



Editorial

Seamless Panels Are The New EV Front Ends

DVN recently visited Covestro's Leverkusen Chempark location, a huge former Bayer plant with an area of about 5 km². This was a follow-up after our Opel visit earlier this year. Opel presented the Manta E-mod show car with what they called the "vizor", a seamless polycarbonate front panel with integrated sensors and lighting and communication elements. We see this as an important innovation with industry-changing potential. Numerous EVs are coming with smooth fronts because a closed front has aerodynamic and design advantages, and EVs don't need a big cooling package like the combustion cars.

Besides internal technology developments in moulding, decoration, coating, and film insert moulding, Covestro are cooperating with customers and suppliers: tier-2 lidar suppliers; tier-1 headlamp, bumper, and front-panel makers; automakers, and also mold makers and technology companies. Because of these widespread partnerships along the process chain, Covestro have a deep view into the future front panel technology.

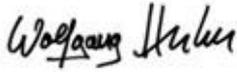
Moulding and coating a seamless front panel including both headlamp lenses is technically possible, according to Covestro's expertise in polycarbonate glazing—although due to mould size, very large machines in the range of 3,200 to 4,000 tons are needed. Time will tell whether the added manufacturing cost and complexity of seamlessly integrating headlamps behind a single front panel can compete with a two- or three-part solution with very tiny or even hidden gaps. An interesting option could be to move single lighting functions from inside the headlamp to the transparent front panel, partly dissolving the traditional headlamp.

Seamless sensor and light integration is a must, of course, but it is still not easy matching demanding automakers' frontal design wishes with optical specifications for polycarbonate lidar covers. Another question is dirt and ice in front of sensors and lighting elements.

Lidar-transparent heating foils including the necessary connectors can be fully integrated by an overmoulding process to fight the ice. Cleaning is still a problem which is being tackled with a lot of water and compressed air today; this opens opportunities for developers of solutions based on anti-stick coatings in combination with smart cleaning technology. However, it is crucial that those coatings have to survive e.g. weathering, stone impact, and car washing.

So: large, fully integrated polycarbonate panels dominate the front ends of new EVs. This has an impact on the system supplier structure, and consequently on the whole automotive lighting industry. It will be fascinating to watch—and participate!

Sincerely yours,

A handwritten signature in black ink, reading "Wolfgang Huhn". The signature is written in a cursive, slightly slanted style.

Wolfgang Huhn
DVN Senior Advisor

In Depth Lighting Technology

Covestro Integrate Design, Function in PC



CHRISTOPH KLINKENBERG, WOLFGANG HUHN, ROLAND KÜNZEL, THOMAS GRIMM

To learn about the future possibilities of lighting, sensor integration, and decoration in vehicle front panels, DVN spoke with leading polycarbonate supplier Covestro's Christoph Klinkenberg, Thomas Grimm, and Roland Kuenzel.

DVN: Thanks for speaking with us today! Can you tell us about some of Covestro's recent innovations?

Covestro: We are expanding our material portfolio with our translucent Makrolon AG DQ grades for new light effects in the automotive exterior. These grades combine excellent transmission and diffusivity properties with lightfast colourants and additives. In addition, we are working on processing solutions to combine design with functional integration. With our near-IR transparent black Makrofol ST films, we can hide lidar sensors seamlessly surrounded by aesthetic printings and light integration. Our developed technology to integrate heating films just partially, but without visible edges in large front panels, is another example to integrate functionality in a smart way and in accord with designers' wishes

DVN: Why is seamlessness so important?

Covestro: Seamless design is a very hot topic for automotive designers these days. It means minimising or completely removing borders between adjacent parts or surface appearances. Good examples are the merger of headlamps with the central front panel or seamless transitions between transparent surfaces and class-A body-coloured areas. In

both fields, transparent polycarbonates offer a good basis for further development we are happy to support our customers with.

DVN: What can you tell us about hidden-unit-lit designs?

