Thu, 23 June 2022
Weekly Newsletter

DVN-I
Automotive Interior

NEWSLETTER #117

Editorial

Polyurethane Sustainability And All Plastics Beyond

SHOULD WE DISMANTLE THE VEHICLE OR NOT? (MECHANICAL INSIGHTS IMAGE)

Polyurethane (PU) is one of the important plastics used in automotive interior, especially in seat foam pads and acoustic damping. I spoke at the recent Europur & Euro-Moulders Conference in Berlin, Germany. The conference discussions reflected the tremendous importance of sustainability, as plastics represent about 12 to 15 per cent of a car's weight, with 150-200 kg of plastic per car. And there's great diversity plastics in a car; VW cites 39 different kinds of plastic—even if 70 per cent of the plastics content is polypropylene (PP); polyurethane (PU); polyamide (Nylon), and polyvinyl chloride (PVC).

PU is the raw material of choice for seating and acoustic interior application, and it is likely to remain so. Its future in a world increasingly driven to minimize waste and pollution and maximize sustainability relies on higher use rate of bio-based materials (bio-polyol) and recycling. It’s a challenge the whole industry is working on, and it applies not just to PU but to all automotive plastics, and the challenge is multidimensional. For example, bio-polyol's sustainability profile is very different if it's made from crop byproducts and waste products, versus if it's made from plants grown on land which would have been more appropriately used to feed humans.

This is just one of the numerous topics you naturally want to remain up-to-date on, and that's why—if you haven't yet—now's a great time to come **join us** as a DVN-Interior member!

Sincerely yours,

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Europur & Euro-Moulders: PU for Comfort, Sustainability

EUROPUR IMAGE

Europur/Euro-Moulders had their annual conference on 8-9 June in Berlin, Germany. Over 400 participants, representing more than 100 companies, discussed the use of polyurethane (PU) in the likes of mattresses; furniture, and automotive applications..

Europur is the European association of flexible polyurethane foam block manufacturers. It includes foam blocks only; semi-finished products and mattresses, furniture, and other consumer goods.

Euro-Moulders is the European association of manufacturers of molded polyurethane parts for the automotive Industry. Its members produce the majority of the molded PU foam used in automotive seating. They work to improve technical and scientific aspects relating to molded PU foam used in the automotive industry.

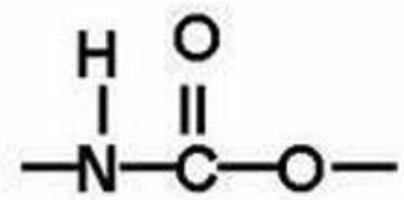
Both are non-profit organizations registered in Belgium. Their missions include promoting PU usage, and sharing technical and scientific knowledge to foster innovation and sustainability within the member companies.

DVN Interior General Editor Philippe Aumont made a lecture at the event, about future material in the automotive interior, leveraging the extensive and ongoing research published in this weekly DVN Interior newsletter. We'll come back to it in a future edition.

Euro-Moulders members are Adient; Ascorium; Carcoustics; Elele; Faurecia; Fehrer; Grupo Copo; Olmo Group; Proseat, and Toyota Boshoku Europe. This 2022 version of the annual convention was a good opportunity for the PU industry to share their major concerns in term of material price increases; difficulties to manage logistics within the value chain, and the opportunities; challenges, and threats brought on by the sustainability push.

Although polyurethane is used in a wide array of industries, this present article is related to automotive interior applications.

Polyurethane (PU) is a member of the wide-ranging and highly diverse family of polymers (plastics). It can be a solid or can have an open cellular structure, in which case it is called foam; foams can be flexible or rigid.



Urethane linkage

Polyurethane foam is made by reacting polyols and di-isocyanates (iso), both derived from crude oil. Additives are necessary to produce high-quality PU foam products, depending on the application the foam will be used for. Two different aromatic isos are used: MDI (methylene diphenyl diisocyanate) and TDI (toluene di-isocyanate). To produce flexible PU, and depending on the specifications of the foam to be produced, other substances are mixed in as well:

- Catalysts are used to increase the reaction rate; they are metallic salts or amine-based compounds.
- Blowing agents are used to produce the foam's cellular structure. It is simply water and CO_2.
- Flame retardants are added to increase the fire resistance of PU foams for market- and automaker-specific requirements. However, spontaneous ignition is not possible for flexible foams under normal operating temperatures.

To facilitate the removal of the foam from its mold (demolding), release agentsare used. These are typically silicone or wax-based.

A typical car contains about 15 kg of polyurethanes, including around 8.5 kg of polyurethane foam in the seats. Its flexibility is well adapted for car seating, in term of design; shape, and comfort—which is why PU foam is found in over 90 per cent of car seats.

WOODBRIDGE AUTOMOTIVE-GRADE MEMORY FOAM (WOODBRIDGE IMAGE)

PU advantages

It's got low mass (light weight). Seating foam has one of the lower densities of any plastic used in a car: 30 to 50 kg/m^3. PU foam used in headliners has density of 20 to 40 kg/m^3. Which really puts in context the 9 kg of it used to produce a vehicle's seat set today.

