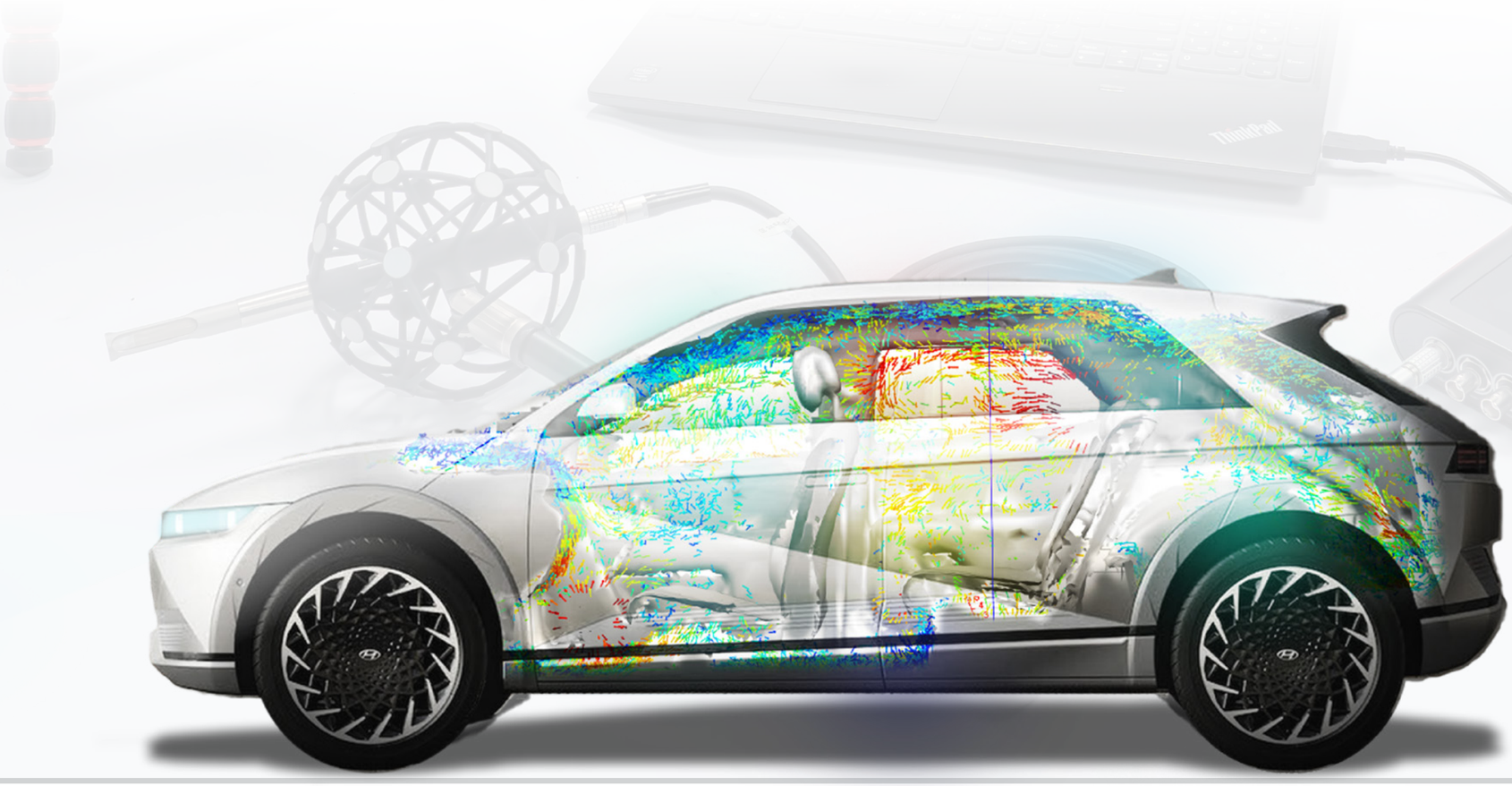
SCAN&PAINT 3D

3D sound vectors on a 3D model in a matter of minutes



Product leaflet

MICROFLOWN TECHNOLOGIES

Scan&Paint 3D

CUTTING EDGE SOLUTION FOR SOUND VISUALISATION AND 3D SOUND INTENSITY

A unique tool for acoustic troubleshooting, sound source localization and noise ranking, allowing you to visualize what you hear. It makes complex problems simple and easy to understand. Localize your sound sources and visualize the sound propagation in full 3D. Scan&Paint 3D offers you 3D sound vectors displayed on a 3D model.

