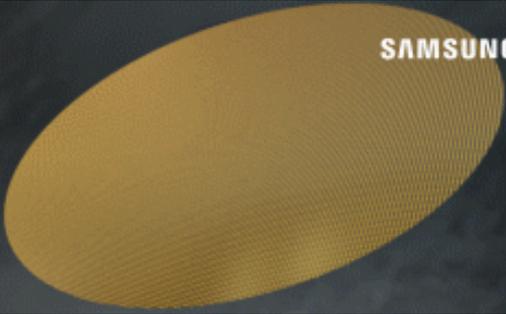


**Monolithically Integrated LED  
for Intelligent Headlamps**

PixCell LED

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**SAMSUNG**



## Editorial

### Tier-2 Specialists: Pushing Lighting Progress For Decades

If you look to the membership list of DVN, you easily find that tier-2 companies build by far the biggest group of members of our lighting community. All of these companies contribute to the continuous progress of automotive lighting systems with significant specialised and proprietary technology and production expertise. Reliable supply and innovations in lighting equipment by tier-1s are strongly influenced and supported by these tier-2s. In the early development phase, automakers also gather technology information from tier-2s to establish their roadmaps.

DVN has considerably nurtured this symbiosis among entities along the lighting value chain, but everything can be improved. I personally think an even stronger focus on information from tier-2s through tools like the DVNewsletter, DVN Reports, DVN Workshops, and DVN Conferences—and of course the DVN website—can be beneficial for the whole community.

In line with these thoughts, in this newsletter, DVN presents an interview with the new CEO of Docter Optics, who have been a DVN member company since the beginning. After the sudden illness of CEO Dr Jan Hamkens in 2017, there have been several changes in Docter Optics' leadership. Since February 2021 there has been a new CEO; the interview in this week's in-depth article will

reveal interesting insights how this tier-2 is positioned and wants to manage its future.



*Ralf Schäfer*

Ralf Schäfer, Senior Consultant to DVN

Remember, the DVN Workshop is happening near Detroit in just a little over a month from today. If you haven't already, hurry and [register online](#) while there's still space available!

# In Depth Lighting Technology

## Docter CEO Enenkel: Glass Expertise Propels Polymer Innovation



After his apprenticeship as an electrician and the completion of his engineering studies in optoelectronics at Aalen University of Applied Sciences in 1996, Martin Enenkel consistently engaged himself in well-known German industrial companies in optoelectronics, sensor technology and lighting technology. This included almost 20 years of work for Phillips Technology, where he held various strategic and management positions in R&D, product and innovation management as well as marketing and sales. A 3-year stay as NAFTA Product Marketing Manager in the USA in Detroit, Michigan was also part of his professional career.

Most recently, Martin Enenkel contributed his in-depth expertise and acquired skills as VP & Head of Strategic Business Unit Industrial Solution at Jenoptik (Optical Systems). His responsibilities there included industrial automation, safety & security and automotive. He thus brings with him industry and management experience that is a perfect fit for Docter Optics.



**DVN: Martin, you are now since March 2021 CEO of Docter Optics. What are your general impressions about the company and how did the first 100 days went by?**

**Martin Enenkel:** I have had a great start at Docter Optics within a highly motivated as well as excellent team that is eager for new challenges and driven by an open culture. Flat hierarchies and the development spirit make it easy to set up and implement goals for the future. Within the last 100 days we have already worked on several themes such as a new corporate identity and company culture and revised the company structure. But most important we worked on new technologies as well as customized application products for an encouraging future.

**DVN: Can you describe the main business fields in which Docter Optics is engaged today?**

**M.E.:** Docter Optics has excellent references in various industries such as automotive, illumination optics, digital projection, biometrics, printing, security/surveillance, machine vision and medical devices. More than 30 years of experience in the manufacture and development of customised optical components, optomechanical and optoelectronic systems have made Docter Optics into an OEM industry leader. Round about 30 per cent of the headlamps of all automobiles produced worldwide have been fitted with our components. Docter Optics developed several patented processes for the industrial scale production of multifunctional free-form components made of our own special glass as well as a multi-layer process for polymer optics and offers nowadays even ready molded precision optics for latest HD-Pixel systems (DOC- $\mu$ Tec<sup>®</sup>).



