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Automotive lighting and driver assistance technologies

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# Editorial

## DVN Japanese Car Light Industry Report Goes Live

Today it is my pleasure to present our new DVN study on the Japanese vehicle lighting industry. A lot of effort went into its creation, including extensive work in Japan with DVN's Hitoshi Takahashi; we met and interviewed important people in the industry and saw a great deal of show-and-tell from the companies involved. We are most grateful to all of them for their courtesy, cooperation, and warm welcome.

You will find in this report an overview of the automotive industry in Japan, describing how this industry is crucial for Japan—and for the world, as Japanese car makers command 29% of the global car production. You'll read about the lighting philosophies, achievements, and efforts of automakers, lamp set makers, and tier-2 suppliers, and about Japan's unique lighting regulatory history and current participation in developing the UN Regulations.

Having now done this report, I am convinced that the Japanese automotive industry even after some difficulties in past years is still very strong and has the competencies and the means to conquer the big challenges of our industry in the future.

Find a summary of the report in this week's newsletter, then download your copy of the full report. I hope to see you soon at the DVN workshop coming soon in Tokyo on June 5th and 6th.

**Be informed that registrations for the Tokyo event are now closed, having reached the maximum occupancy allowed by security requirements at the Ritz Carlton Tokyo Hotel.**

*Jean-Paul Ravier*
*DVN Senior Consultant*

# In Depth Lighting Technology

## Preview: DVN Study on Japanese Car Lighting Industry

The complete report for the Japanese industry for automotive lighting is now available for download by DVN Gold Members. To build the report, primary author Jean-Paul Ravier and his lighting co-expert Hitoshi Takahashi, visited Toyota, Nissan, Honda, Koito, Stanley, and Ichikoh in Japan.

Japan has a very strong automotive industry with a global market share for car production reaching 29%, far ahead of American (18%) or German (16%) makers. Among Japan's strong players are Toyota, № 1 in capitalisation; Nissan, who are with the Renault-Nissan-Mitsubishi Alliance № 1 in the world for quantity of cars produced, as well as Honda, Suzuki, Isuzu, Mazda, and Subaru. For lighting, Japanese set makers control 35% of the worldwide market. In this market, Koito are the worldwide set maker leader with 22% market share in value, with Stanley and Ichikoh being the other main Japanese set makers.

Toyota and Koito were early pioneers for LED lighting in 2007. Now LEDs are in another developmental phase with a strong standardisation to decrease costs and thereby expand application as seen on the performant LED bi-function modules developed by Koito, now with just one LED and no fan for better compactness and lower cost. These are used on many Toyota models.

*Bi-function LED modules*

The other strong direction of LED evolution is the new styles allowed by specific new technologies, like the jewel-eye lenses and slim inline technologies developed by Honda and Stanley, or the direct lens system developed by Nissan and Ichikoh.

*Honda Acura with Stanley Jewel Eye double reflexion*

*In line technology on Honda cars by Stanley*

*Nissan Leaf with Direct Lens Ichikoh system*

Japanese are also producing interesting ADB systems, the current top technology in lighting for safety even if in this domain they were preceded by European as their main markets in Asia and America were not as receptive to this function as Europe. All three major Japanese set makers have ADB modules, and they're installed on Toyota/Lexus and Mazda cars and in preparation for Honda and Nissan/Infinity cars.

*Toyota Lexus LS with a Koito 24 segments ADB matrix system*

*Mazda CX5 ADB by Stanley*

*Toyota Alphard ADB by Ichikoh*

New solutions for ADB are also prepared particularly for high definition systems, for instance by Koito with an interesting and notably affordable mechanical system with a mirror wheel spinning at 6,000 rpm and reflecting the light from synchronised LEDs. This system will soon be commercialised. Furthermore, Japanese makers are actively preparing for a future featuring strong evolutions towards connected, electrical, and autonomous vehicles.

The new report contains in-depth interviews with VIPs from a cross-section of important industry titans, including:
- Kazuhiko Nakashima, Toyota Group Manager of Advanced Safety Systems, who talks about the importance of systems for the new lighting functions;
- Hitoshi Nakagaki, Nissan Senior Engineer (along with Tsuyoshi Noda and Manfred Jules), showing the importance of style and signature for the development of headlamps and rearlamps;
- Hidefumi Watanabe, Chief Engineer for Honda lighting (along with Kazuo Aoyama and Shigato Iwamoto) particularly explaining their last Jewel eye and In line thin lens technologies;
- Yuji Yokoya, Koito Executive Vice President (along with Yuji Higashi, Satoshi Yamamura, Masaru Sasaki, Takayuki Amma and Shigetoshi Kajiyama), explaining the strategy of Koito with standard modules and new solutions for ADB;
- Shigeru Sakayauchi, Stanley group manager and Masafumi Ohno, Chief engineer, presenting their second generation ADB and their directions for the future, and
- Kazuyuki Miyashita, Ichikoh Director and Senior Managing Executive Officer (along with Takayuki Furuya and Sébastien Denis), showing their last LED and ADB technologies.

