



Swiss precision meets acoustic finesse

Novicos paves the way for V-ZUG to “right-first-time” acoustics - made in Switzerland

The heart of V-ZUG is where precision meets tradition. For more than a century, top-quality household appliances have been leaving the halls of this Swiss company steeped in tradition. But beyond visible quality, V-ZUG has an additional, audible goal: achieving precise acoustics from the first attempt. To achieve this, the engineers called on the expertise of Novicos and sparked an acoustic revolution.

“Right-First-Time” - Acoustics for V-ZUG

“Acoustics has been on our agenda for a long time,” explains Lucas Ziegler. The dedicated engineer and his colleagues are driving forward simulation at V-ZUG and have made a name for themselves with their remarkable powers of comprehension. “Acoustic measurements are routine at V-ZUG, but simulation has long been a real challenge.” V-ZUG is not alone in facing this challenge—acoustic simulations are so demanding that the industry often relies solely on physical prototypes. “Trial and error is costly and unnecessary. It also overlooks opportunities,” says Ziegler. “Our goal was to make the acoustics of our equipment realistic in simulation right from the start.”

Two criteria were crucial in the choice of service provider: proven expertise and the ability to combine simulation with measurement. „We held several discussions with potential service providers. Novicos was by far the most competent,” recalls Ziegler. „We also knew that some of our questions could only

To the point

- V-ZUG integrates acoustics into the development of its household appliances and makes precise numerical predictions.
- Only a few companies have mastered the necessary combination of simulation and measurement: Novicos impressed with its expertise.
- In each work package, Novicos succeeded in transferring knowledge that now enables V-ZUG to carry out the analyses itself.
- An ‘acoustics bible’ serves as V-ZUG’s reference work for the acoustic evaluation of household appliances.



be answered by combining simulation and measurement. Novicos offers simulation and measurement from a single source - that was very valuable for us."

The art of omission

V-ZUG chose a washing machine as a test object to build up its expertise in acoustic simulation. The acoustics of washing machines are so complex that they are ideal research objects. "Ask three engineers why a washing machine sounds the way it does and you will get three different answers. None of them can prove it," says Ziegler. This is where Novicos comes in. "When creating simulation models, there are two key questions: what details can we neglect and how accurate is the influence of critical components?" explains Dr. Thorben Schröder, Project Manager Engineer at Novicos. Novicos took on this task and analyzed the influence of critical components in their own acoustic rooms. "The results were a boon to our department," says Ziegler "Now we just have to concentrate on the parts and components that are really relevant in terms of acoustics."

How measurements drive simulation

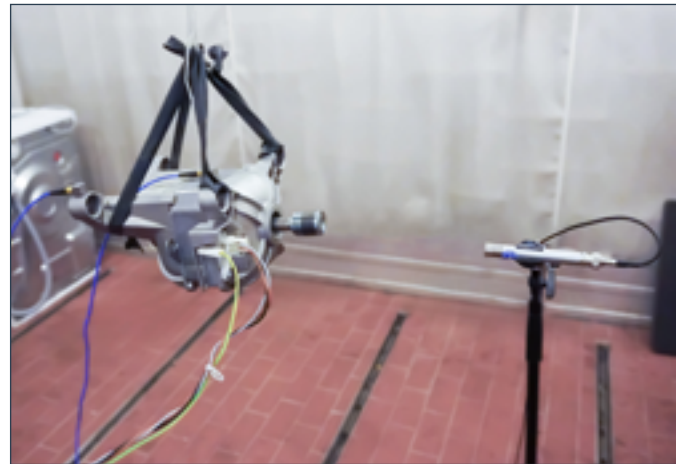
Components that are acoustically critical but cannot be efficiently modelled in simulation are of particular interest. These include combined damping elements such as suspension struts. "In such cases, we get around the complexity by measuring the mechanical and acoustic effects and then incorporating this data into the simulations," explains Dr. Joscha Piepiorka, development engineer at Novicos.

The skillful combination of measurement and simulation requires in-depth technical understanding and experience. Novicos used acoustic measurements with microphones and acceleration sensors to quantify input variables - such as the blocking forces of subcomponents - for the simulation. "Every question I had during the project was answered comprehensively and clearly by Mr. Piepiorka and Mr. Schröder. I was impressed by their knowledge and its application to our specific case," says Ziegler of the knowledge transfer.

The "acoustic bible" from V-ZUG

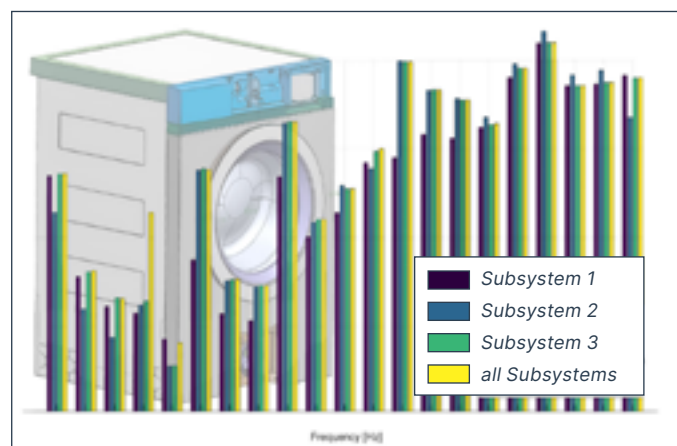
As part of the knowledge transfer, Novicos not only enabled V-ZUG to combine measurement and simulation, but also made significant progress in computation. Novicos performed complex multi-body simulations, validated the results with measurements and compared the effectiveness of different methods. The results were equally convincing: "We now have an evaluation matrix that visualizes the influence of individual components on the sound," says Ziegler. This 'acoustic bible' thoroughly characterizes the relevant sound paths of the washing machine and can be utilized for its further development as well as other V-ZUG products."

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Measurement of system excitations by the engine (vibrations and noise) for the simulation model.

... "I was impressed with your knowledge and application to our specific case" ...



Share of subsystems in total sound

Knowledge transfer success story

Ziegler is already working with Novicos on a follow-up project. "In this acoustics project, I'm already doing the calculations myself and Novicos is only supporting us with measurements," says Ziegler. "This shows how successful the knowledge transfer between Novicos and V-ZUG has been."

The newly acquired expertise in acoustic simulation strengthens V-ZUG's position as a quality leader. Ziegler and his team are once again delivering on V-ZUG's promise to its customers: Perfection - truly "Made in Switzerland".



Structural and air model derived from the CAD model and coupled to the vibroacoustic model. (below)

Extract from the frequency analysis of the vibroacoustic model (frequency spectrum 25 - 4850 Hz)