It is good at absorbing noise. PU has sound-absorbing and vibration damping qualities, which contribute to comfort and freedom from distraction inside the car.

It is versatile and offers design freedom. Car seats have widely evolved over time together with knowledge of ergonomics. And they keep doing so, because PU offers a wide choice of performance and processing characteristics, allowing applications to be tailored for advanced shapes and forms using the same basic chemicals.

It is recyclable through a range of technologies, and offers the potential for mono-material solutions, which facilitate dismantling and recycling.

PU challenges

As discussed at the conference, challenges come along with PU, too.

Most of the raw materials used to produce flexible polyurethane foam today are derived from crude oil. Foam producers are investing in research to increase the use of polyols from renewable sources in production. Foam produced with renewable raw materials must still comply with the stringent emission limits for VOC (volatile organic compounds) set by automakers.

LIANGUAN RECYCLING EQUIPMENT (REUSING IMAGE)

Recyclability: PU foam being produced from materials derived from crude (or vegetable) oils is a welcome feedstock in waste-to-energy plants. This is why energy recovery is today the preferred solution for the end-of-life treatment of the foam content of car seats. Industry is investigating other forms of end-of-life treatment, as regulations are pushing in this direction. Strategies include:

- Mechanical recycling, in which foam is recycled into rebonded foam and used for applications such as vibration and sound damping; flooring; sport mats; packaging, and carpet underlay;
- Chemical recycling, wherein production scrap (offcuts) can be chemically recycled via glycolysis processes to produce polyols, or
- Feedstock recycling, which involves recovering hydrocarbons from mixed plastic wastes and feeding them back into the petrochemical manufacturing chain as feedstock materials, to produce new raw materials.

Conference Lectures

One session was dedicated to the flexible foam industry, including mattresses, and a second session was dedicated to the automotive supply chain.

PLASTIC RECYCLER EUROPE IMAGE

Chaim Waibel from Plastics Recyclers Europe presented the upcoming revision of the End-Of-Life Vehicles Directive and what it might mean for plastics in vehicles. The EU Waste Framework Directive (WFD) sets the basic concepts and definitions related to waste management, including definitions of waste; recycling, and recovery. Today 368 megatonnes are used, only 30 of which are collected and recycled. There's also the PPWD, Packaging and Packaging Waste Directive**,** which sets out recycling targets of used packaging for EU member states.

FOAM BLOCKS (ADIENT IMAGE)

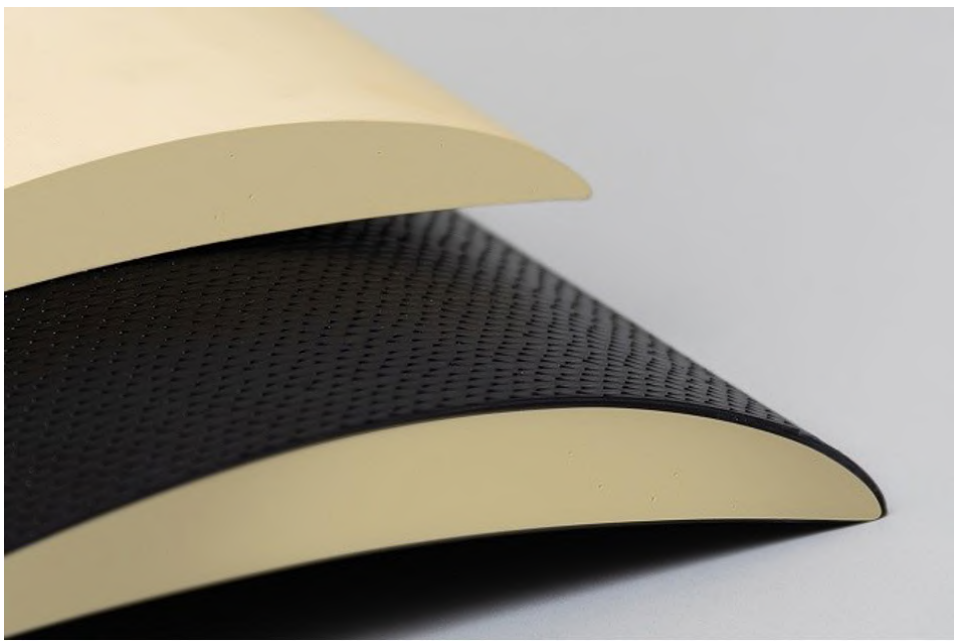
There was a presentation on putting car interiors on the way to greater sustainability by **Michel Berthelin,** Adient's EMEA VP of seating. He described a commitment to sustainability, stating that PU remains the material of choice for comfort, as long as the human body; safety requirements; geography, and automaker sourcing criteria remain the same. PU has the right value chain and the scalability for automakers and final customers to get the right product for their money. Seats need low-block height (compactness); in-seat heating and cooling; renewable materials, and NVH/Sound improvements. From those perspectives, PU is the best solution, even if it is not yet fully renewable. A seating carbon footprint today looks like 210 kg

CO_2, for a 70-kg car seat set where steel; PU foam, and PP are the main contributors. Adient's target is to reduce this by 70 per cent, from cradle to grave.

