Thu, 1 August 2024
Weekly Newsletter

DVN Interior

NEWSLETTER #223

Editorial

Car Acoustics And The Driving Experience

VI-GRADE IMAGE

Car audio acoustics is the science of sound behavior in automotive environments. It encompasses the design and layout of car interiors, the placement and configuration of speakers, and the materials and parts used to enhance or damp sound. Automakers can optimize their cars' audio systems to deliver the best possible sound quality by understanding the principles of car audio acoustics and incorporating them into their designs.

Cars are increasingly electric, so engine and transmission noise no longer mask audio deficiencies, and so the topic is more influential to the driving experience than ever before.

We met with Shanghai Xinzhisheng Technology, a Chinese company specializing in automotive acoustics, and this week's in-depth article is a look at that company as well as one of their specialties, passive noise cancellation in car interiors.

Don’t forget to register and plan to attend the upcoming DVN Interior Torino Workshop, on 22-23 October in Torino, Italy. All information is on the **DVN Interior Website**, including the detailed docket, expo program, and sponsorship opportunities. Don’t miss it, save the date! I'm looking forward to meeting you there.

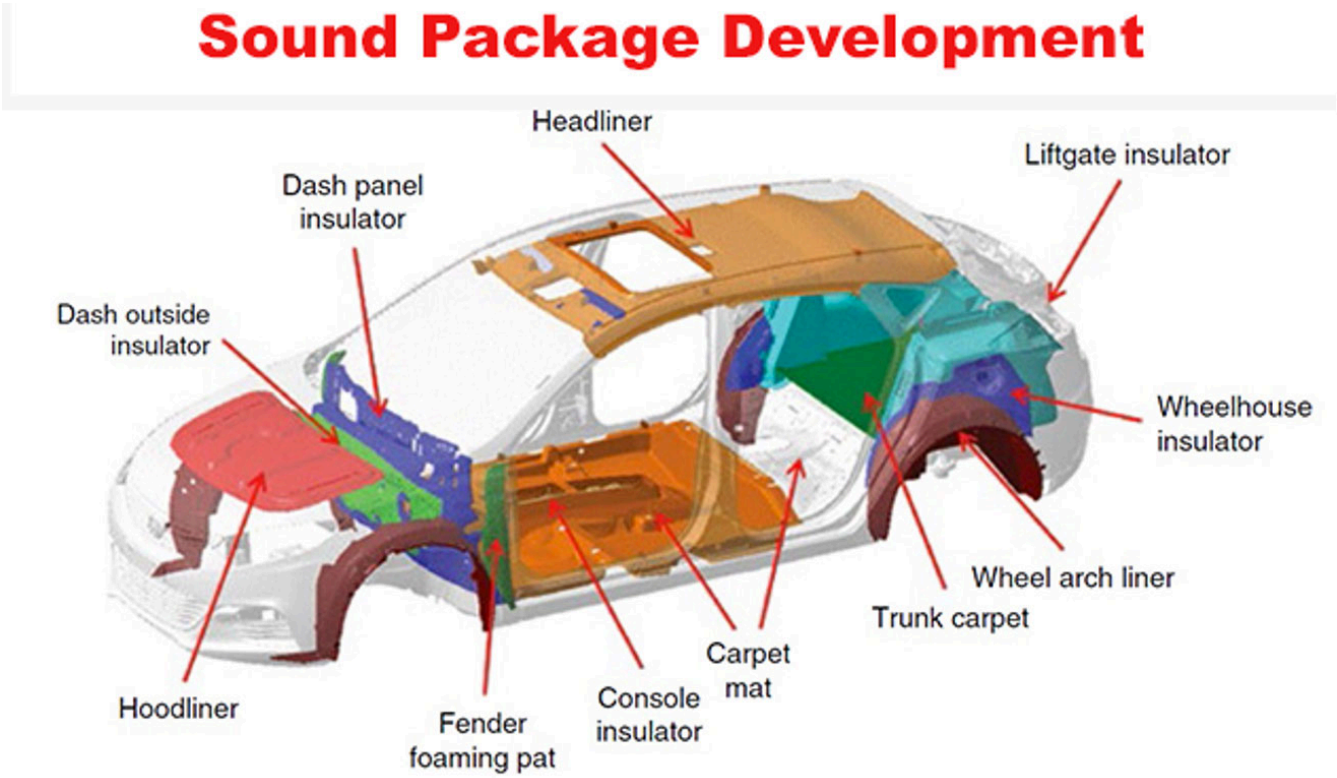
It's summer vacation time, so your DVN Interior newsletter is on hiatus until Thursday, 22 August.

Sincerely yours,

Philippe Aumont
DVN-Interior General Editor

In Depth Interior Technology

In-Vehicle Acoustics and Passive Noise Cancellation



ALFA ACOUSTICS IMAGE

With logistical assistance from DVN Interior's China representative Ann Ai, we met with Shanghai Xinzhisheng Technology. They specialize in automotive acoustics.