Covestro: We offer tailored dark-tinted transparent colours in Makrolon AG that appear black in off-state. When you switch on a light or display behind a cover molded from these colours, their light will become visible from the front. Such effects can also be created with coloured Makrofol films.

DVN: How can sensors be integrated invisibly?

Covestro: Materials are needed which in addition to existing exterior requirements are highly transmissive for sensor signals. For lidar, therefore, we developed our Makrolon AG ST and Makrolon AX ST portfolio. These grades combine transmission levels in the visual range from 90% to 0%, with highest transmission in the near-infrared. If our customers wish, we are specifying for every delivered lot to have at least 89 per cent transmission at 905 nm and 2 mm wall thickness.

To qualify our material and define specifications for mass production lidar applications, our technical lab in Leverkusen, Germany, is equipped with a laser measurement device by that we can analyse beam qualities depending on different lens designs and check for optical boundaries and limitations together with our customers. Different moulds with optical surface quality can be used for those developments.



Integrating design and functional elements with advanced molding



Front panel with "two-sided" film insert molding and seamless heating integration



Visionary concept for brand identity, communication, and elegant effects integration

DVN: Tell us about the long-term trends you're seeing.

Covestro: The use of transparent or translucent elements in the exterior for light effects, display visibility, and integration of 3D-structures as well as printed decoration on the backside. It is very clear why most automakers are showing such effects in their concept cars in recent years: transparent resins enable entirely new design ideas compared to traditional exterior materials.

Another trend is applying designs similar to these smooth fronts to the rear of the car. Connecting both rear lamps with transparent or translucent panels adds new value and design opportunities.

Interesting as well and starting mainly from China are "smart exterior parts". These can be e.g. dark transparent door pillar bezels acting as HMI (human-machine-interface), covering displays or hiding cameras as well as other sensors.

DVN: What is the future of recycling? What are the next steps?

Covestro: We at Covestro believe it's important to widen the view from traditional ways of mechanical recycling towards recycling technologies based on chemical methods. At the same time, it gets more and more important to improve the design for recycling. This includes selecting materials according to their compatibility, suited for the same recycling process as well as improving how different materials are joined. Ease of separating different resins is mandatory for mechanical recycling but also improves efficiency in chemical recycling.

Lighting News

Lighting Highlights From ELIV

LIGHTING NEWS



KT NEUMANN, FORMER CEO OF CONTINENTAL



DR. MICHAEL KRUPPA

Every two years the huge ELIV (Electronics in Vehicles) conference takes place in Bonn's world conference center. Because the conference has grown to attract well over 2,000 participants, the traditional location at Baden Baden became too small; moving to Bonn was necessary. Now, after Covid, ELIV shrank to about 700 live and over 100 online participants and about 70 exhibitors. The

main topic was software technologies, end-to-end architecture, AVs, EVs, and electronic innovations. Two notable lighting presentations were included; Audi's head of Lighting Innovation Dr. Michael Kruppa's talk was entitled "Digital Light for Digital Cars", and DVN's Dr. Wolfgang Huhn gave a presentation called "Adaptive Driving Beam—The next mandatory Safety System?" based on the strong DVN ADB Report. (Got your copy? [Get your copy!](#)).

Highlights were clearly the keynotes and panel discussions with VIPs like KT Neumann, former CEO of Continental; Opel; and VW China, who now runs his own business based in Silicon Valley. His conclusions:

- Software is everything;
- Not the Car is in the Center of our Universe but the cloud and the services;
- We will not be able to fund the various developments from our own cash flow but will need the capital markets to fund it



ST Micro Audi A6e-tron OLEI



EQS front end



EQS rear front

ST Microelectronics showed an Audi A6 e-tron concept rear end with highly functional and beautiful OLED applications. Mercedes displayed their new EQS 450+ with stunning front, rear, and interior lighting.

Momentive: Making Complex Sensor Integration a Reality

LIGHTING NEWS

Forward Lighting, Sensors and Front End Modules



Exterior Parts and Glazing



Interior Parts and Displays



Momentive, a company with turnover of USD \$2.3bn, have 5,000 employees. They specialise in silicone and related matters.