Jan Arnet, CEO of the Bertschi Group—one of the world's largest logistics companies for chemicals—shed light on the global supply chain issues, by explaining the multifaceted reasons behind them: from Covid to a ship blocking the Suez Canal to lockdowns in China, skyrocketing fuel costs, the shipping container shortage, and Russia's war on Ukraine.

Yochai Gafni, Commercial Director for Dow's PU activities, gave a presentation on "Adapting to a Changing World". Dow Chemical Company is an American multinational chemical corporation headquartered in Midland, Michigan, and is among the three largest chemical producers in the world. Gafni shared his vision of the changing world: green investments are 2 to 3 times bigger than non-green equivalents; the green capital market is a catalyst for change; employees are willing to get satisfaction through their values and the new generations of employees are data-literate. Interregional trade is progressing, and digitalization is increasing at a galloping pace.

VUCA—volatility; uncertainty; complexity, and ambiguity—refer to the turbulent conditions and unpredictability of the outside environment. Covid was the first wave, climate change and bio-diversity wave are coming just behind and they are much bigger waves! We're going from a world of abundance to a world of constraints. So, assets must be as flexible as possible. PU remains a material of choice, and many recycling process opportunities exist to minimize its environmental footprint. Gafni stressed that collaboration within the value chain is essential; change represents an opportunity, and inertia is an enemy.



PU RESIN SYSTEMS ENABLE LIGHTWEIGHT SANDWICH CONSTRUCTION (HUNTSMAN IMAGE)

Huntsman is an American chemical company, headquartered in Texas, manufacturing polyurethane; performance products, and adhesives, Shpresa Kotaji, Huntsman's global sustainability expert, talked about LCA (life cycle assessment) to identify the most effective changes to be made. LCA was cradle-to-grave, but the drive toward a circular economy has changed it to cradle-to-cradle (closing the loop).

Carbon footprint is not the only parameter! For instance, bio-based materials have an impact on land use; eutrophication, and acidification. New materials (bio or recycled) are difficult to assess, as they have very limited LCA data available. However, arable land for bio today is less than 0.1 per cent of total land.

Alejandro Navazas from EuRIC, the European Recycling Industries Confederation representing 6,000 companies, stated that Europe uses only 12 per cent recycled materials. Presently six million cars are recycled per year; four million new ones are added, and four million are exported out of Europe. The key question is whether or not vehicles should be dismantled. If not, the vehicle goes into a shredder, and plastic are extracted through magnetic sorting (PST—Post Shredder Technology)

CARGILL IMAGE

Yavuz Selim Sahnturk from Cargill, an American global food corporation based in Minnesota, presented their R&D center focused on bio-based chemistry. They have a Bio-Polyol, called BiOH®, and every megatonne of BiOH save five barrels—795 liters—of oil.

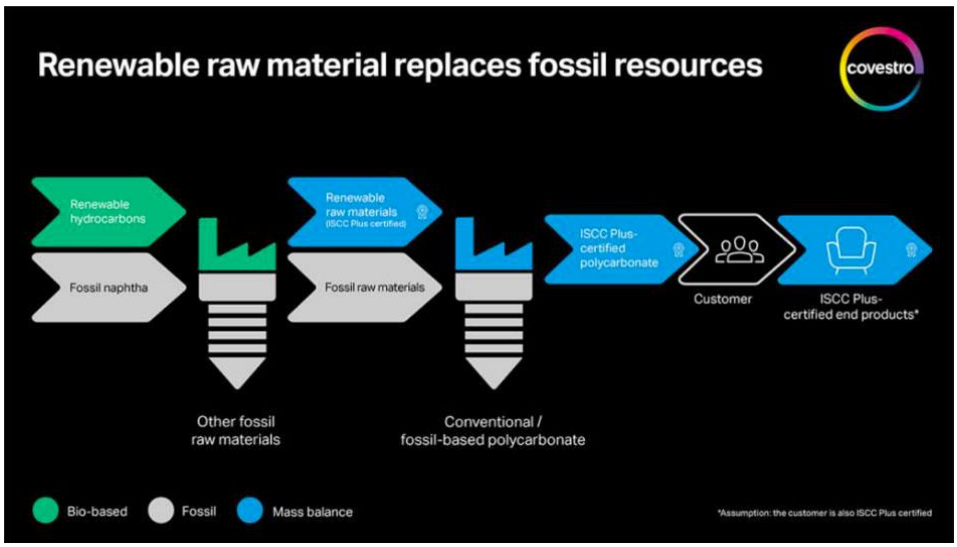
The world's soy production is used at 19 per cent for human food; 77 per cent for animal food, and “only” 4 per cent for industry

BASF and Neveon addressed the disruptive nature of the SPI and UN plastics treaty. Neveon was created in February 2021 by bundling forces of six different foam companies under one umbrella brand, and it's part of the Greiner Group—a leading global manufacturer of plastics and foams based in Austria. BASF is a German multinational chemical company and the largest chemical producer in the world. Its headquarters is located in Ludwigshafen, Germany.