Passive Noise Cancellation

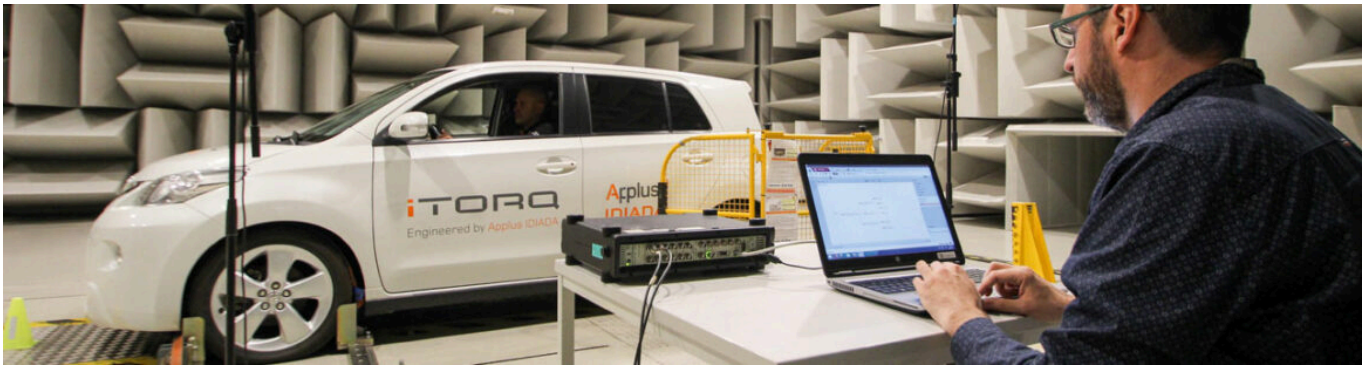
HYUNDAI ACOUSTIC LAB (HYUNDAI IMAGE)

Car noise is that measured during the driving of the car, and it is an increasingly important element of car design. Noise fatigues the driver and passengers—which, in turn, can degrade safety—and it influences the overall user experience.

Passengers inside the cabin are subjected to external noise sources including road-tire noise, wind noise, engine noise, HVAC noise, exhaust noise, vibration noise, electric seat adjustment noise, etc. The relative contribution of these noise sources to the total noise depends on several factors, such as the vehicle's speed and acceleration conditions, the quality of roads and tires, and the vehicle's aerodynamics, among others

EVs produce high-frequency sounds from electric motors, which are generally quieter and can be muffled and minimized with design techniques like transmission loss and acoustic absorption. So in an electric vehicle, powertrain noise contributes relatively little to total noise compared to traditional ICE vehicles. With a conservative estimate of 6dB background noise reduction because of the absence of an engine, the other noise sources stand out and can get annoying to human ears.

Yet, EVs are still noisy. Batteries increase the weight of the whole vehicle dramatically, compared with the weight of an ICE vehicle. This puts increased pressure on the tires and the road surface, so the tire and road noise are greater. EV weight has led to the adoption of lighter structural plates, which are not conducive to noise isolation. For the same reason, automakers put a limit on the weight of the acoustic package, which is not good for sound insulation and sound absorption either.



ACOUSTIC TESTING (HBK IMAGE)

Why is it so important to reduce noise? Well, for one thing, it's crucial for accurate voice interaction and control, and for the clarity of wireless voice calls and in-car voice conversations. Removing low-frequency road noise, in particular, is important to improve the quality of car audio.

What are some characteristics of interior noise?

• The main energy is below 1,000 Hz, the dynamic range can exceed 100 dB, and the road noise is mainly low-frequency tire noise, which is transmitted to the cabin from below through the chassis. Passenger voices are in the 500 - 2,500 Hz range, so improving speech intelligibility means improving the signal-to-noise ratio in that frequency band, suppressing low-frequency road noise, and reducing the masking effect of noise on speech.

Passive noise cancellation (PNC) uses noise-isolating materials to absorb and damp the energy of undesireable sound waves. Structural damping materials such as fiberglass and foams are sandwiched between car body parts. Laminated glass, door sound barriers and seals, tuned mats for the dashboard, floor, and roof are among the parts used to damp the sound waves before they reach inside the cabin.

AUTO CARPET (AUTONEUM IMAGE)

Traditional PNC parts include liners behind the dashboard, between the engine compartment and cockpit, floor carpets, parcel shelves, headliners, door panel insulation, back seat trim, pillar insulation, trunk trim, wheelhouse insulators, and more.