Each of them is confident that lighting will remain important in the future, along with new functions for communication and safety. For that, systems and software will be decisive, and Japan can count on their strong capacity in this domain as well on their cooperation already initiated with worldwide data management specialists.

# LIGHTING NEWS

## Audi in Push for Projected Light Signals

On a recent Audi concept car, the turn signals aren't confined to the car body itself: stripes of light like the ones on the car extend across the ground. Audi lighting designers Konrad Tröger and César Muntada think the importance of innovative light-based communication features will increase; Tröger says "In future, the interplay of digitalisation and connectivity will be even more crucial for light design. It will become a kind of visual language".

*Tröger (left) and Muntada*

As demonstrated in an online video, The Audi e-tron Sportback concept projects light signals onto the ground, transforming the road into a stage. When the turn signal is activated, the LED strip on the rear of the car begins to pulsate, but then something unexpected happens: in time with the indicator, the light signal extends across the ground as if by magic—and over the feet of nearby pedestrians. Why? Tröger explains: "When an Audi driver wants to turn, the indicators are now almost impossible to miss, even if a pedestrian is looking at their smartphone".

This isn't the only way that the new electric concept car uses light to communicate with other road users and potentially increase safety; the stop light signals have also been enhanced: If the driver steps hard on the brakes, the car is surrounded by a pulsating red graphic that is also projected onto the ground. This is reckoned to be especially helpful for nearby motorcycle riders and cyclists. These innovative Audi light signals are made possible through the use of high-resolution matrix laser projectors

This light technology also allows to project signals, animations, and guidance.

## New Video Presentation of ELS

There's a new movie showing the attractive current state of management and students of the ELS programme. Philippe Jaillette replaced Jean-Paul Ravier last December as ELS chairman. He is a graduate from ESCE, a famous international business school. Several years after graduating, he completed his education with the ISM Executive MBA in International Business Management. He spent more than 30 years in automotive tier-1 suppliers in management roles. His latest assignment was with Hella, well-known for their lighting activity, and also specialising in ADAS, which is why he was excited when ELS contacted him.


Jaillette says "The clear target of ELS program is to prepare young engineers to be hired and become project managers in the area of vehicle lighting globally. The ELS program not only provides photonic and embedded electronics background to the students, but it makes them familiar with the language of designers, that is crucial in the automotive industry".

## Hella Show & Tell at IFAT/Munich, RETTmobil/Fulda

Hella exhibited at IFAT 2018 in Munich a multitude of lighting and electronics solutions designed for municipal and special vehicles. The focus, however, is on products which bring about optimal visibility and thus ramp up the safety factor in the work situation. Such products include rear combination lamps, reversing lights, DRLs, work lights and ø90mm module headlamps, electronics products with control units for LED applications and also turning angle sensors and rain/light sensors. They showed off a new slim variant of their well-known BST warning light series; with its low height of 12.8 mm and slim design, this warning light fits in well, for example, with the shape of municipal vehicles.

Another highlight is the Hella Visiotech projection module, which can mark out danger zones in an operational area. When the appropriate projection modules are employed, individual illumination and symbols can be projected onto the ground. The compact SL 60 warning light is fitted with such technology, too. Consequently this warning light enables lines in blue or red to be shown on the ground in order to use visual communication to improve safety during the daily work routine. And the end result is that everyone can recognise from far off that a vehicle is in service and involved in operations.

*Visiotech*

Hella were also present at the RETTmobil in Fulda, Germany with their specialized portfolio for police, fire, and rescue services, including the new Visiotech lamps.

## Covestro Polycarbonate Pulls Heat from LEDs

A heat sink is crucial for the long-term performance of LED lighting luminaires, helping to dissipate heat. Aluminum, a popular material for this component, has disadvantages that include its weight, appearance and tendency to corrode. SLP Lighting selected a special plastic from Covestro to provide efficient cooling for their new CircLED product.

CircLED is a ø46cm round high bay fixture for general high bay applications such as auditoriums, exhibit halls, factories, distribution centres, and warehouses. SLP also have an IP66-rated version for harsh, wet environments. The housing, injection moulded with Covestro's thermally-conductive Makrolon® TC8030 polycarbonate, acts as a heat sink for the luminaire.

