

REPORT
THE WONDERFUL STORY OF LIGHTING
History, Current Technologies & New Challenges

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Editorial

DVN Tokyo Workshop Postponed To 1-2 December, 2020



While the automotive industry progressively resumes production all over the globe, we are learning week after week that events are cancelled or postponed. DVN Workshops are right in the same line, while lighting technologies are going so fast. It's difficult to gather an audience for lectures with everyone keeping 2 m distance, to network and to visit exhibition booths with masks and without the usual proximity of experts presenting the technology.

And so the DVN Workshop in Tokyo, originally slated for the end of August, is postponed to 1-2 December. I hope the lighting community will be at that

time happy to be there, to network and listen to the speakers, like last January at our wonderful Workshop in Munich.

To continue presenting lighting technologies during the disruption, we've organised an online technical meeting with EPIC, the European Photonics Industry Consortium, on Wednesday 27 May from 15:00 to 17:30 CEST (09:00 to 11:30 EDT, 06:00 to 08:30 PDT, 22:00 to 00:30 JST). VIP speakers will present the latest lighting technologies, and I am convinced it will be fruitful to put together experts on photonics with experts in lighting. This week we introduce EPIC; watch for more detail about the event next week—meanwhile, please save the date.

Meanwhile, don't miss this week's in-depth coverage of Flex-N-Gate, a global tier-1 powerhouse with 68 integrated manufacturing facilities worldwide and 23,000 employees.

Stay well and stay safe,



DVN PRESIDENT

In Depth Lighting Technology

Flex-N-Gate's Innovative Lights & Assemblies



Flex-N-Gate, headquartered in the U.S. state of Illinois and with an extensive network of factories and offices, supply advanced structures, metal and plastic bumpers, interior trim, lighting, chassis assemblies, and other automotive systems to virtually every automaker in the world.

Over 23,000 employees work at 68 facilities located in the U.S., Canada, Mexico, Brazil, Argentina, the U.K., Spain, France, Germany, and China. The company was founded and continues to be led by American billionaire Shahid Khan.



Flex-N-Gate maintain keen competencies in integration. They produce more than 90% of automotive vehicle exterior locations where production volume sensor integration is possible, and they're already a leading sensor integrator ready to answer the calls of its OEM customers as they prepare for mass production.

They also have been making impressive development efforts in new kinds of lighting systems for when autonomous vehicles are ready for purchase. For example, an animated multicolour grille and emblem, integrating a multi-functional ADB and using lightweight materials. There's a show-'n'-tell of it [online](#).

Flex-N-Gate's Demonstrator

At CES last January, Flex-N-Gate demonstrated a production-intent sensor integration solution with special attention to the competing goals of robust thermal management, minimal lens intensity loss, wide field of view, and easy manufacturability. Several features equip the demonstration vehicle:

- Integration of Ouster OS1 in the headlamp
- ADB

- Animated light bars and badge lighting
- Lightweight fog lamp

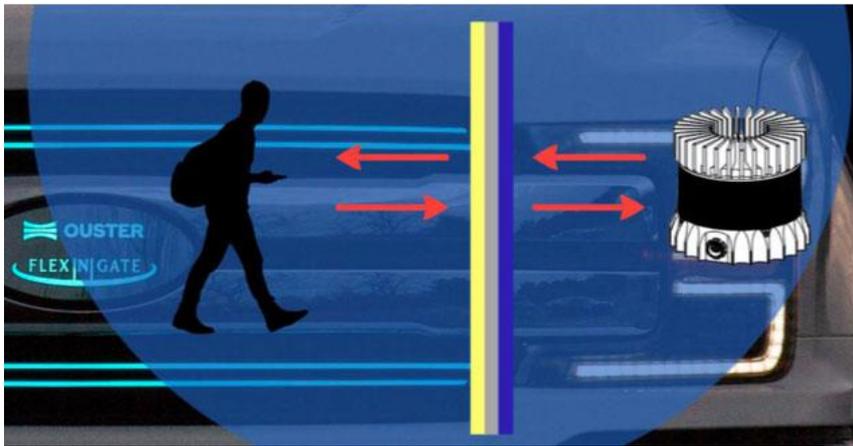
Ouster OS1



Flex-N-Gate seamlessly integrated Ouster's OS1 lidar technology into the headlamp. It's a multi-beam, high resolution, high reliability, compact and lightweight (<400g) flash lidar that Flex|N|Gate found easy to integrate.