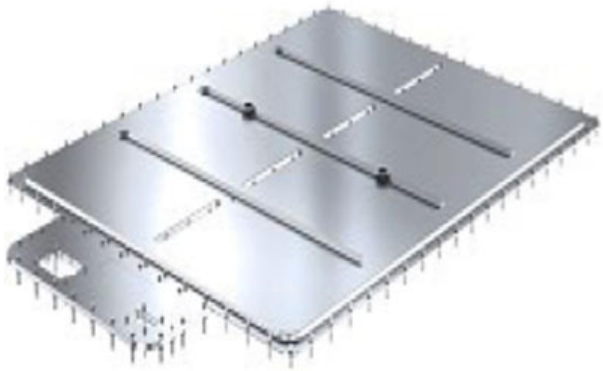
Shanghai Xinzhisheng Technology

Shanghai Xinzhisheng Technology is in Jiading, Shanghai's automotive industry hub. They have a large intellectual property portfolio including a unique automotive active road noise suppression system, a centralized microphone-array partition noise cancellation pickup system, and a cockpit audio-optical music rhythm system; Their products cover NVH technology, audio and sound effects, human-computer interaction, and other acoustic products for new energy vehicles.

SHANGHAI XINZHISHENG IMAGES FROM NOW ON

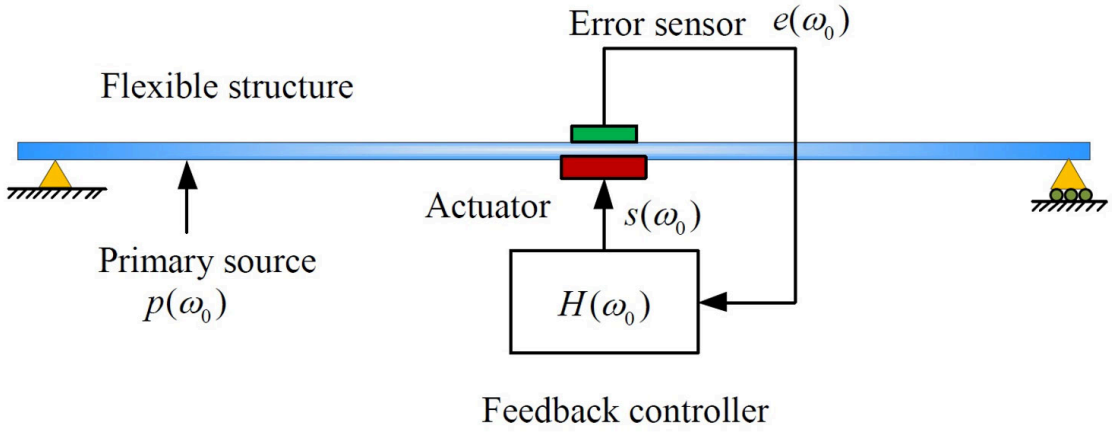
Structural vibration damping + ANC

Xinzhisheng provides solutions for structural active vibration and noise control technology. If you think of the cabin of a car as a well-enclosed space, the air sound conduction path has been blocked. Road noise mainly vibrates through the innermost plate of the chassis and radiates into the cabin as a secondary sound source. Therefore, it is necessary to block the conduction path of the structure.



Structural resonance active control technology

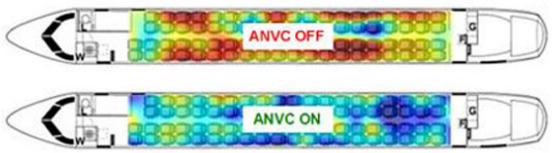
The structural vibration signal is extracted by a single-axis accelerometer, and the active inverse vibration is manufactured through the ANC circuit, and the low-frequency resonance peak generated by the structural vibration is offset by the piezoelectric ceramic exciter to form an active counterweight. This has a much better vibration damping effect than a passive counterweight, and does not increase weight.



基于反馈架构的振动控制方案

Structural Noise Reduction Technology

Structural vibrations are measured using accelerometers and inverse signals are generated by piezoelectric exciters to minimize the energy of acoustic radiation in the target space. Multiple sources of secondary noise radiation and interaction with reflective surfaces need to be considered. It's a systematic approach with a new set of testing and implementation methods. At least 8 dB of noise attenuation can be achieved.



It is stable, reliable, and affordable, with significantly better results than previous methods. Its technological advantages include:

- Excellent vibration and noise attenuation
- The circuit is simple, and the DSP computing power requirements are not high
- Instantaneous convergence
- The system is very stable and there is no problem of running away
- Targeted multi-point arrangement with flexible quantities
- The effective bandwidth is better than that of RNC