Unmatched solution for 3D sound intensity

SCAN&PAINT 3D AT A GLANCE

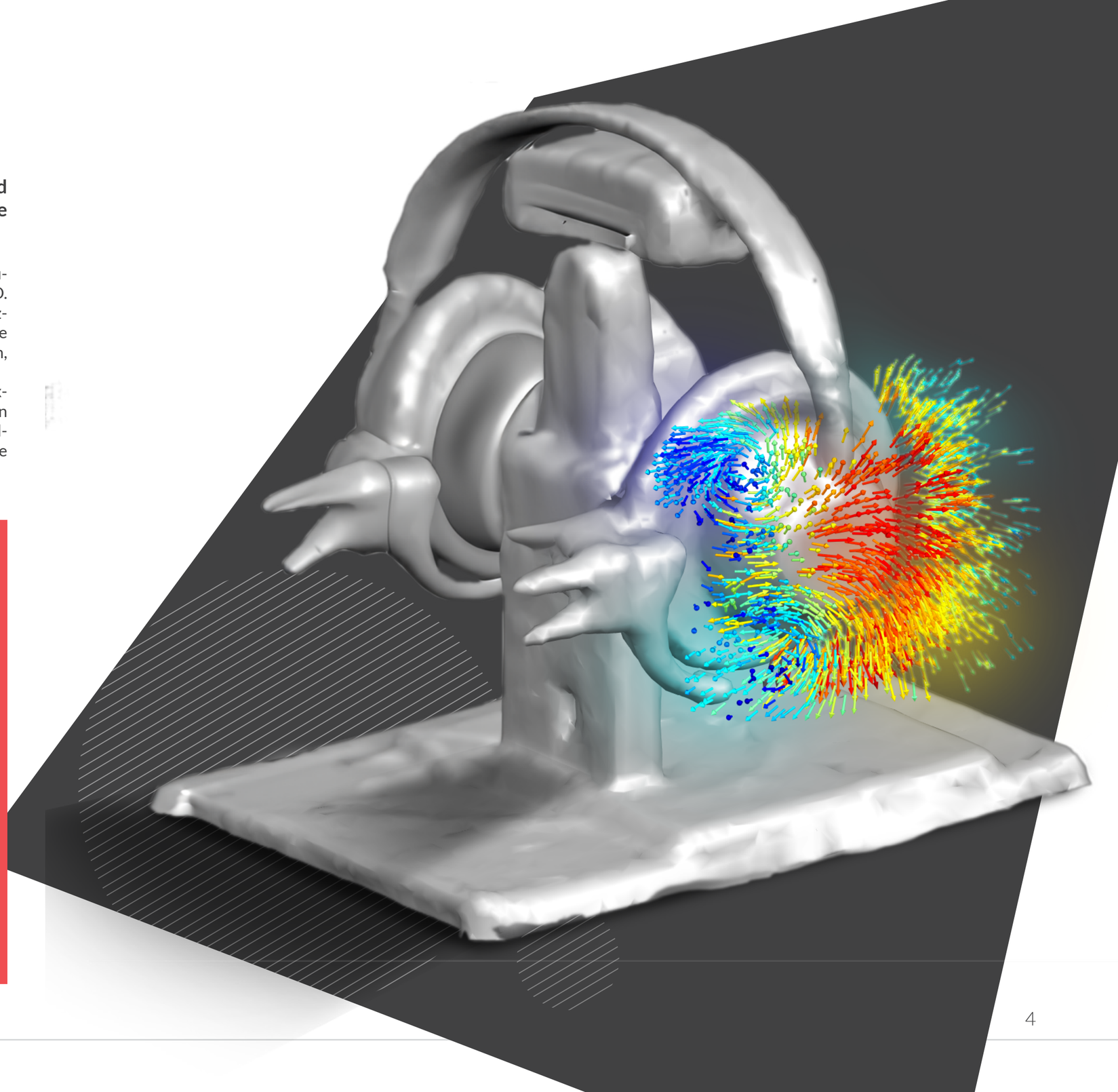
Sound source localization is an important topic in the working field of sound & vibration, from the product development stage to the end of line quality control.

