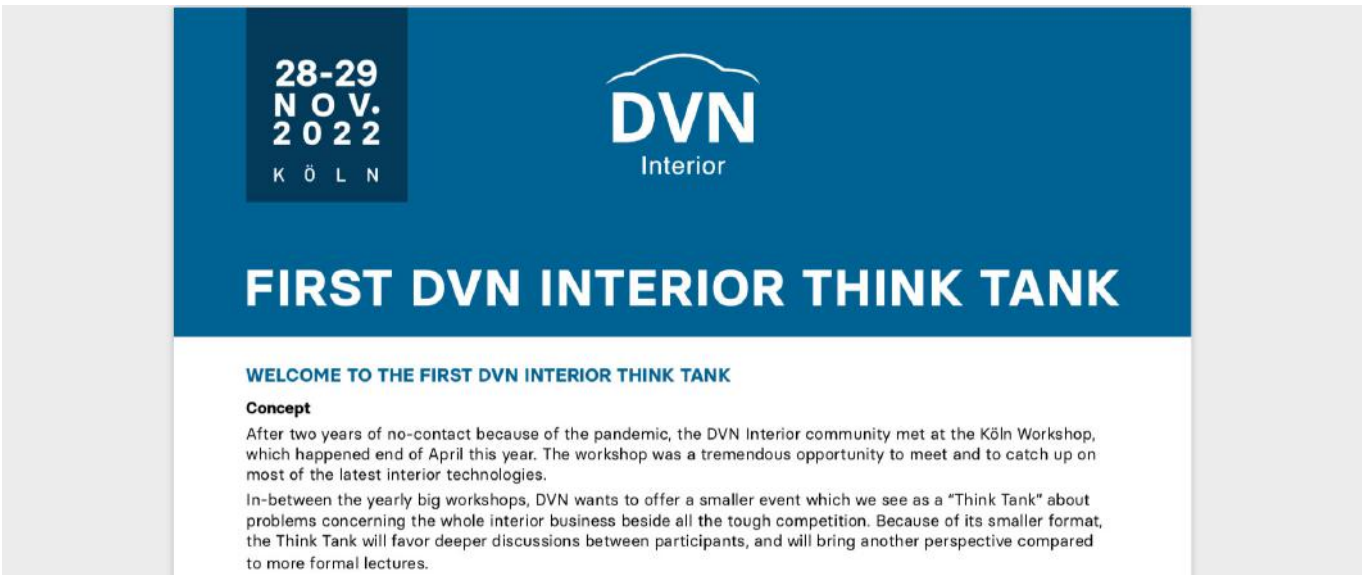
Thu, 20 October 2022
Weekly Newsletter

DVN-I
Automotive Interior

NEWSLETTER #132

Editorial

DVN Interior Think Tank Coming Soon



The first-ever DVN Interior Think Tank seminar is set for 28-29 November at the Pullman Hotel in Köln, Germany; please take a look at the event leaflet sent last week to all DVN-I members. We'd be honored to see you there—the more attendees the better the event will be for everyone—so if you can join in, please **confirm**.

Interior heating and cooling has a significant influence on on the power consumption of an EV, and this week we take a look at innovations in that field, in context of today's energy scarcity and the impending 2035 combustion-engine bans on the slate for Europe and other places around the world.

We've also got coverage this week of stretchable electronics; free form displays, and much more.

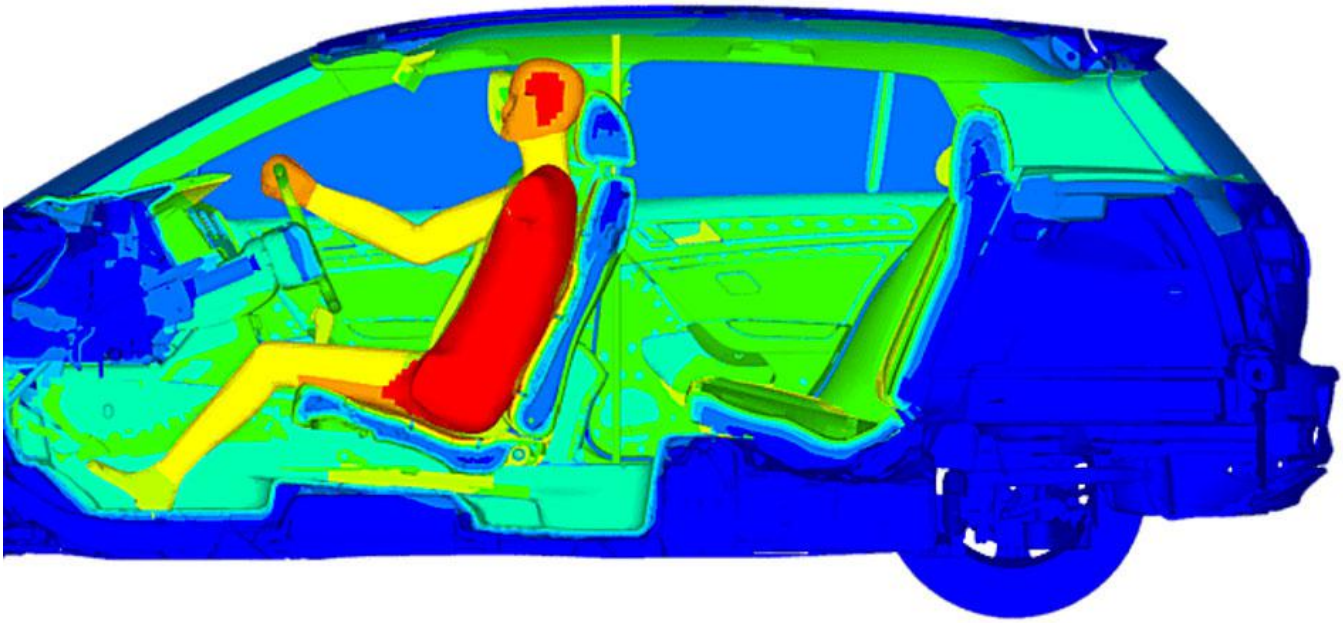
I hope you enjoy this newsletter, and I look forward to seeing you in Köln at the end of next month.

Sincerely yours,

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Cabin HVAC: Innovations and New Challenges



CABIN THERMAL SIMULATION (THESEUS-FE)

For over a century now, drivers have been taking convenient advantage of the waste heat their cars create to stay warm in winter. Only about a third of the energy contained in gasoline gets used to propel a vehicle along the road. Nearly two-thirds of the energy is turned into heat, some of which is absorbed by the coolant with the rest going out the exhaust pipe.

From today's relatively informed perspective, it's kind of ghastly such a wasteful process is the standard means of powering the world's transportation sector. We never before had to think about the environmental implications of a thing such as 'waste heat'; we just took it for granted. No more; now electric vehicles are here and they do not create waste heat.