The traditional application of hardcoats is for headlamp lenses, but hardcoats are now used in many automotive applications to improve resistance to weathering, abrasion, and chemical attack; and to improve cleanability and optical clarity of plastic and polycarbonate parts.

Further areas are opening for hardcoats: plastic front-end modules replacing grilles on EVs, which can be decorated (or even illuminated in some countries), for example. Hardcoats can also be deployed to protect ADAS devices like cameras, radars, and lidars, and connectivity devices like V2X-5G antennas.

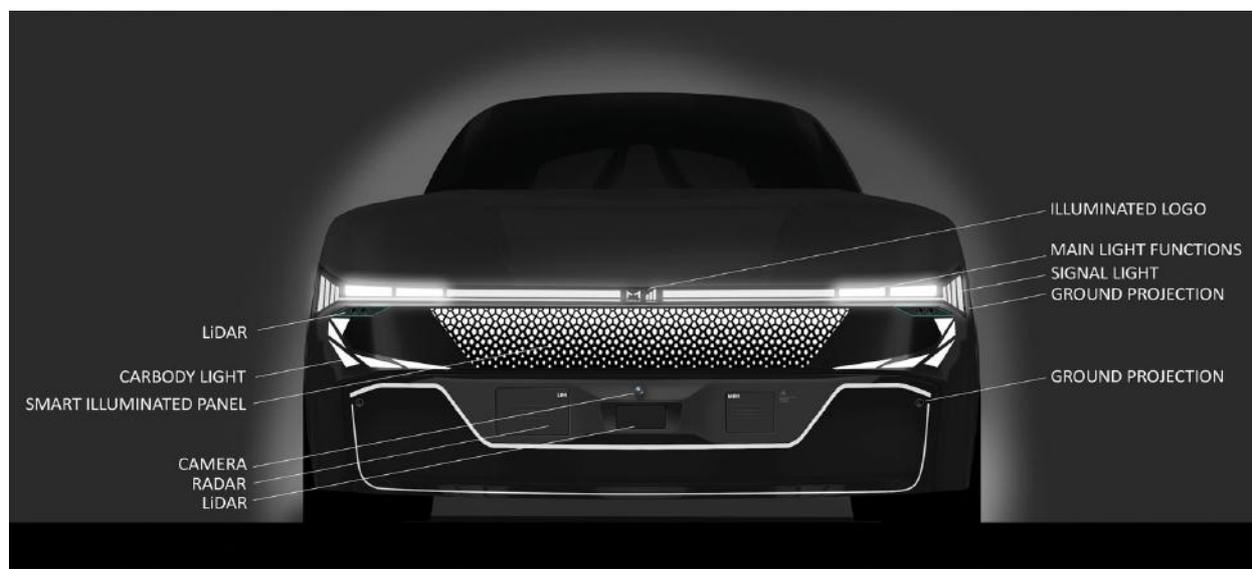
For these various applications, Momentive have developed a variety of products, mainly classified under their curing process: thermal or UV. According to the weathering tests like outdoor testing in Florida or Arizona or to the quicker but less precise artificial testing, thermal hardcoats like their AS4700 family have better results out to the equivalent of seven years in Florida, compared to around five years for UV hardcoats like UVHC5000 family. Thermal harcoats are also better for abrasion: in car wash simulation testing, they lose only five to seven per cent of gloss compared to 45 per cent for UV coatings.

Hardcoats are interesting for lidars, as at a wavelenth of 905 nm the transmission is up to 93 per cent with a double AS4700 coating instead of 89 per cent for uncoated polycarbonate. And hardcoats can improve the cleanability plastic parts: putting drops of water on the surfaces, they start to roll at just 11° for a special variant of the AS4700 coating, close to the 12° of glass, and much better than the 36° for uncoated polycarbonate or 25° for traditional AS4700.

The process to obtain the best results is complex, requiring a baked primer application; after the hardcoat application itself a special cure must be done. Momentive have optimised this process during the last six years, with specialised spray techniques and equipment.

