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It takes many, individually tuned strings
to create harmony.

*Joseph Freiherr von Eichendorff (1788 – 1857),
German poet, novelist and playwright*

Comfort lastingly determines the perceived quality
of a vehicle. Continental NVH Engineering is the
experienced partner for the development of systems
and components for automobiles with best noise
and vibration characteristics.

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Our Competence

Quiet, pleasantly sounding and comfortable automobiles is the passion that drives us at Continental NVH Engineering. Our team of highly motivated specialist creates solutions for your NVH needs, relying not only on their own experience gained over many years, but also make use of the unique networked know-how of Continental AG while developing and manufacturing tires, brakes, mounts and chassis systems. We provide you the right support:

- In our well equipped NVH labs and at our proving grounds or at your facilities.
- Defining the optimal product design during the development process.
- Solving critical NVH problems in the phases just before and after start of production.

Our experience includes:

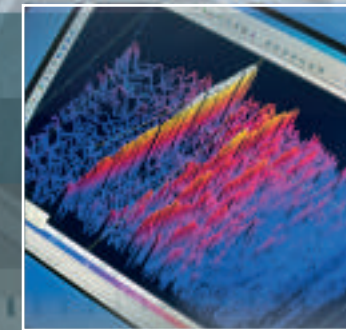
- Tire, brake, chassis, powertrain NVH
- Whole vehicle NVH
- NVH testing
- NVH simulation
- Psycho-acoustics
- Subjective evaluation
- Machinery noise and vibration
- Rotating machinery dynamics
- Noise legislation
- Vibro-acoustics expertise
- CAD / CAE
- Prototype vehicle preparations
- Project management

Flexible Solutions

Concepts, models and components

- Root cause analysis
- Component layout & refinement
- Component integration
- Design verification
- Benchmarking

And we also supply components ready for production.