Any new product must have a DPP—a Digital Product Passport—to comply with sustainability and information-tracking requirements. requirements and Information requirements

VITA GROUP IMAGE

Mike Murray, CTO of the Vita Group, presented how PU foam can achieve a net zero impact. PU is the material of choice, he said, because of its light weight; cost; open/closed-cell versatility, long life, and other factors.
The UK-based Vita Group has a portfolio of sustainable foam brands, and these innovations in material science enable the industry to meet its net-zero targets. They recycle 30,000 tons per year, and were recently won an innovation award for Orbis, a commercially-available foam made using raw materials from the Renuva mattress recycling program; and for the Vita Rest Origin pillow made with polyols derived from castor oil.



COVESTRO IMAGE

Patrizia Wegner from Covestro presented the Mass Balance methodology used in her company to bring circular-economy principles into the value chain, and to trace materials in a complex value chain. Mass balance is a chain-of-custody method that allows fossil and alternative feedstock to be mixed in production, but separated in bookkeeping. It is able to track materials through the value chains and allows attribution of alternative feedstock, like bio-based raw materials, to selected end products.

All in all, PU is the raw material of choice for seating and acoustic interior application, and it is likely to remain so for the foreseeable future. Its continued favor relies on higher use rate of bio-based materials (bio-polyol) and recycling. DVN Interior will continue to report regularly on progress in the PU world, so stay tuned.

Interior News

GM Patents Anti-Motion Sickness Technology

INTERIOR NEWS

General Motors has filed a patent application for anti-motion sickness technology for autonomous vehicles.

In the application, filed with the United States Patent and Trademark Office (USPTO), GM notes that even if autonomous vehicles proliferate, people may still be hesitant to ride in them. A self-driving car that causes motion sickness probably won't make the best first impression.

Motion sickness is more likely to occur as passenger in automated vehicle will be focused on something else than driving, such as reading a book or scrolling through a phone. Those are the kinds of things many people are expected to do in vehicles when they no longer have to drive themselves. So, eliminating motion sickness is even more important in autonomous cars.

To that end, GM outlined a system of lights and images that visually represent the forces of acceleration, braking, and cornering in the form of an image of the vehicle on the screen, or changing color or light patterns. A sound system or haptic feedback could be used to provide a similar effect.

This, GM says, not only helps align a person's sensory perception with the forces acting on their body—addressing the cause of motion sickness—but also build trust by providing more information about what the vehicle is doing.

Motion sickness has been a big issue since automobiles have existed. Drivers have some buffer against it because of their interactive connection with the car, but passengers fare worse, especially children. For a long while nobody cared to do anything about it, as the driver was making the purchasing decision. That has changed, as the driver gradually becomes more of a passenger. We can expect that autonomous car development will also benefit driven vehicles, as a by-product!

GM-controlled Cruise is close to offering driverless taxi rides to the public in San Francisco. Cruise currently uses modified Chevrolet Bolt EV hatchbacks, but will eventually switch to a purpose-built vehicle called the Origin. First shown in 2020, it will be manufactured by GM at the automaker's Factory Zero plant in Detroit.

Infineon 3D Depth Sensors for Safety & Comfort

INTERIOR NEWS

3D depth sensors in vehicles are growing in importance, from enabling innovative HMI solutions to improving passive safety. To address this increasing demand, Infineon, in collaboration with 3D time-of-flight system specialist PMD Technologies, has developed a second generation of the ISO 26262-compliant, high-resolution "Real3" 3D automotive image sensor.

Infineon's 3D sensing VP Christian Herzum says the new sensor "enables cars with functions from the consumer world, while maintaining automotive standards and even improving passive safety. For instance, reliable and secure facial authentication allows seamless connectivity for any type of service that requires authentication such as payment, battery charging or accessing private data".

The sensor comes in a 9 × 9mm^2 plastic BGA package and offers a VGA system resolution of 640 × 480 pixels with a tiny image circle of 4mm. This allows the use of lens sizes similar to those seen in smartphones, but now also for automotive applications. The high resolution of the Real3 sensor also makes it suitable for camera applications with a wide field of view, such as complete front-row occupant monitoring systems.

The new sensor meets all requirements for detecting driver distraction and fatigue. This enables the offering of a DMS with secure 3D facial recognition using only one ToF camera. It produces 3D body models enable accurate estimates of occupant size and weight, as well as highly precise passenger and seat position data, which is key information for intelligent airbag deployment and restraint systems.

Infineon says besides safety critical applications, the 3D data allows for comfort features such as gesture control or intuitive interior lighting that follows passengers' movements. Additionally, the imager might be used in environmental perception scenarios as a flash-lidar.