VEHICLE LIGHTING PARTS MADE OF GLASS OR POLYMER; FREE-FORM OPTICS, ASPHERES, LENSES

But Docter Optics is not only successful as an automotive supplier. The company also manufacture complex optical and optoelectronic systems, like fluorescence microscopes, fingerprint scanners, and optics for machine vision applications. With the help of their ready molding process directly from melting glass, they can provide glass components even for non-optical applications for a wide variety of industries. And Docter Optics Express Glass Services delivers semi-finished technical glasses (a few millimetres up to 1.5 metres) with the help of modern, self-developed 5 Axis-CNC-Centres through Europe.



CUSTOMISED OPTICAL COMPONENTS, OPTOMECHANICAL AND OPTOELECTRONIC SYSTEMS / ASSEMBLIES

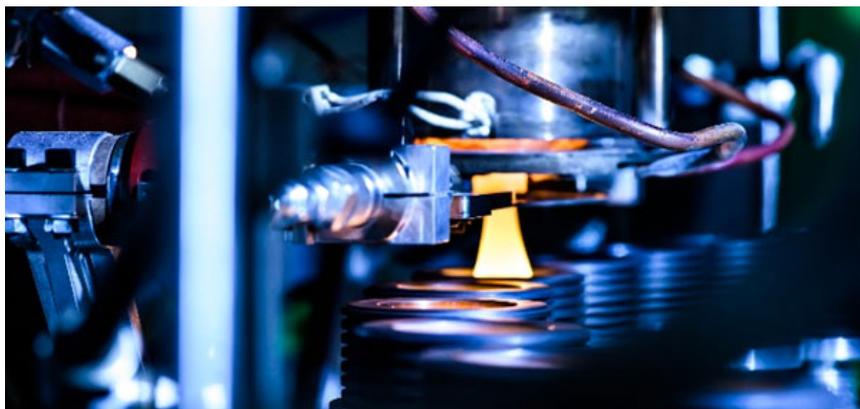
This is why Docter Optics is enjoying a reputation as a reliable and strong partner within a broad field of industries.

**DVN: Which general capabilities set your company apart from your competition in the vehicle lighting field? What would you say is Docter Optics' greatest strength?**

**M.E.:** The modular structure of our five competence centres—automotive, optical systems, express glass services, precision components, and polymer optics—offers an exceptionally deep value chain. This includes all development services: optical design, verification, prototyping, testing, qualification, tool and mold construction, as well as the corresponding documentation. Our team of specialists understand the physics of the materials we work with, has know-how in the design of optical components up to complex systems and especially excellent experience in process engineering. The successful, economical and high-quality series production of optics is based on various process

technologies that Doctor Optics can offer and on the knowledge of how the design of the tool must be arranged in order to guarantee the required optical functionality.

An example is the introduction of our patented glass molding process that uses glass gobs for high precision molded aspheres and free-form lenses with finished optical surfaces on both sides in fully automated operation. This represented a milestone not only in terms of economic large-scale production, but also in terms of lens design, stability and quality.



PATENTED LARGE-SCALE PRODUCTION METHODS: BLANK MOLDED FREE-FORM OPTICS MADE OF LIQUID GLASS

**DVN: For automotive lamps, a shift from glass lenses to polymer lenses is clearly visible. How does Doctor Optics deal with this development?**

**M.E.:** Decades of experience in the production of optical components made of glass have helped us in developing a technology for polymer optics—even if the two processes are completely different at first glance. Nevertheless, there are noticeable parallels across the entire value chain.

In 2018 we started the large scale production of polymer lenses for the automotive industry with the concept of a fully automated multilayer process similar to glass. With the help of this unique process Doctor Optics once again sets the international benchmark in terms of the cycle times and quality which will enable to react flexible to the highly cost driven market.



DOCTER OPTICS POLYMER COMPONENTS FOR AUTOMOTIVE APPLICATIONS

You don't have to be a prophet to predict the coexistence of glass and polymer in automotive applications—possibly even a symbiotic solution is conceivable. An example could be glass components directly in front of high density light

sources and design-oriented polymer lenses for secondary optics. From my point of view, hybrid solutions combine innovation and profitability to its best.