Plastics Bring Solutions in Automotive Lighting

LIGHTING NEWS



PARTS WHERE MARELLI AND SAMVARDHANA MOTHERSON ARE WORKING TOGETHER

Marelli and Samvardhana Motherson have formed a new partnership to integrate sensors for ADAS and autonomous driving in illuminated exterior body parts like front grilles, bumpers and others. The partnership plans to create translucent, back-lit trim parts and other decorative panels, with LED lighting shining through them at night and taking on the color of the car body in daylight.

- **Motherson** uses injection molding, films, printing technologies and painting and surface coating to integrate light modules into large exterior parts like bumpers and fascias. The integration of the light sources within the exterior parts is the key for a successful product" Timo Schwarz, chief technology officer at Motherson Innovations. said.

- **Marelli's lighting division** will focus on automotive lighting and sensors integration. «The company applied a similar concept in its Smart Corner product, which integrates sensors for autonomous driving within vehicle headlamps and tail lamps. Andrea Stella, senior VP of R&D at Marelli Automotive Lighting said..

"Driving innovation and shaping the future of mobility together with our customers requires not only the ability to best respond to their current needs, but most of all the ability to anticipate forthcoming evolutions and rising market trends." Sylvain Dubois, CEO of Marelli's Automotive Lighting division, said.

Acting NHTSA Chief to be Made Official

LIGHTING NEWS



U.S. President Joe Biden says he intends to appoint Steven Cliff as the head of NHTSA, the National Highway Traffic Safety Administration. Cliff has been serving as the acting head of the agency; formerly he was Deputy Executive Director of the California Air Resources Board.

The Biden Administration also plan to announce that Duke University engineering and computer science professor Missy Cummings will be NHTSA's new senior security adviser.

NHTSA has not had a senate-confirmed administrator since January 2017, and not even a candidate has been mentioned since 2019; it was one of many agencies willfully left leaderless by the former Trump administration.

The United States has seen a sustained increase in road deaths. Last month, NHTSA estimated 8,730 people died in traffic crashes in the first three months of 2021, up from 7,900 deaths in the same period last year—an increase of 10.5 per cent despite a 2.1 per cent drop in road-vehicle travel.

TCL's Smart Glasses Have Colour μ LED Display

LIGHTING NEWS



TCL have a new AR smartglasses product called the Thunderbird Smart Glasses Pioneer Edition. TCL say the colour display is based on microLED technology, with a pixel pitch of 4 μ m. No shipping date or price has been announced for the product, which is likely still at an early development stage.

An online [video](#) shows the use of three monochrome microdisplays, combined to show a single full-colour image. The company say the glasses "create a stunningly expanded view, which is the equivalent of watching a 140-inch screen, 4 metres away (...) delivered by 47 pixels-per-degree resolution and dual 1080p Sony FHD Micro OLED panels while stereo speakers bring ultra-rich sound".

Driver Assistance News

Consumers Ignorant About AVs: Study

DRIVER ASSISTANCE NEWS



Innoviz have announced the results of a commissioned [study](#), finding low consumer education about AVs across all segments of the population and significant discrepancies in levels of comfort and excitement about the AV future based on gender, geography, and generation. Innoviz commissioned an independent global research firm to conduct the study with 2,000 American adults. Main conclusions:

- **People don't know the difference between AVs and assisted driving systems.** When the respondents were asked to pick which of two statements best describes an 'autonomous vehicle', 42 per cent of the respondents chose the incorrect response
- **Women are less excited than men about an AV future.** Men were nearly 3 times more likely than women to say they'll buy an AV once they are available.
- **Trust in AVs corresponds with geographic density, with those in cities being most trusting.**
This discrepancy in trust and excitement was also seen in terms of geographic density. Those in the more dense, urban areas were more likely to buy an AV when they are available compared to those in less dense areas.
- **Millennials and Gen-Xers are AV champions.** When it came to the perceptions of benefits, Millennials (1981–1996) and Generation X (1965–1980) were much more likely to have a positive view (~50%) than the younger (Generation Z, 1997–2012) or older generations such as Baby Boomers (1946–1964) and the Silent Generation (before 1946).

