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Weekly Newsletter

DVN
Lighting & ADAS

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Editorial

Next Step In Digitalisation: Eviyos

Two weeks ago, the official launch of ams OSRAM's micropixel Eviyos 2.0 product started. I had the chance to visit the ams OSRAM fab in Regensburg and to look in on the front-end production and testing. In this DVNewsletter's in-depth article you can see more details on technology and history for that.

Micropixels, originally intended to make ADB systems better, are now found to have a multitude of applications. Beside glare-free ADB, they can be used to highlight specific areas on the road, they can give lanekeeping help, and can provide driver communication with safety and warning symbols or text. That is the key issue for the future: software and electronics are both needed to access the digital world of communication. And automakers need engineers and suppliers to deliver new safety functions, new surprising ideas, and new business cases.

We see more and more divided markets in terms of legal allowance of lighting innovations. In ECE it will need more and convincing research and efforts to speed up and bring more digital chances on our roads. China is in the lead, which creates pressure in Europe. And the U.S.? Well, "just" 11 years after ECE there is now a super-complicated ADB possible, with technical solutions helped by microLEDs. About digitalisation…we will see.

Now look to the LED story: LEDs were used in dashboards in the 1980s in red, green, and orange for signalling. In the exterior lighting world, the first LED rearlamps came in 1997 on the Maserati Ghibli, world-first white DRL on Audi's A8 W10 in 2004, world-first low beam on a Lexus in 2007. And 15 years ago, in 2008, LEDs conquered all lighting functions in the first full-LED car, the Audi R8. Its low beam had 14 LEDs and its high beam had eight, all 1 mm^2 items.

Today we talk about 25,600 LEDs with a pitch of 40 microns in 320 columns and 80 rows, each LED smaller than the diameter of a human hair. That is real innovation speed. And the story of microLEDs has just started, but we already know the next chapter is coming. The LED development cycle is not at its end. Next target: 100,000-LED arrays that may serve the desire for larger fields of view and better resolution. A complete family of microLED systems with a varying number of LED seems possible, giving a big push to functions plus innovations we don't see today. Communication and digitalisation—these are growing fields in our lighting business, enabling much more than on-off and high-low beam.

If you are interested in more details on ADB and microLEDs, watch for the DVN ADB study, which will be available soon.

Sincerely yours,

Dr. Michael Hamm, DVN

In Depth Lighting Technology

ams OSRAM's New Eviyos® 2.0: A Front Row Seat View

Dr. Michael Hamm, DVN

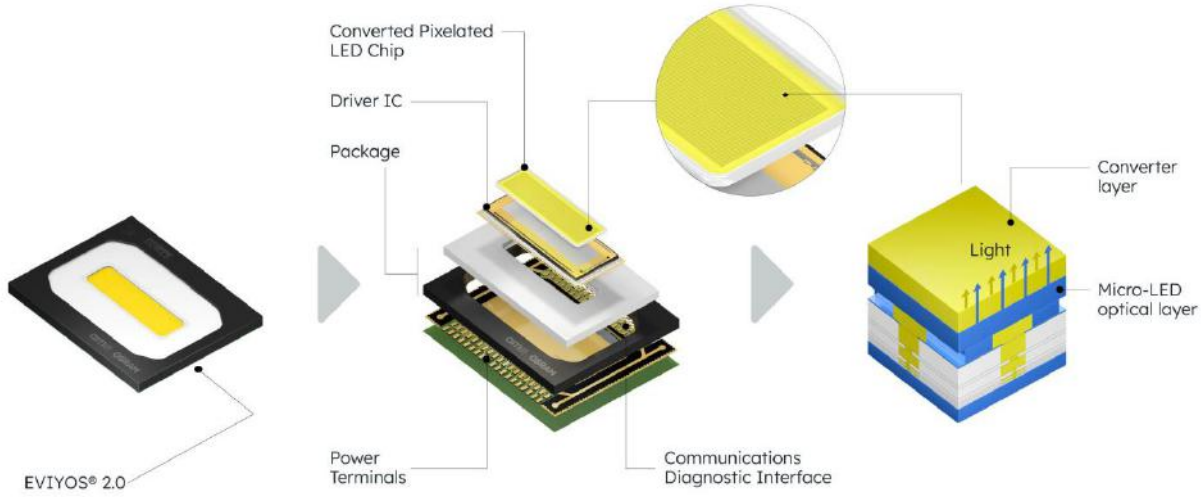
On 19 July, 2023 ams OSRAM announced their Eviyos® 2.0. Right in that moment, I was able to visit the ams OSRAM fab in Regensburg, to have a look at the front-end production and testing, and make an in-depth interview with Wolfgang Lex, ams OSRA's Automotive Senior VP.