**DVN: In our observation, the vehicle lighting world shows some reversing trends from globalisation to more regional focused approaches. Do you also share this opinion? Are such trends important for your company and how do you want to deal with them?**

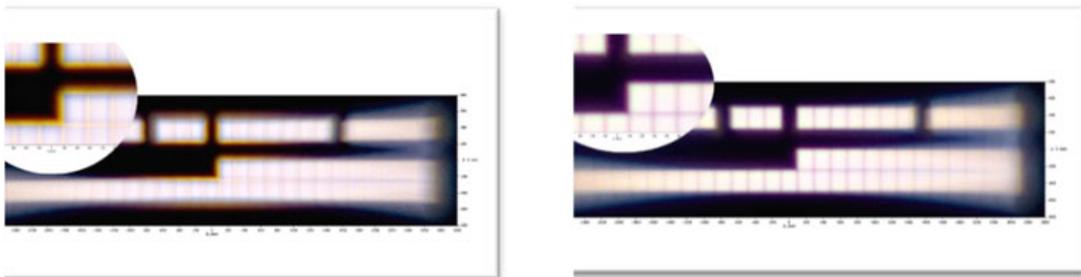
**M.E.:** Doctor recognise the trend to create local hubs to support core-based demand on-site as well. Actually, we are evaluating the local hub trend and check potential partners.

**DVN: Another strong trend is the increasing use of LED headlamps. This trend has two directions: low-cost LED for mainstream vehicles and sophisticated ADB functions for higher grade executions. How do these diverging trends impact your business?**

**M.E.:** Certainly, all vehicles will continue to require certain designs of optical technologies in the future, not just static systems for street lighting, but also dynamic solutions to projection and communication.

Classic headlamps typically use for their static light beam function single aspherical glass or polymer lenses. But this is not enough for future light functions e.g. in modern HD pixel light systems. There are various challenges that have to be solved. Within dynamic lighting systems you have to minimise the headlight dazzle with a maximum scene illumination and additionally project further information on the road like lines or patterns. This is why economical dynamic solutions need optical systems including high precision lenses with around factor 10 higher surface precision compared to components for static headlamps.

The latest Docter Optics free-form technology (DOC- $\mu$ Tec<sup>®</sup>) enables the industrial production of such kind of precision lenses without any further rework (e.g. grinding or polishing) and therefore offers high volume high pixel products at a reasonable price. It enables the OEM to reduce the total number of lenses and offers the possibility to add customized mechanical shapes to the front lens.



DOCMTEC<sup>®</sup>: LENS WITH STANDARD ASPHERES (LEFT); WITH READY-MOULDED HIGH-PRECISION FREE-FORM OPTICS (RIGHT)

But anyway, future HD-Pixel Light Systems require a significant increase in optical performance. And therefore completely new technologies are needed. Our Head of Optical Design, Dr. Hagen Schweitzer, will give further impressions

on this topic within Doctor Optics presentation at the upcoming DVN US Workshop in September.

**DVN: Photonics is becoming a buzzword for a number of applications where optical elements are needed and designed for advanced, new applications like lidar and lifi, etc. Which opportunities do you see for your company in such emerging business and technology fields?**

**M.E.:** Applications from the photonic industry are and will remain the possibility of another strong footprint for Doctor Optics. How? Let's take lidar as an example: lidar is one of the fastest-growing markets in automotive and industrial applications and offers high potential for autonomy. Modern lidar systems are currently emerging and increasingly changing from prototype towards serial status. Actually you might need round about five up to seven lidar systems to recover the car surrounding. One Lidar systems is around a few hundred € value; to be competitive, I can admit you might need a target price less than €100. To meet this you have to reduce the amount of components, for example by using the same light path for transmitting and receiving through one free-form lens. In contrast to headlights, lidar systems are completely exposed to the weather and the environment which calls glass back with all its USPs. Therefore the DOC-µTec<sup>®</sup> technology is a perfect match for state of the art lidar system design, too.

**DVN: As a final question, we would like to look with you into the future of vehicle lighting until the end of this decade. On realisation and broad market penetration of which 3-5 trends and technologies would you put your money as a best bet?**

**M.E.:** I see three major trends: optical sensors for autonomous driving; hybrid lenses for HD pixel light systems, and new optical elements for interactive displays.

**DVN:** Martin, we thank you for this elaborate and open interview and your vision on the future. Doctor Optics has always been a very respected member of our DVN lighting community, and we are sure to keep it like that despite these difficult times we all are going through. We wish you a lot of success in your new function and a bright future for Doctor Optics together with your engaged team!