Maserati Uses Rightware Kanzi Display Technology

INTERIOR NEWS

RIGHTWARE IMAGE

Maserati has chosen Rightware's Kanzi UI toolchain to create the primary human-machine interface (HMI) for their 2023 Grecale SUV. Kanzi software powers the graphics in both the digital instrument cluster and the HUD. Kanzi enabled a highly productive process for creative design and software engineering, accelerating Grecale HMI development while bringing significant cost savings to the complex project, resulting in a major leap forward for the driving experience.

The Grecale is Maserati's first vehicle with a fully digital instrument cluster, and their first production vehicle with on-screen graphics designed in-house. The Maserati Innovation Lab in Modena implemented a design produced by the Style Center in Turin. In the past, Maserati provided high-level UI concepts to their HMI supplier, who managed design and implementation. Using Kanzi, a small team of Maserati designers and engineers took the instrument cluster and HUD from initial design concepts to mass-production-ready in just under two years. The result is a digital cockpit which maintains the classic Maserati look. Kanzi allowed the team to deliver a unique UI with rich 3D graphics in the instrument cluster without losing the appearance of the brand’s traditional mechanical gauges.

With Kanzi, Maserati had complete control of the user experience and graphical visualization from prototype through production. Rapid prototyping in Kanzi Studio gave the team the flexibility to iterate the design often throughout the process. With traditional tools and workflows, such intensive iteration tends to cause lengthy delays; UI design has traditionally taken at least three years. Moving from the start of design to production-ready in less than two years is a major achievement. Beyond shortening the development cycle, Kanzi enabled Maserati to leverage leading-edge graphics to create a contemporary and unique user experience.

Each Grecale powertrain variant will require unique information to be shown on the digital displays while maintaining the look-and-feel of the model family. Leveraging the advanced capabilities of Kanzi, Maserati can easily manage UI variants within a single project, maximizing reuse for a consistent brand identity.

Marelli's Integrated Cockpit Domain Control Unit

INTERIOR NEWS

HMI innovation requires an evolution in vehicles' electronic architecture. To address this shift, Marelli offers streamlined, intelligent, and connected cockpit and in-vehicle electronics solutions like the Integrated Cockpit Domain Control Unit (DCU), which allows multiple functional domains to be merged into a single SoC.

Marelli's DCU manages different operating systems and the related display interfaces at the same time with what they call Hypervisor technology, offering improved safety. The multi-display area also provides a unique coherent interface and delivers entertainment and personalized experience thanks to seamless integration and advanced HMI. This seamlessly-integrated display solution combines multiple standard TFT modules to form a single wide look display in all operational modes, ensuring a great optical performance.

Lossless passive black panels together with efficient backlight management and local dimming technology allow energy savings of up to 60 per cent compared to traditional solutions.

Reflective Rearview Mirrors Might Beat LCD Screens

INTERIOR NEWS

The interior rearview mirror has stayed about the same for a lot of years, and although digital ersatz mirrors —a mirror-shaped screen showing images from a rear-facing camera—have begun to come in, there are sturdy reasons why the regular old, normal old, boring old shiny-glass type might win out over the high-tech solution.

Dr. Jay Pratt is a professor in the Psychology Department at the University of Toronto. He's a perception and visual cognition researcher, specializing in how humans selectively acquire information from the visual field; how that information influences actions, and what happens to the ignored information. In a recent exchange with U.S. auto blogger Jason Torchinsky, Dr. Pratt explained how and why digital rearview mirrors can actually worsen things for the driver, compared to a standard mirror.

It's common for farsighted drivers to see a clear image in a rearview mirror, but a blurry one in a rearview screen. Dr. Pratt explains:

"The mirror is essentially reflecting light from distant objects plus the distance between your eyes the mirror (i.e., everything is distant viewing). The LCD screen, however, is taking images from distant object, going through some processing, and then projecting it at the relatively short distance from your eyes (i.e., a relatively short viewing distance) …putting your reading glasses on might bring the LCD into focus—but you'd lose focus on the sideview mirrors. Indeed, I wear progressive lenses; reading viewing at the bottom, distance viewing at the top. This is good for driving because dashboards are down and windshields and mirrors are up. But an LCD screen above my head would require me to tilt my head a lot to get my reading correction onto the screen.

"Try this. Stand a foot or two away from a mirror in a bright space. Hold something with writing at the mirror; it's probably fuzzy without your reading glasses. At the same distance, now hold the object with writing beside your head and look at it through the mirror. By doubling the viewing distance (object to mirror to you) the writing is probably crisper (albeit reversed). Or think of it this way. If you had a picture of a distant mountain on an LCD screen near your head, you would need glasses to see it clearly. If it was a mirror at the same distance, with a mountain in the distance, you would not need your reading glasses. A reflection appears to be the same distance from the 'other side' of the mirror as the viewer's eyes are from the mirror.