Early EVs used resistance heating to warm the interior—the kind invented in 1883 by Thomas Edison: electricity is passed through a coil of wire, which heats up and warms the air around it. It works, and it's mathematically 100 per cent efficient (since the only byproduct of creating heat this way is more heat), but it uses a huge amount of electricity for the heat created.

EVs have been progressively moving away from resistance heating and more toward newer ways of doing the job, like heat pumps. Even newer thinking involves heating or cooling only what is necessary, like a single driver or certain surfaces instead of the whole cabin. As a bonus, these new kinds of HVAC can free up more usable space inside the car. We'll look at examples later in this article.

EV Acceptance also Includes HVAC Performance

Research continues to show range-anxiety is still among the top reasons consumers hesitate to buy an EV. And activating the climate controls in an EV means less energy will be available for moving it down the road. Attuned drivers use the heated steering wheel and seat warmers instead of the heater whenever they can.

When air conditioning first became available in automobiles, the early compressors took a great deal of power and significantly reduced gas mileage. For awhile nobody cared much, but as fuel prices went up and A/C technology advanced, systems became more efficient and effective. The same thing will happen—is happening—with cabin heating for electric vehicles.

The latest technology to address the comfort inside the cabin of EVs uses advanced heat pumps with new coolants that vaporize and condense faster.

Refrigerant Supports Industry Sustainability

GENTHERM IMAGE

As science evolved, the climate-trashing effects of hydrofluorocarbon refrigerant HFC-134a ("R134a") became more understood and less tolerable, which sparked a search for a more benign replacement—just as happened in the early 1990s when HFC-134a replaced chlorofluorocarbons like the previous CFC-12 ("R-12") refrigerant, which was severely destructive to Earth's ozone layer.

In the early 2000s, manufacturers started evaluating new refrigerants. Following years of technical and safety evaluations, the global auto industry decided on hydrofluoroolefin HFO-1234yf as the best choice to provide environmentally and personally safe and efficient cabin cooling. R1234yf was easy for automakers to transition to in their assembly plants, and required minimal under-the-hood change and engineering costs. 2022 marks the 10^{th} anniversary of the first adoption of HFO-1234yf in serial vehicle production, and the adoption of R1234yf has gone from zero to 190 million units in just a decade. R1234yf boasts a global warming potential of less than one, which makes it significantly more environmentally preferable over a vehicle's life cycle than all other options—R134a's GWP is 1,430; its predecessor R12's GWP is a whopping 8,500!

Since there's no internal-combustion engine to drive an air conditioning compressor or to generate waste heat to warm the cabin, EVs use electric compressors and heaters which draw power from the main battery pack and reduce driving range. On the other hand, these hermetically-sealed compressors—like the ones in refrigerators and home air conditioners—are much less likely to leak refrigerant into the atmosphere, because they don't have the engine-driven compressor's crankshaft seal with high-pressure refrigerant on one side and the low-pressure atmosphere on the other.

EVs also need to control the temperatures of battery modules, motors and other electronics used in these models. Extreme temperatures can cause a battery or motor to fail, affect charging time, reduce battery life expectancy or, in rare circumstances, cause the battery to catch fire. These risks all point to a need to develop new thermal-management systems that minimize power consumption while providing thermal control of the cabin and electronic components.

To achieve this, one leading technology is the heat pump—basically a two-way air conditioning system which can move heat out of the area to be temperature-controlled, like a traditional A/C, or *into* the area like a traditional heater. A heat pump can climatize not just for the cabin, but also can contribute to thermal management for motors; batteries, and electronics.

By designing an EV with a heat pump instead of a conventional electric heater, an automaker can extend the driving range of an average EV by 10 per cent.

Now, let's look at some automakers' and suppliers' solutions:

Honeywell

Honeywell International, the product of a 1999 merger between Honeywell and AlliedSignal, is a publicly-traded, multinational conglomerate corporation headquartered in Charlotte, North Carolina, USA. They primarily operate in four areas: aerospace; building technologies; performance materials and technologies, and safety and productivity solutions. Refrigerants are among their products.

As global demand for R1234yf, so has production capacity. Honeywell built the first world-scale R1234yf plant in the U.S. in 2017; they've been expanding capacity in the U.S. and in Asia to support the rapid market growth. This year, almost all new light vehicles sold in the U.S.; Canada, and Europe will use R-1234yf. By the end of 2023, Honeywell expects more than 95 per cent of light vehicles sold in Japan and South Korea to use it, as well.

So far, the use of R1234yf has provided a global warming reduction equal to retiring 10 million older vehicles. Automakers around the globe are using the new refrigerant and agree that no other technical innovation in the industry has shown a positive climate impact this quickly.

Mitsubishi Heavy Industry

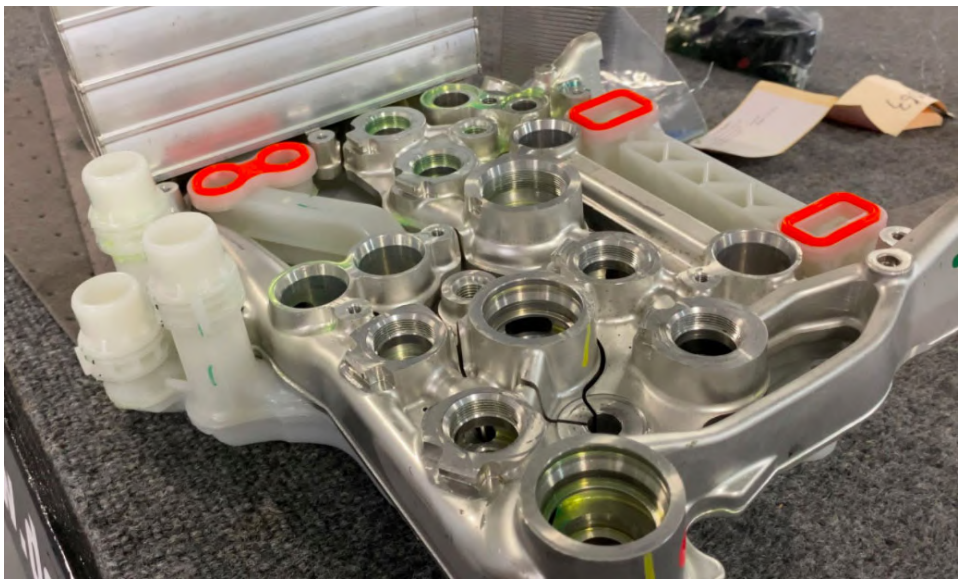
MHI HVAC COMPONENTS (MHI IMAGE)

One of the keys to a more efficient system is to develop stronger heat pumps. A heat-pump water heating system developed by Mitsubishi Heavy Industries (MHI) was advanced through development by watching costs; configuration, and response. The unit combines an advanced heat pump with an advanced electric compressor, both added to an existing cabin unit used in many EVs today, and MHI says the system maintains the same level of comfort with greater efficiency. Specifically, the new compressor increases efficiency by about ten per cent. It is also the smallest compressor available for the task, and keeps its efficiency rating through all RPM ranges.