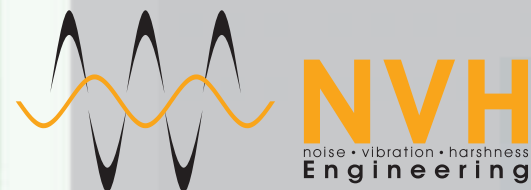


Vehicle Harmony

A quiet and comfortable ride is our common goal

P a s s i o n f o r T e c h n o l o g y

Continental NVH Engineering



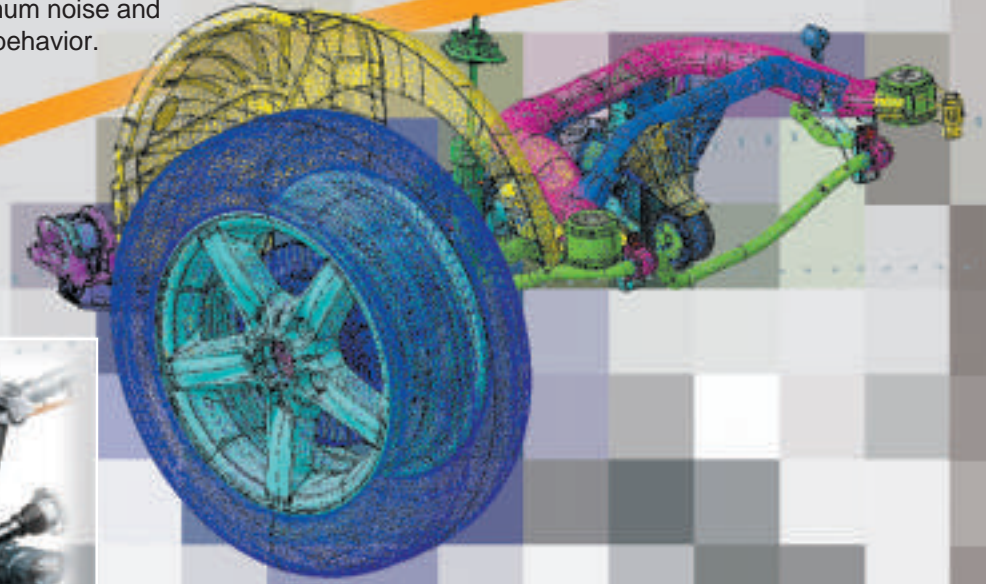
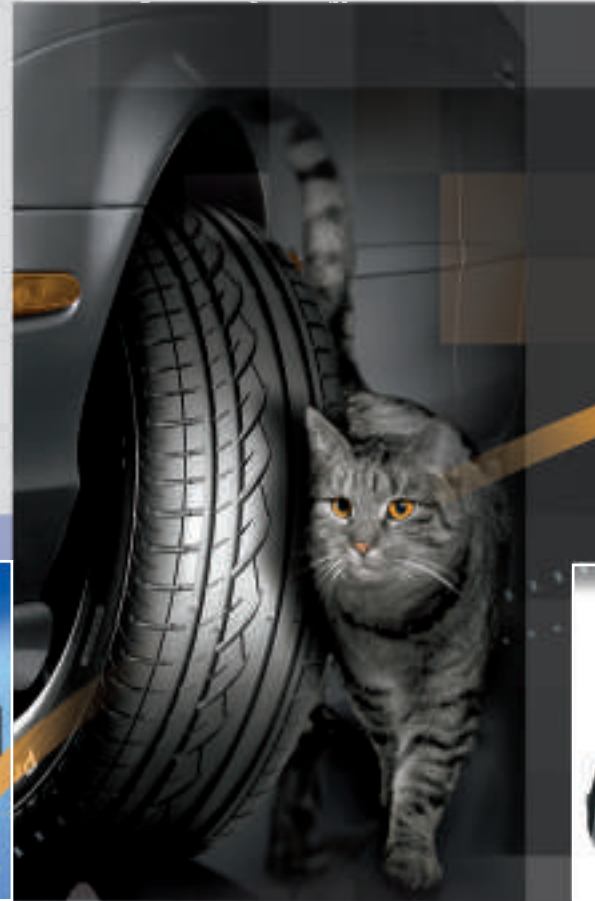
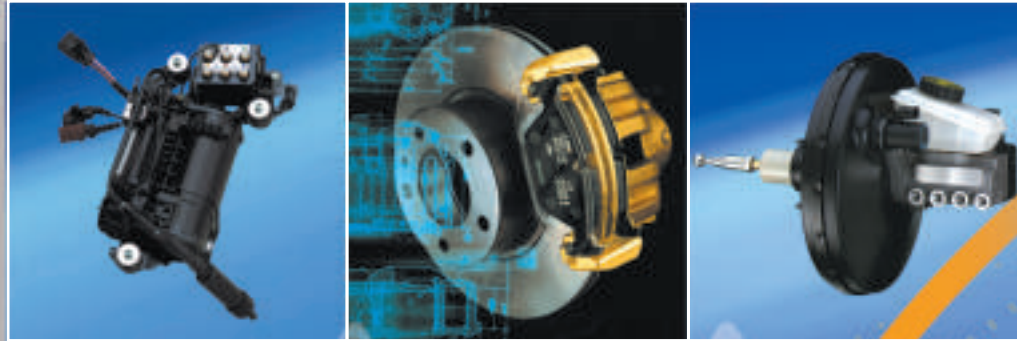
- Modal alignment • Tire / brake / suspension / steering interaction • Tire / suspension / body interaction • Powertrain / suspension / body interaction
- Brake / body interaction

Component Design & Refinement

We have the know-how to achieve the desired NVH performance of your products. As your partner, we will support you with our expertise during the whole development process. We will suggest cost-effective solutions at the start of your project or we will solve problems at any stage of development process, always considering the interaction of all relevant components.

Component Integration

Meeting challenging goals is our strength. We assist our customers in the fine-tuning of vehicle comfort – with all our experiences as a manufacturer of tires, brakes, chassis components and the associated hard- and software. Our knowledge of the interaction among these products and with other components shortens the development and coordination phases. This is how we smooth the way for the perfect integration of individual products with optimum noise and vibration behavior.