Kyocera: First Camera-Lidar fusion sensor

DRIVER ASSISTANCE NEWS



Kyocera have unveiled what they're calling the world's first camera-lidar fusion sensor with MEMS mirror, and the company have announced a portfolio of developing innovations that promise to take ADAS technology to new levels in the long-term quest for fully autonomous vehicles.

Kyocera are developing new solutions that apply convergence, miniaturisation, and solid-state conversion for multifunctional sensors that can simplify ADAS design and help contain the requirements of processing. The company's latest ADAS innovations represent an integration of technologies in advanced materials, components, devices and communications infrastructure.

Because cameras and lidar each offer unique advantages, they are often used in combination. Cameras are ideal for detecting the colour and shape of an object, while lidar excels at measuring distance and creating very precise 3-dimensional images. However, digital imaging of two units that do not share the same optical axis exhibits a deviation error known as parallax. A computer can theoretically integrate two channels of data to correct the parallax error, but the resulting time lag creates a barrier to any application requiring very precise, real-time information, such as driving.

Kyocera's camera-lidar fusion sensor is currently under development and is expected to be released by March 2025.

Rain Impairs Driver Assist Tech: AAA Study

DRIVER ASSISTANCE NEWS



The performance of ADAS used to help vehicles automatically brake and stay in lanes is significantly reduced by moderate and heavy rain. That's the conclusion of a [study](#) newly released by the American Automobile Association. Researchers at AAA, a federation of North American motor clubs, found that vehicles' automatic emergency braking systems, in several instances during simulated rainfall, no longer recognised stopped vehicles ahead—and that lanekeeping systems performed considerably worse.

That could lead to dangerous situations if drivers rely too heavily on the systems, whose performance is typically evaluated in ideal conditions. AAA's Director of Automotive Engineering and Industry Relations Greg Brannon says "The reality is people aren't always driving around in perfect, sunny weather, so we must expand testing and take into consideration things people actually contend with in their day-to-day driving".

In the AAA study, no test car crashed into a stopped vehicle under ideal conditions. But during simulated rainfall, 17 per cent of test runs resulted in crashes at speeds of 40 km/h (25 mph), increasing to 33 per cent at 35 mph (56 km/h).

General News

VW CEO Invites Tesla CEO to Address VW Executives

GENERAL NEWS



Tesla owner Elon Musk addressed 200 Volkswagen executives via a video call after an invitation from German automaker CEO Herbert Diess, who wants to galvanise senior VW officials for a faster pivot to EVs. Diess said he called on Elon Musk to argue that VW needs faster decisions and less bureaucracy for what he called the biggest transformation in the history of the business.

Musk's comments at a VW executive rally in Alpbach, Austria, included praise for VW for being an 'icon' and 'Tesla's biggest challenger'.

When Diess asked him why Tesla was more agile than his rivals, Musk claimed it's because of his management style and that he's an engineer (though governments around the world are increasingly questioning whether it's more because Musk takes shortcuts around safety regulations).

In a post on LinkedIn, Diess added that he called on Musk as a "surprise guest" to argue that VW need faster decisions and less bureaucracy for what he called the greatest transformation in VW history.

Stellantis Torino Plant to be EV Hub

GENERAL NEWS



2021 MASERATI GHIBLI HYBRID, THE BRAND'S FIRST ELECTRIFIED MODEL (STELLANTIS IMAGE)

Stellantis, made up of 14 motor brands including Chrysler, Peugeot, Fiat, Citroën and Jeep, plans to convert their factory in Turin, Italy into an electric vehicle (EV) hub.

The Mirafiori plant, which already produces the Fiat 500 EV, will produce a new electric platform to build the Maserati models between 2022 and 2024. Stellantis has said that Maserati will be all-electric by 2025. The Maserati Ghibli and Quattroporte, now produced in the Grugliasco plant, located 4km away, will move to Mirafiori by 2024, with no impact on employment.

