Tue, 12 November 2024
Weekly Newsletter

DVN Lighting

NEWSLETTER #879

Editorial

Innovation In Plastic: One Of Stakeholder To Solve The Lighting Challenges

Automakers all face the same challenges of how to reduce carbon footprint, do nice design, and shorten product development time—all at the same time! Plastic is part of the problem, but also part of the solution, as I saw during my visit to Covestro HQ.

Plastic suppliers are clearly central to carbon footprint reduction. Recycled and bio-based proposals are coming, and plastic companies are part of the new recycling supply chain growing and gaining traction (mostly in Europe for the time being). Plastic suppliers are also one of the main contributors to nice-looking lamp design. They are a wellspring of new ideas for illuminated panels with films, new materials with new properties for illumination, and so much more.

Because simulation is crucial to faster development, which is why companies like Covestro are investing in material optical-properties databases to ease the job of the optical designer.

Really, the lamp design revolution was made possible by two key sectors: light sources manufacturers and plastic suppliers. Among DVN members we have more than 10 companies involved in light sources manufacturing and more than 10 involved in plastic raw material supplier—which demonstrates strong taproots in the vehicle lighting business. Innovation can and must carry on in this way to continually propose products with better optical properties, lower weight, less CO_2 emission, and (this is the automobile industry) cheaper price!

Paul-Henri Matha
DVN Chief Executive Officer and Lighting General Editor

In Depth Lighting Technology

DVN @ Covestro HQ

I had the pleasure to be invited by Jan Helmig and Jochen Hardt at Covestro HQ located in Chempark, Leverkusen.

Chempark is covering a 11 km2 total area, including 85km pipe bridge, 45,000 employees, 102 km factory roads, 102 km tracks and 500 enterprises. And it is obviously the historic location of Bayer

Covestro is a key player in the automotive lighting industry, as one of the main player in optical plastic raw material supply. Without any polycarbonate, we would still have glass lens, rectangular headlamp shape and most of all the latest innovation in our field would not have been possible.

Company started in 1863, founded under the name “Friedr. Bayer et comp.” in Barmen, today a district of Wuppertal. Company started to manufacture and sell synthetic dyestuffs from coal-tar. In 1937, Otto Bayer discovered Polyurethanes and in 1954 Hermann Schnell invented Polycarbonate and from this time, Covestro has built a reputation as industry pioneer.

In 1980s, Covestro delivered Makrolon© for the first Automotive headlamp lens. In 1993 the polycarbonate headlamp lens of Opel Omega was the first one in Europe.

On September 1st, 2015, Bayer MaterialScience became a separate legal entity operating under the name Covestro, with Headquarter remaining in Leverkusen.

Covestro generated sales of EUR 14.1 billion in fiscal year 2023. At the end of 2023, the company had 48 production sites worldwide and employed approximately 17,500 people (calculated as full-time equivalents).

Covestro is still on the top of the innovation with remarkable innovative products they have revealed in the last few months:

- Recycled Polycarbonate from old tires
- PU coating for front grills (BMW iX), including film integration
- PC-Heatsink as alternative to aluminum heatsink
- Diffusive EL polycarbonate for edge light design
- Imagio® OMD

At the same time, Covestro is investing in optical lab to be able to support lidar measurement (and lidar integration behind PC-lens) and has just released an optical database with all their PC optical properties to accelerate the work for tier1 and OEM for optical simulation and testing.

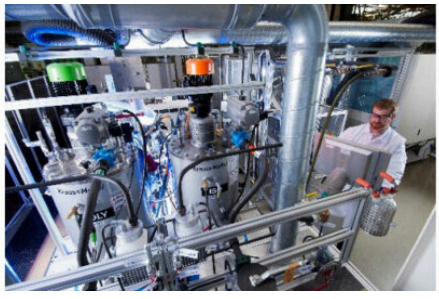
Recycled Polycarbonate from old tires

Covestro

Neste, Borealis and Covestro have signed a project agreement to enable the recycling of discarded tires into high-quality plastics for automotive applications. The collaboration aims at driving circularity in plastics value chains and the automotive industry. When no longer fit for use, tires are liquefied by means of chemical recycling and then processed into base chemicals and further into polycarbonates of high purity. These can then be used in various automotive applications, from parts of headlamps to radiator grilles.