Water-cooling condensers use laminated-plate heat exchanging technology. The plates form a flow channel for the refrigerants (which move the heat outside of the cabin) and circulants (which move the heat within the cabin). A real-time equipment test in a fully functioning EV resulted in increased flow of warm air at 0°C. Cabin temperature rose faster but the incoming air at foot level remained at the same temperature.

A future combination of a conventional water heating system with this type of system could make auxiliary heating even more efficient in very cold climates, according to MHI.

Tesla's Octovalve



TESLA MODEL Y COOLING SYSTEM MANIFOLD (MUNRO & ASSOCIATES)

Tesla says their Octovalve enables a 10-per-cent increase in range for the Model Y car. It's part of the company's effort to improve heat pump technology. The cooling circuit was integrated into a single heating and cooling management system for the vehicle that optimizes the thermal energy flowing throughout the vehicle.

Renault

RENAULT IMAGE

More than 300 patents were filed during the design of the new Renault Mégane E-Tech EV and its platform. Several of them support the objective to maximize habitability, and to ease sleek design. A target of the development team was to offer more roominess without affecting the exterior volume, so as to preserve the compactness of the car. To that end, it was decided to relocate some of the components of the HVAC unit to the engine compartment. This was made possible by the architecture specific to the electric motor, which is much more compact than a combustion engine.

To achieve this, they imagined a new fastening system which ensures the vibration and mechanical resistance of the HVAC unit on the firewall, as close as possible to the front axle. This mounting system has two reinforcements attached to the firewall and four fixing brackets attached to the HVAC unit. It's a fine example demonstrating that an EV's less-bulky powertrain allows components and subsystems to be relocated for the benefit of interior roominess.

Sensirion

SENSIRION IMAGES

Must cabin heating be sacrificed for environmental compatibility? Sensirion says no, and instead of heating and ventilating the whole cabin, maybe most efficient would be to do it from the seat, especially if there's only a driver in the car.

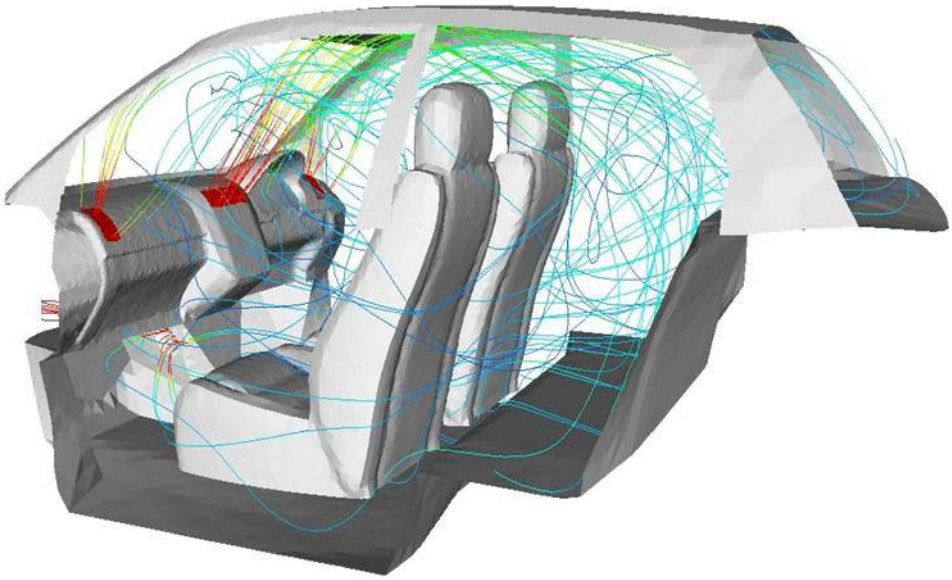
Ventilated seats make people perspire less, and have the potential to make automotive climate control systems consume less energy at comparable comfort levels. The air conditioning system in a conventional car consumes about 6 per cent of the energy, but heating and cooling the interior of an EV can consume 10 to 40 per cent—a big bite out of the amount of the onboard energy. Since vehicle range is the biggest obstacle (real or, more often, perceived) for EV adoption, industry has a strong incentive to optimize the climate systems of these cars.

Another point for controlled ventilated seats is the more targeted way of reaching a state of comfort, compared to warm or cold air flowing towards the driver and passenger. While the air from the HVAC indiscriminately tries to heat or cool entire cabin including windows; trim; unoccupied seats, and all other surfaces, the seat is in direct contact with the vehicle occupant. Therefore, developers are using heated seats, steering wheels and surfaces to warm specific body parts by conduction.

Seat ventilation also removes humidity faster than passive diffusion through the seats, leading to an evaporative cooling effect—most desirable on a warm day. And even if cooling is not wanted, human beings do sweat, so seat heating and seat ventilation may be used to dehumidify them. The relation between temperature and humidity shows that temperature alone is not a sufficient information to control seat ventilation.

Sensirion is based close to Zürich in Stäfa, Switzerland. Their engineers have developed a new generation of miniaturized humidity and temperature sensors. The Sensirion Automotive Climate Seat Sensor (SACS) is sensitive enough to measure even the smallest increase in humidity on the seats, before people notice discomfort. The new humidity and temperature sensor enables proactive control of seat ventilation, which maintains comfort in the interior in a timely and energy efficient way without having to resort to the air conditioning system.

Conclusion



CABIN THERMAL SIMULATION (THESEUS-FE)

The components of the HVAC system are not the only items being researched and reshaped. The industry must make every effort to create safe, comfortable, and safely-comfortable living car space by providing compact, lightweight and energy-efficient components.

Compressor and motor size reduction frees up more space, and efficiency increases help batteries run them with less energy, but materials research—refrigerants, for example—is playing an increasing role in development at the molecular level. Innovative heat pump technology is also a key vector, as is targetted rather than whole-cabin intelligent heating and cooling.