The Eviyos® 2.0 has 25,600 LEDs on a single monolithic chip—a new record in individually addressable chips in the automotive projection world. The Eviyos® 2.0 product consists of the multipixel emitter and a driver which individually controls the operation of each of the 25,600 LEDs.

The LED chip has a compact 40-mm^2 footprint and is available with a 1:4 (25,600 pixels) or 1:3 (19,200 pixels) aspect ratio. The LED pixel pitch is 40 microns, and the array counts 80 lines and, depending on the aspect ratio, 240 or 320 columns. Osram

specify the chip achieves typically 85 MNits at nominal current, with total range from 75 to 100 MNits (MNits is the spec coming from displays; one Nit is one candela per square meter). This chip makes a superior brightness and first optical prototypes have made a digital matrix beam with significantly more than 75,000 candelas.

Target colour bin for the Eviyos® 2.0 is C_x 0.318; C_y 0.33. In conversion calculation that means a correlated colour temperature (CCT) of about 6200K (ECE/SAE white). There is a wide operating temperature range of T_j = -40 to 125 °C for the companion ASIC (application-specific integrated circuit), and an operating temperature range of T_j = -40 to 150 °C for the Eviyos® 2.0.



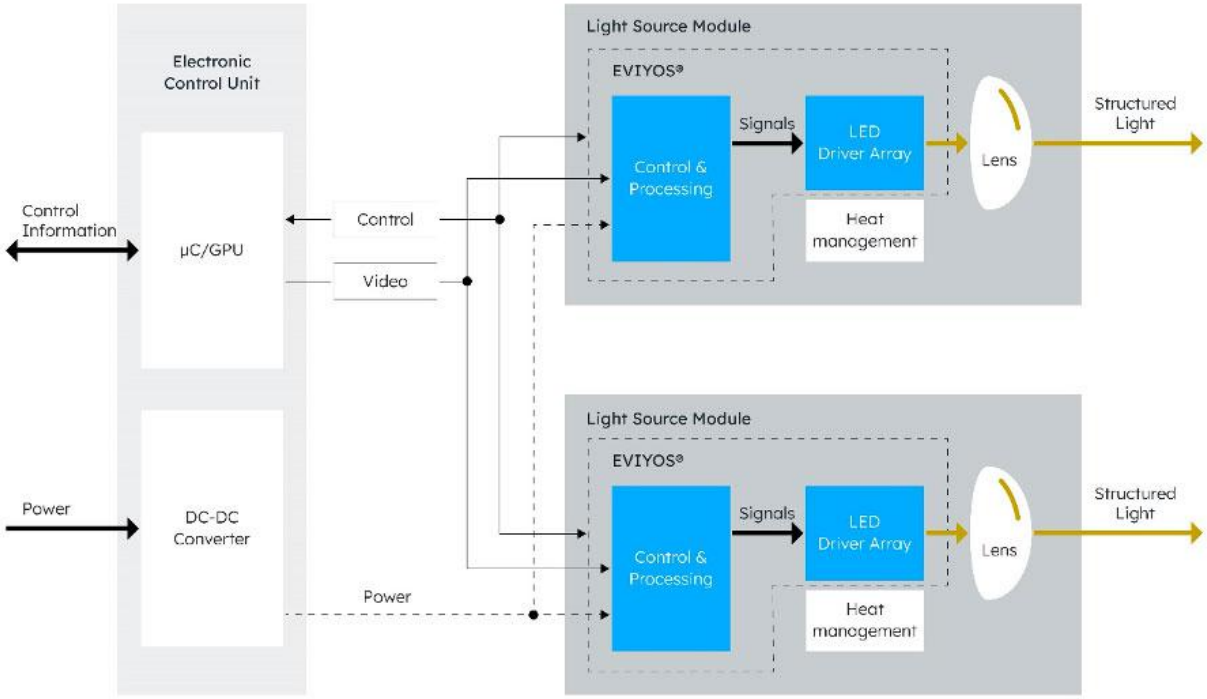
ams OSRAM Eviyos® 2.0 and what is under the LEDs (image: ams OSRAM)

