replicated and the generated noise is measured; and the Frequency Response Function (FRF) measurements whereby a noise source known as a volume velocity source is placed on each bikes' most important source locations to capture the microphone response to the calibrated noise from each source.

The bikes were installed in LMS' semi-anechoic chamber equipped with a dynamometer to reproduce road conditions. More than 20 microphones were located around the individual motorbike elements and the noise levels

recorded. These elements included the engine, gearbox, intake, exhaust and rear tire. The ASQ capabilities of the LMS Test.Lab software then combined operational and FRF data to determine the noise contributions of each possible source. From all the collected data, a ranking of the most 'noise-generating' elements of each motorbike was established.

Identifying the noise culprits

As a result of this procedure, LMS was able to identify precisely the main noise source for each test. Although Husqvarna had some idea as to what the "offending" sources might be, the critical issue was to pinpoint the exact cause of the noise emission.

"Husqvarna could not have confidently identified the noise sources by itself," explained Mr. Mantovani. "LMS is a leader in this kind of analysis. We had neither the instrumentation nor the know-how to do what they did. These results allow us to target the right components for noise emission for our future bikes, thereby reducing the amount of 'trial and error' development that is so time and money consuming."

Far from the end of the story

In 2007, Husqvarna was bought by the BMW Group. This meant the company had to move from its MV Agusta premises to new offices – and this move included

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a brand new data acquisition and analysis system. The extensive analysis capabilities and flexibility of LMS Test. Lab, which enabled Husqvarna to extend its analysis to root cause identification using TPA (Transfer Path Analysis) as well as advanced rotating machinery testing with angle domain processing at lower costs, were certainly deemed advantages.

"When I visited LMS in Belgium, I was impressed by their methodology and engineering know-how," commented Mr. Mantovani. "The softwarewas extremely user-friendly and yet powerful enough to analyze the noise problems we were facing."

Alessandro Mantovani decided that to go with LMS was looking towards the future and to a time when Husqvarna would need more precise and in-depth analyses capabilities. This led them ultimately to choose what Mr. Mantovani termed "a more refined platform for tomorrow and beyond."

There was, though, one final, decisive factor in favor of LMS Test.Lab, "Having already worked with LMS Engineering Services," said Mr. Mantovani, "we had created a good working relationship founded on cooperation. I viewed LMS as a potential long-term partner with the know-how and technical expertise to take Husqvarna to the next level."

The company is very much looking forward to utilizing the potential of LMS Test.Lab software suite and the extremely flexible and mobile LMS SCADAS Recorder hardware.

"The first activity is to do some benchmarking of vibration levels," said Mr. Mantovani. "We can also use the same system for acoustics. Choosing a multi-purpose system lets us to avoid an investment in multiple systems and offers the ease of use and efficiency of a single software tool for all applications. There may even be an opportunity to work with LMS on fluid-dynamics optimization. We are looking forward to many years of continued cooperation," concluded. Mr. Mantovani. ■

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