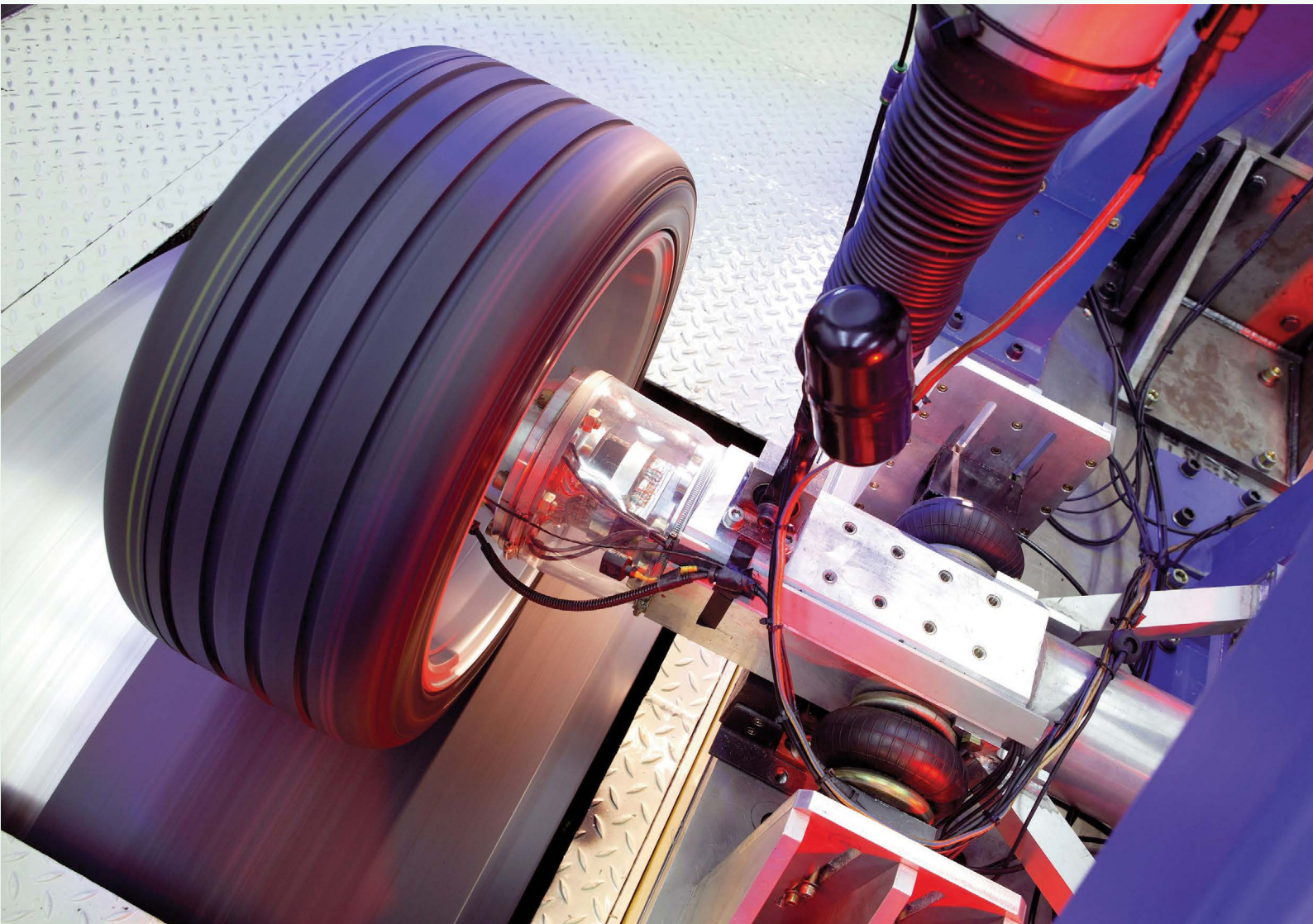




## Continental tests PULSE Reflex

*When Brüel & Kjær needed assistance during the beta development phase of the post-processing platform PULSE Reflex, getting Continental's input was a high priority. For Continental AG's NVH Engineering department it was an opportunity to 'try before you buy', so they set about comparing the results between their existing PULSE LabShop real-time analysis platform and the new post-processing platform PULSE Reflex – which turned out to be even better than they expected.*