Interior News

Forciot Hands Detection at Automotive World Japan

INTERIOR NEWS

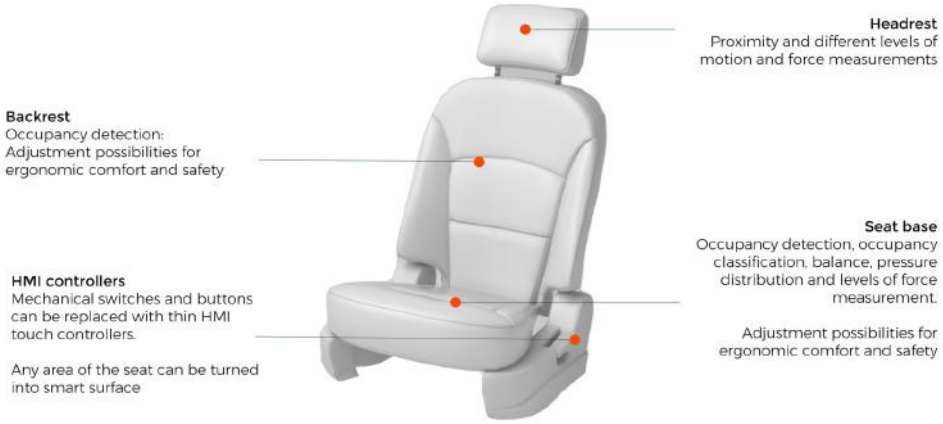
FORCIOT IMAGE

At the Automotive World show in Nagoya, Japan late last month, Forciot showed their Grip; a 3D multi-touchpad; steering wheel sensor demonstrator, and other in-vehicle technology.

AUTOMOTIVE WORLD
NAGOYA

Forciot develops stretchable-electronics technology to enable customers to transform their products to sense and interact with the changing world in new and sustainable ways.The company's stretchable-electronics solutions are tailored to different form factors and sizes. They can be used on both rigid and soft surfaces for seamless integration. For example, the technology can be integrated into a steering wheel to detect place and grip of the driver's hands.

- This, in turn, enables the car to detect whether the driver is effectively and attentively controlling the vehicle; is ready to resume control from an automated driving mode that is ending for whatever reason, or is distracted or fatigued.



Another application for stretchable electronics is in seats to detect occupant position; movement, and pressure on the seat and backrest, and to detect whether a person or an object is on the seat (occupant classification)—perfect for connection to a seat belt reminder system, or for detecting dangerous behavior from sudden or illogical movements based on pressure distribution.

- Hands-On Detection (HoD) senses if the driver is reaching the steering wheel properly and seated in a correct position relative to the steering wheel. Why? Well, how about to enable automatic seat adjustments?

Forciot's HMI control panels can replace mechanical buttons, switches, and sliders anywhere in car interior —doors; seats; consoles; trims, etc—to enhance UX and to bring more functionality.

Henkel Automotive Display Solutions

INTERIOR NEWS

HENKEL IMAGES

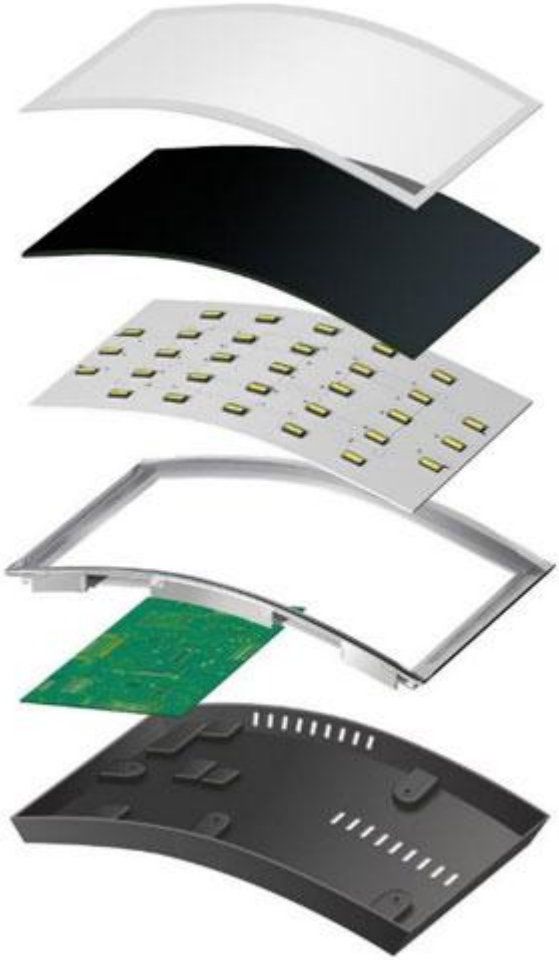
Henkel, a German multinational chemical and consumer goods company headquartered in Düsseldorf, recently gave a technology update in their display module manufacturing. Included were the likes of optical bonding; structural bonding, and thermal management material solutions to support automotive advances.

Henkel says their solutions foster better use of interior space as well as to accommodate larger and more responsive screens that deliver higher levels of control. And, to enable an efficient manufacturing process, Henkel offers high-specification application equipment developed in partnerships with leading global lamination equipment manufacturers.

The wide variety of automotive display designs and applications can present challenges to produce these devices. Manufacturers need to be able to meet different display designs while accounting for factors such as heat dissipation for circuit boards; overall structural strength, and integrity of the display housing structure of the dashboard.

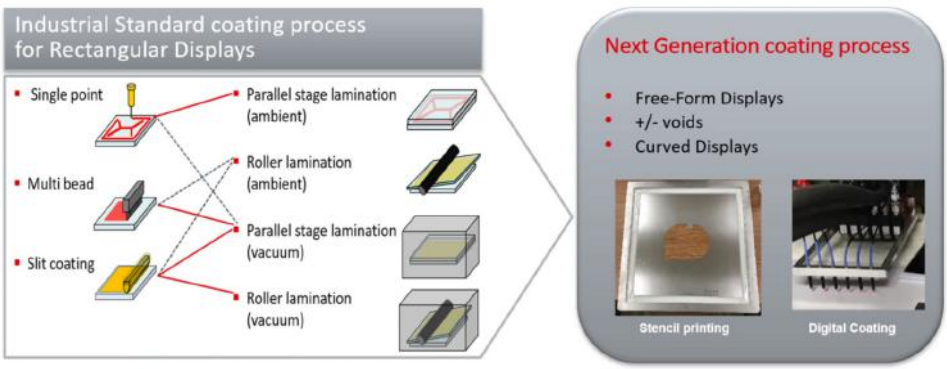
Multi-panel automotive displays are one of the advances currently being developed. Multi-panel displays combine single displays into one bigger component, allowing a cleaner look and feel in the interior of a car and reducing machine production footprint.

Free-formed and curved displays



The design and manufacturing of automotive displays requires a variety of materials that range from ensuring the strength of the display housing structure, to controlling heat dissipation from led circuit boards, to the bonding of the cover lens to the TFT/LCD. Henkel has the material solutions that enable the manufacturing of high-quality automotive displays meeting custom specifications.

Performant optical bonding is a requirement for any automotive display, since it allows for sensitive touch screen features that provide higher levels of control for interior systems. There are two main types of optical bonding materials: liquid optically clear resins (OCR), and optically clear adhesive tapes (OCA). Henkel is an industry leader in OCR technology, which provides numerous benefits for flexible designs; faster cure speeds, and higher optical performance over OCA. Henkel has developed liquid optically clear adhesives that enable optical bonding solutions for various display designs and applications.