In a matter of minutes the complete sound field, as 3D sound intensity or particle velocity, is displayed on a 3D model over a broad frequency range and with an unparalleled dynamic range. The tiny 3D sensor makes it possible to obtain results with a very high spatial resolution, down to 3mm, enabling measurements even on very small objects.

Localize your sound sources and visualize the sound propagation in full 3D. Use one data set for for localizing dominant sources and accurate broadband sound power calculation, for the overall level or per segment.
The comprehensive and advanced export option enables a bridge between simulation and measured results, allowing flexibility on the use of the data.

Key features

- 3D visualization of
  - Sound intensity vectors
  - Particle velocity vectors
  - Sound pressure distribution
- Broadband Solution | 20Hz - 10kHz
- Unmatched spatial representation down to 3mm, frequency independent
- Results created in a matter of minutes
- Applicable in challenging environments e.g. vehicle interior or non-anechoic conditions
- Calculation of Sound Power Overall & per selected surface area
- Extensive date export option e.g. to bridge the gap with simulation
- Real time tracking in 3D of the sensor position
- Multiple 2D plane visualization



Portable yet powerful

Cutting edge sensor technology

3D SOUND INTENSITY PROBE

The state of the art sensor used in the system is the three dimensional 1⁄2 inch USP regular probe. The sensor consists of three orthogonally placed Microflown acoustic particle velocity sensors and a sound pressure microphone.

The Microflown USP probe is the first sensor that has the unique capability of allowing the direct measurement of all acoustic quantities: sound pressure and tri-axial particle velocity. The sound intensity can be calculated by taking the time averaged cross spectrum of particle velocity and sound pressure. 3D Sound intensity vectors can be obtained without any frequency limitations covering a range of 20Hz to 10kHz. The small sensor size allows measurements to be taken with an unmatched spatial resolution.

Furthermore the sensors are not highly affected by the environment and allow sound intensity measurements in situations with a high sound pressure over sound intensity ratio (p/I index).

Real time position and orientation tracking

The sensor´s orientation and position are automatically tracked in 3D by the tracking camera. The optical tracking system is based on monitoring a defined measurement space using an infrared stereo camera.

Each camera is equipped with an infrared (IR) pass filter in front of the lens, and a ring of IR LEDs around the lens to periodically illuminate the measurement space with IR light. This light is not visible to the human eye and is completely safe to work with.

The sensor is equipped with a spherical marker, consisting of embedded retro reflective stickers. The incoming IR light is reflected by the stickers. The IR light reflections are detected by the stereo camera, and the tracking system translates them to exact 3D coordinates along with the sensor orientation.

The tracking camera, that automatically tracks the position and orientation of the sensor, can be repositioned easily during measurement sessions, providing flexibility together with the ability to capture complex objects, such as a car interior in full 3D. Multiple measurements from different camera views can be merged into one full 3D project.

Hardware overview

A TOOL FOR EVERYONE

When dealing with acoustic measurements, not one of them is often the same. For example, the environment or use case can be very different, varying from large to compact objects, spacious to cramped rooms. You name it. Having the proper hardware at hand is vital in many cases. To ensure that you have the right tool for the job, we created a base package that you can upgrade to fit your needs.