"*Imagine you're sitting at your desk looking at a computer monitor. The monitor might be 2 feet away from you, and for that you need your glasses (…) if we replace the monitor with a mirror, it's reflecting whatever is behind you, say that back wall of your office some 10 feet away. So 10 feet between the mirror and back wall, plus another 2 feet between you and mirror, and your viewing distance is 12 feet. At that distance, you don't need glasses to see the detail [of] the back wall in the mirror. It's all a matter where the light information is coming from; a nearby screen or reflected from a more distant object. Or suppose you have a mirror that has a sticker on it. You stand 5 feet from the mirror, looking straight at it. Your image is 10 feet away; 5 from you to the mirror and 5 from the mirror back to you. The sticker viewing distance is only 5 feet (from the mirror to you). So depending on one's eyesight, one might be in focus and one out of focus. The [rearview screen] is like a sticker on a mirror.*"

And that's not the only difficulty brought by rearview screens. Dr. Pratt again:

"*Transitions from LCD to windshield are hard. I'm guessing that the reverse transition, from windshield to LCD is much easier. This may be due to the attention capturing properties of the LCD. LCD screens are very luminant with lots of light energy, and changes in luminance are very good at automatically capturing our attention. For another driving example, normal roadside billboards are pretty easy to ignore, but LCD billboards are much more distracting. Depending how much light energy the LCD is pumping out, being right near our focus of gaze (unlike the LCD center consoles away from where we should be looking), these things might be harder to disengage attention from than a mirror. After all, the mirror is just reflecting light from outside the car; it's the same luminance out the front and back windshields).*"

But wait, there's more; there are perspective-angle issues as well:

"*Only a camera mounted on the rearview LCD monitor would give the same perspective as a rearview mirror. A camera anywhere else would give a different perspective. That could be offset with some fancy processing of the images, but do to so would [take] a lot of computing power. With enough practice, the new camera perspective would come to seem normal.*"

New Mercedes GLC is Roomy for People And Cargo

INTERIOR NEWS

MERCEDES-BENZ IMAGE

The new Mercedes GLC increases its overall length by six centimeters to 4.72 meters, and its wheelbase by 15 millimeters. It gives 95 cm of rear legroom, a key parameter for rear passenger comfort. This growth is also reflected in a 50-liter increase in load volume. The mild hybrids hold 600 liters, while the PHEV manages 460 liters. With the rear seat bench folded down, the volume goes to 1,640 liters.

MERCEDES-BENZ IMAGE

Both an off-road driving mode and hill descent assist are standard features. An off-road screen specially implemented in the infotainment system provides information on inclination and steering angles, topography and geo-coordinates.

The GLC comes with at least the Avantgarde equipment line as standard fitment, which in addition to chrome accents now also includes a power liftgate; Parktronic including a rearview camera, and an inductive charging cradle for smartphones. This upscale base level fits in with Mercedes' increased emphasis on luxury.

The range of assistance system is like that in the C-Class and other Mercedes vehicles. The infotainment display shows a camera-generated image that depicts obstacles such as debris in the immediate vicinity of the hood. An assistant for maneuvering with a trailer is also available as an option. The parking package

with 360-degree camera also receive the "transparent hood" as an innovation, which provides support especially when driving off-road.

The MBUX infotainment system is now more digital and intelligent, according to the manufacturer. The days of round instruments are also over. They had to make space for a high-resolution LCD screen; 12.3” digital instrument cluster, 10.25” touch-screen infotainment. The central display above the center console is slightly tilted toward the driver, elegantly integrated into the center console and easy to control—either as a touchscreen or using the 'Hey Mercedes' voice control. It also has dual-zone automatic climate control, a household-style power outlet, HD Radio, two front USB ports, and rear USB ports.

The Design Lounge

LumenFlow Maximizes Design Precision to Get Every Photon

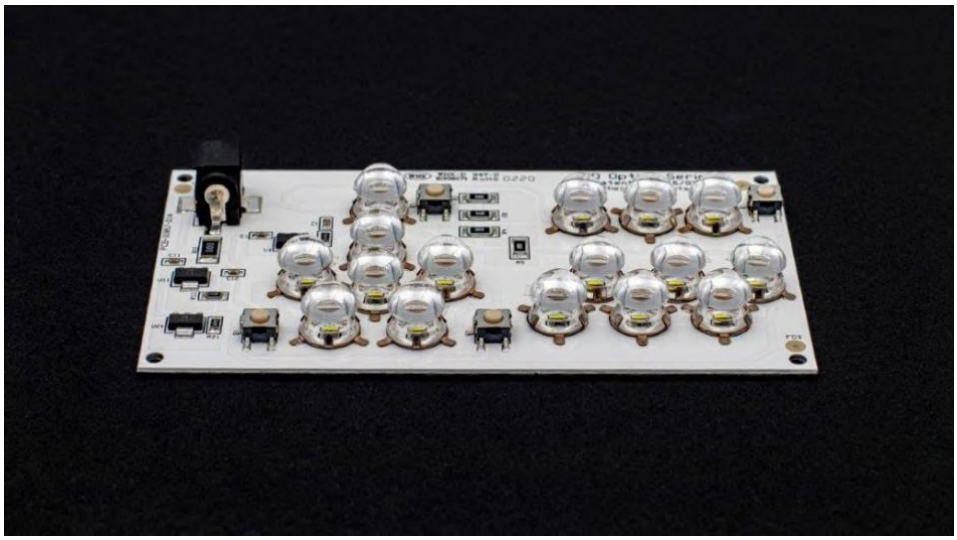
THE DESIGN LOUNGE

Located in Zeeland, Michigan since 2000, LumenFlow has been working to put every last photon to work in the designs they do for their customers. Founders Brian Zatzke; Paul Bourget, and Harold Blunt started as a photonics company doing complex lens designs and advanced laser work. They quickly grew and evolved, and soon expanded their services in markets including aerospace; transport; agriculture, and architecture. In 2015, a seasoned technology and lighting professional, Mark Leonard, joined LumenFlow and added horsepower to expand the company's markets and services.