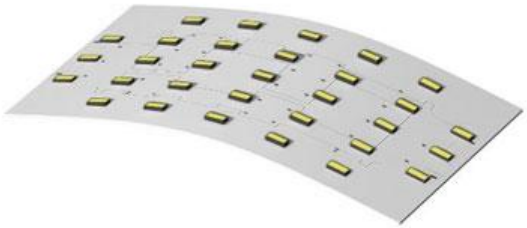
Liquid Optically Clear Adhesives (LOCA) are used to help ensure high optical bonding of the protective screen cover lens to the display. This may include bonding of different substrates such as plastic to plastic; plastic to glass, and glass to glass. Multi-substrate bonding can be applicable for free-formed and design displays, including curved designs. Henkel's LOCAs can be cured under UV or visible light, or by UV and chemical reaction. They're available in low; medium, or high viscosity. The UV or visible light curing capability gives another advantage: since the liquid adhesive cures instantly to a solid polymer when exposed to UV or

visible light, improved process efficiency can be expected as well. Benefits include 400 per cent better contrast ratio in sunlight; triple the impact resistance; lower energy consumption; improved heat tolerance, and superior impact load absorption to enable thinner and more flexible designs.

Structural bonding for automotive displays is required to attach the display module on to the frame or housing structure to the automotive dashboard or elsewhere in the vehicle. There are several challenges for automotive structural bonding that includes bonding of narrow borders and thin bond lines, and quick handling strength.

SpeedCure™ is Henkel's special method that accurately and efficiently cures adhesives in display applications on targeted areas by using customized LED light tooling. It is a unique and efficient method for curing on demand and to shorten curing times for the adhesive down to 30-60 seconds, and to allow for faster handling of the parts in the production process. This process involves the use of radiation that gives off heat to reduce the required curing times. Radiation can be applied both directly or indirectly depending upon the equipment and the application area of the adhesive.

Display Thermal Management



System designs are trending towards multi-functional displays with larger sizes, increased power consumption, and manufactured with higher number of circuit and LED chips. Thermal interface materials are designed to transfer heat away from electrical components and carry out key functions such as heat dissipation, stress relief, insulation for electrical circuits, and to ensure continued stability for electrical components.

Henkel's Loctite® and Berquist® brands are designed to meet these needs and offer an extensive line of thermal management materials for automotive displays. This includes higher thermally conductive thermal gap pads and gap fillers that are designed to meet the challenges of automotive display manufacturing.

Valeo Innovations Preview at Paris CES

INTERIOR NEWS

DVN IMAGE

CES 2023 will be the first event celebrating Valeo's 100th anniversary. At CES Unveiled last week in Paris, Valeo offered a preview showcase of their vision and products in advance of CES 2023, and they proudly presented the CES 2023 Innovation Awards for four of the technologies making mobility cleaner, safer and smarter: their Interior Immersive Fascia; their Cyclee™ 48-volt electric bike; their Thin Bilite lighting module, and their Trained Park4U®.

Geoffrey Bouquot, Valeo's CTO and VP of Strategy and External Relations had a stage discussion with CES VP and Show Director John Kelley. He emphasized that Valeo's Safer & Greener strategy is driven by the very high number of car fatalities—still more than 1.2 million a year—and the ICE ban coming up everywhere sooner or later (Europe in 2035).

As the 'metaverse' is a hot topic, addressed through a roundtable at this conference, he pointed out that the for a company like Valeo, the challenge is to be prepared for this new broad/virtual perspective, and to understand how to anticipate the metaverse and how many engineers must be trained for that.

Dräxlmaier's Onboard Networks and Interior Concepts

INTERIOR NEWS

DRÄXLMAIER IMAGE

The International Suppliers Fair IZB in Germany is aimed at all automotive industry suppliers and has its location at the headquarters of Volkswagen in Wolfsburg, Germany. The 2022 event ran from 11 to 13 October.

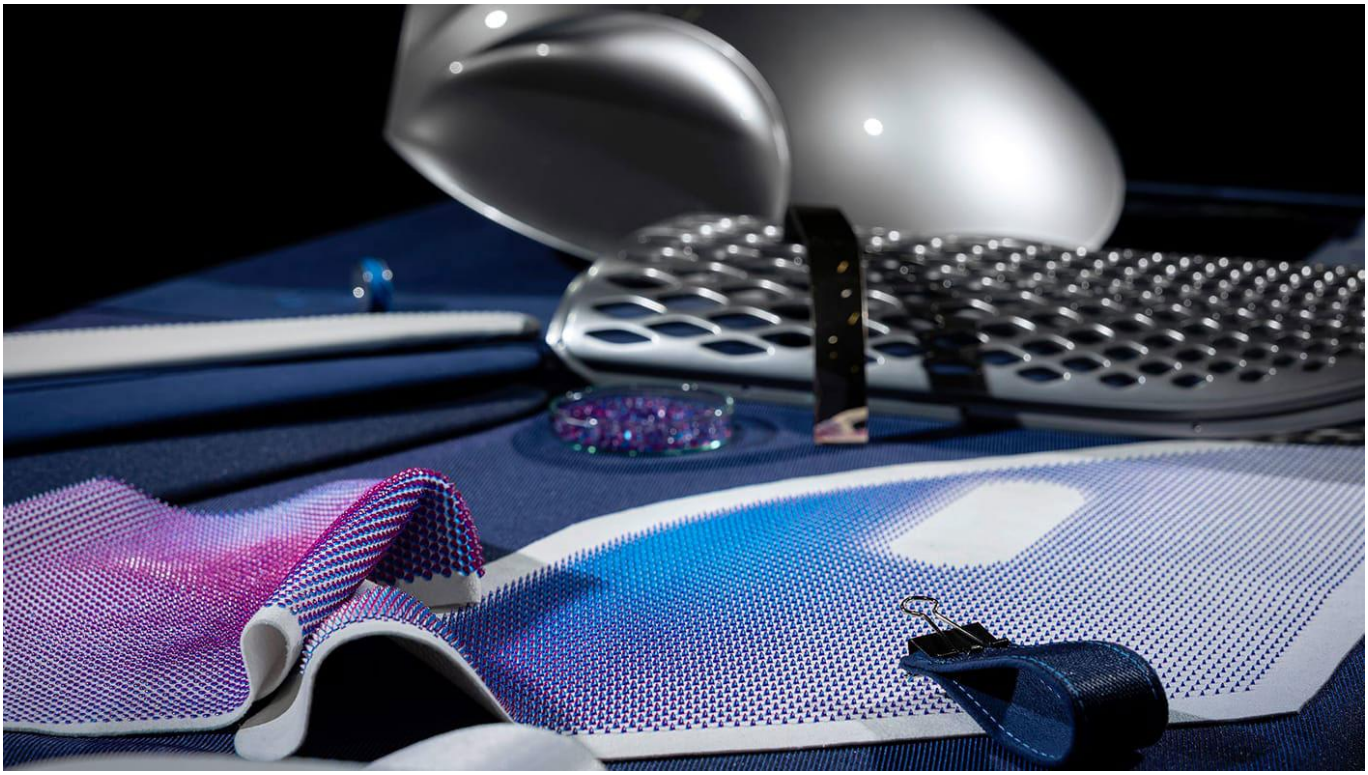
This year at IZB, Dräxlmaier presented their products: wiring systems; interiors, and e-mobility. As a modern electronics architecture, they've developed intelligent electronic and hybrid power distributors for the zonal on-board energy network.