# Lighting News

## Hella Select Faurecia as Majority-Stake Buyer

LIGHTING NEWS



French supplier Faurecia will buy a majority stake in Hella and make a public tender offer for the remaining shares for €60 each—all of which values Hella at around €7bn.

The deal was made with a group of family-related shareholders' 60% stake; the group considered binding offers from Faurecia, Plastic Omnium, and Mahle, and worked with investment bank Rothschild on the transaction.

The deal, expected to close early 2022, is one of the biggest in the European auto parts industry in the past three years.. According to the statement, the combined group will have pro forma sales of €23 billion in 2021 and wants to reach 33 billion by 2025.

Revenue synergies are expected between €300 million to €400 millions of sales by 2025,

"The debt financing of the transaction is fully secured through a bridge facility with tier-one banks. Faurecia's current credit ratings are expected to be confirmed by all three agencies shortly," the company said.

Hella's headquarters in Lippstadt would remain a major corporate center.

"This combination is a unique opportunity to create a global leader in automotive technologies," Faurecia CEO Patrick Koller said in the statement.

The family shareholders will receive €3.4 billion in cash and close to €600 million in Faurecia shares.

"The family will continue to overlook the further development of this leading European company as shareholders and with one representative family representative at Faurecia's Board of Directors, underlining the Family's strong commitment to the combined company.

# Audi Concept Bristles With Designed Lighting

LIGHTING NEWS



The front of Audi's Skysphere roadster concept is an EAV—an electric autonomous vehicle—so it has no need of a radiator grill. Instead, there's a great big front display with a 3-dimensional, LED-lit rendition of the four-rings Audi logo in the middle. The front display, plus the adjacent surfaces on either side of it, are packed with white LEDs to provide functional and stylistic new effects based on light. There are welcome and farewell displays, of course, and a wide variety of other modes as well; Audi say "gentle dimming and a structured, rhythmically pulsating light produce an elegant effect".



DRLs are vertical arrays at the left and right edges of the central display, and there are ultra-miniature headlamps (mock-ups?).

The rear design is also dominated by a digitally controlled LED surface that spans the entire width of the vehicle, with a red version of the illuminated four-rings logo at top-centre. Numerous red LEDs and their reflections create dynamic lighting and shadow effects.

The vehicle's wheelbase can reportedly be changed, and doing so causes the LEDs in the front and rear display a specially composed dynamic sequence.



Next month, watch for the DVN Report on production and concept vehicles launched from June to September—including this Audi Skysphere.

# Koito Buy More Cepton Shares

LIGHTING NEWS



Koito will buy USD \$50m worth of additional shares in Cepton Technologies, a US startup who design, manufacture, and sell lidar for ADAS and AD. Cepton say their Micro Motion Technology lidar has long product life due to its frictionless actuator, and that it outperforms other companies' products in terms of monitoring distance and angular resolution. That's what drove Koito's initial investment in Cepton in February 2020; since then, Koito have been promoting co-development of lidar with Cepton, aiming to start volume production in 2023. By integrating Cepton's advanced lidar technology into Koito's technology in product design and volume production of automotive components, Koito will accelerate product development for vehicles equipped with ADAS and autonomous driving systems.

Cepton's lidar uses innovative technology for laser scanning, different to conventional ones like mechanical rotation or scanning mirrors. Its simplified, frictionless architecture was designed to provide excellent durability, dependability, and manufacturability, at an affordable price—as required for automotive components.

Koito's Director and Managing Corporate Officer Takayuki Katsuda says "We anticipate that Koito-manufactured lidars using Cepton technologies could be used in various locations in vehicles including headlamps, dashboards, and behind the windshield".

# Rivian in Talks for \$5bn Texas plant

## LIGHTING NEWS



Rivian Automotive, the EV startup backed by Amazon and Ford, are in talks to invest at least \$5bn to build a factory near Fort Worth, Texas. The factory would be able to produce 200,000 vehicles a year, and could create at least 7,500 jobs by 2027.

