

# CASE STUDY

## V9x Shaker System at TÜV SÜD Test House

In Spring 2013, the Head of Brüel & Kjær Field Service, Falk Uschner, and VTS Product Manager, Ole Thorhauge, visited TÜV SÜD Product Service GmbH in Mannheim, close to Frankfurt, Germany. The purpose of the visit was to gain insight into the challenges and routines of a dedicated test house that provides services for all world-leading German automotive OEMs and their sub-suppliers. The Brüel & Kjær team wanted to gain a deeper understanding of what the present and future requirements are for class-leading vibration test equipment with respect to its use, functionality and services.



## TÜV SÜD – The Company

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With its headquarters in Munich, Germany, the company was founded in 1866. TÜV SÜD is one of the world's leading technical service organisations with more than 20,000 employees across 800 locations. Its range of services includes consultancy, inspection, testing and expert reporting as well as certification and training. The company focuses strongly on reliability, safety and quality, environmental protection and profitability.



## TÜV SÜD Product Service GmbH

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*Wolfgang Jakobi,  
Head of Department  
Industrial Products/Environmental Simulation*



The competence centre for environmental simulation within TÜV SÜD Product Service GmbH is based in Mannheim, employs ten people and is dedicated to providing a wide range of environmental testing services in its multi-purpose environmental chambers. Vibration testing accounts for about 50% of the business – but the facility also provides drop testing, HALT (Highly Accelerated Lifetime Testing), HASS (Highly Accelerated Stress Screening), climatic testing, corrosion testing, humidity testing and dust protection.

Falk and Ole were received by Wolfgang Jakobi, Head of Department Industrial Products/Environmental Simulation, and Haridimos (Hari) Mountogianakis, Product Specialist/Lab Manager. Wolfgang and Hari have 23 and 15 years' experience respectively in vibration test, which is reflected in their great insight, dedication and care for their business, customers and equipment.

TÜV SÜD Product Service GmbH's customers range from German Automotive OEMs (for example, Mercedes Benz, Daimler, BMW, VW, GM, Ford) through automotive sub-suppliers to a wide range of companies within the railway, medical, aerospace, military and defence industries.

## Vibration Testing at TÜV SÜD, Mannheim

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The Mannheim facility has a range of vibration test systems from different suppliers – from Brüel & Kjær, it has an old LDS V870 shaker (26.7 kN random force) that has served them very well for the last 15 years and an LDS V9 shaker system (105 kN) installed back in 2006.

"From durability and lifetime testing to multi-axis testing. All variants of sine, random shock and drop tests, resonance, search and dwell – our range of tests is vast," says Wolfgang. "Some of the more interesting tests are some of the very tough, long-duration tests performed on automotive components, electrical motors and actuators; some specialised multi-sine tests for electrical vehicle testing; helicopter testing based on a random test topped with out-of-band discrete sine tone, and on the very special side some very fast sweep testing for the nuclear power plant industry simulating the impact of a low aircraft flyover. However, one of the most memorable were the vibration tests carried out on parts of the first European Mars Rover, which was launched back in 2004."

"At a test house, there is no such thing as a typical test," says Hari. "The tests are normally specified by the customer and can range from 10 minutes to 100 hours in each axis and the levels can range from 0.1 G<sub>rms</sub> up to 40 G<sub>rms</sub> or higher for shock tests." In addition, consulting and guiding customers

is a very important aspect of a test house's work as Hari explains, "As a test house, we must fully understand the customers' requirements and act quickly to adapt to their needs in a very responsive and dynamic way. This is where experience and a good range of high-performance and flexible shakers comes into play". He continues, "This is where the V9 shaker comes into its own – the V9 has a nice large working area and can be quickly converted from vertical testing to horizontal testing. It is also very useful for combining temperature cycling with vibration testing as TÜV SÜD has an environmental chamber, mounted on rails, which can slide over the shaker".

*The long-serving LDS V870 at TÜV SÜD's Mannheim facility – it has served them well for over 15 years*



## V9 – A Workhorse with a Shaky Start

*Haridimos (Hari) Mountogianakis, Product Specialist/Lab Manager*



**"The V9 now runs the toughest test we do. We are happy and the V9 is doing well"**

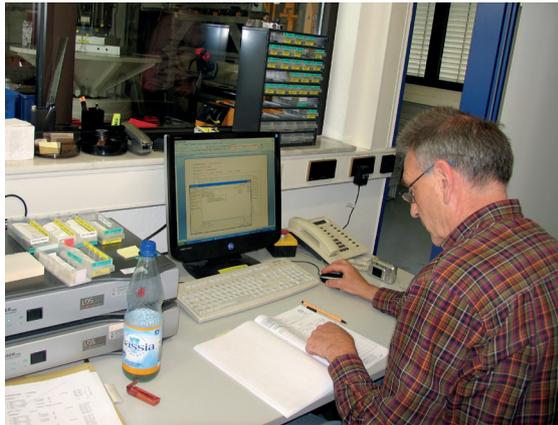
*Haridimos (Hari) Mountogianakis, Product Specialist/Lab Manager*

The V9 was installed at Mannheim back in 2006. Hari remembers, "The V9 was chosen based on its very high performance with respect to force, velocity and a long 3" stroke, which is really good for shock and low-frequency testing. The V9 is our high-force shaker for large and heavy payloads. We also have several head expanders up to 1500 mm in diameter and a large 1500 mm slip table with 12 bearings so, for example, we can test a whole pallet packed with equipment and products in one go – excellent for transportation testing".