As part of the collaboration, Neste turns liquefied discarded tires into a high-quality raw material for polymers and chemicals manufacturing and supplies it to Borealis. Borealis will then process the Neste-produced raw material into base chemicals phenol and acetone, which are supplied to Covestro. Covestro can use these materials to make polycarbonates. The share of recycled content is attributed via the mass balancing approach all the way to the final products using ISCC Plus certification.

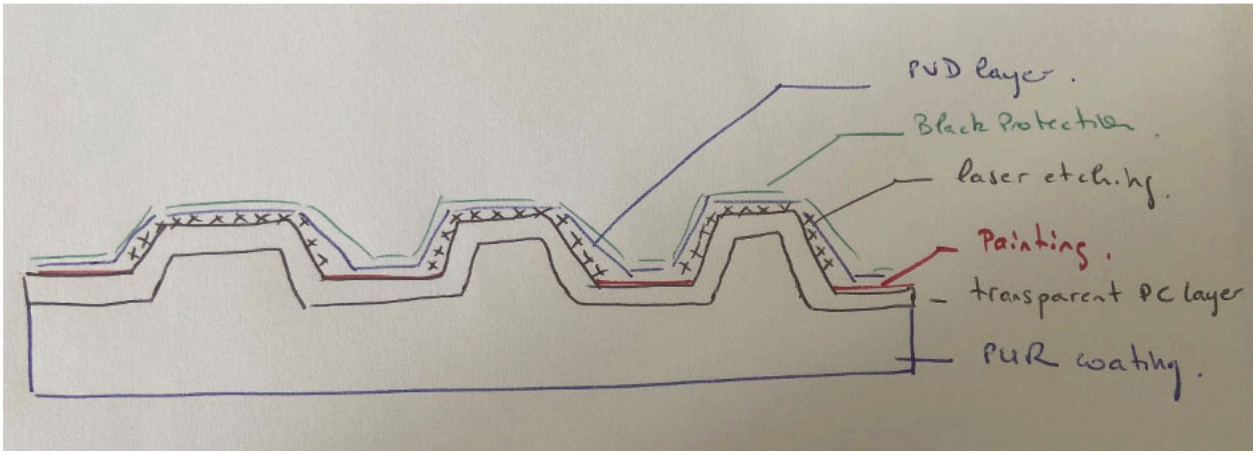
The first products based on the collaboration are already available as each party has manufactured the first batch of their respective contribution to the project. Aside from polycarbonates, the project partners may also consider polyurethanes as a possible end product, which could also find its way into parts of the interior of a car. The companies emphasize that the potential to scale-up these types of developments should be considered when setting ambitious targets for future EU regulations, such as the End of Life Vehicles Regulation.



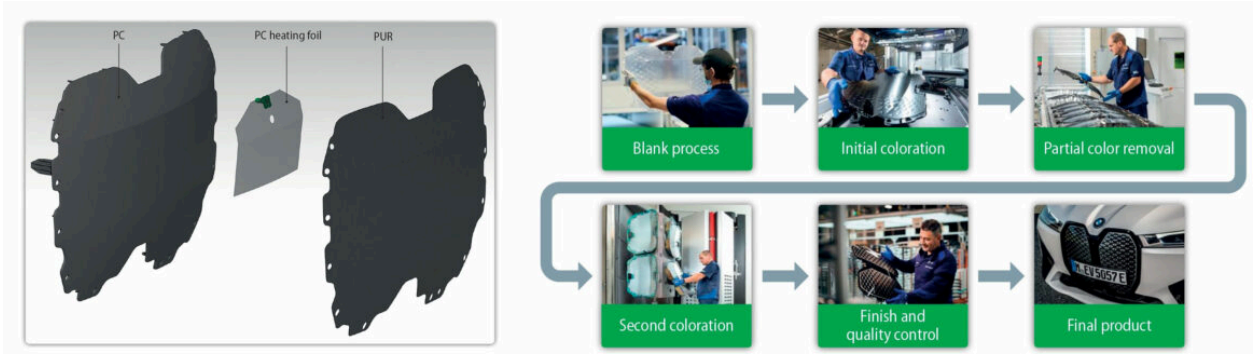
The combination of Injection Compression Molding, In-Mold-Coating and partial Film-Insert-Molding enables a novel design like the one on the BMW iX front panel (Kidney):

- Integration of medium range RADAR behind the kidney panel without any air gap
- Defrosting system with heating film integrated in the PC layer
- Multicolor class A finish