SYSTEM SPECIFICATION

Sensor	
USP Regular Probe:	20Hz - 10kHz | Particle velocity | Sound pressure | Sound intensity Error margin: Class 1 | Noise floor (20 Hz - 2 kHz): 21 dB(A) SPL, 32 dB(A) PVL Noise floor (20 Hz - 2 kHz): 27 dB(A) SPL, 48 dB(A) PVL | Maximum level: 130 dB
DAQ + Power sourse	
MFPA-4 + Scout V2:	Resolution: 24bit | No. inputs: 4 | Input ranges: ±1 V, ±10 V | Max. sample frequency: 52 kHz
	or
Voyager:	Resolution: 24bit | No. inputs: 6 | Input ranges: ±0.1 V, ±1 V, ±10 V | Max. sample frequency: 48 kHz
Optical tracking camera	
PST Iris:	Tracking distance: 50cm up to 7m | Frame rate: up to 120Hz | Data transfer: 1x USB 2.0
	or
PST Base HD:	Tracking distance: 20cm up to 3m | Frame rate: up to 200Hz | Data transfer: 2x USB 3.0
Other information	
Type of noise:	(time) stationary condtions
Measurement result outcome:	Color sound vectors in 3D for particle velocity and sound intensity, colored bulbs for sound pressure overlaid on a 3D models of the device under test. 2D interpoloted color sound maps for one or mulitple planes in any direction.
Analysis options:	Narrow band, Octave Bands, 1/3 & 1/12 Octave bands, Sound power calculation, Comprehensive export options, multi-view for fast & easy comparisson of results