Headlamp lens intensity loss is minimal, thanks to an AR coating tuned to the OS1's specific wavelength, IR-transparent polycarbonate, and a 10-year hardcoat.



Data from two lidars are fused into a single point-cloud for a 210° FOV. It's a solid-state thermal solution that is robust, silent and requires no fans. Flex-N-Gate predict further cost reduction using a lidar heatsink specifically optimised for the headlamp.

ADB



LIDAR DISPLAY: THE IMAGE ON THE MONITOR IS WHAT THE LIDAR IS SEEING

The single lighting module provides high-resolution ADB and enhanced light-on-road functionality, increased driver visibility on both high and low beams, beam-steering and corner-light control. Foreground lighting is provided by an auxiliary source.

Animated light bars and badge lighting

Four animated light bars with customisable animation have individually addressable LEDs; uniform blending derives from Flex-N-Gate's patented technology. Badgelighting from a customisable back-lit badge illuminated in white (for front position) and turquoise (for autonomous mode) is achieved using multiple strings of LEDs for each colour.



FRONT END WITH ANIMATED LIGHT BARS AND BADGE LIGHTING

Lightweight fog lamp

Flex-N-Gate's lightweight fog lamp uses a thermally conductive plastic for a 12% component reduction and a 46% weight reduction compared with anodised die cast aluminium.



The material's high thermal conductivity manages heat well, its high modulus handles structural loads, its low CLTE provides dimensional stability, its electrical conductivity dissipates static charge, and its low EMI shielding enhances electronic integration. Moreover, this material is fully recyclable and supports high production rates.

Interview: Joel Roach, Director of Lighting Engineering



DVN: In 2012 Flex-N-Gate bought Ford's ACH (Automotive Components Holdings) unit, which made lighting products. What was the attraction of ACH at that time?

Joel Roach: [Flex-N-Gate owner Shahid] Khan, an engineer by training, remains actively involved in all aspects of our global business, including our technology offerings. He relentlessly seeks opportunities to serve our customers and enhance our position in the automotive supply base. In some cases, we achieve his vision through acquisitions, and ACH is a perfect example. Its lighting products businesses and strategic customer relationships aligned well with our strategies in exterior plastics and module businesses.

DVN: What are the lighting activities of your company today, and how do you assess your company as versus competitors like Koito, Marelli, Valeo, and Hella?

J.R.: We supply exterior lighting for the automotive market and we are increasing our offerings to an persistently expanding customer base. Our core lighting operations in America support additional lighting manufacturing capabilities in Mexico and Spain. We have added lighting capabilities to those of our technological centre In France. We leverage our core cross-functional strength by integrating lighting into the front grilles, rear liftgates, and exterior components we design and supply. Today, we integrate sensing devices in our lamps and with our other exterior structural components. We focus on our abilities and as technologies arise, we amplify our strengths. We distinguish our abilities from our competitors in that we provide robust, manufacturable solutions that push emerging lighting technologies into new and pioneering vehicle locations.

DVN: You equipped your demo-car with ADB. Do you know when NHTSA will allow this technology in US?

J.R.: As automotive component supply industry participants, we all share the same crystal ball. We actively monitor the ongoing discussions/debates while

concurrently advancing the art and science of our offerings to assure implementation readiness when NHTSA releases a decision.

DVN: You talked of high-resolution ADB. What technology do you use—matrix, μ LED, TI DMD...?

J.R.: We engage in active development projects with each technology. We are evaluating the market place to determine how our customers would seek to utilise each technology to either illuminate the road or offer a new form of UI/UX. Given our target market, matrix likely offers the greatest near term potential.

DVN: Considering performance and regulation, how do you evaluate vehicle lighting in the American market versus Europe?