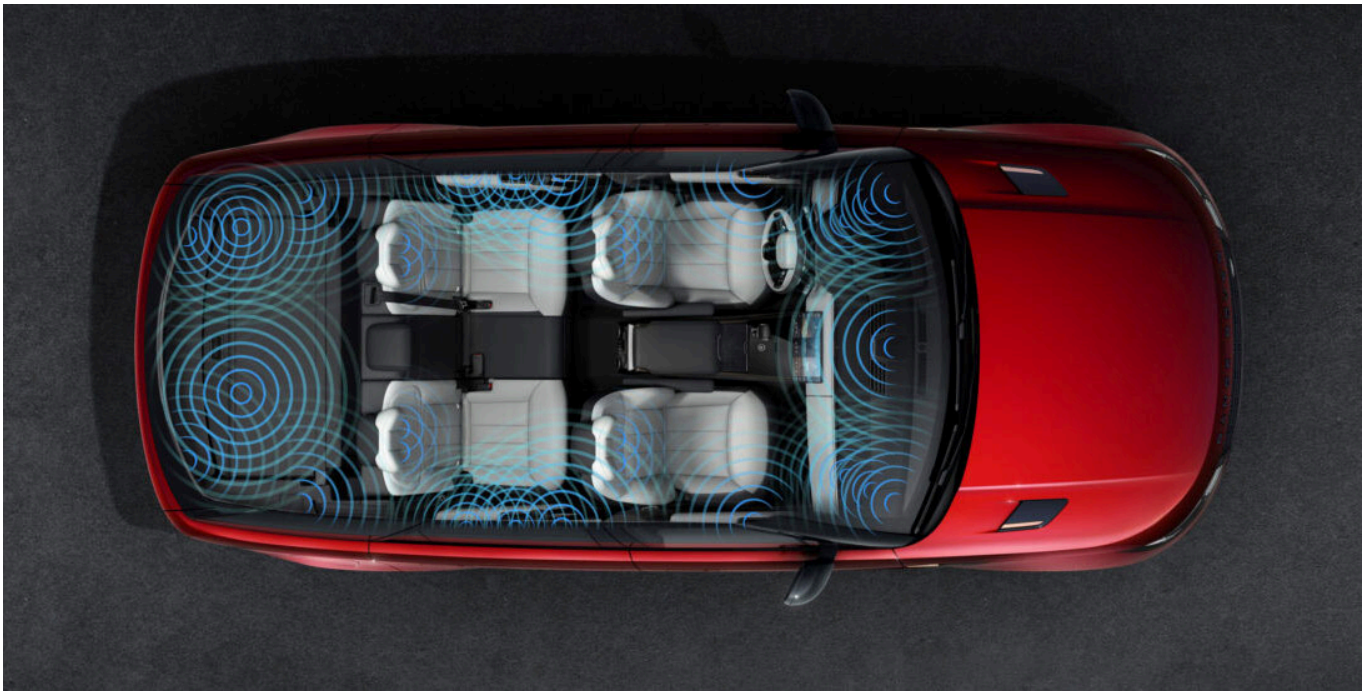
It reduces or eliminates expensive A2B chips, minimizes wiring harnesses, uses a relatively inexpensive single-axis MEMS accelerometer; the algorithm is simple, and the cost of DSP chip is controllable. It also allows for a flexible number of devices.

DVN Interior will report more on this topic, for there are many companies operating in this space—including Autoneum, Trèves, Adler Pelzer, Auria, and material suppliers such as 3M and Covestro. The whole ecosystem is pursuing new technologies including ANC, acoustic panels, and more.

Interior News

JLR + Meridian Work on Sound and Noise Cancellation

INTERIOR NEWS



JLR IMAGE

JLR wants to expand their collaboration with Meridian Audio, a British audio supplier creating innovative technologies since 1977. According to JLR, Meridian's experts will participate in the design of new models at an unusually early stage. This is crucial in view of JLR's electrification plans. Together, the two companies want to create interiors designed for a good sound experience. Since the noise and vibrations caused by a combustion engine are absent, electric cars have fundamentally different conditions for the sound perception of the occupants. JLR presently offers active noise cancellation. In the third stage of development, it will detect and countervail wheel vibrations as well as tire and engine noises that try to make their way into the passenger cabin.

JLR has been using Meridian's expertise since 2010, with resultant audio systems available for all the maker's models. The highest level of Meridian audio technology is currently installed in the Range Rover models with the Signature Sound System. It has 1,600 watts and 35 speakers, including two 20-watt speakers in each headrest of the four outer seats.

Loomia Puts Stretchable Electronics Into Cars

INTERIOR NEWS

LOOMIA IMAGE

Stretchable electronics stand to move the boundaries of how and where electronic devices can be integrated. Unlike conventional rigid electronics, stretchable electronics can bend, twist, and stretch while maintaining functionality, opening new possibilities for seats, interior trims,health-monitoring systems, wearable devices, and more.

They're built by embedding electronic devices and circuits onto stretchable substrates like textiles, PU, or any soft interior material. This allows the completed circuit to experience large strains without failure, ideal for applications that require conformability and resilience to motion and deformation.