Makrolon TC8030 polycarbonate offers several benefits for LED lighting applications including high thermal conductivity, low mass, and enhanced design freedom. It also can be used to inmould LEDs on the printed circuit board in the heat sink assembly to reduce costs. Brian Faul, a Covestro business development manager, says this grade of Makrolon® provides strong heat-transferring capability, enabling the design to maintain an acceptable steady state temperature of heat-sensitive LEDs.

## Philips Lighting Shines at Nürburgring

Last weekend was the 24 Hours of Nürburgring, one of the most legendary automotive endurance races in the world: a circuit tour exceeding 25 km with 210,000 spectators and some 148 cars entered. Among them: the Peugeot 308 Racing Cup Team Altran, equipped with LED retrofit Philips X-treme Ultinon LED automotive lamps from Lumileds.


According to Lumileds, the Philips X-treme Ultinon LED headlamp retrofits pleases drivers with its powerful beam and "arctic white" light; while at the rear, the X-treme Ultinon LED signal light retrofits allow vehicles to be clearly visible by competitors. Watch for in-depth coverage of these and other LED retrofit products in DVN.

# DRIVER ASSISTANCE NEWS

## Mobileye in 8-Megacar Self-Drive Tech Deal

Mobileye have signed a contract to supply their self-driving technology for installation on eight million cars from a European maker.

The deal, one of the largest yet for Mobileye, is a sign of how carmakers and suppliers are accelerating the introduction of features that automate certain driving tasks—such as highway driving and emergency braking—to generate revenue while technology to enable fully automated driving in all conditions is still years away from mass-market deployment.

The deal for the advanced driver assisted systems will begin in 2021 when Intel's EyeQ5 chip, which is designed for fully autonomous driving, is launched as an upgrade to the EyeQ4 that will be rolled out in the coming weeks, said Erez Dagan, senior vice president for advanced development and strategy at Mobileye.

Mobileye say there are some 27 million cars on the road from 25 automakers that use some sort of driver assistance system,

and Mobileye have a market share of more than 70%.□"By the end of 2019, we expect over 100,000 Level 3 cars with Mobileye installed," Mobileye CEO Amnon Shashua said.□Mobileye are working with a number of automakers, such as GM, Nissan, Audi, BMW, Honda and Fiat Chrysler to supply Level 3 technologies by next year.

At their Jerusalem headquarters, Mobileye are also testing a more advanced Level 4 technology in Ford Fusion hybrids with 12 small cameras installed and four of the soon-to-be-released EyeQ4 chips in the boot (trunk).

## Transforming MEMS Scanners into Lidar□

MicroVision have developed a time-of-flight (MToF) ASIC, on a high-performance RF process, that can be used with their MEMS scanners to create a lidar sensor.

The company are working on lidar sensors with point cloud densities of 5 million to 20 million points per second in resolutions of approximately 720 vertical lines. The products are expected to be available in volume production early in 2019.

"Our MToF ASICS represent a tangible step forward in our goal to bring small, inexpensive lidar-based products to the consumer, smart home, and automotive markets. Our interactive projector for IoT applications, and our consumer lidar for smart home and office applications will use these ASICS," said Perry Mulligan, MicroVision's CEO, in a statement.

## ON Buy SensL

ON Semiconductor Corporation have bought SensL Technologies, an Ireland-based leader in silicon photomultipliers and lidar sensing products for automotive, medical, industrial, and consumer markets.

ON Semiconductor

This acquisition positions ON to extend their market leadership in automotive sensing applications for ADAS and autonomous driving with expanded capabilities in imaging, radar and lidar.
By combining this acquisition in Ireland with previously acquired radar technology and design centres in Israel and the United Kingdom, ON are well positioned to provide a comprehensive set of sensor solutions for next-generation highly autonomous vehicles, and to solidify their position as a leader in image sensing and ultrasonic parking assistance. In the second half of this year, ON plan to introduce samples to the market which incorporate technology from the radar assets acquired in 2017.

The SensL team, located in Cork, Ireland, will report directly into the Image Sensor Group. This expands a global sensor design footprint that now includes major locations in the United States, the UK, Japan, India, and Israel.

SensL have been a leader in the emerging field of automotive lidar with multiple customers and strong roadmap based on their leading SPAD and SiPM based depth sensing technologies.
The firm have put deep investments in R&D for the past 15 years, and their technology is based on CMOS, which provides the economies of scale for cost-effective solid state lidar solutions and enables leading depth accuracy, distance and power consumption for challenging imaging situations.