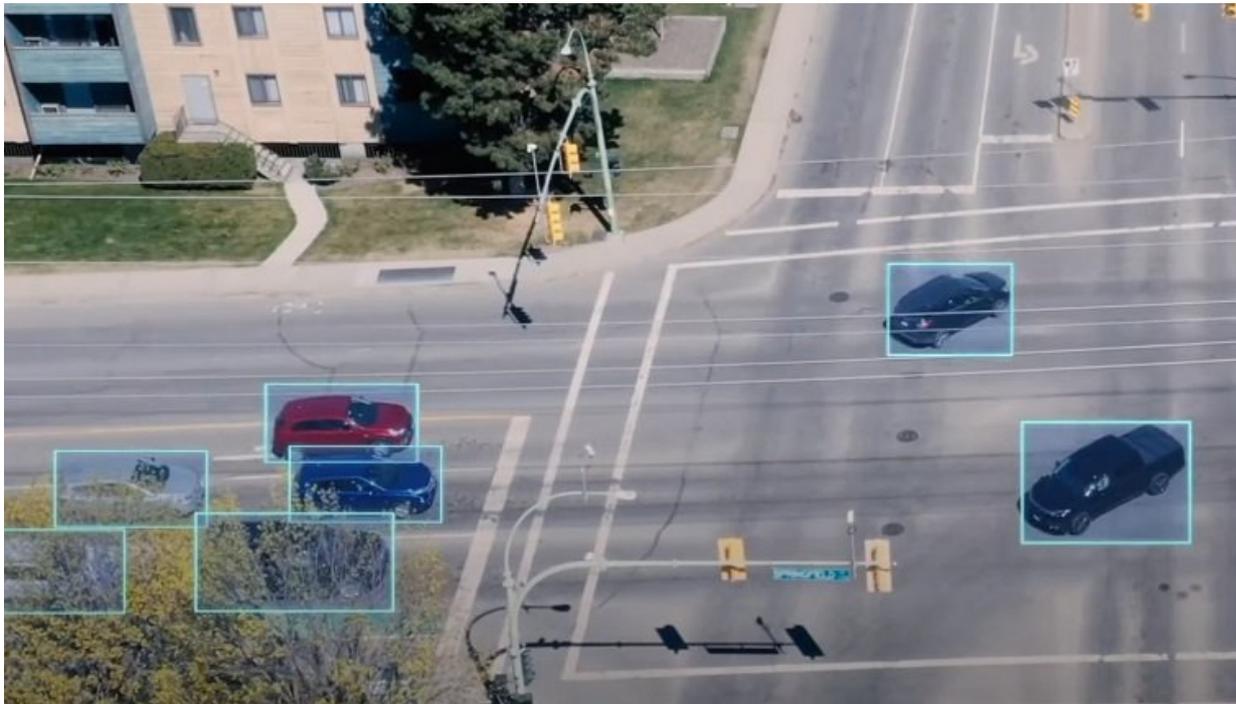
The capital investment commitment from Rivian includes a minimum \$2bn in real property improvements and \$1.6bn in hard construction costs; Rivian have committed to completing the initial investments by the end of 2024.

While a number of states and cities are still under consideration, the Texas site has become the front-runner for Rivian, whose CEO R.J. Scaringe had previously been eyeing an Arizona location—but that interest faded on available-infrastructure concerns. No final decision has been made and it could be some weeks before a deal is agreed with one of the cities or states.

# Driver Assistance News

## Five Lidar Uses in Smart Cities *Extract from Electronics360*

### DRIVER ASSISTANCE NEWS



LIDAR DETECTS VEHICLES AT A BUSY INTERSECTION

In smart cities, lidar units are attached to traffic lights, street lights, or dedicated towers to get a bird's eye view of neighbourhoods. Here are some of the use cases:

**Traffic monitoring:** using lidar for traffic monitoring will be a big step for smart cities. Because lidars operate in low light conditions, they can monitor traffic flows both day and night.

3D lidar can be deployed to count cars in busy intersections across multiple lanes of traffic. Additionally, the technology can identify different types of vehicles with better accuracy than standard cameras.

**Pedestrian monitoring:** lidar can help municipalities identify high pedestrian traffic locations by counting the people at intersections, city parks. This information could be used for future city planning if more sidewalks are needed or foot bridges. It could also help in future and current pandemics when social distancing is needed. Additionally, lidar can detect where a person is located and in which direction they are moving.

**Security management:** along the same lines as people counting, security management via lidar provides real-time detection, identification and tracking of people, vehicles and even small animals.

The lidar can be fine-tuned for custom alarm perimeters to meet the needs of businesses or government buildings that require an additional layer of security.