Eviyos® 2.0 is a high-output, high-efficiency automotive light source that enables energy saving in vehicles; only those LEDs are energised that are required to maximise the driver's safe view, so light is not wasted. The individually-controllable pixels make it possible to adapt the light beam to the driving situation, with optimum illumination of the road and without any glare. Besides nighttime driving safety improvement by providing permanently glare-free high beam light, it also adds safety by bringing HD-quality projections onto the road.

No light without ASIC

Behind the monolithic microLED begins another world of micro, in this case electronics. Each of the 40µm LEDs has to be driven and controlled individually. The LED semiconductor array of 40 mm^2 is soldered to the top of a pixel-driver IC. This gallium-nitride-on-silicon stack is directly bonded to the thermally conductive base of the package substrate. The phosphor layer on top of the 320 × 80 LEDs converts a part of the emitted blue radiation into yellow to generate white light.

The Eviyos® system includes the interfaces to the ECU via the digital companion ASIC. RGB8, UART, and SPI interfaces are used to capture video data. UART over CAN, I^2C, and SPI interfaces are used for diagnosis and control access. With a highly parametrizable diagnosis scheduler, the Eviyos® system relieves the ECU and minimises diagnosis access.



Eviyos® 2.0 and electronic infrastructure—example for one control ECU and two headlamps. (ams OSRAM image)

Digitalisation in Adaptive Driving Beam

In adaptive driving beam systems, the multipixel headlamp is mounted in a lensed headlamp assembly and combined with an intelligent camera for scanning the scene in front of the vehicle. This enables the headlamp in high-beam mode to dynamically switch off enough LEDs to avoid glare for other road users while maximising the driver's view of the road. Dynamic control of individual LEDs also enables the headlight to project accurately along curves, extending the driver's view of the road ahead. Unexpected possibilities were found during development; initially the basic target was only making high beam ADB systems better, but a pixelized structure could also allow the Eviyos® Array to make a display on the road. With 25,600 LEDs arranged in 80 lines and 320 columns, it is possible to display graphical elements, pictures, and text. Car-to-driver communication, such as projections of warning and road condition signals, can be realised with this single but complex LED light source.

The car communicates in new ways to the driver and to others in the car's surroundings. For example, headlights based on the Eviyos® 2.0 can project a snowflake symbol on to the road surface to warn of icy or slippery conditions, helping to increase awareness of danger and so reducing the risk of accidents.

Digitalisation enabled by Eviyos® 2.0: symbol projection on the road. (ams OSRAM image)

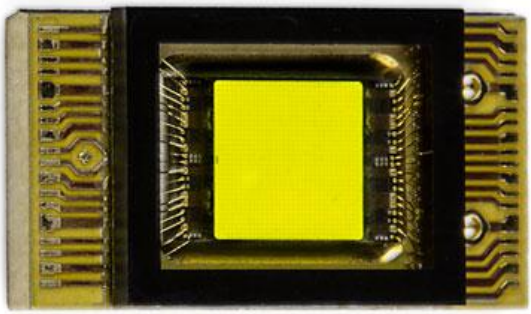
History: 2.0 Means There Was Work Before.

More than 10 years ago, in January 2013, a special group of expert companies gathered together to start a public funding project for a multi-pixel-LED array. It was named “µAFS”.