Leonard says "It wasn't long before we expanded our services beyond optical design to include luminance and illuminance engineering. We are pushing the boundaries of light. We see the light differently and can take what we see and know and translate it for the customer into effective optical designs. Every photon counts!".

Dow Silicones has a long-term contract with Lumenflow to provide optical design services and characterization to help showcase the capabilities of Dow's optical-grade silicones for lighting optics. LumenFlow studied the material and started creating unique optical designs with it for controlling LED light, using an entirely new approach to designing and molding optics: one-piece compound optics molded in one shot, complete with undercuts. This kind of thing is impossible to make using traditional materials like polycarbonate or glass.

Cofounder Brian Zatzke says "Taking that basic design, we created five additional optics with very different properties. Three refractive with 10-; 30-, and 50-degree output, and two compound optics with 10- and 30-degree outputs".



1-PIECE COMPOUND OPTIC MOLDED IN ONE SHOT (LUMENFLOW IMAGE)

Zatzke says his company also has developed down-converting phosphors to create silicone optics that provide the spectral output needed—another neat trick possible only with optical silicone.

DOWN-CONVERTING PHOSPHOR CONVERTING BLUE LIGHT INTO A CUSTOM WHITE LIGHT (LUMENFLOW IMAGE)

Lumenflow can do all kinds of things to enable new and exciting LED optics by understanding physics and how it interacts with materials like glass; plastics, and silicone. These skills and talents have made them into leaders in optical design and control luminance and illuminance for their customers.

In 2019, LumenFlow joined Ventura Manufacturing, a worldwide supplier of precision-molded optical-grade silicones to the commercial lighting; automotive; appliance, and office furniture industries. Since then, LumenFlow's capabilities and market reach have grown dramatically. With Ventura's help, they are focused on designing and manufacturing lighting, optical and photonics systems, and subassemblies for diverse industries. This they do from manufacturing facilities in the United States; Hungary; Mexico, and China.

As the complexities of light design increase, so do the challenges of creating light assemblies, especially automotive ones. It's a challenge to create beauty coupled with efficiency and performance. As the demand grows for increasingly polyvalent eye-candy light designs, auto interiors are increasingly fertile ground for LumenFlow's visualization and photonics designs. Zatzke says "We're controlling photons and designing optics everywhere light exists on a car".

For more information, please **visit LumenFlow**.

The Original Living Room on Wheels

THE DESIGN LOUNGE

DVN Interior Coffee Corner

Foam is the reason why car interiors are soft. Gluing; stitching; springs, and wireframes come along with a multitude of techniques and assembly practices combined to give ergonomic and acoustic comfort, refined iteratively over the years.

However, long before anyone talked about (usually big American) cars as 'living rooms on wheels', someone actually built a real one. This is the Davis Divan (divan = couch), a 3-wheeler designed and built by Gary Davis between 1947 and 1949. The whole interior concept was to build an automobile around a couch. Everyone gets a front seat—no more fighting or calling "shotgun!". The brochure spoke in proud

terms of the car's couch seat: *Its single spacious, comfortable seat, 64 inches wide, has hiproom for four adults; its foam rubber cushion is beautifully upholstered in long-wearing synthetic fabrics.*

Besides the aircraft-inspired styling; disc brakes; hidden headlamps, and built-in jacks, Mr. Davis claimed it could make a u-turn at 42 miles an hour (68 km/h). Take a look at the **period video** to get the idea. And all this while the driver and any passengers were comfortably seated on a couch.

That's a snazzy front seat idea. It didn't catch on for roadgoing cars, but what a great concept for an amusement park ride!

News Mobility

Automated Cars Will Soon Drive at 130 km/h

NEWS MOBILITY

MERCEDES-BENZ IMAGE

An increase is in the works for the maximum speed allowed for automated vehicles in Europe to 130 km/h from the present limit of 60; the draft regulation also provides for automated lane changes.The plans must now be adopted by WP.29, the World Forum for Harmonization of Vehicle Regulations. The next meeting will be held at the end of June 2022, and the new rules could come into force as early as the beginning of 2023.

In June 2020, several countries adopted the UN Regulation on Automatic Lane Keeping Systems, the first binding international regulation L^3 vehicle automation. The current proposal builds on that.

According to a Commission communication, this means the automated driving system must comply with local traffic rules, ensure smooth driving, and limit traffic congestion. The data storage system for automated driving is required to also record lane changes initiated by the system.