For e-cars, Dräxlmaier offers components such as charging sockets; wiring harnesses; battery electronics, and battery systems. The company advertises trouble-free interaction between the individual components and reduced power losses. This includes a high-voltage charging system that is designed to reduce complexity as well as the number of interfaces.

Dräxlmaier integrates functions such as heating and ventilation and their operation via touch into the surface of the interior. The supplier's ambient lighting is intended to enable seamless communication between passenger and vehicle and provide atmospheric as well as individual interior lighting. An important component in the interior for Dräxlmaier is their "FIS Touch" technology (Functionally Integrated System): a touch control is implemented under a hard and a soft surface and, in the case of the soft surface, illuminated by a translucent textile.

Cork and Cactus Fibers: Carmakers Want Sustainability

INTERIOR NEWS



DPA-TMN / MERCEDES BENZ IMAGE

In order to produce cars with the lowest possible emissions, automakers are increasingly relying on climate-neutral materials such as recycled waste or mushroom and plant fibers. In the long term, however, the path leads to many directions. One recent one is pineapple fibers for the seats, kapok nuts in the fabric and floor mats with old fishing nets. Automakers are coming up with more and more new ideas to make the production of cars more sustainable, not only from an economic point of view but also in terms of environmental protection.

But with the ecological awareness, things are not always getting easier. Take fishing nets, for example. They go through a long process before they are processed into floor mats and put in the car. It starts with the search for ghost nets: after the dives, the nets are cleaned on land, dried and finally shredded. The granules are then sent to Aquafil (see **previous DVN-I coverage**), a company that specializes in processing recyclates. At the end of the production chain, the newly regenerated nylon, called Econyl, goes on large rolls to suppliers who turn it into floor mats. CO_2 emissions from Aquafil are around 80 per cent lower than from conventional petroleum-based nylon production.

Thermoplastics made from 100-per-cent recycled material are already being used today in places where customers won't see them, such as in the substructure of the door trim or cable ducts. In the i3, BMW integrated flax fibers for the door panels and parts of the center console. The new BMW iX uses wood certified to the FSC environmental standard and natural wool fiber. With partners such as BASF and Interzero, BMW is researching and developing new recycling options, as well as new materials—for example, pyrolysis oil from organic substances as a basis for new plastic products. The material Deserttex is based on cactus fibers and polyurethane plastic, and could serve as a leather substitute in the future.

Volkswagen also uses new materials to lower CO_2. Materials like flax; hemp; kenaf; cellulose; cotton, and woods. In the ID.Buzz and ID.Cargo, polyurethane recyclates are used instead of leather. VW uses a mix of recycled PET bottles and shredded T-shirts for the seat surfaces and door panels. Mazda, meanwhile, uses cork in the interior of the MX-30.

Last year at the IAA in Munich, Faurecia showed a cockpit made of hemp fibers, a special biofiber composite material and fossil-free steel, the production of which produces no CO_2 emissions. The Mercedes EQS and EQE already use cable ducts made from recycled household waste. For the leather alternative of the Vision EQXX study, Mercedes used powdered cactus fiber and mushroom mycelium, the underground rootlike structure of fungi.

All components must meet the same high standards of quality, safety and reliability, whether from primary or secondary source. In the long term, you need a value chain—no matter what materials are chosen—and a circular economy wherein waste is reduced and recycling is emphasized. The less mixed material there is in the vehicle, the easier it is to reuse materials several times.

Nvidia's Drive Concierge

INTERIOR NEWS

NIVIDIA IMAGE

Nvidia's Drive Concierge platform extends intelligent features to each interior occupant using the Drive AGX compute platform; Drive IX software stack, and Omniverse Avatar Cloud Engine (ACE).

Capabilities of the system include extremely clear graphics in the cockpit and instrument cluster, in addition to intelligent digital assistants, driver and occupant monitoring for improved levels of vehicle safety and streaming content consisting of games and films.

Drive Concierge is run on the cross-domain Drive platform, enabling it to virtualize and host multiple virtual machines on a single chip for faster development.

By using a centralized architecture, the platform delivers driver information and a wide array of cockpit and infotainment functions. It also supports the Android Automotive operating system, allowing automakers to easily customize and scale in-vehicle infotainment offerings.

When the vehicle is being controlled by AI, a detailed view of its perception and planning layers is displayed in 3D graphics, allowing drivers and passengers to always see what the AI is seeing or doing. This is possible because Drive Concierge is integrated with Drive Chauffeur to provide 360°, 4D visualization with low latency.

For infotainment, passengers can watch videos and play games on any vehicle screen using the Nvidia GeForce Now cloud gaming service. This gives access to over 1,400 titles without needing to download anything. Automatic updates and unlimited cloud storage also feature within the system.

For additional safety, Drive Concierge uses interior sensors and deep neural networks for driver monitoring. The smart solution ensures a driver's attention is on the road when AI is not in control of the vehicle. Passenger monitoring is also possible.

For BMW In-Car Video Games are Getting Serious

INTERIOR NEWS

BMW IMAGE

From 2023, new BMW vehicles will be equipped with the "AirConsole", which brings OTA streamed video games directly to the vehicle displays. The range initially includes simple titles such as racing and skill games. Graphically, the AirConsole, from Swiss startup NDream, is still far below the capabilities of current consoles.

However, BMW is pleased with this additional offer. Senior VP of Connected Car Development Stephan Durach says: "With AirConsole, we are using the latest cloud technologies in combination with a large selection of entertaining casual games. This turns every waiting situation in the vehicle, such as charging, into a joyful moment."

The joyful moments are made possible with the smartphone, which then becomes the control unit for the AirConsole in the BMW models. The connection is established via a QR code scanned on the display of the car; and then they can start playing directly and without much waiting time. The video games themselves are not installed on each vehicle individually, but are streamed centrally to the cars.

Video games in vehicles are not a new trend. The premium competitors of Mercedes and Audi are also working on corresponding projects. Tesla is already planning to integrate the Steam game distribution platform. Unlike the AirConsole, Steam primarily offers access to the latest video games.