J.R.: Europe continues to lead North America in road illumination performance and regulatory adoption. The North American market (regulatory and third party) continues to prioritise concern for oncoming driver glare over the beneficial impacts on down-the-road illumination. IIHS top safety credentials carry considerable weight in many OEM customer-implementation strategies. In our view, US regulatory reluctance in ADB needs to be re-examined; allowing ADB implementation should lead to immediate and sustainable benefits in glare reduction and illumination improvement. Admittedly, the current regulatory framework also enables faster implementation of brand identity and ground-effect type lighting in components such as grilles, mirrors, emblems, and badges.

DVN: What is the market penetration of LEDs in American car lights, front and rear, and how do you foresee it in the next five years?

J.R.: There is an all or nearly-all LED version of every lamp we presently make. We have seen a steady increase in take rates towards these LED versions as well. These trends, on our view, will continue and even accelerate in the next five years. Better economics supported with improved optical and thermal performance of LEDs will support these trends.

DVN: Are you aware of the feedback of US consumers regards to lighting?

J.R.: We hear US consumer feedback concerning lighting. Some of those concerns arise in your earlier questions. ADB takes a significant step above the auto-high beam features that many consumers currently enjoy. North American pickup truck consumers in rural areas and their urban counterpart SUV drivers have an enduring love affair with non-passenger vehicles; ADB technologies—which reduce glare and improve down-the-road illumination—offer valuable features to such drivers. The ability to create a unique appearance with the emergence of more accent lighting and continued evolution of signal lamp styling will feed the time-honoured North American appetite for individual expression.

DVN: How do you see the new lighting functions to improve safety like guidance lines, danger signals, curve indications, and communication with vulnerable road users?

J.R.: Safety improvements of this nature remain in the development stage, engaging still-open questions like what will consumers value, and what will laws permit. We are active in several emerging technologies that offer the

communication capabilities that will dominate these developments. We remain live to finding the most effective ways to implement and scale these technologies in the production automotive supply industry.

Lighting News

SEAT's Elvira: «Always an Opportunity Behind a Problem»



Carlos Elvira, Head of the Department of Lighting and Signalling at SEAT, and one of the greatest lighting experts, shares his experience on the confinement.

“Dear friends and colleagues in the world of lighting. It is a real pleasure for me to address all of you. For this I thank DVN and especially my friend Hector for this opportunity.

Opportunity that allows me to communicate to you the sensations that we live and experience in this period of so special and unique confinement. After the first few weeks and as usual something we work on-line, and we already have a certain experience that has allowed us to value the efficiency and effectiveness of remote work.

Personally, I am living with my team the evolution of this experience and today after six weeks, I can tell you that the balance is somewhat more positive than what we previously thought.

Far from the despair of the first days, today we have found the meeting points in the time schedule and the meetings are more agile, faster and more efficient.

We should consider that we have had some bad moments that for our team it is only possible to overcome by going back to our own strategies.

Strategies that characterize us and force us to be faithful to our DNA. This DNA has allowed us to overcome lowest points. And this shows that innovation is our source of inspiration to overcome adversity. This gives us willness to work in our private hours for future new projects.

It is thanks to all these tough experiences that I can I provide you with my recipe to overcome any bad moment. Every problem is followed by an opportunity. This is a fact, there is always a hidden opportunity behind a problem. It is necessary to equip ourselves with a positive attitude that clears the future of problems and lets us see the future opportunities.

And friends, never forget that every time we fall, we have to get up and this is another fact. After a fall we get up and are somewhat stronger and more experienced. Therefore, looking ahead, facing the future with optimism.

Let's think about our work "lighting" and the wonderfulness of the product that we develop or manufacture. We are privileged in this industry.

Stay healthy and hopeful."

EPIC Online Technical Meeting on Vehicle Lighting



EPIC, the [European Photonics Industry Consortium](#), was founded in 2003 and now there are 650 members.

14 people including 7 PhDs work there. The General Manager is Carlos Lee, and the CTO is José Poso.

EPIC advances the interests of the industry and their member companies in a variety of ways including:

- Networking on photonic technologies with events, media interface, and market research;
- General information by newsletters, and
- Online technical meetings— 120 of them a year.