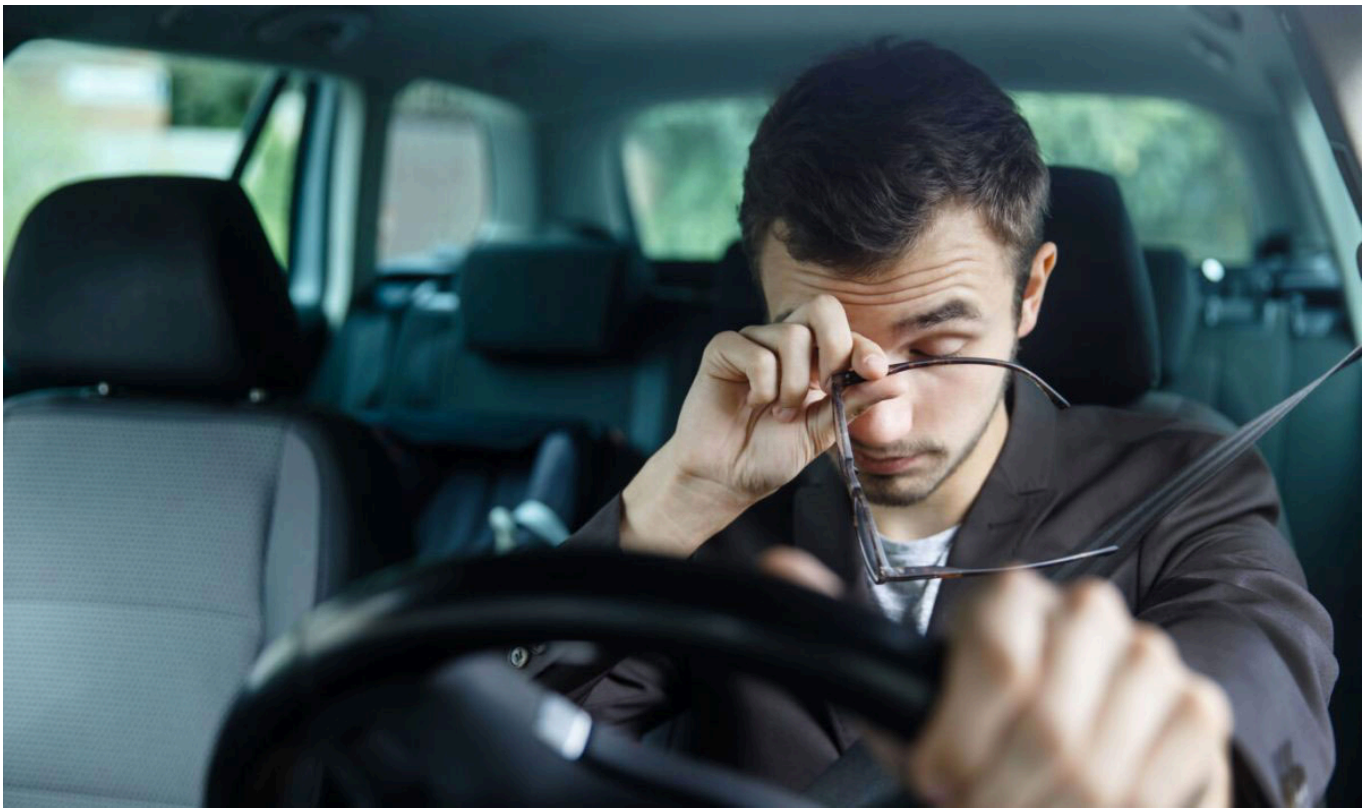
The Loomia Electronics Layer (LEL) is a soft, flexible circuit layer that can be patterned for stretch without straining the conductor. The LEL's unique properties allow it to be easily designed for heating, lighting, pressure sensing, and more, making it a versatile solution for a wide range of applications. It offers a hybrid solution of laminating a mesh conductor onto a TPU. This allows for stretch in areas that will not disrupt the function of the conductor itself for stable resistance throughout the product lifecycle.

One of the most exciting aspects of LEL technology is its ability to integrate with textiles. This integration is achieved through various techniques such as sewing, laminating, and using pressure-sensitive adhesives. The result is a blend of fabric and electronics, creating smart textiles that can sense, react, and adapt to their environment.

The LEL offers advantages over traditional flexible electronics options. It is more drapable, allowing for a closer fit to the human body, especially in a seat. Its low-resistance conductors maintain their electrical properties when stretched, ensuring consistent performance. Additionally, the LEL can combine multiple functionalities into one component, streamlining the design process and reducing the need for additional parts.

Seeing Machines, Valeo Partner for DMS

INTERIOR NEWS



Vision technology company Seeing Machines designs driver monitoring systems. They have announced a strategic collaboration with Valeo, along with the acquisition of Asaphus Vision, a group—already involved with three automotive programs—with machine learning and artificial intelligence capabilities, unique IP, and a Berlin office.

Valeo's units will complement Seeing Machines' leadership in driver and occupant monitoring system technology. Together, they will jointly pursue opportunities across the global auto industry to meet the growing demand for enhanced interior cabin experiences, alongside meeting increasingly stringent safety regulations across the world.

Valeo will transfer their driver monitoring perception system software activity to Seeing Machines. This will primarily be facilitated by Seeing Machines' acquisition of Asaphus, a Valeo-owned German company based in Berlin, dedicated to the development of driver and occupant monitoring software.