In the US, NHTSA has issued guidelines telling automakers that any in-vehicle entertainment devices should be designed so the driver cannot use them "to perform inherently distracting secondary tasks while driving."

The Design Lounge

Polestar 3: Elegant Scandinavian Simplicity

THE DESIGN LOUNGE

POLESTAR IMAGES

The Polestar 3 has been recently presented. According to its press release, it will begin deliveries next year, beginning with a dual-motor/long-range trim.

Inside, the Polestar 3 is really about the display — a 14.5" touch-sensitive tablet affixed to the dashboard, floating above a minimalist, barren ground. The details and trim are as nice as you'd expect, with slate-

colored wood giving those gold accents, ornate Bowers & Wilkins speaker drivers with 25-speaker audio system with 3D surround sound and Dolby Atmos capability.

It has jewel-like media dial; soft-closing doors; an electric steering column, and a heated steering wheel. The Pilot pack includes a head-up display, Park Assist Pilot and the Pilot Assist driver assistance system.

Interior materials include MicroTech upholstery, animal welfare-certified leather, and fully-traceable wool upholstery. Polestar states then when 3 production begins, they will complete a life cycle assessment to find additional ways to reduce its carbon footprint throughout

The Polestar 3 will be the first vehicle to feature centralized computing from the Nvidia Drive core computer, serving as its AI brain. Infotainment will be powered by Qualcomm's Snapdragon cockpit platform to deliver high-definition displays; premium sound quality, and seamless connectivity.

It allows for OTA updates, enabling continuous software improvements and rollouts of new features. Five radar modules; five external cameras, and twelve external ultrasonic sensors will support numerous advanced safety features inside and out of the EV and are complemented by two closed-loop driver monitoring cameras that can trigger warning messages; sounds, and even an emergency stop when detecting a distracted; drowsy, or unconscious driver.

Everything looks extremely simple and refined.

It's an EV, with expected 480-km EPA range, and a price around at €100,000. Initial production of the Polestar is expected to begin at Volvo Cars' facility in Chengdu, China beginning in mid-2023; first deliveries are expected in Q4 of 2023.

Thermal comfort

THE DESIGN LOUNGE

COFFEE CORNER
DVN
Interior

FAVCARS.COM IMAGE

Fan Volume divided by air speed equals amount of ventilation required. That is all you need to know for the most primary to this day, car interior component. In times, design is the instant synthesis of the inevitable truth hidden behind a car interior technical package and, HVAC is the most voluminous hardware that cannot not be replaced by anything smaller, softer, or virtual. While it is likely to 'negotiate' hard points with sweeping—often tortured—tangent surfaces, it is nearly impossible to get by when a hard voluminous component with very identifiable dimensions, needs to fit within. The overall, aesthetically coherent, digital model is confronted to a reality-check always comes in real, physical terms. Air-vent surface is directly related to the output and air-duct section (preferably round, on mostly linear paths) enables the air flow given by the unit and thus, its analog physical size and proportions.

The unit is immediately recognizable in the technical package of every single project brief. It usually stands right underneath the Y,0 section (the middle) of the instrument panel and often posing on the floor. In most berlins the specific technical volume is partially covered by the center console, so often that some designers believe that floor consoles were only invented for this reason, to cover the HVAC unit.

While HVAC stands for Heating, Ventilation and Air Conditioning, in design language it stands for 'pure frustration and compromise' to any original and stylish interior design proposal. However, it seems there is another appealing offbeat styling approach to tackle design bottlenecks: 'instead of hiding it, let's design around it'. In this particular instance, the approach is legitimate since thermal comfort in car interiors constitutes their main reason to exist: protection from any external condition.

To square this complex equation of essential comfort, Citroën presented a study at the 2007 Frankfurt motor show. C-cactus is aiming to explore new forms of interior design using the smallest number of fundamental parts. By studying new forms of expression and new technical solutions, Citroën's engineers have drastically reduced the number of required components. Removing anything non-essential and grouping several functions in a single part, the dashboard was gone! The efficiency of the HVAC unit is emphasized to the point that is almost unnecessary to open windows. A simple slide device is put in place, getting rid of both

window frames and opening mechanisms and reducing the number of parts of a conventional hatchback door panel from twelve to just two. Steering column and air-conditioning ducts are the essentials that become visible.

Citroën's C-cactus interior is a real interior that explores a specific design language to demonstrate a new balance of priorities while proving that essential can be synonymous to comfort.

News Mobility

Nio: New Subscription Model, No Full Purchase

NEWS MOBILITY

NIO IMAGES

Chinese automaker Nio is bringing three subscription-only models to Germany and other European countries. Company founders William Li and Lihong Qin presented two models, because Nio does not want to offer cars for sale. Anyone can test the ET 7 sedan for a month, for €1,549. If the contract is not cancelled, the monthly amount decreases gradually. This can run for up to 60 months.

The second option is a fixed monthly installment with terms between 12 and 60 months. During the test phase, a swap of the battery is still free of charge in a battery swap station. How the pricing per exchange as well as the energy looks like, Nio has not yet said.

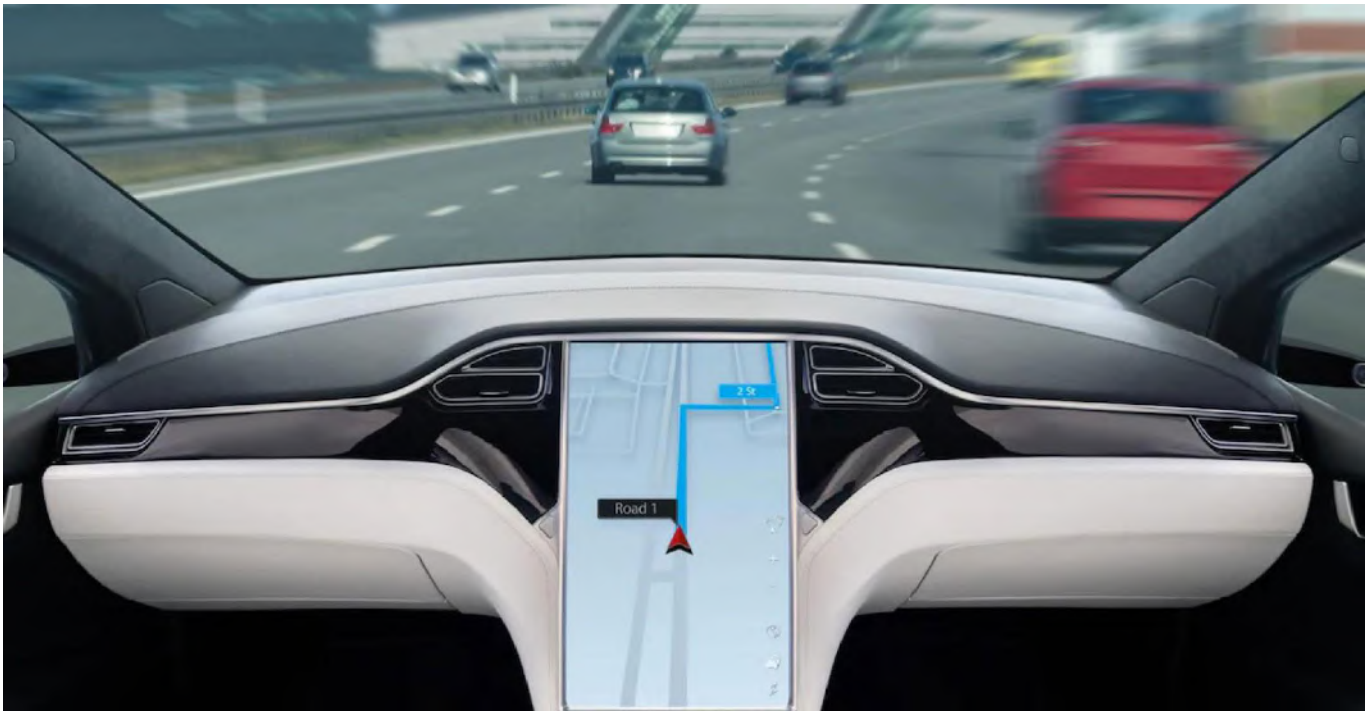
Battery swap: The driver positions the ET 7 in a square in front of the station, and from then on everything runs automatically. The car backs up on its own and is lifted in the station. The ten screws in the floor are loosened, after which the empty battery disappears into storage. A camera inspects the battery for external damage, and only then does the charging process start. The new battery is inserted into the vehicle and