Up to then, pixel systems had been based on a large number of individual LEDs for low beams and, for a short while, also for adaptive driving beams (matrix systems). This project targeted a complete new approach of moving from normal millimetre-size to the world of ASICS and micrometre-LEDs.

After only 1.5 years, the consortium could demonstrate that with only the first developed chip it was possible to drive and control 256 LED pixels. Continuing development, ams OSRAM realised a light source consisting of 1,024 pixels with a pitch of 0.125 mm. This was the Eviyos® 1.0. The LED semiconductors were mounted onto the driver chip. Therefore, the unit could be controlled via a serial data interface.

The idea was that an anamorphic lens system in the lamp imaged all pixels onto the road to create high resolution AFS/ADB patterns, which were calculated in real time in the vehicle. Today it is clear that a more conventional optical system of 3-6 lenses is sufficient for projections on the road. Another idea was to use multiple of those 1,000-pixel LEDs to cover a wider field of projection. In the end, it had to be stated that the number of LED pixels and the resulting resolution when generating an acceptable spread of ±12-20° was not sufficient.



Eviyos® 1.0: 1,000 LEDs; enabler for the new generation.
(ams OSRAM image)

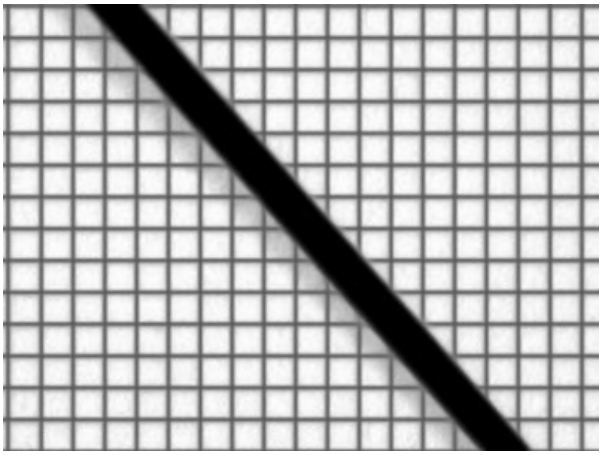
This was the first step (as we today know) to light sources with more than 1,000 pixels. The challenge was to define the light points during chip processing itself, and enable them to be linked directly with the electronic driver chip and electronic control system, guaranteeing reliability, producibility, and cost effectiveness. In the new configuration of OSRAM with their new parent company ams, there was a good opportunity to combine the expertise and manufacturing abilities of both companies. Now we see that LED pitches of 40 microns and the full addressable ASIC below are available with full automotive qualifications.

Today, even more than 25 kilopixels have become reality. And for sure, the story continues.

Size comparison

But what does that mean, 40 microns? Do we have an equivalent in our daily life? The answer is yes, just touch your hair. Compared to a human hair, a single LED chip on a Eviyos® matrix is about half the size (depending on the hair).

Visit to the ams OSRAM Fab



Microscopic view of Eviyos® 2.0 chip, with human hair across it. Compare the 40-micron LED pitch and see that each LED is smaller than the hair. (ams OSRAM image)

For the Eviyos® 2.0, ams OSRAM passed the AEC-Q102 (attm 003) for high complex Optoelectronic Multichip Modules. This specification serves primarily as a rating standard for discrete optoelectronic component products entering the automotive market, and is also the latest international standard for automotive LEDs. Verification items include: LED T_j (junction temperature), Hydrogen Sulfide Test (H_2S), Gas Mixture Corrosion Test (FMGC), Pulse Life Span (PLT), and more. Each test is designed to make sure LEDs can be expected to stay operable in the harsh automotive environment and protect your safety while driving.

The ams OSRAM fab in Regensburg has a complete test lab able to perform these tests.

In the test labs for LED. Many ovens, many tests just to be sure the LED does not fail also in extreme conditions.