PST Iris

50.5 cm

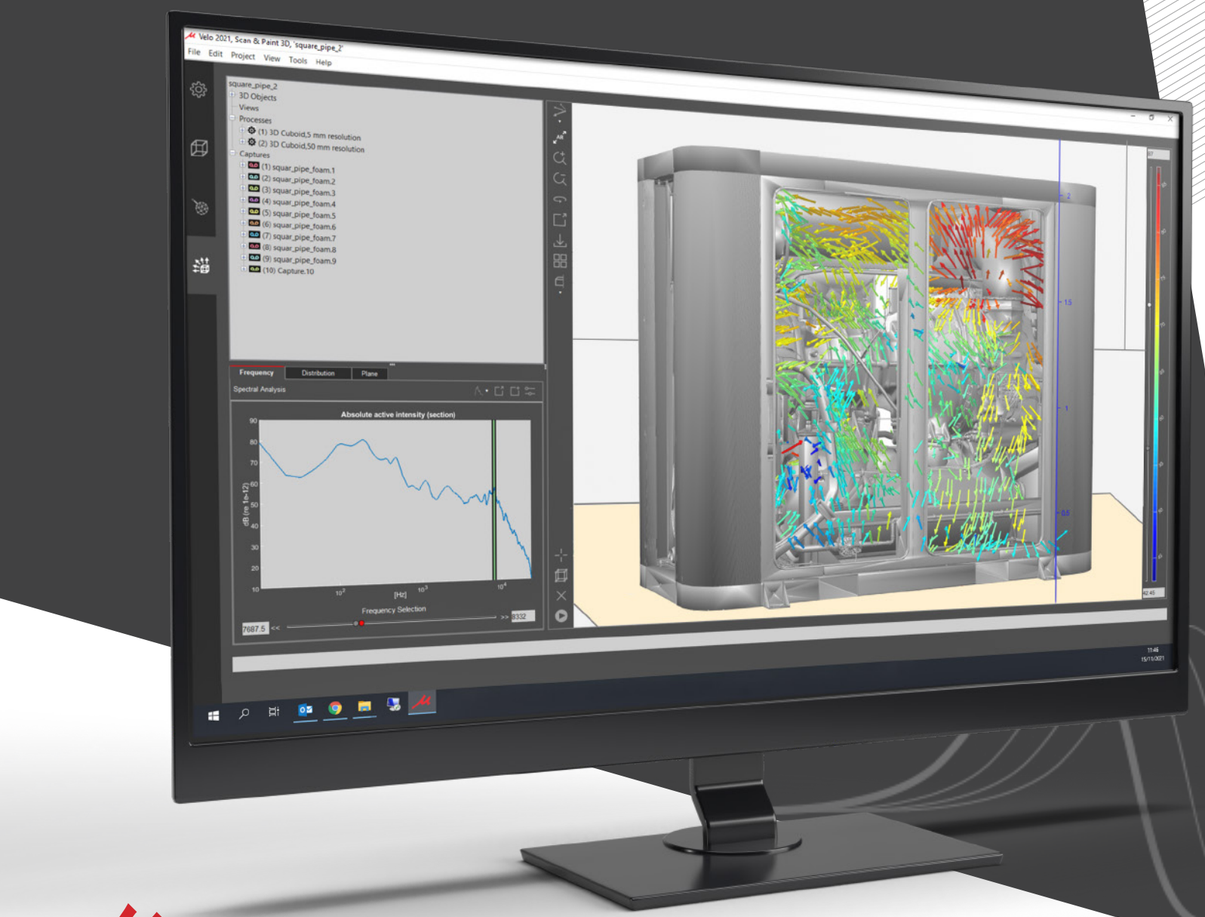
PST Base HD

31 cm

VOYAGER

Intuitive & comprehensive
NEXT LEVEL SOUND VISUALISATION SOFTWARE

What originally started with sensor technology has become one of the world's most unique instruments for sound visualization. Microflown Technologies integrates different hardware products with a powerful but user-friendly software package.



Offering so much more than a 3D sound map

Scan&Paint 3D Software application comes as part of Microflown successful VELO platform. It is one of the first VELO applications to transition to the 64bit version, decreasing file loading time and increasing software and PC performance capabilities.

The Scan&Paint 3D solution prides itself on being user-friendly and a plug & play solution, meaning that the software and hardware work synchronized to facilitate connections, leading to a straightforward setup condition.

Certifying the solution is user-friendly also shows in its ingenuous icon-based GUI design, transcending language barriers and skill levels, making the Scan&Paint 3D software intuitive and quick to learn. In addition, the software guides the user through configuring, importing, measuring, post-processing, and the results.

But don't let this simplicity fool you. The software packs a punch regarding the variety of tools in its arsenal. Users can import different 3D files and make measurements with multiple 3D geometries. Compare multiple analysis configurations within one project by creating different processes with different quantities. On top of this, the software displays data in real-time, making it the perfect tool for troubleshooting.