There were a few teething problems before the system was fully up and running. Wolfgang remembers, "Installation was problematic and some annoying power module blow-outs on the amplifier

had to be resolved. The V9 design was rather new and also revealed some issues with the guidance and load support systems". However, all of these issues were solved. Hari adds, "I think that it's important to emphasise that the service technicians did a great job. The service we received was never the problem". The V9 shaker at TÜV SÜD today has the latest design and Hari is satisfied, "The V9 now runs the toughest test we do. We are happy and the V9 is doing well".

*TÜV SÜD's V9 operator at Mannheim. You can just glimpse the V9 through the window. The 16-channel LASER vibration controller is situated on the desk*



Over the past 2½ years, the V9 has been used, on average, for six hours a day, clocking up more than 3000 hours of intense testing. At the time of writing, the V9 was undertaking a 20+g test on a 150 kg motor. The shaker literally drains the life from a very durable motor in less than six hours.

Product Manager Ole Thorhauge comments, "It's always concerning when our customers experience issues. Since Brüel & Kjær acquired LDS back in January 2009, we have done our best to stay very close to customers who use our shakers as intensely as test houses such as TÜV SÜD. We are constantly striving to improve our products and increase performance and reliability.

In early 2010, we released brand new power modules for the amplifiers, which have proved to be extremely reliable". Ole continues, "In 2010 we also initiated a hefty V9 validation project, which led to a number of process and design changes, all based on issues closely-related to what TÜV SÜD has experienced. We have carefully monitored and succeeded in improving the V9's reliability. The V9 is now a very mature shaker with strong specifications and, to reflect this, we have decided to call it V9x. It is already used for the most diverse applications around the world".

Brüel & Kjær wants to stay very close to customers such as TÜV SÜD in order to ensure that its products and services work well for its customers. "It is equally important to understand our weaknesses when we experience problems," says Ole. "When Brüel & Kjær took over LDS, our dedicated goal was, and still is, to support our customers with market-leading products for the coming decades."

## Vibration Test Services – Uptime is Key

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You cannot run a vibration test lab with very high force shakers without getting your shakers serviced. For a commercial test house such as TÜV SÜD, unplanned downtime generates lots of logistical issues and problems. Even if test schedules have to be moved around, it is important that customers' tests and product release schedules aren't affected. Wolfgang says, "For us, the most important thing is that we can keep to our schedule. Our customers need to be able to rely on it. So, incorporating predictive maintenance by a professional service provider into the test house plans is all important". Brüel & Kjær Service Manager Falk Uschner is very aware of this. He says, "We are constantly monitoring the needs for service and, in the past two years, we have strengthened our service team all over the world. In Europe, for example, we now have eight field-service people covering Germany alone and a total of seventeen for Europe as a whole". He adds, "A few years ago, we concluded that, globally, we had too few dedicated service staff. Realising this, Brüel & Kjær's Top Management invested heavily and, with added resources, our processes and response times have improved dramatically. We are now the biggest vibration test service force in Europe".

## Market Trends in Vibration Testing

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The test house business is experiencing change. There is a push towards testing larger and heavier payloads. In the case of TÜV SÜD in Mannheim, this is especially with larger sub-assemblies for cars and trains. "The transportation testing of heavier objects has also become more demanding," says Wolfgang. "When we bought the V9 Shaker system we were sure a 1500 mm slip table could handle almost anything. We now see requirements for 2000 – 2500 mm slip tables for testing payloads. "

The German automotive industry is currently also very active in the field of ensuring reliability for HEV (Hybrid Electrical Vehicles) and the demand for large vibration test systems is on the increase. As Hari says, "Just take HEV battery assemblies as an example. They alone can weigh up to 450 kg or more".

## Conclusion

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At the end of the visit, Wolfgang summed up his feelings, "The last two years have been very good, and the Brüel & Kjær V9 has proved to be a very reliable and powerful vibration test system. The vibration test business is growing – and with requirements for testing even larger and more payloads in the future, we will be investing in more shakers in the coming years". He added, "...and we will be considering more LDS shakers".

*VTS Product Manager Ole Thorhauge (left) and Wolfgang Jakobi (right) discuss the future of vibration testing*



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Germany, Service  
LDS shakers  
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