These meetings last around two hours from eight conferences of companies outside EPIC which generally present their needs in photonics, such as electronics, optics, lases, and sensors. One of these meetings, the 27th of this month, will focus on vehicle lighting. EPIC has set up an information page about the meeting [here](#). Car manufacturers and lighting suppliers will talk and listen with tier-2 suppliers belonging to EPIC.

ZKW, TU Wien, Emotion3D in Research Project



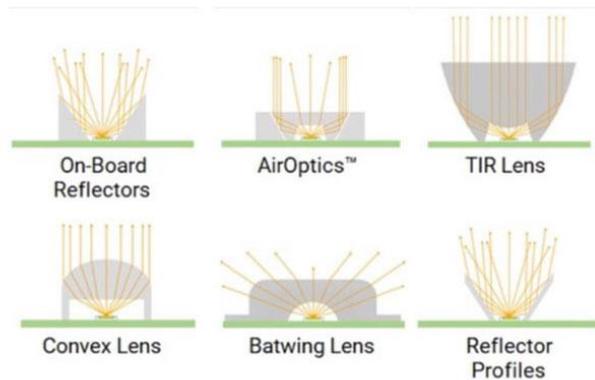
As part of the CarVisionLight research project, ZKW are working with the Technische Universität Wien and software specialist Emotion3D to develop intelligent light technology solutions.

The project focuses on automatic image capturing and processing in traffic and adaptive lighting systems. The objective of this industrial research is to create lighting systems that can approach or even exceed the capabilities of human perception, and appear to "think with you" (though even the best machines cannot actually think).

CarVisionLight is part of the ZKW technology program for sensor integration. The program also includes the Dragonfly Project to integrate sensors and cameras in headlamps to facilitate automated driving functions. ZKW CEO Oliver Schubert says "With CarVisionLight, we are combining our expertise with our partners to develop lighting systems for the next generation of cars".

Modern vehicle lighting systems support optimal street lighting with automatic lighting functions, cameras and sensors. But there is still much room for improvement in automatic recognition of people, animals, and objects, especially at night. Currently, for instance, system designers lack valid data on the distance at which—and the reliability with which—a pedestrian can be detected by an intelligent lighting system at night. So ZKW worked with TU Wien to carry out extensive measurements to improve automated detection and increase safety in and around traffic after dark.

Fusion Optix LEDMate Onboard Optics



The Fusion Optix LEDMate onboard Optics are designed to focus, spread, reflect or otherwise modify light output from LED boards. They are typically used in space-constrained applications and where tight control of the LED output is required.

LEDMate works with high- and mid-power LED packages. A variety of beam focusing options are possible using simple interchangeable optics that sit on top of a line of LEDs. The optics have a low profile and small cross-sectional size and support a variety of aluminium extrusion designs.

Fusion Optix are a leading LED lighting technology company with a unique range of light management components and LED light engine products.

Compound Photonics' New μ LED AR Display



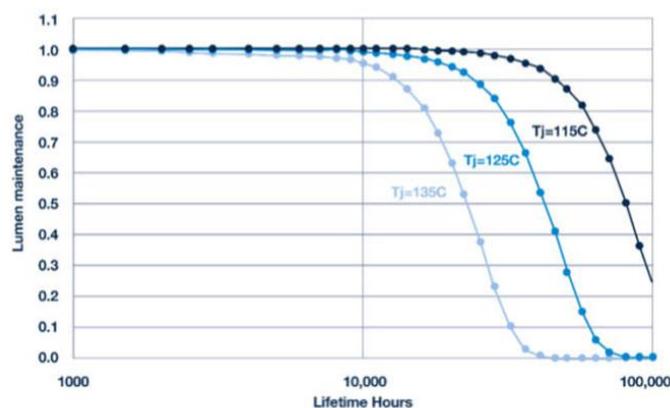
U.S.-based microdisplay specialists Compound Photonics (CP) have launched a digital backplane which enables Micro LED technology for high definition microdisplay subsystem integration.

CP reengineered their market-ready LCoS backplane technology into an innovative constant current drive configuration for μ LED pixels based on a ~ 3 μ m pixel, 1080p display format. The technology can be integrated with μ LED

displays to accelerate the manufacturing process by bonding the devices to a backplane driven by CP's NOVA display drive architecture. The subsystems meet AR requirements for compactness, optical performance, and brightness with high frame rate, low latency, and low power consumption.