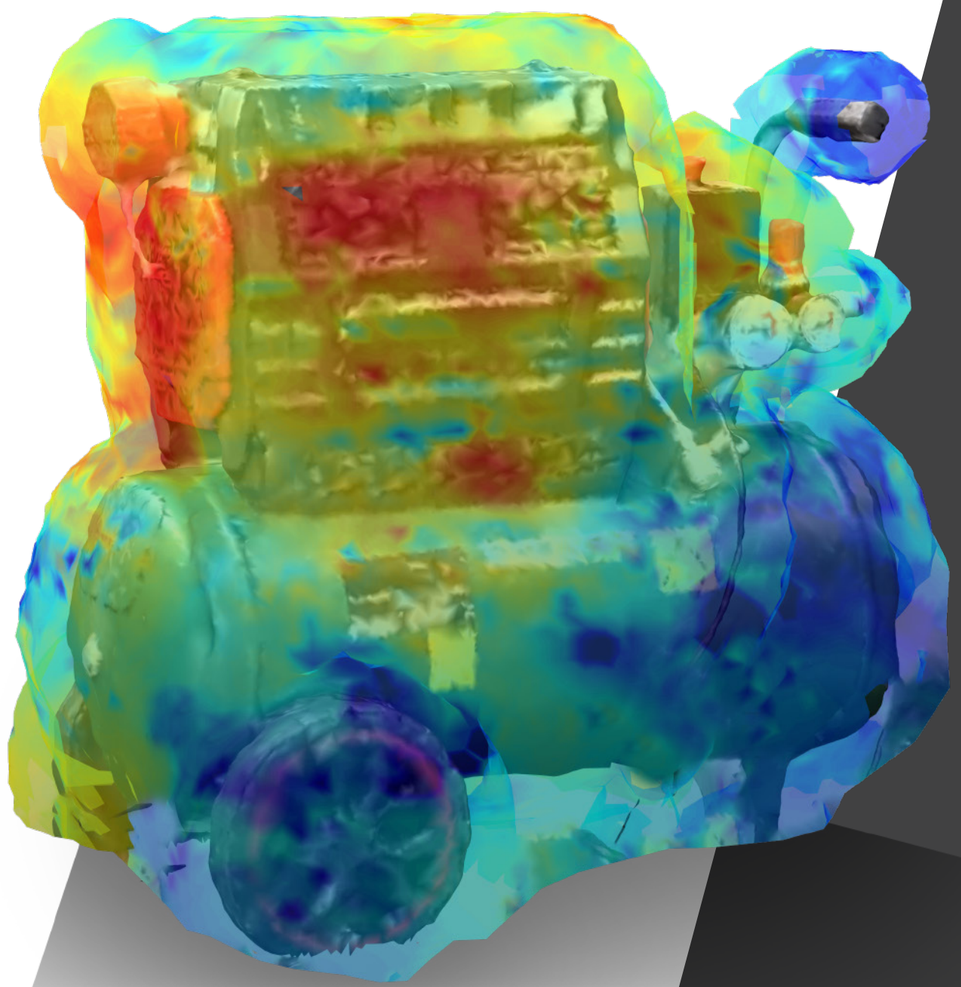
Direct import of 3D models

All results are visualized on an interactive 3D model. The software can directly import a variety of standard file formats and has embedded tools to modify loaded files. File format standards from popular programs like CAD or Sketchup. Examples of format types are .obj, .stl, .3DS, .Shape and .dae.

Alternatively, if no model is availably for import, a fast method using a Structure Sensor to obtain a detailed 3D model can be offered. The structure Sensor can be used either with an Ipad or PC and provides a 3D model in a directly compatible file format in a matter of minutes. But the software also alows for the use Appel's LiDAR sensor.

Redefining Sound Analysis

In the ever-evolving realm of sound and vibration analysis, precision and clarity are paramount. The latest enhancements to Scan & Paint 3D, elevating your sound analysis capabilities to unprecedented heights. Our cutting-edge modules redefine how you perceive, analyze, and communicate sound data. Let's delve into the transformative features that are set to revolutionize your approach to sound analysis.



CHARTING SOUND FIELDS

FULL 3D WRAPPED SOUND MAPPING

Accurate visual representations of measurements are now at users' fingertips with the introduction of full 3D-wrapped sound maps. Performing 3D sound localization and identifying noise issues becomes an effortless task, thanks to this feature's ability to provide an intuitive and detailed overview of sound distribution at a user-defined distance range. An enveloping layer is automatically calculated at an arbitrary distance from the object's surface, visualizing just the right data of interest.

DYNAMIC SOUND VISUALIZATION RESULTS

Take 3D sound localization to new heights by visualizing data in different ways, whether it's exporting text-only, Excel, images, or stunning customizable videos. Showcase your expertise like never before with dynamic and clear video exports. Our solution empowers you to communicate your findings and insights effectively, ensuring seamless collaboration and impactful results

SOUND POWER CALCULATION & RANKING

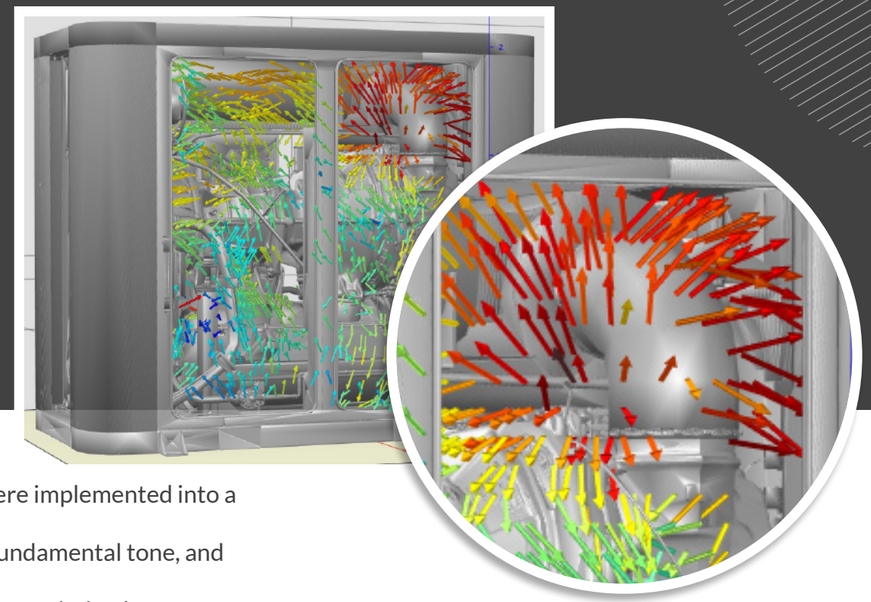
Besides unparalleled 3D sound visualization, users gain the ability to define customizable planes, allowing efficient quantification and ranking of essential sound sources. This invaluable functionality provides deep insights, enabling users to pinpoint and prioritize areas for improvement and optimization with ease.