**Urban planning:** lidar surveying allows municipalities to create detailed 3D models of cities that can be used for: military operations, disaster management and recovery, city mapping, new building construction, updating city maps, or detecting urban environment changes.

**The self-driving car connection:** as vehicles become more connected, in smart cities vehicle-to-everything (V2X) will allow the car's communication system to use sensors and other data sources to transmit and receive information. Lidar in self-driving cars will constantly capture data about the vehicle and its surroundings and transmit this information to a central database to spread road conditions and roadway systems to other vehicles. This system could also relay road hazards or emergency situations to other vehicles to alert them to stay away or find a new route.

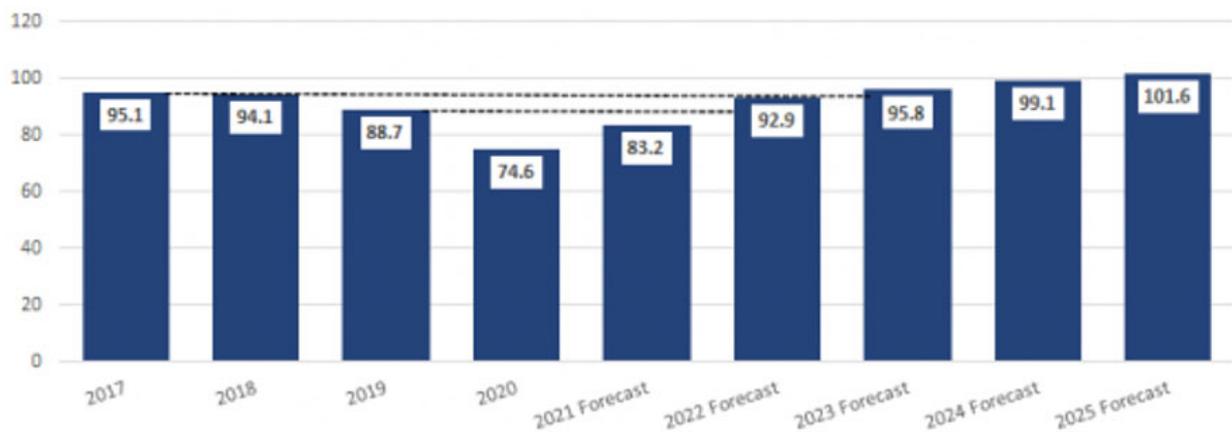
The overall idea is that lidar will enable municipalities to create safer streets while cutting traffic and parking issues.

# General News

## Production Expected to Exceed 2017 High-Mark in 2023

### *Summary of WardsAuto report*

#### GENERAL NEWS



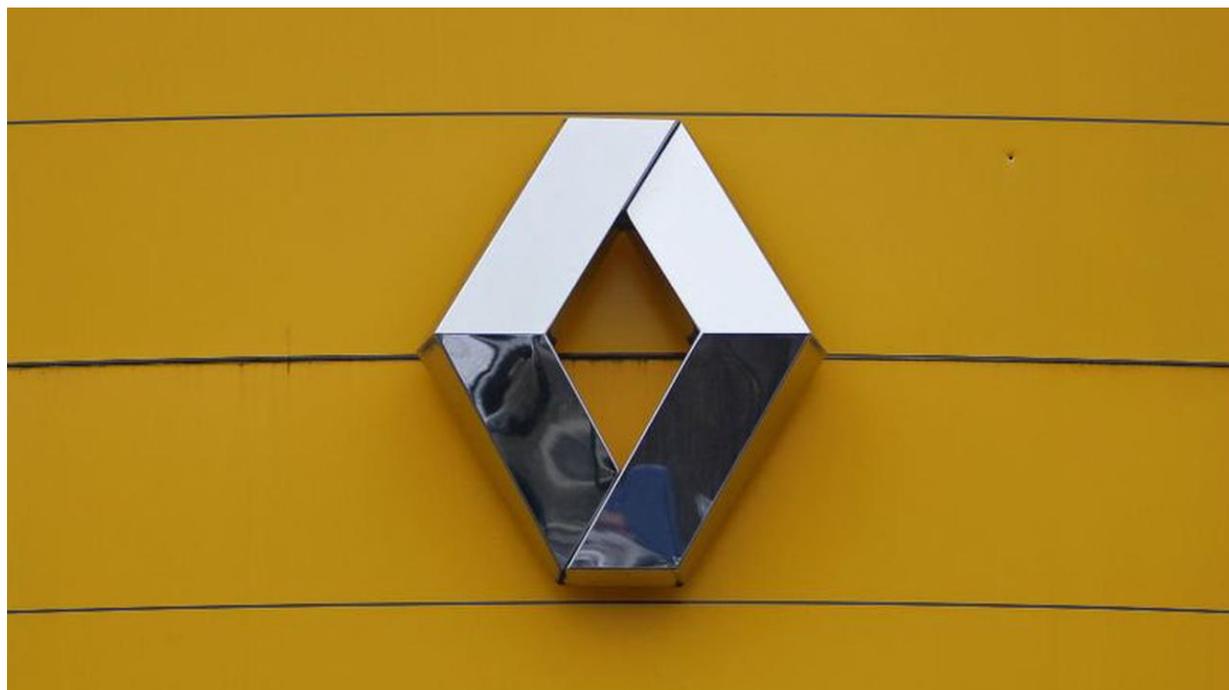
GLOBAL LIGHT-VEHICLE PRODUCTION (MILLIONS)