# Continental



The Continental Corporation is based in Hannover, Germany and is divided into the Rubber Group and the Automotive Group (Continental AG). With approximately 2000 tyre retailers and franchises in 15 European countries including various retail organisations, Continental ranks among the top five automotive suppliers worldwide.

Continental AG (the Automotive Group) is a world-leading manufacturer of tyres, brake systems, vehicle stability control systems, engine injection systems, tachographs and other parts for the automotive and transport industries. It achieved sales of approximately €6 billion in 2010.

Continental AG's three divisions – Chassis & Safety, Powertrain and Interior – employ around 87,000 people in more than 170 locations worldwide, with NVH centres in the USA, Malaysia and Europe, and a new R&D centre in Shanghai. The famous tyre business is run as a separate unit of Continental AG, and is the world's fourth largest tyre manufacturer after Bridgestone, Michelin and Goodyear.

## History

*Tyre assembly at the factory in Hannover-Vahrenwald, 1921*

Continental was founded in Hannover in 1871, as the stock corporation "Continental-Caoutchouc- und Gutta-Percha Compagnie." At that time, manufacturing at the main factory in Hannover included soft rubber products, rubberised fabrics, and solid tyres for carriages and bicycles. With an impressive string of firsts, Continental has remained at the cutting edge of tyre development ever since.

**1898** – Production of automobile pneumatic tyres with a plain tread

**1900** – Continental balloon fabric seals the gas cells of the first German airship

**1904** – Develops the first grooved tyres for automobiles in the world

**1905** – Commences production of riveted anti-skid tyres

**1909** – French aviator Louis Blériot becomes the first person to fly across the English Channel, with Continental Aeroplan material covering the flying surfaces of his monoplane

**1951** – Continental commences production of steel-cord conveyor belts

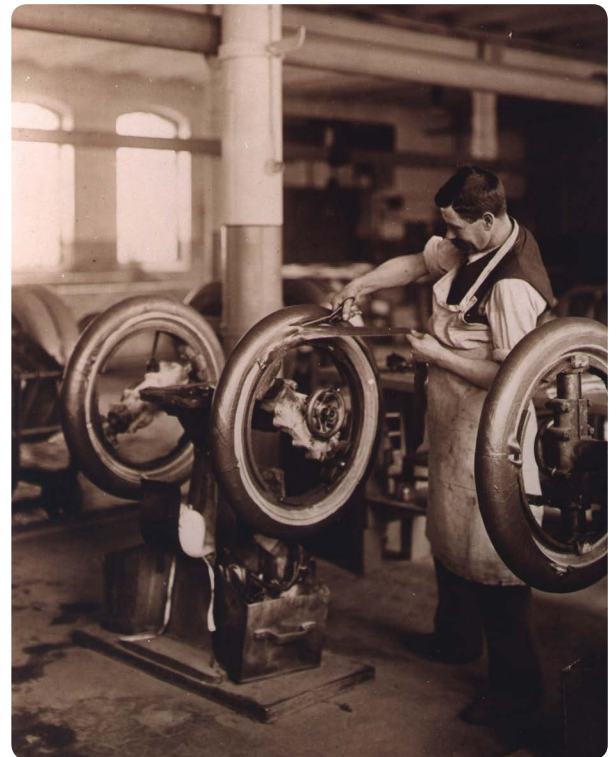
**1955** – Develops the first air springs for trucks and buses

**1974** – Supplies the European automotive industry with the first extrusion blow-moulded polyurethane gaiters

**1991** – Launches the first environmentally friendly tyres for passenger cars

**1997** – Presents key technology for hybrid drive systems

**2003** – Unveils the world's first road tyre approved for speeds up to 360 km/h (224 mph) – the ContiSportContact 2 Vmax





## A long-term development partner

The Continental Group's headquarters at Hannover is also where the European NVH department is located. Here, the NVH group works with tyres and automotive components to refine the overall vehicle experience. Describing themselves as experts for the entire range of vibration perception from hearing to feeling, the NVH department performs engineering services for external customers as well as the Continental Group – sharing test data and results globally. "Comfort lastingly determines the perceived quality of a vehicle" is a mantra for the NVH department, who declare that their common goal is "a quiet and comfortable ride."