SCAN&PAINT 3D SOFTWARE LICENSES	STANDARD	PRO
Data recording	✓	✓
3D Tracker (incl. live tracking)	✓	✓
Support 3D objects texture mapping	✓	✓
Sound pressure, 3D Particle velocity, 3D sound intensity Mapping	✓	✓
Troubleshooting Tools	✓	✓
Multi-view tools for result analysis and comparison	✓	✓
Colormaps based on planar sections	✓	✓
Advanced colormap display (3D wrapping and spherical sections)	✓	✓
Full export options (incl. *.csv and* .mat .avi)		✓
Multi-Panel grouping, comparison and sound power ranking		✓
Overall sound power estimation (cuboid-based)		✓

Reducing noise emissions from Lontra's LP2 compressor

LONTRA CASE STUDY

LP2 is the first fully packaged blower manufactured by Lontra using its proven patented BladeCompressor. It operates at up to 1barG, delivering up to 2630 m^3/h of air at 2500rpm. It is a positive displacement machine, which produces 1 discharge per revolution, resulting in low frequencies of emitted noise. This poses some unique acoustic challenges for various aspects of the design, and led Lontra to use the Microflown equipment.



Goals

Lontra has a culture of innovation, encouraging thorough engineering evaluation to design better products. Lontra wanted a rigorous approach to identify and precisely target key noise sources in the new blower, to efficiently achieve a quiet product.

Why use Scan&Paint 3D?

Scan&Paint 3D allowed Lontra to identify sources within the enclosure, prioritise and precisely target them with minimal modifications and cost. The key benefit from Lontra's perspective is the ability to accurately resolve frequencies below 50Hz, which is critical due to the low running speeds of the LP2. The Their equipment can also calculate sound power even when used in relatively small test cells, which is important to avoid costly facilities.

Method

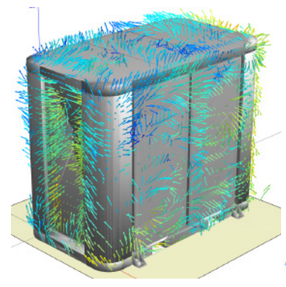
A pre-production LP2 unit was scanned using Microflown Scan & Paint 3D to locate where sound was emitted from the enclosure (scanning the outside), and to then identify the sources responsible for those emissions inside the enclosure (scanning the interior of the opened enclosure). Due to the size of the LP2 package, the outside of the enclosure required around 16 individual trajectories, by repositioning the 3D camera. All the trajectories were analysed together in the Velo software, giving a single processed dataset.

The results were used to inform design changes, which were implemented into a subsequent enclosure:

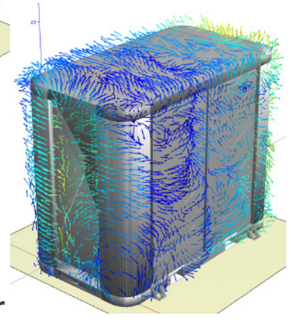
- Redesigned inlet silencer to better attenuate the fundamental tone, and hence reduce excitation of the rear panel
- Softer anti-vibration mounts to reduce vibration transmission between front and rear panels
- Stiffening of front and rear panels
- Improved outlet pipe cover
- Better quality control for enclosure panel assembly

Using just a single set of acoustic scans, Lontra was able to reduce the A-weighted sound power of the enclosure by over 3dB by identifying a key vibration transmission path inside the enclosure. Furthermore, this improvement was achieved with minimal cost additions to the enclosure, and little previous acoustic data or experience of the Microflown Velo software, which is a great first result for Lontra.

It is also clear that there are still improvements to be made, and that by using Microflown equipment we will be able identify, prioritise, and address them in a more efficient and cost-effective manner.