CP collaborated with μ LED AR display specialist Plessey and revealed their co-developed 0.26-inch integrated μ LED display module for AR/MR applications this past February. CP's Electrical and Software Engineering VP Ian Kyles says the custom, constant current pixel circuit design "provides greater tolerance to forward voltage variation and IR drops in the Micro LED array resulting in a previously unattainable level of uniformity. It additionally features globally on-the-fly programmable pixel current control that greatly increases the system bandwidth, enabling higher frame rates while maintaining full bit depth". The backplane has additional steering pixels beyond its native 2048 \times 1080 resolution to enhance alignment and integration of the display within the optical system.

HB LED Longevity: It's Up to the Driver



High brightness LEDs are bringing about a revolution in lighting, especially at the front of automobiles. There are still cost-benefit tradeoffs; only with long lifespan can HB-LEDs be justified in cost-sensitive automotive applications.

Operating temperature is the main factor when it comes to longevity. To improve it, the driver can also provide features such as dimming, fault protection and the ability to control multiple strings of LEDs.

HBLEDs can win out in most applications, if their prospective lifetime can be achieved and this comes down to effective thermal management. LEDs rarely fail abruptly under normal conditions, but lose brightness due to propagation of lattice defects (called "dislocations"). A typical plot of lifetime against HBLED chip temperature is shown here:

Fundamental to maintaining chip temperature within design limits is the driver IC specified, but the application also dictates the type of driver needed. A controlled current source is often the best solution.

Driver Assistance News

Valeo XtraVue Makes Trailers Invisible



Valeo have won a 2020 PACE Award for their XtraVue Trailer, the world's first system enabling drivers to see through the trailer or camper they are towing. This innovative driving assistance technology makes towing objects simpler and safer for drivers.

Using cameras and software developed by Valeo, XtraVue combines the data recorded by the vehicle and trailer cameras into a single, homogenous image. The image is displayed on screen in front of the driver, enabling them to see what's going on behind their vehicle as if they could see right through the trailer or camper. Driving and manoeuvring becomes easier than ever, whatever the size of the vehicle being towed. Drivers can change lanes, reverse, and park with confidence they're not about to hit something or someone.

Volvo, Luminar to Deliver Autonomous Highway Driving



Volvo plan to offer fully autonomous highway driving capability on their 2022 models, with help from U.S. technology company Luminar.

Volvo models starting with the XC90 and eventually including the next-generation XC60 and V60 will be what the maker call "hardware-ready" for autonomous driving. Customers who choose the optional Highway Pilot will get a package of technology that includes autonomous drive software, cameras, radars, backup systems for functions such as steering and braking, and Luminar's lidar system integrated into the roof.

Volvo have a minority stake in Luminar, which they may expand, and meanwhile the automaker and supplier are coöperating to see if it's possible to make lidar systems standard in models built on Volvo's SPA2 platform. Volvo will be Luminar's first series-production customer, though Luminar are also working with Audi, Toyota, and nine other automakers, Luminar founder and CEO Austin Russell says.

In the past, a lidar system cost roughly \$10,000. Russell says Luminar has been able to bring that down to \$1,000 for autonomous driving applications and \$500 for ADAS solutions built in volumes in the hundreds of thousands. Luminar's system, called Iris, can detect human poses including individual limbs such as arms and legs at a range of up to 250 metres, compared with about 30 or 40 metres from some currently-available lidar systems.

Velodyne to Supply EasyMile



Velodyne Lidar have a new three-year agreement with French autonomous vehicle specialist EasyMile. EasyMile use Velodyne's lidar sensors in their EZ10 autonomous passenger shuttles that are deployed on public and private roads in more than 30 countries.

EasyMile will enhance their EZ10 shuttle fleet with Velodyne's sensors for safe and efficient navigation on roadways. Electric and driverless, the EZ10 shuttle was the one of the first autonomous shuttles—launched in April 2015. It has a track record of over 200 deployments and more than 600,000 km driven in autonomous mode. Each shuttle can hold up to 15 passengers, and includes a built-in automated electric ramp to support accessibility for individuals with disabilities.