**"I love the batch-processing functionality of Reflex. It has great usability, and is very flexible. It's also very intuitive"**

*Dr. Oliver Schürmann*

Continental's NVH Engineering Department has used Brüel & Kjær's equipment for many years almost exclusively, developing a strong relationship between the two companies in the process. Central to this are Dr. Oliver Schürmann and Dr. Ernst-Ulrich Saemann, both highly experienced members of Continental's NVH Engineering team.

Dr. Schürmann has worked at Continental since 1995, and has experience in R&D, and within the truck-tyre and car-tyre business units. He designed, installed and commissioned their modal analysis test facility.

The mutual trust earned through working together over the years led to Continental's NVH Engineering Department becoming involved in the beta testing programme for PULSE Reflex Core software. As well as giving Brüel & Kjær valuable feedback during the beta testing stages of the new solution, the testing served as an introductory demonstration that allowed the NVH Engineering Department to evaluate PULSE Reflex Core as an extension for their Brüel & Kjær PULSE LabShop software.

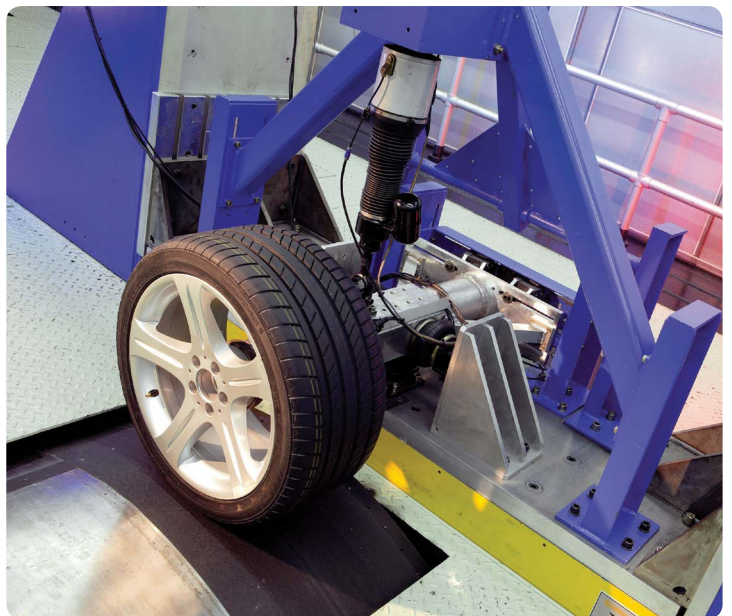
"We joined in the beta testing because we wanted to validate PULSE Reflex as an upgrade to LabShop. In the testing we primarily wanted to see if we could get the same result in Reflex as in LabShop," says Dr. Schürmann.

## The test setup

*Drum-speed and tyre-speed are put into their PULSE analyzer LAN-XI front-end using normal high-speed sampling*

The application in question is to test the sound a tyre makes, and specifically to test for peaks in the noise data that correspond to tyre rumble. The test in the images is called a 'cleat test' that checks for structure-borne vibration in the Y and X axes, while performing simultaneous noise testing.

In order to simulate events that are normally noisy for tyres such as potholes, bridges, and expansion joints, a 5 mm-high steel plate is added to the rolling-road 'drum' that the tyre makes contact with, as shown in the picture. Five microphones and five vibration channels capture the data during the test, which is run at a steady 40 km/h.