The chips are manufactured in a cleanroom area. The process involves growing the InGaN crystals on a sapphire patterning substrate, in a process known as epitaxy. Using their special award-winning thin-film technology, ams OSRAM coat the top surface of the epitaxial substrate with metal. This metallised side is then soldered onto a thin carrier material and serves as a reflector. The original sapphire substrate is subsequently removed. After patterning, which requires many further steps—such as contacts, passivation and anti-reflex coatings—the light-emitting epitaxial layer sits on top of a highly reflective metal mirror layer, stabilised by a carrier. The chip can therefore emit almost all of its light at the top, a major advance in the brightness of LEDs. All of these chip production steps need a cleanroom atmosphere.

To enter a clean room, even as a visitor, you receive a hood that reaches the shoulders and a face mask attached to the headgear so that only the eyes are visible. Then there are overalls, which must not touch the floor with the upper body when putting them on. There are special shoes for the feet and rubber gloves for the hands.

The air in the clean room is filtered by special filters in the production ceiling. The air flow enters the room through the ceiling and exits through a raised floor. This ensures that the particles are kept down to ensure even more freedom from particles.

Clean Room means a big effort for installation and working staff, including visitors. I have had the unique chance to visit the Eviyos® assembly line with Joachim Reill (Senior Director of System Solution Engineering), introduced by Dr. Jörg Schäfer (Vice President and Head of Site & Manufacturing, Regensburg).

DVN Interview: Wolfgang Lex, Senior Automotive Vice President at ams OSRAM

DVN: Why Eviyos® 2.0?

Wolfgang Lex: High-resolution adaptive forward lighting is set to become the next big differentiator. Eviyos® 2.0 is the enabler of the most precisely controllable forward lighting systems and is a major new value creator for the automotive industry.

DVN: What is the core competence for a product development like Eviyos®?

W.L.: It is deep understanding of physics and materials. We have about 5,500 developers worldwide. In Regensburg are also engineers with deep verticalization—phosphors, chips, materials, manufacturing, development. And competence is persistence and perseverance. Eviyos® 2.0 was not possible with the previous work in the basics. We started 10 years ago. And we were not so successful with the first generation. My engineers were a little disappointed when this yearlong hard work was not delivering the breakthrough with 1,000 pixels. But I told my staff at that time: You made the rocket that was able to reach orbital stage. This alone is a super achievement. With our next generation we will have the chance to go to the moon. That is the 25,600 pixels we have today. Now we can say mission accomplished. Next target then is Mars.

DVN: What does the new constellation of ams OSRAM mean?

W.L.: Lighting semiconductors will become intelligent. In 2020, ams completed the deal to acquire OSRAM. And this new combination of skills already brought new products and success. The intelligent RGB LED with driver was launched and is a success. Right now, the Eviyos® 2.0 with an intelligent ASIC designed by ams is launched. This new company constellation made us realise that now you no longer need to share know how with external suppliers; it is internal, integral and quick.

And, the combination of ams and OSRAM is the answer to digitalisation.

Lighting News

Active Digital OLED Signature in Audi Q6 e-tron

LIGHTING NEWS

With up to eight digital light signatures for the headlights and rear lights, drivers can personalise their Audi Q6 e-tron by choosing a signature in one of two ways. Six additional signatures with a coming home/leaving home lighting scenario and the corresponding digital light signature are available through additional option packages.
For the first time, customers can optionally select digital light signatures for DRL and for rear lights. With a total of 8 optional digital light signatures in the DRL and in digital OLED rear lights 2.0, customers can design the look of their Q6 e-tron like never before. Customers are also able to buy digital light signatures after purchasing their car.
Audi's Head of Lighting Design César Muntada says "We've given the light signatures their own personality and the digital world its own æsthetics at the same time".

The active digital light signature at the front is created via the interaction of the algorithm with 12 dimmable segments, while at the rear, all the digital OLED segments are used. The individual light segments interact so that the light signature's overall image does not vary in luminous intensity.

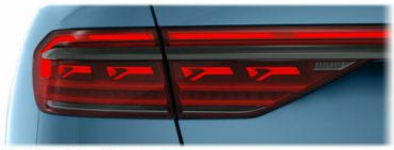
In the rear, the digital OLED lights can specifically communicate with the immediate environment. The number of segments per digital OLED panel has increased from six to 60, compared to the first generation. Six OLED panels with 360 segments in total are used in the Q6 e-tron's rear lights. The new E^3 electronic architecture makes it possible to control this significantly increased number of segments using a software module on one of the domain computers. The steady increase in the number of segments per digital OLED panel will, in future, make it possible to develop the rear of the car into a display that further improves car-to-X communication and road safety.