To be able to realize this design, different steps are needed to succeed:

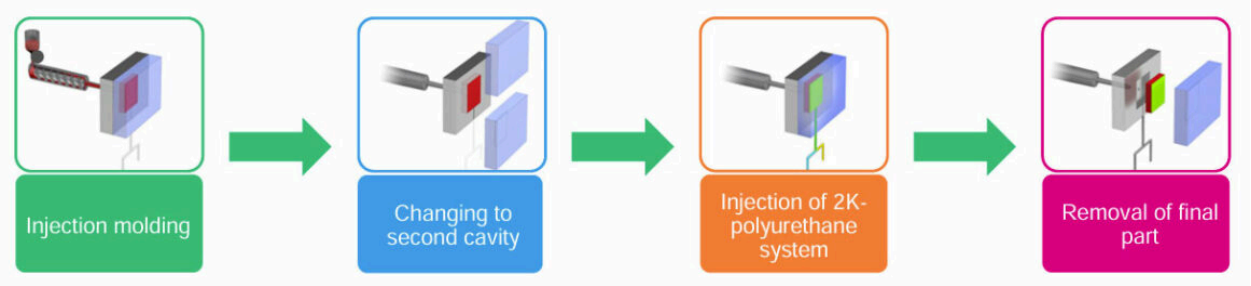


- 3D structure with prisms of varying depth integrated in a transparent PC base substrate with compression molding process (compression process interest is to reduce and homogenize pressure during injection, thus reduce warpage, sink marks and inner stress.) Addition of a 3D PC heating foil on A-surface (Film Insert Molding)
- PUR (Polyurethane) coating layer to obtain a class A finish
- Black Painting on the B-side
- partial laser etching of black paint
- PVD (physical vapor deposition) process with metallic appearance
- Black protection on the B-surface



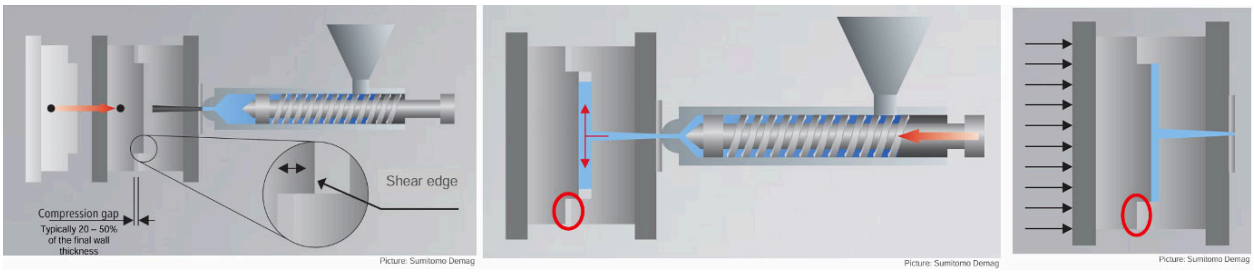
PUR Coating layer is based on Covestro´s raw materials Desmodur and Desmophen. It imparts high scratch resistance to the component finish and is self-healing. Minor scratches simply disappear on their own after a short time (see video extract from BMW : (2) Video | Facebook)

This technology is replacing classical spray coating process including multiple steps (injection, storage, cleaning, pre-treatment, coating, curing) by a 2K injection process. Other advantages are the possibilities to have sharp 3D structures or replication of delicate mold structures.