Before



After

Want to read the full case-study

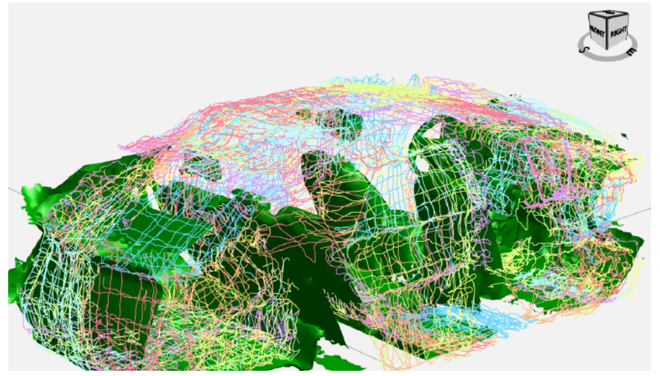
curious about full mesurements and results?

CLICK HERE

Acoustic performance enhancement of a Hyundai electric vehicle interior

HYUNDAI CASE STUDY

The vibro-acoustic properties of a car cabin play a key role in the perception of vehicle quality. One of the main NVH goals of most car manufacturers is to enhance acoustic performance while meeting demanding weight and cost targets. Traditional applied experimental techniques have strong limitations, especially testing a complete vehicle is mostly unfeasible, requiring an independent evaluation of each subsystem.



Goals

Apply a novel methodology to enhance acoustic performance while meeting demanding weight and cost targets.

- Complete vehicle 3D scanning and broadband, high spatial resolution sound field mapping
- Noise ranking of vehicles sections, so called panel contributions
- Design and improve the acoustic package of a commercial electric vehicle

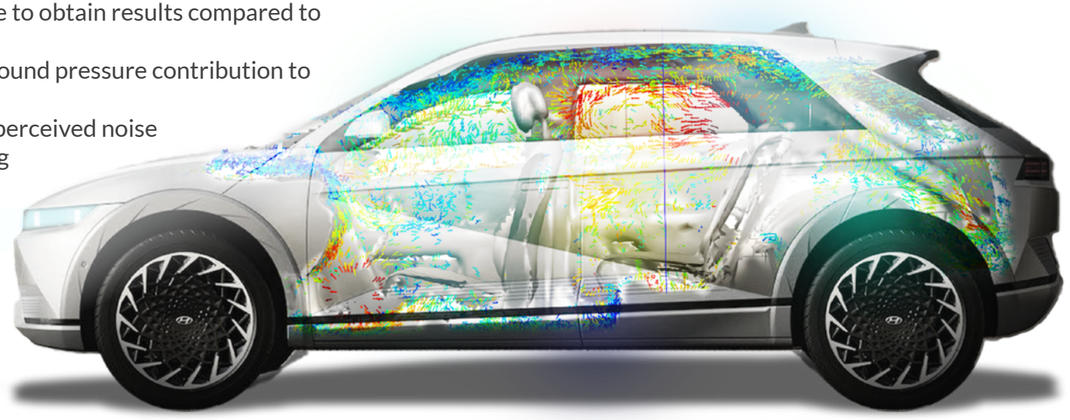
Outcome

The visualization of sound intensity in a 3D space enables to get an intuitive and comprehensive understanding of sound radiation mechanisms as well as the interaction between problematic elements. By 3D scanning, it was already possible to identify two critical bands with very different behavior. The trunk has the highest acoustic emission for lower frequencies, whereas the C pillar, B pillar, and rear passenger windows seem to dominate the medium frequency range.

Secondly, a ranking of the main sections of the car interior was presented, showing that the combination of reciprocally measured acoustic transfer functions with 3D sound intensity measurements can reveal the main problematic areas for multiple operational conditions and/or frequency bands. This information was used to apply an effective acoustic treatment in order to reduce the noise perceived by the vehicle's passengers.

Introduction of a novel technique

- Easy identification of the problematic area in terms of noise emission
- Broadband, high spatial resolution visualization of the sound field to intuitively identity main sources
- Significantly decrease of required time to obtain results compared to traditional techniques
- Ranking of the panels based on their sound pressure contribution to a defined reference position
- Knowledge and information over the perceived noise by the vehicle's passenger for applying proper and effective damping treatment



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