New ADAS Calibration Demonstration



ADAS sensors must be calibrated. However, the wide variety of systems and the different approaches of vehicle manufacturers leave many questions unanswered. Hella Gutmann provides answers to these questions in a 5-minute [video](#).

The technical animation guides the viewer through the different calibration steps around the vehicle. In the captivating video, the viewer follows the calibration procedure for front camera, front radar, laser scanner, all-round vision camera, rearview camera and all-round vision radar sensor. As if by magic, the required tools move to their correct positions before the calibration is initiated with the mega macs diagnostic tool.

The entertaining video provides hands-on information for workshop procedures and training. Hella Gutmann suggest the video also be played on a screen in the waiting area, to impress customers with the calibration competence of the workshop.

General News

U.S. Traffic Deaths Down, Pedestrian Deaths Up in 2019;



U.S. traffic deaths fell in 2019 for the third straight year even as overall road use increased, according to preliminary government data released Tuesday. NHTSA reported an estimated 36,000 people died in motor vehicle traffic crashes last year, down 1.2% in 2018, even as travel rose 0.9% percent to 3.23 trillion miles.

The fatality rate was 1.10 per 100 million vehicle miles traveled, down from 1.13 in 2018. Last year was tied for the second-lowest annual fatality rate in U.S. history.

As recently as 2007, 41,000 people died on U.S. roads and the fatality rate was 1.36 per 100 million vehicle miles, and 51,000 people died in 1980 when the fatality rate was three times higher than the current rate.

NHTSA have been grappling with a recent spike in pedestrian deaths that some attribute to more distraction and use of electronic devices. In 2018, the number of pedestrians killed rose to its highest level since 1990 climbing 3.4% percent to 6,283.

VW's Virus Rebound is Led by China



Volkswagen Group say demand in China is starting to rebound, thanks to customers who are switching from public transport to personal vehicles, but warn that sales will not recover as quickly in other parts of the world.

VW brand sales and marketing boss Juergen Stackmann says sales of passenger cars in China were above year-earlier levels in the last week of April—a month in which sales in Germany were down 60% on the year, with the rest of Europe down 85% as some major markets like Italy and Spain came to a full stop. Sales in North America, meanwhile, were down 50%, and down 81% in South America.

Stackman predicted "a two-speed Europe. Southern Europe was hit really badly. Italy, Spain and to some extent France. We expect recovery to take much longer, it will be bathtub shaped," he said.

Northern European countries, including Norway, Sweden, Denmark and Germany fared better. In Germany, sales to fleet customers remained almost at normal levels in April compared with a year earlier.

BMW Q1 Group Revenues Up, Automotive Down



It is becoming apparent to the BMW Group that delivery volumes in key markets are not going to return to normal in the space of just a few weeks.

BMW Management Board Chairman Oliver Zipse says "Quite clearly, the situation remains serious and market forecasts are subject to constraints under these circumstances. We are gradually ramping up our production again according to demand in each market. However, we are monitoring developments extremely closely to be able to respond with maximum flexibility, By 2025, the Group intends to invest over €30bn in R&D".

The BMW Group remain convinced of the importance of focussing on the innovations required to meet those needs as crucial to its enduring success: "We remain focused on investing to enhance our future success. We will also continue to train young people," said Zipse with emphasis. "In no way does the pandemic call our business model into question. Driven by technology and innovation, our business model will remain future-proof after the current crisis has ended." With these aims in mind, the BMW Group continue to invest in broadening its expertise in key future-oriented fields of technology. Potential for greater synergy and efficiency in indirect purchasing as well as in terms of material and production costs is also being leveraged throughout the Group. By the end of 2022, the Group intends to save more than €12bn through efficiency-boosting measures.

In the first quarter of 2020,

- Group revenues increased slightly to €23bn with automotive segment revenues at -6.4%, delivering a total of 477,000 BMW, MINI and Rolls-Royce brand vehicles to customers worldwide (-20%).
- the BMW Group incurred substantial upfront expenditure on the road to providing tomorrow's mobility. At €1,380 million, R&D expenses for the three-month period remained high (2019: €1,396m; -1.1%).