Our NVH team members are experts in the field of following product applications:

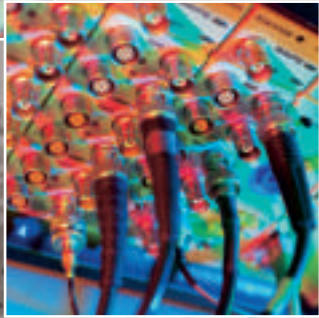
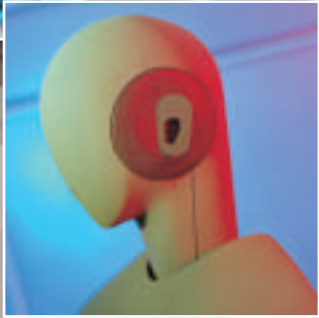
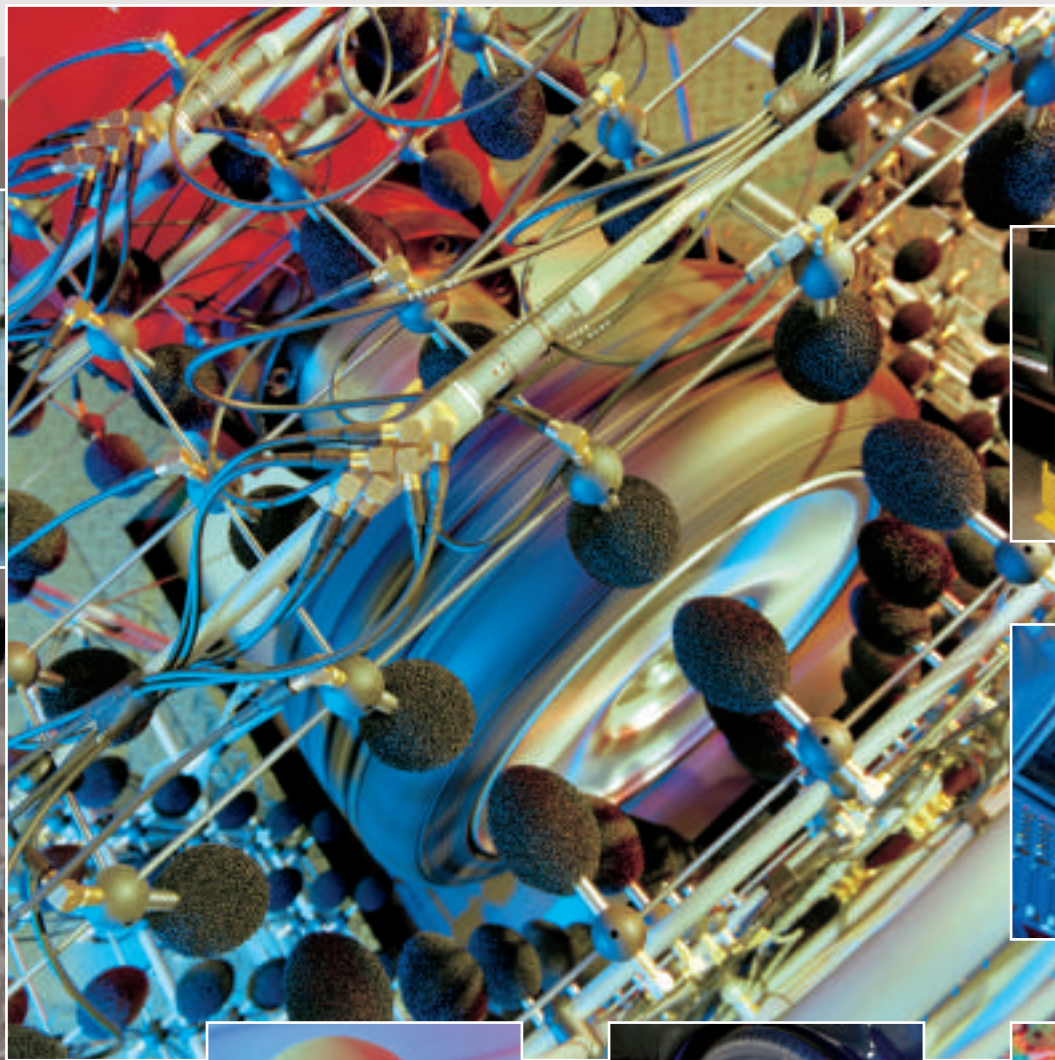
- Tires and wheels
- Hydraulic brakes
- Electronic brakes
- Brake actuation
- Electronic air spring system
- Compressors
- Silencers
- Mounts, bushings, absorbers, brackets
- Active noise control
- Active vibration control
- Fluid systems
- Drive belts