In the front, the new digital DRLs and light modules are now visually separate, creating greater design clarity. The designers have designed the 70 individual LEDs in these new digital DRLs as transparent 3D objects. The front section of the digital DRLs features a precise prismatic structure, while a metalized 3D trim surrounds them to draw the focus

to the car's digital eyes. Michael Kruppa talks about the two technologies in **this online video**.

DVN saw and covered this technology in our visit to Ingolstadt this past May, meeting Stephan Berlitz and his lighting team.

Heckleuchten-Signaturen im MMI auswählbar
Rear light signatures can be selected in the MMI


Heckleuchten-Signatur 1
Rear light signature 1


Heckleuchten-Signatur 2
Rear light signature 2


Heckleuchten-Signatur 3
Rear light signature 3

ams OSRAM's New Osire Intelligent RGB LEDs

LIGHTING NEWS

ams OSRAM have introduced new technology which greatly simplifies the implementation of dynamic, colour- and intensity-changing arrays of hundreds of RGB LEDs in car interior lighting.

The new Osire® E3731i RGB LED features a digital core that enables low-latency communication over a standard serial bus interface with any microcontroller. ams OSRAM has also developed a new open system protocol (OSP) running on the Osire E3731i.

Using OSP, any microcontroller can transmit instructions to modulate brightness and colour individually to each LED. OSP is available for use, licence- and royalty-free, by any maker of vehicles, LEDs, lighting systems, or microcontrollers. By using the Osire E3731i LED and OSP, automotive manufacturers can realise novel dynamic lighting effects in the car interior. Up to 1,000 LEDs can be connected in a daisy chain, controlled via one microcontroller. ams OSRAM Senior Product Manager Hermann Senninger says, "Dynamic lighting promises to add value to cars by combining changes in colour and brightness with pulsing, breathing, or moving light effects, for decorative or functional purposes. The Osire E3731i and OSP enable dynamic interior lighting to be implemented with a simpler architecture, fewer components, less wiring, and at lower system cost. These benefits are attracting customers already, and we expect to see the product deployed in production vehicles soon".

New Škoda Scala and Kamiq Headlamps: Design details

LIGHTING NEWS

Ahead of the digital world premiere of refreshed Scala and Kamiq models, Škoda are releasing design sketches that showcase the updated front end and headlamps. Four years on from their initial production launch, Škoda are introducing upgrades that incorporate technical enhancements and a fresh appearance.

The reshaped Scala headlamps now extend to the grille, and they contain convergent DRL strips at the lower and upper edges of the lamp, angled up at the outboard edge to create a distinctive new light signature.

The Kamiq's new lamp has a slimmer upper element of the signature split lamp, and the main lamps beneath have grown larger. They house the optional Top LED Matrix headlamps with distinctive hexagonal modules, available for the first time for the Kamiq as well as the Scala.

ZF finds New Automakers Hot For New Tech

LIGHTING NEWS

Nio CEO William Li, left, and ZF CEO Holger Klein

Holger Klein, CEO of ZF Friedrichshafen, says young automotive brands such as Nio, Xpeng, Lucid, and Tesla are pushing ZF in a different way than traditional automakers: "They have a different expectation on speed; speed is king".

The new brands want ZF's newest technologies as quickly as possible, even if some bugs haven't been eliminated in development. "If your latest innovation feature doesn't work as reliably as you would expect from a German premium brand, it's somehow OK," Klein said. "This happens when the customer wants a particular car and a particular function and is willing to accept some deficiencies".

That urgency doesn't mean ZF is willing to compromise on their proven development processes or skip quality steps, Klein hastened to point out, it just means that ZF knows the newcomers will be tolerant. "I think that makes many of them faster," he said. "It is demanding to keep pace with this speed".