Valeo Brain Division CEO Marc Vrecko calls the collaboration "another demonstration of Valeo's ability to build the ground for successful cooperation with core technology companies. These last five years, with Asaphus, we have been able to grow the company, develop their AI perception technologies and build a solid position in interior monitoring systems".

Asaphus generated a €49k profit in 2023.

The acquisition of Asaphus' operating business, currently engaged in two Automotive programs in Europe and one in China, is expected to have a cash-neutral impact on Seeing Machines in the short term, with a positive contribution as services and other revenues grow over time.

Seeing Machines CEO Paul McGlone (interviewed in DVN in 2023) says, "With our shared culture of innovation, this collaboration will enable our team to continue to lead the interior sensing market as we complement our highly specialized skills and work with Valeo, a world leading automotive technology company, to deliver driver and occupant monitoring solutions to more automotive customers, globally. As regulations making driver monitoring systems mandatory across the EU come into effect this month, the market for enhanced safety and convenience solutions is expanding daily. Thanks to our proven, class-leading technology, we are very well placed to solidify our industry leadership position, supporting our customers in getting their programs successfully to production".

Audi A5 Goes Live

INTERIOR NEWS

AUDI IMAGES

In the new Audi A5, passengers are greeted by a redesigned interior, for example, from flooding the dashboard with display space to the large monitor for the front passenger.

For journalists, the sight is not completely new, as the Q6 e-tron anticipated this architectural style.

The new interior ensures plenty of space. Elegantly curved lines emphasize the width and frame the front passengers. Materials that are pleasant to the touch and look meet the "digital stage" already installed in the new Q6 e-tron with the curved panoramic display consisting of an 11.9" central instrument and 14.4" touchscreen. This is complemented by the optional 10.9" display for the front passenger and a new, configurable HUD.

Chat GPT is in the car, whether occupants like it or not. Standard equipment has been expanded in details, such as the navigation system, the electrically-opening and -closing trunk lid, and the telephone tray with inductive charging function.

In addition to customization options, Audi offers three packages: "Tech" with full LED headlamps, 3-zone automatic HVAC, and Audi MMI plus; "Tech plus" with matrix LED headlamps, front passenger display; and "Tech pro" with digital OLED rear lights, steering wheel heating, heated front and rear seats, and adaptive damper control.

Audi has significantly expanded the lighting and especially the OLED technology for the A5. For example, the digital light signatures for the three-dimensional headlights and rear lights can be changed at the touch of a button. In one of eight configurations, a new image is compiled from the 364 segments at the rear

several times per second. This creates an unusual kaleidoscope effect—those travelling behind will be amazed, or perhaps distracted.

The range of assistance systems has been extended. The rear parking aid, lane departure warning system and attention and drowsiness assistant (DMS) are standard. The adaptive driving assistant plus is available as an option. This uses swarm data from other vehicles, which is calculated in the cloud. Other options include Active Front Assist, which includes Front Emergency Brake Assist, Evasion Assist, Turn Assist and Cross Traffic Assist. The driving assistant also uses traffic sign-based cruise control.

New Interior for Bentley Continental GT Speed

INTERIOR NEWS

BENTLEY IMAGES

Bentley's Continental GT Speed and GTC Speed will be handcrafted in Crewe, England. Production and deliveries are scheduled to begin in the third quarter of 2024.

The new edition of the Continental GT offers a straight cockpit with a digital instrument cluster and an infotainment system with a large display that can be hidden thanks to a rotation mechanism. In digital detox mode, the occupants look at three small round instruments instead of a large screen—it would be interesting to learn, after awhile, how many owners leave it that way full-time. The whole thing is embedded in an ensemble of fine materials and lots of leather. Special features include HVAC with air ionizer and a Naim audio system with 18 loudspeakers.

There is a choice of three different audio systems, and acoustic glazing is standard. The Bentley Rotating Display shows either the 12.3" display, three analogue round instruments, or a smooth, handcrafted wood veneer at the touch of a button. The infotainment system offers features including wireless Apple CarPlay and Android Auto, OTA map updates and connected car services.

The environment display in the driver's instrument panel supports and enables driving in semi-assisted mode by providing feedback to the driver how the car is responding to other vehicles. The vehicle's

'understanding' of the surrounding environment allows for Intelligent Park Assist, the latest generation self-parking system with speed control.

The HVAC system has been revised to increase cabin wellness including air ionizers, a new particulate matter filter, and displays showing air quality outside and inside the vehicle. The system also synchronizes with the car's satellite navigation, knowing when it might be necessary to improve cabin air quality (for example by recirculating the cabin air when in a tunnel).

The 20-way adjustable seats in the Continental GT are already known for comfort and refinement. New interior features include the optional Wellness Seating with Postural Adjust and Auto Climate for the front seats, minimizing fatigue and providing a high level of relaxation.