We can solve your NVH problems



- **Create a quiet environment**
 - Brake creep groan noise
 - Boom
 - Modal alignment
 - Engine sound quality
 - ABS/ESC operation noise
 - Booster/pedal sound quality
 - Tire cavity noise
- **Develop a vibration-free vehicle**
 - Brake judder
 - Steering wheel nibble
 - Axle, engine and cabin shake
- **Achieve a plush ride**
 - Impact harshness
 - Bounce memory

Very few NVH problems can be solved by computer simulation alone. That's where the test facilities of NVH Engineering come in. Test methods – continuously refined and perfected over the years and certified by international standards – are the tools we deploy to develop NVH-optimized components, modules and vehicles. We use the most modern instrumentation in our laboratories and proving grounds or at your site.



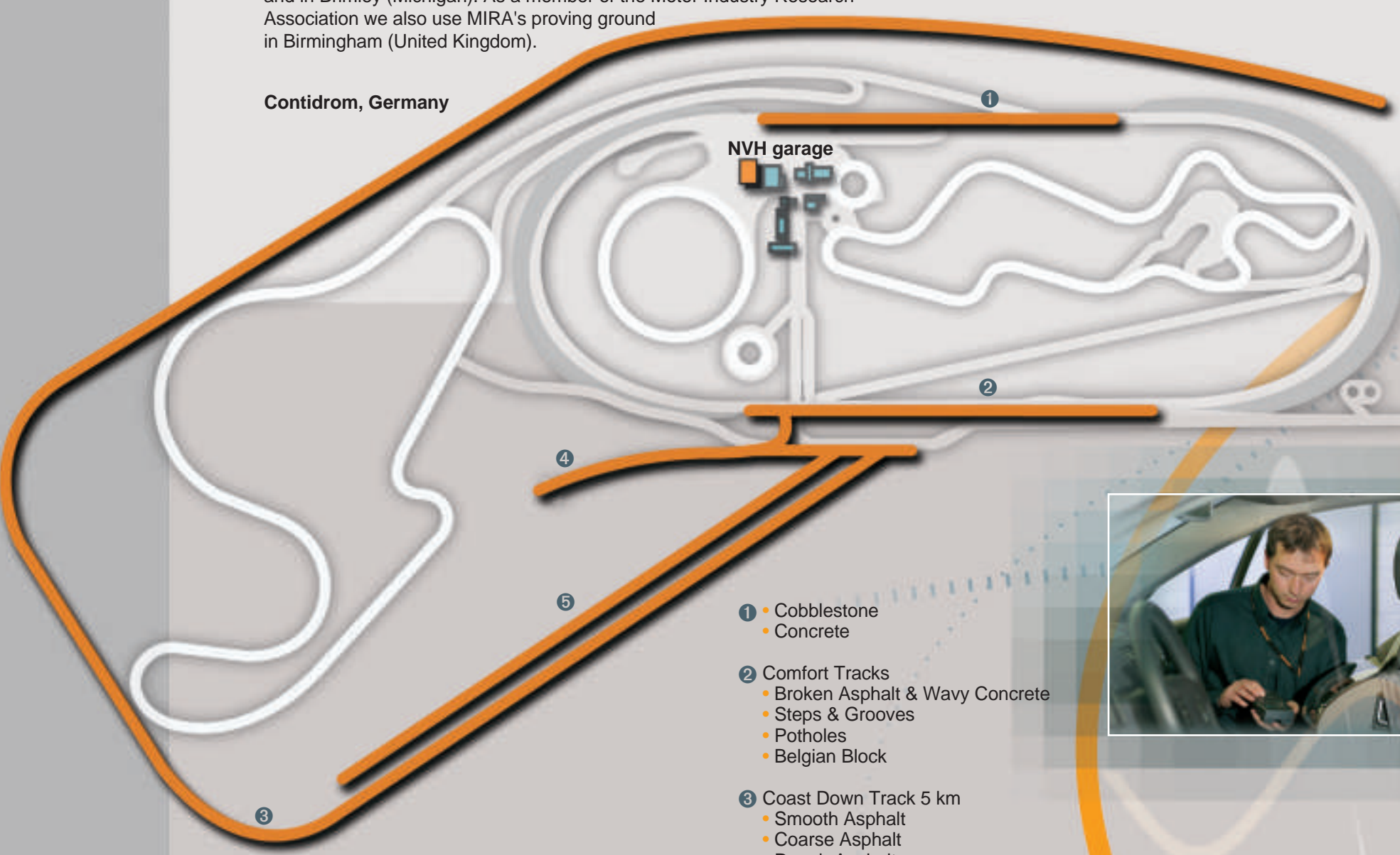
Continental NVH Engineering has at its disposal:

- **Proving grounds**
 - Contidrom, Wietze-Jeversen, Germany
 - Uvalde, Texas, USA
 - Brimley, Michigan, USA
- **Vehicle test stands**
 - 4-drum chassis dyno in semi-anechoic chamber
 - 2-drum chassis dyno in semi-anechoic chamber
 - 4-poster vehicle test stand in semi-anechoic chamber
 - Vehicle vibration transfer test stands
 - Semi-anechoic vehicle chamber
 - Closed prototype areas
- **Component and module test stands**
 - Axle drum test stand
 - Climate vibration test stand
 - Modal analysis test stands
 - Middle to high frequency hydro-pulse test stand
- **Measuring systems**
 - Data acquisition systems with up to 94 channels
 - Digital tape recorders with up to 64 channels
 - Force, acceleration, velocity, displacement sensors, GPS
 - Sound intensity probes
 - Acoustical holography systems
 - Sound absorption measurement system
- **Sound quality**
 - Binaural head systems
 - Sound quality analysis labs

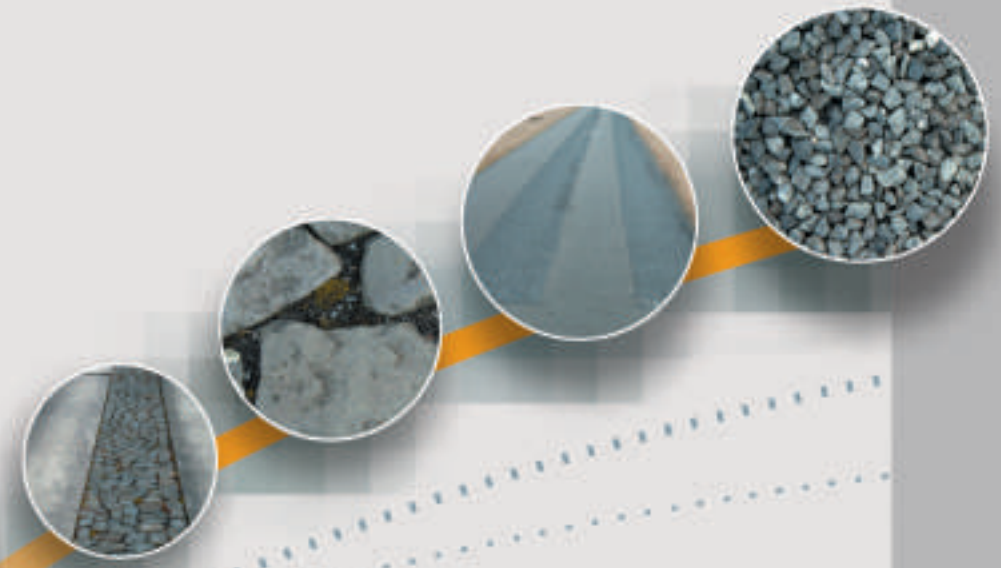
Proving Grounds

Efficient NVH Engineering needs roads that allow reproducible test results. At Continental we have those roads – at our proving grounds in Germany and USA. Here we can reproduce all driving situations on various road surfaces from cobblestones to smooth asphalt under well defined conditions. Our proving grounds are conveniently located – in Hannover (Germany), in Uvalde (Texas) and in Brimley (Michigan). As a member of the Motor Industry Research Association we also use MIRA's proving ground in Birmingham (United Kingdom).