screwed into place. After less than five minutes, the Nomi assistant display and the two other screens in the car come back to life. A green light in the exchange station signals the driver that the cycle is complete. For customers it means that the purchase price of the car goes down because the battery is leased.

"Flexibility is the new premium," explained William Li. With the subscription models, the company is targeting a generation that no longer wants to buy a car or switches more quickly between models.

Consumers Don't Understand or Trust AV-AD Tech: Survey

NEWS MOBILITY



J.D. Power; Partners for Automated Vehicle Education (PAVE), and the MIT Advanced Vehicle Technology (AVT) Consortium conducted a study this past June, based on six unique attributes of consumer comfort with fully automated vehicles. The comprehensive metric measures consumer readiness for AV technology in several categories: personal vehicles; commercial vehicles; public transit; riding if unable to drive due to age or injury; sharing the road with other AVs; and consumer purchase intent.

The conclusion: consumers don't share the auto industry's excitement about AVs, and are uncomfortable with the idea. That's according to the J.D. Power 2022 Mobility Confidence Index, based on responses from 4,000 vehicle owners in the U.S. aged at least 18.

Part of the reason for the mistrust, J.D. Power experts say, is a lack of knowledge about those vehicles due to confusing messaging from the industry. Respondents to this year's report knew only little more about EV than last year's participants.

Some 56 per cent of study respondents thought current driver technologies are the same as fully automated self-driving systems. Consumers showed further confusion when asked about terminology used to describe different levels of automation. For example, consumers use the same three terms (assisted driving; driver assistance, and semi-autonomous) when describing multiple levels of automation. They don't understand industry lingo, including SAE levels (*L*^{2}, *L*^{3}, etc).

Other findings: consumers are less ready for automated self-driving vehicles than they were a year ago: The index score for consumer AV readiness is 39 (on a 100-point scale), a 3-per-cent decline from 2021.

The study reveals an opportunity for more effective learning methods: 26 per cent of respondents report they learn about advanced driver assistance systems from dealers. Other respondents say they get their education from owner's manuals (32 per cent) and online searches (27 per cent).

Most respondents avoid active driving assistance: Only 26 per cent report using it, but those who frequently do use it want it on their next vehicles.

Most respondents (76 per cent) say they want more information on how the vehicle technology meets government standards to feel comfortable with automated vehicles.

J.D. Power senior auto benchmarking and mobility development manager Lisa Boor says "Industry stakeholders must work together to ensure clear and consistent messaging, and the use of consumer-facing terminology is part of this".

General News

SMR Buys Ichikoh's Mirror Biz

GENERAL NEWS

Samvardhana Motherson Automotive Systems Group has agreed to buy 100 per cent of Ichikoh Industries' mirror business—including three plants in Japan and China and a 260-patent IP portfolio, catering largely to Japanese automakers.

Motherson's Vision Systems division serves customers from 37 facilities across 18 countries, supplying interior and exterior mirrors and camera-based detection systems.

In July 2022, Motherson established two facilities in Hamamatsu, Japan; they say this Ichikoh acquisition is the next major step in their strategy for increased geographic and customer diversification. Completion of this transaction will provide Motherson with local R&D and manufacturing footprint, further strengthening group's relationship with Japanese carmakers.

This will be the third acquisition under the Vision Systems business division during the current five-year plan, following acquisitions in Turkey and China. With this transaction, Vision systems will achieve most of their strategic geographical expansion objectives that were highlighted as a part of the of the Group's 2025 five-year plan.

Motherson Group is a diversified global manufacturing specialist and one of the world's largest and fastest-growing automotive suppliers for automakers. Motherson customers are served from more than 300 facilities in 41 countries, with a team of over 150,000 dedicated professionals. The group recorded revenues of USD $10.5bn for FY22, and is among the top 25 largest automotive suppliers worldwide.

Leoni's New Development Center

GENERAL NEWS

LEONI IMAGE

Leoni, based in Nuremberg, Germany, is a cable-and-harness company. They've opened a new development center for wiring systems in the form of the Innovation Industrialization Center (IIC) in Kitzingen, Germany. The supplier sees the IIC as a kind of 'think tank' where products and manufacturing processes are developed and tested together with customers.

In the future, experts from research, development and production from all Leoni Group locations will work together on a project-related basis in an area of around 3,000 m^2. Suppliers, customers and universities will be able to be involved at any time, according to a statement.

Automated processes are now to be researched at the new development center. According to Leoni, this step was made possible by the switch to a zonal wiring system architecture. The units will become more manageable and the cable lengths significantly shorter.

To this end, the IIC has its own production cell for the fully automated production of smaller cable harnesses. The company is also investigating the joint work of cooperative robots and humans on the product, as well as smart logistics vehicles.

"At the IIC, we synchronize product and process development," says Leoni COO Ingo Spengler. For example, zonal wiring system architectures enable more efficient manufacturing processes compared to the classic wiring system, the supplier says. "The IIC enables us to achieve sustainable savings, among other things through globally standardized production processes and shortened start-up times." With sales of well over €4bn, Leoni is ranked № 64 in the "Automobil Industrie" top supplier ranking. The supplier, which has been badly shaken financially in recent years, is looking