A WardsAuto report forecasts production climbing back to the last pre-pandemic level (2019) in 2022, with the 2017 high-record figure of 95 million units being equalled in 2023.

Despite the microchip-related cuts this year, LMC are forecasting global light-vehicle production to rise 12 per cent year-over-year in 202.

# Renault, Geely Partner in China, South Korea

## GENERAL NEWS



Renault and Geely have signed a framework agreement to set up a joint venture to build and sell Renault-branded hybrid vehicles—and possibly full EVs—in China using Geely's technologies, supply chains and manufacturing facilities; Renault will focus on sales and marketing.

The two automakers also agreed to explore a joint localisation of Geely's Lynk & Co hybrid vehicles in South Korea, where Renault have been manufacturing and selling cars for more than two decades.

The venture would focus on China and South Korea initially, but would likely to be expanded to other Asian markets. The JV is modeled on an EV-focused venture Geely set up in 2019 with Daimler, which plans to manufacture in China and sell Smart-brand EVs based on Geely technology using Daimler's global sales network.

The Geely-Renault venture, however, would be completely separate from Geely's venture with Daimler. For Geely, China's biggest local automaker by sales, the newest new JV would strengthen their strategy to use partnerships with other automakers to share technologies, supply chains and manufacturing, which reduces development costs of EV and other future mobility technology. For Renault, the partnership would help the French automaker rebuild their presence in China after they ended a JV with Dongfeng Motor Group in 2020.

Renault and Geely will build the cars in Geely's existing factories, with an aim to eventually export them. Renault and their global alliance partner Nissan had the same Chinese partner, Dongfeng, before the Renault-Dongfeng JV was dissolved in April 2020. At that time Renault said they would focus on light commercial vehicles and electric cars in China.

# PSA N° 1; Valeo N° 3 on French 2020 Patent List

## GENERAL NEWS



The French INPI has filed its 2020 list of patent applicants and the automotive sector is once again widely represented there through manufacturers and equipment suppliers, with PSA and Valeo respectively occupying the first and third step of the podium.

The INPI 2020 patent list has been unveiled and it once again gives pride of place to the automotive sector. The PSA group—who became Stellantis by merger with FCA—leads with 1,239 patents filed, ahead of Safran (1,103) and Valeo (819). Since 2012, PSA and Valeo have taken the top slot six and three times, respectively.

Valeo ranked first among French patent applicants in the world, with 1,913 patents published, of which 53 per cent were in France, 21 per cent in Germany, 8 per cent in China, 5 per cent in Japan, 3 per cent in the USA, 2 per cent in South Korea, 5 per cent in Europe (excluding France and Germany), and 3 per cent in the rest of the world. Valeo CEO Jacques Aschenbroich says “This ranking testifies to Valeo's very strong capacity for innovation, a pillar of our strategy, and to the fact that France, which represents more than half of our published patents, remains obviously the stronghold of our R&D activities”.

Others in the top ten include the Renault group (N° 5 with 483 patents), Michelin (N° 8 with 285 patents), and Faurecia (N° 10 with 234 patents). In the Top 50 also appear Continental, Suzuki, Nissan, Bosch, Plastic Omnium, and Chassis Brakes International.