Contidrom, Germany



- 1 • Cobblestone
• Concrete
- 2 • Comfort Tracks
• Broken Asphalt & Wavy Concrete
• Steps & Grooves
• Potholes
• Belgian Block
- 3 • Coast Down Track 5 km
• Smooth Asphalt
• Coarse Asphalt
• Rough Asphalt
- 4 • Pass-by Track
ISO 10844
450 m
- 5 • EU Certified
Pass-by Track
ISO 10844
W / Heating Facility
900 m



Contact:

Proving Ground Contidrom, Germany:

Contidrom
 Contistraße 2
 D-29323 Wietze-Jeversen
 Phone: +49 (0)511-976-3 16 06
 Fax: +49 (0)511-976-3 16 40



Proving Ground Brimley, Michigan, USA:

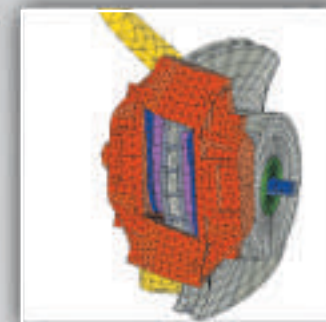
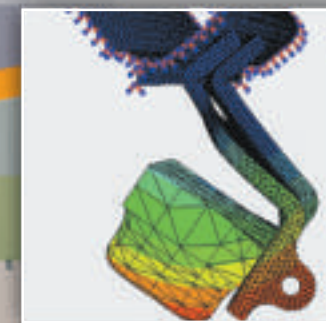
Brimley Development Center
 9301 South M-221, Brimley
 MI 49715
 Phone: +1-906-248-67 00
 Fax: +1-906-248-68 55

Proving Ground Uvalde, Texas, USA:

Continental Tire North America, Inc.
 Uvalde Proving Ground
 Batesville Road, P.O. Box 480
 Uvalde, Texas 78802-0480
 Phone: +1-210-591-70 00
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Simulation Tools & Methods

Do it right the first time! We supply high-grade vibration models of individual components for whole vehicle simulation. We identify the most promising product design at the earliest possible stage of development by simulation. With coordinated test and simulation modules we provide support for our customers in the decisive phases of the design process. Through modeling we help to explain complex test results, to pinpoint optimization potentials and to make use of them in a timely and cost efficient way.