General News

Renault and Stellantis : Records

GENERAL NEWS

Renault Austral compact SUV

Renault posted an operating margin of 7.6 per cent in the first half of the year, the automaker's highest ever and already close to their 2025 target, on strength of higher prices for their cars, improved volumes, and cost reductions.

The company also returned to a net profit in the six months through June, recording a net income of €2.12bn after posting a €1.68-bn loss in the first half of 2022. CEO Luca de Meo called the results "the outcome of our continuous efforts to reduce costs over the last three years and of our strategy focused on value" along with the first positive results of an unprecedented new-product push. "Our fundamentals have never been as sound and robust."
Renault's order book in Europe is at 3.4 months of sales at the end of June, and set to stay above a target of two months through the year, the company said. Sales were up by 13 per cent worldwide, and 24 per cent in Europe.

Stellantis set records for net income and sales in the first half of the year. The increased sales of pure electric cars also helped. Compared to the same period last year, net income rose by 37 per cent to a record €10.9bn. Adjusted operating margin climbed to 14 per cent, beating analysts' expectations.
Stellantis, whose brands include Peugeot, Fiat, Chrysler, Jeep, and Opel, also benefited from higher deliveries in the past six months. They drove sales to a record high of €98bn, an increase of 12 per cent compared to the previous year. Sales of battery electric vehicles increased by almost a quarter.

Stellantis believe demand in Europe, the Middle East, and Africa will be stronger than expected.
Against this background, too, the management confirmed targets for the year.

VW Buy Into XPeng

GENERAL NEWS

VW Group, aiming to boost their sales in China, have pledged to invest $700m and acquire a 4.99-per-cent stake in Chinese automaker XPeng as part of a deal to jointly develop and produce two midsize EVs for China.

The new EVs will be produced at VW's new development, innovation and procurement centre in Hefei, and sold in China under the Volkswagen brand. Earlier this year, VW Group announced plans to invest €1bn into the facility, called 100%TechCo, in an attempt to respond to China's fast-changing consumer needs.

The connectivity and advanced driver assistance system software will also come from XPeng. The models are expected to start production in 2026.

In a separate agreement, Audi will expand their partnership with SAIC to produce luxury EVs for the Chinese market. The companies plan to develop a new platform for premium EVs.

Both deals come as VW have seen sales fall in China, one of the maker's most important markets.

Valeo, PO, Forvia Set Records

GENERAL NEWS

Valeo's Figures Are Up for H1-23

Sales of €11.2bn, up by 19 per cent. Original equipment sales are also up by the same amount, 19 per cent, and ADAS up by 26 per cent, outperforming automotive production by 8 points LFL, on an operating margin of 3.2 per cent. That's up 200 basis points compared with H1-22 as adjusted.

There's strong business momentum, as well: and order intake of €18.8bn, with profitability up versus 2022, when profitability was already above the levels set out in the supplier's Move Up plan. More than half of these orders are linked to innovations in driving assistance, driven by strong worldwide demand for software defined vehicles and Valeo’s strong position in this market.

PO Report Strong Growth in H1-23

Plastic Omnium outperformed global automotive production by 8.9 points in the half-year, with an outperformance in all regions, with a strong growth of 34.7 per cent to €5,815m. The Operating margin is €210m, up 16.9 per cent or €30m, driven by historical activities and agile and dynamic cost management in a context of continued high inflation. The Group is confident in achieving its annual target. Lighting activity is aligned with operational and financial targets announced at the beginning of the year, with an operating margin at break-even for a first time in the month of June.

Forvia Hikes '23 Targets on Strong Auto Production

Forvia raised their annual sales and margin forecasts, saying they expect global automotive production to grow faster than previously anticipated.
They now foresee 2023 sales of around €27bn, up from the previous outlook of €25.7bn, and an operating margin of 5.7 per cent of sales, up from 5.5 before.
Global automotive production grew more than 10 per cent in the first half of the year, on sustained demand and gradual improvement in semiconductors supply.

The company, born from Faurecia's takeover of Hella, say persistent inflation on energy and labour costs continue to weigh on margins, while the impact from raw material costs should be smaller than last year.