Mood lighting around the cabin works the sculptural shapes of the seats and doors to create a cocooning effect, with the user able to choose the color of the lighting from 30 options.

The colored fabric top of the GTC convertible consists of seven arches and opens in 19 seconds at road speeds of up to 48 km/h. The Bentley models offer all-wheel steering, torque vectoring, active roll stabilization and a new generation of control software for the electronic stability control as standard. In addition, the vehicle is equipped with active suspension with a new two-valve shock absorber system and dual-chamber air springs for high driving comfort.

Dacia, NGG Introduce OSM-Based Navigation Maps

INTERIOR NEWS

DACIA IMAGE

Nielsen Norman Group (NNG), an American computer user interface and UX consulting firm, has launched NNG Maps, a new navigation solution for Dacia vehicles, based on the OpenStreetMap (OSM) platform.

The OSM platform is a free, open geographic database updated and maintained by a community of volunteers via open collaboration.

The NGG map solution integrates OSM's global database with customized automotive content and services from NNG and its partner network, aiming to provide a more comprehensive and up-to-date navigation experience for Dacia drivers.

NNG Maps builds on more than a decade of in-house experience with OSM, aiming to enhance the UX with frequent map updates, richer content, greater road network coverage and more points of interest.

The collaboration between NNG and Dacia leverages OSM’s base-layer data, allowing auto makers to customize maps to meet specific brand and customer preferences. NNG’s experience in map compilation and validation aims to ensure that the maps are feature-rich, current and frequently updated.

The company says the solution has already gained traction with thousands of drivers across Europe, including France, Germany and the Netherlands, all registering to use the service. Further regional expansion is planned from 2025.

The Design Lounge

Cadillac's Sollei Luxury EV Convertible Concept

THE DESIGN LOUNGE

COFFEE CORNER
DVN
Interior

GM IMAGES

Cadillac has revealed their Sollei concept, which showcases Cadillac's ability to craft opulent, elegant luxury vehicles. It is a two-door convertible take on the highly customizable Celestiq EV, designed to demonstrate "the ultimate design expression of a coach-built luxury electric convertible".

The exterior design seems in line with that of the Lyriq and Celestiq, particularly with the distinctive front grille and light signature.

The Sollei and Celestiq have the same wheelbase and overall length, and use the same Ultium battery platform.

The Sollei concept is less about the driving experience and more focused on design and craftsmanship. The name comes from "sol," for sun, and "lei," for leisure, and the design reflects tranquility.

The Sollei is hand-painted in Manila Cream, a color first used on Cadillacs in 1957. The 23" wheels have a silver finish, and other metal trim, such as the brushed aluminum windshield surround, has a rose gold 'Aurora' look. Instead of door handles, there are subtle buttons integrated into the door trim.

The doors themselves are big, longer than 1.5m, and the interior is full of rich leather and surfaces of the finest wood. The wood was left unstained to show off the natural color and grain patterns with an open-pore finish. Each strip of wood is hand-cut and hand-laid using a furniture technique called marquetry, and the paneling runs down the side of the cabin and up the rear of the seats in a pattern that has an Art Deco flair.

The cabin shares the same cream-yellow color as the exterior, which pairs beautifully with the light tans of the wood. The wood pattern on the seat backs as well as the stitching and perforation on the seat cushions kind of reflect the sun. The Nappa leather is coated in a pink iridescent pigment, which Cadillac says produces a 'subtle color-changing sunrise effect'.

The dashboard is largely the same as that in the Celestiq, with the same 55" displays spanning the width of the dashboard and containing two separate screens. In between the rear seats sits an integrated chiller with a powered glass door, holding a crystal decanter and glasses. The interior ambient lighting has 126 color choices and several zones that can individually adjusted.

Along with the drink set, the Sollei also features a more unique accessory in between the rear seats. Due to the car's open-top nature, Cadillac included a custom brushed metal and leather-wrapped case. The kit also

includes a leather-bound journal with hand-painted bird illustrations and a leather tool roll to hold pens and pencils so birdwatchers can record what they see.

Cadillac's press release also mentions a fabric roof that we don’t see in the pictures.

News Mobility

Toyota Mobility at Paris Olympics

NEWS MOBILITY

DVN IMAGES

The Paris Olympics just started last Friday, and mobility is at the center of this type of event, happening in a very dense urban environment.

Toyota joined the Olympic Partner program in 2015, becoming the first mobility partner of the Olympic Movement. The company works with Organizing Committees to provide sustainable mobility solutions for the Games, while also delivering a mobility legacy in the host cities and countries.

In collaboration with the IOC, the IPC and the Paris 2024 Organizing Committee, Toyota is committed to making Paris 2024 the most innovative showcase of inclusive and sustainable mobility to date. In total, Toyota will provide a fleet of at least 2,650 electrified vehicles and 700 electric last-mile mobility solutions for the Games.