## Tesla Driver in U.S. Crash Misused Autopilot

The driver of a Tesla Model S that recently crashed into a fire truck in the U.S. state of Utah has admitted she was using the car's Autopilot feature at the time of the crash. The Tesla was traveling at 96 kph (60 mph) when it hit the truck, which was stopped at a light

*Tesla Model S after it hit the back of a fire truck*

In a statement, the South Jordan Police Department said the driver admitted that she had engaged the car's Autopilot and was playing with her phone instead of driving the car in the moments leading up to the collision. The police say the driver did not brake or take any other action to avoid the crash.

# GENERAL NEWS

## Toyoda: Toyota Faces Life-or-Death Battle

Toyota president Akiro Toyoda says Toyota must prepare for a new round of economising—even as the world's top automaker accumulate record profits.


To lead the effort, Toyoda has put together an organisation of carefully-chosen executives he calls the "Seven Samurai", a reference to a famous Akira Kurosawa film about brutal warriors in feudal Japan. Toyoda said during Toyota's mercantile year-end gain proclamation last week that "Cost control is crucial" and described the future of automotive manufacturing as a "life-or-death battle".

Currency fluctuations being what they are, the Yen has strengthened against the Dollar and other currencies, eroding asset gains as stagnating sales and muted profitability in North America cloud the outlook. The company aim to reduce costs by ¥130bn ($1.22bn) in the fiscal year to end Mar 31, 2019.

## Europe Sales Still on the Rise

Registrations grew 9.6% to 1.34 million in April across the EU and EFTA markets, according to data released last week by industry association ACEA.

- Volkswagen Group sales rose 13%, led by a 25% jump of Seat. The group's core brand, VW, was up 19% percent, while Porsche rose 13% and Skoda 10%.
Audi registrations slipped 1%.
- Renault Group sales rose 10%, boosted by a 24% gain of Dacia and a 4% rise at the Renault brand.
- DS Automobiles led gains at PSA Group with a 44% jump, while Peugeot brand rose 15% and Citroen was up 7%. Registrations at Opel/Vauxhall were up 1.8%.
- Ford's monthly volume rose 14%.
- Hyundai and Kia gained 15% and 4%, respectively.- Nissan sales rose 5%, while

Among the losers last month,
- Fiat slipped 4.5%
- BMW brand was down 3%
- Mercedes-Benz's volume was flat.

Sales Europe's five largest markets were up last month.
- Spanish registrations jumped 12%
- UK rose10% in the UK and a 9 percent increase in
- France rose 9%
- Germany rose 8% percent while sales in
- Italy rose 6.5%

In the last four months, EU and EFTA registrations were up 2.6% to 5.63 million.

## Japan Sales Rise in April

Japan's new vehicle market bounced by 3.2% to 366,155 units in April from 354,747 units a year earlier, according to registration data released by the Japan Automobile Manufacturers Association.


The increase follows six months of declining sales from relatively high year-earlier levels after the country posted its longest period of uninterrupted economic growth since the boom years of the 1980s in the fourth quarter of last year.

Despite last month's moderate rebound in vehicle sales, economic growth looks to have peaked in the current cycle – with business confidence beginning to ebb in the first quarter.

Sales in the first four months of the year were still 1.3% lower at 1,906,848 units from 1,932,496 units a year earlier, with passenger vehicle sales falling by 1.8% to 1,608,937 units while truck sales increased by 1.4% to 292,330 units. Medium and heavy-duty bus sales were 11.5% lower at 5,581 units after particularly strong growth in previous years.

Toyota's sales fell by 7.8% to 529,531 units in the four-month period, while second-placed Honda's saw its volume rise by 1.5% to 271,480 units, Nissan 242,731 units (-2.8%); Suzuki 256,622 units (+2.8%); Daihatsu 236,876 units (+6.5%); and Mazda 84,815 units (+3.1%).

## VW Atlas Wins Award in America

The 2018 Volkswagen Atlas was named Best Family SUV by the Northwest Automotive Press Association (NWAPA) at the 2018 Outdoor Activity Vehicle of the Year competition.

For more than 20 years, NWAPA has held the event to evaluate the best SUVs, crossovers, and pickups available to consumers. Vehicles are tested on closed courses that replicate conditions active buyers in the Northwest might encounter in their daily and weekend travels and adventures.

"We are delighted that the journalists of NWAPA picked the Atlas as their Best Family SUV for 2018," said Derrick Hatami, Executive Vice President of Sales and Marketing for Volkswagen of America. "In a very competitive segment, the Atlas delivers a winning combination. Its spaciousness, configurability, and capability make it an ideal vehicle choice for buyers all over the U.S."