With the process, Stellantis will make the factory a center of electrification for the group. They'll start to design the new electric platform for Maserati models, improve performance at all their Italian plants, and give Italy a strategic role among the group's main domestic European markets. Italian newspaper La Repubblica reported that Stellantis could increase production of the ICE Fiat 500 at Mirafiori by shifting some volumes back there from Tychy, Poland.

So far, it's good to see the transition to EV development and manufacturing is organized pretty smoothly. As the industry is shifting to electric, similar moves are happening with many automakers, especially in historical location, like Renault in the North of France, and many others.

Foxconn released three new cars in a row

GENERAL NEWS



Foxconn officially released the pure electric vehicle brand Foxtron. The new brand was created by a JV established by Hon Hai Group and Yulon Motor. In addition, three new models of Model C, Model E and Model T were brought.

Model C is positioned as a pure electric mid-size SUV, which is expected to become Foxtron's first model, which will be officially launched in 2023.

Model E is a pure electric medium-sized SUV and adopts a coupe style design, and its shape is jointly developed with the Italian design company Pininfarina,

Model T is an electric bus. It is reported that the new car will have high-level driving assistance software and hardware, and a certain level of driving assistance functions.

Baidu Apollo and Weimar officially release two new cars

GENERAL NEWS



Baidu Apollo and Weimar officially released two new cars, both of which are based on Weimar W6. One is a mass-produced model of Apollo Moon, a new-generation unmanned vehicle equipped with Lidar, the other is a mass-produced model equipped with Baidu's ANP pilot assisted driving system and AVP autonomous parking system. Since then, the cooperation between Baidu and Weimar has completed the full coverage from autonomous parking AVP, pilot assistance ANP to fully driverless Apollo Moon models.

According to the cooperation plan, Apollo's autonomous driving technology will become an important indicator for distinguishing the different configurations of the Weimar W6 production version. Both the Weimar W6 unmanned vehicle Apollo Moon and Weimar W6 ANP+AVP models adopt the "ANP-Robotaxi" architecture, which can achieve data symbiosis and sharing, feed each other back, and create a super data closed loop.

It is reported that the Weimar W6 ANP+AVP model is equipped with 12 cameras, 5 millimeter wave radars and 12 ultrasonic radars, which can realize higher-level pilot assisted driving capabilities such as intelligent avoidance, autonomous lane changes, up and down ramps, and entry and exit service areas. It is worth mentioning that by adding a customized lidar and corresponding unmanned redundancy to the ANP+AVP model, it can realize full unmanned driving capability and become the unmanned Apollo Moon.

Baidu believes that the cooperation between the company and Weimar Motors will not only accelerate the mass production of smart cars, but also bring Baidu's technology to dimensionality reduction and data feedback closed-loop route to the extreme. In the future, Baidu Apollo will continue to strengthen the R&D of autonomous driving technology, empower more cooperative car companies, and continue to help the large-scale commercialization of autonomous driving.

Tesla Post Biggest Q-Profit on Record Deliveries

GENERAL NEWS



Tesla delivered 241,000 EVs in Q3-2021, 73 per cent more than Q3-2020, with record second consecutive quarterly profit, amassing \$1.6bn in the third quarter despite the global semiconductor shortage and other supply chain challenges.

Revenue jumped 57 per cent to \$13.8bn, and automotive gross margins increased to 30.5 per cent. Executives expect strong demand for Tesla's EVs to propel growth as they strive to ramp up production at new assembly plants in Texas and Germany. Tesla were helped by \$279m in pollution credit sales to rivals, although that number fell for the second consecutive quarter. Tesla said their average selling price fell 6 per cent year-over-year.

Tesla CFO Zach Kirkhorn said "Overall I'm very proud of what the team have accomplished and excited for the next phase of growth in Q4 and 2022. The team has done a tremendous job of improving our financial health over a short period of time while continuing to improve our accuracy and pace of execution"