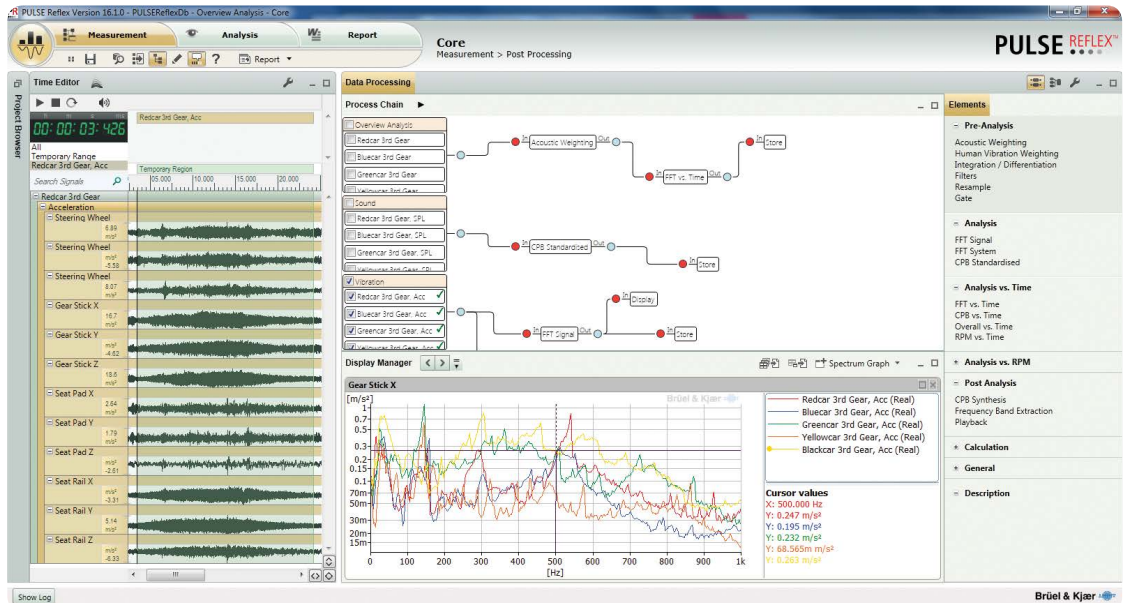
Each test takes about two minutes, and then an average of a number of tyre rotations is taken. The intention is to evaluate peaks in the range from zero to 6.4 kHz, and specifically, the engineers are interested in four ranges between 4 and 260 Hz – which are in the range where tyre rumble is found.

## Comparing PULSE Reflex with LabShop

After one day of training on PULSE Reflex Core, Continental's NVH department found the software was so intuitive that they were able to just get on with using it, without any further help. As Dr. Schürmann says, "We could see the peaks and read the frequency, and found that the reporting function is intelligent and flexible."

"I can now filter time signals in Reflex. For example, I found I could set up band pass filtering for each range separately," says Dr. Schürmann, before adding, "The search and sorting functions for files in Reflex is a great improvement over LabShop."

A PULSE Reflex Core screenshot showing the intuitive process tree and multi-window interface



Not surprisingly after such successful beta testing, Continental's NVH Engineering department was convinced. The interface was a key point for Oliver, "It has great usability, and is very flexible. Handling chains is automatic and the 'drag-and-drop' operation is very easy and intuitive. I can now create a chain, save them, and then reload them into another project. Then I can process the data with the same setup, so there are no errors," he says.

## Batched and dispatched

At Continental, reports from the tests typically go to either the tyre development manager if it is being conducted for Continental, or to the vehicle manufacturer if it is a project. Reporting is eased thanks to Reflex. "Comparison of results from different tyres is now much easier with Reflex, as we now have an identical reporting format. So now I can set up a batch calculation which is very quick and easy, and process the data with the same chain. So A-B comparison is totally accurate," says Dr. Schürmann. "Ultimately, Reflex saves a great amount of time and produces very accurate reports. I love the batch processing as I can set it up and walk away to do another task."