The regulation also lays down provisions on type approval, technical requirements, audits and reports, and tests on test tracks and under real-world conditions. The new functions must also meet the UN's cybersecurity and software update requirements.

“Lüneburg Lens” 3D Printed on the Road for Autonomous Cars

NEWS MOBILITY

Currently, around 15 to 20 sensors are needed to drive a car automatically. Arizona-based Lunewave, an automotive antenna and sensor technology company, says four of their radars would be enough for even L^5 autonomous driving. The Lüneburg radar consists of 6,000 chambers, and its production can only be realized using 3D printing.

Today's radar sensors distinguish between objects, but do not recognize whether they are alive. In the case of an automatically executed evasive maneuver, this can be crucial to the decision tree. Lunewave's radar system should therefore be able to detect this important difference. CTO Hao Xin says "Our algorithms detect whether there is a person standing there or something that is not alive". This works because radar signals sent by a person and by a non-living object show subtle differences. For example, a person always moves a little bit. A radar "sees" them breathing and even their heart beating.

Lunewave says just four of their radars suffice for L^5 vehicular autonomy because the spherical antenna of the Lunewave lens is designed such that incident beams are focused at one point on the opposite side. This ensures very good reception quality for all directions in space. And it also works from the receiver to the transmitter: a focused signal is sent out as a broader wave.

The Lunewave lens captures a 360-degree radius, provided the radar is mounted on the roof of the car. At the moment, Lunewave is only running tests with the radar on the hood or bumper. At this position, up to 180 degrees can be achieved horizontally, as the vehicle itself blocks the rest of the radius. Looking to the future, to passenger-carrying drones and flying cars, Lunewave is working on a vertical radius of 180 degrees.

Because the antenna is spherical, the structure starts in the center and is continued layer by layer towards the edge. In the process, the permittivity of the material must decrease. To achieve this, the layers become thinner and thinner. The antenna thus has at least ten layers, and in some higher-quality products even 100 layers. 3D Printing is done by photopolymerization; more precisely, by stereolithography and polymer jetting. The two resin-based processes stand for smooth surfaces and fine details. Lunewave uses the standard acrylic PMMA as the material. The complete manufacturing process from pre-processing to post-processing remains a major trade secret. The system's electronics, on the other hand, are off-the-shelf. Xin says "We're using off-the-shelf silicon integrated circuits; with the current signal processor chips, all the data can already be processed".

General News

Stellantis to Leave ACEA, Create Mobility Forum

GENERAL NEWS

STELLANTIS' 14 BRANDS

Stellantis will leave lobbying group ACEA by the end of the year, and will put on their own annual event to address mobility issues. Stellantis say it's part of a new approach to addressing issues and challenges of future mobility, including a shift away from traditional lobbying activity.

The automaker, with 14 automotive brands, said they're planning an annual "Freedom of Mobility" event—the first one scheduled for early next year—with the goal to identify how to bring clean, safe, and affordable freedom of mobility for society in the face of global warming implications. That rubric comes as the 27 EU countries preparing to vote on a proposal that would ban sales of new internal-combustion passenger cars starting from 2035.

Stellantis CEO Carlos Tavares says ""The environmental challenges ahead of us coupled with a rapidly evolving business environment require an efficient, global and inclusive 360-degree approach involving all those who wish to contribute to building sustainable mobility. We intend to create a public forum in which contributors can come together to address the key questions surrounding the debate on decarbonized mobility and provide actionable next steps for us to take together. Access to clean, safe and affordable mobility for the citizens across the world is at stake". Tavares is a former president of ACEA, which represents the 16 major European car, truck and bus constructors. The group does not include newcomers such as Tesla and several Asian brands, including Suzuki and Subaru. Stellantis would be the first key automaker to withdraw from the Brussels-based group, which advocates for the industry at the European Union.

The forum will be planned and coordinated by an advisory board of experts representing various stakeholders in the industry, including mobility and technology providers, academics, politicians, scientists,

among others. It will host debates on specific topics for each meeting, within a framework guided by these principles:

- Global view – the forum will address several questions with a 360-degree approach;
- Fact-based – the forum will rely on facts to drive insights and possible solutions;
- Transparency – the forum will be open to the public ensuring that all positions are made available to all;
- Respect – above all attendees must engage in an honest, respectful, and collaborative manner.

Porsche Promotes Mobility Startups for Mobility

GENERAL NEWS

PORSCHE IMAGE

Porsche wants to invest a double-digit million amount to promote the foundation of startups. The goal of the collaboration, the company said, is to establish six companies with new business models in various areas of mobility from 2023 to 2025. Porsche will initially hold a minority stake in the startups and could buy them outright after three years. The first two startups are to be founded before the end of this year.

The startups' focus will revolve around Porsche's core activities: predictive maintenance; supply chain transparency, and digital commerce, for example. The startups will be focused on technology-based solutions, but as the companies are in the industrial, physical, and moving worlds, there may be some hardware activity as well.