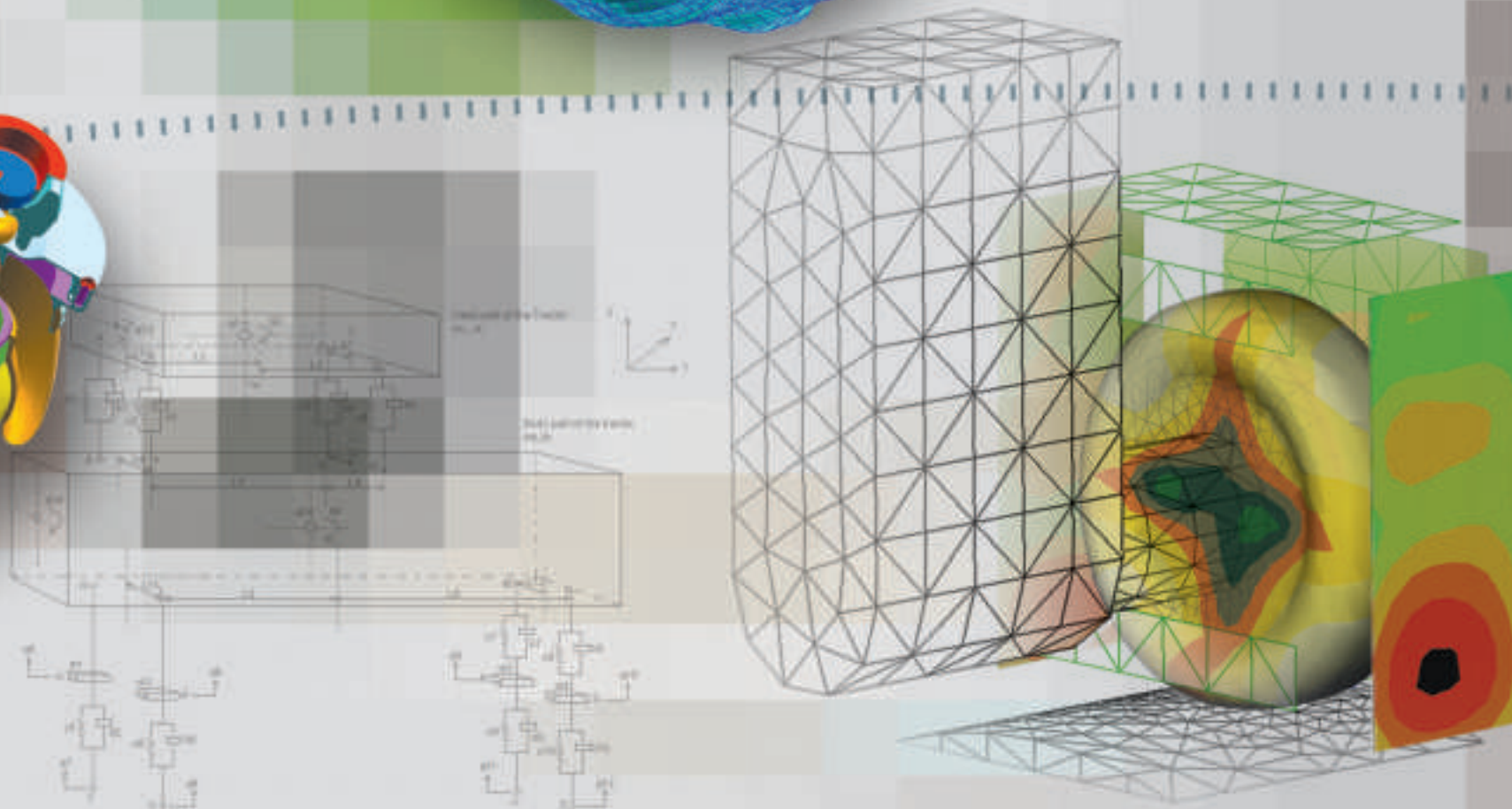


Our simulation and design engineers use tools such as:

- FEM (ABAQUS, NASTRAN, IDEAS, GENFEP)
- BEM (RAYON, SYSNOISE)
- IBEM (RAYON)
- Multi Body Models (ADAMS, D Tire)
- MATLAB, SIMULINK, SEAM
- CAD (CATIA V5, UNIGRAPHICS, AUTOCAD)

Application Examples

- Repetitive pattern noise optimization
- Modal models
- Dynamic structure optimization
- Multiple mount optimization
- Impact harshness
- Noise source identification
- Noise radiation
- Active compensation algorithms
- Handling Simulations



Silence is not just the absence of noise, but a quietness that allows people to open their eyes and ears for another world.

Serge Poliakoff (1900 – 1969), Russian painter and graphic artist

What a blessing it would be if we could open and shut our ears as easily as we open and shut our eyes!

Georg Christoph Lichtenberg (1742 – 1799), German physicist

Something that is getting worse in our time and that bothers me is the noise, the level of loudness. I'm all in favor of quietness. I think that freedom from noise is something wonderful.

Heinz Rühmann (1902 – 1994), German actor

The greatest revelation is silence.

Lao-tse (4th – 3rd century before Christ), Chinese philosopher, founder of Taoism