Toyota’s mobility solutions for Paris 2024 align with the automaker's 'Start Your Impossible' initiative, which aims to inspire employees, partners, and customers, and connect them with the company's core beliefs—including a commitment to support the creation of a more inclusive and sustainable society in which everyone can 'challenge their impossible', and the company's goal to provide freedom of mobility for all.

These solutions include 250 Accessible People Movers (APMs), redesigned for Paris 2024, with the European-built model set to support the transportation of athletes, visitors, and staff around various facilities, including competition venues and the Olympic and Paralympic Village.

These low-speed, short-distance BEVs are the latest illustration of Toyota's mobility-for-all vision, and are designed to offer last-mile service and to transport people with accessibility needs.

Alphabet to Pour Another $5bn Into Waymo

NEWS MOBILITY

WAYMO'S AUTONOMOUSLY DRIVEN JAGUAR I-PACE (WAYMO IMAGE)

Google's parent company, Alphabet, will invest another $5bn over the next few years in their autonomous driving operation, Waymo. Alphabet CTO Ruth Porat announced the news during the company's quarterly financial results call with investors last week: "This is consistent with enabling Waymo to build the world's leading self-driving technology".

Waymo has been developing their autonomous vehicle tech for over a decade now. Originally the Google self-driving car project, its roots lie in Stanford's entries in the 2005 and 2007 DARPA Grand Challenges. At first, the Google project used modified Toyota Priuses and Lexus SUVs, but the company planned to deploy cute pod cars with two seats and no steering wheel.

In 2016, Alphabet spun Waymo off as a standalone company. The following year, the pod car—called the Firefly—was cancelled; instead, Waymo placed big orders for hybrid Chrysler Pacifica minivans and fully electric Jaguar I-Paces, then installing their own sensors and autonomous driving hardware. The company is also starting to test their tech with a Chinese Zeekr EV.

Waymo presently operates commercial ride-hailing services in San Francisco, Phoenix, and Los Angeles, with Austin, Texas, next on the list. According to Alphabet, there are more than 50,000 paid Waymo rides a week across those four cities, and recently, press reported that the robotaxi operator is trying to get approval to start offering pickups and drop-offs at San Francisco International Airport.

General News

ID.Unyx is Volkswagen's New China Sub-Brand

GENERAL NEWS

VW IMAGES

Volkswagen has founded a new sub-brand for the Chinese market. With ID.Unyx, the car manufacturer wants to reach young, lifestyle-oriented people.

The first model is an electrically powered SUV coupé, which is due to be launched in the summer. Four more models are to follow by 2026.

According to VW, the first model comes with a "particularly progressive design": with a golden logo and golden vehicle lettering, LED matrix headlamps, LED tail lights, illuminated crossbars, and an illuminated VW logo at the rear. There is also an interactive 3D avatar as HMI to the occupants. Its appearance can be customized in an app and synchronized with the vehicle HMI. The avatar's voice can be configured based on a human voice.

The car can be seen and bought in exclusive showrooms using virtual and augmented reality. Volkswagen developed the ID.Unyx at their innovation and development center in Hefei in eastern China, where they develop and build EVs for the Chinese market.

Volkswagen plans to launch 34 new models in China by 2030: 16 electric ID models, twelve cars with combustion engines, and six with plug-in hybrid drive. The cars are to be developed in collaboration with SAIC-VW, FAW-VW, and the Volkswagen Smart E-Mobility Hub. VW is also developing two small electric cars together with Xpeng.

BYD Plant Expansion Continues in Turkey

GENERAL NEWS

BYD IMAGE

BYD's recently-announced second European car plant, in Turkey, is part of the Chinese company's rapid expansion on the global market. The first European plant of the Chinese market leader for e-cars and hybrids is currently under construction in Hungary. According to as yet unconfirmed reports from the Bloomberg agency, the second factory is to be built in the Turkish province of Manisa, not far from Izmir.

BYD is building new car factories at a rapid pace worldwide, and not just in Europe. On 4 July, just a few days before the signing in Istanbul, BYD started production at their new plant in Rayong Province, in Thailand. A subsidiary of BYD is currently investing in a new plant for car batteries in Thailand. In January of this year, the first BYD cars rolled out of a new plant in Uzbekistan. In Brazil, BYD has taken over a former Ford plant. According to media reports, they are looking for a suitable location in Mexico.

BYD's strategy is supported by rapid and sustained success on the market. In the second quarter of 2024 alone, they sold 980,000 new cars—40 per cent more than in the same period last year. BYD overtook Tesla as the market leader for EVs in China last year, and now sells more vehicles of any drive type than the former local hero Volkswagen.

The Chinese company is following a long-term plan to produce as many key components as possible themselves, from the battery and chips to the electric drive; they are expanding their own research and development accordingly. BYD is investing the equivalent of €1bn in the new Turkiye plant, with an annual capacity of 150,000 vehicles. A new research and development center is planned at the same time, as announced by the Turkish Ministry of Industry.