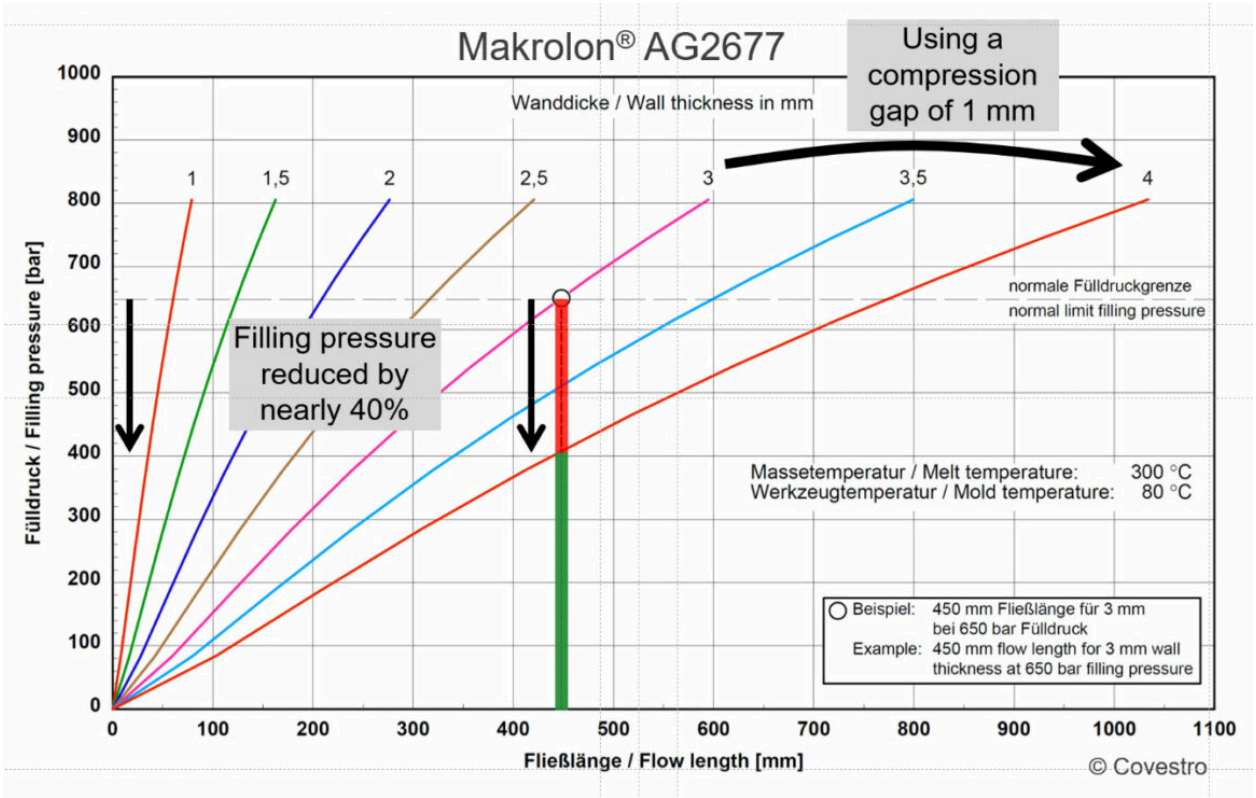


Source: Covestro

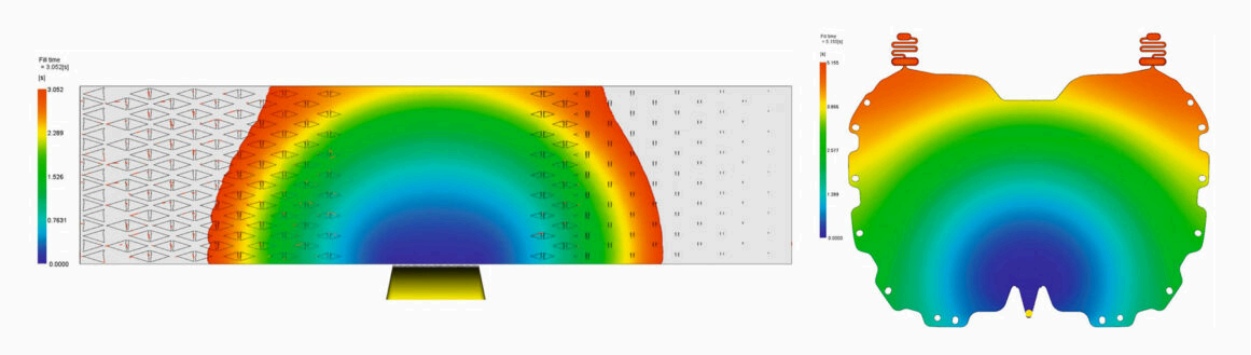
Compression molding (ICM) is used to reduce internal stress (lower pressure during injection, lower clamping force)), improve surface replication, reduce sink marks, improve optical properties and improve geometry tolerances. Injection is done in two steps as described below:



Thanks to this technology, Covestro claims filling pressure reduction potentials of 40% and more.



Covestro provided detailed support to BMW in the development of the front panel. Various development molds were trialed at Covestro's technical lab in Leverkusen, in addition to Covestro extensive simulations on the rheological behavior of both injection compression molding material and the PUR reaction system during mold filling.



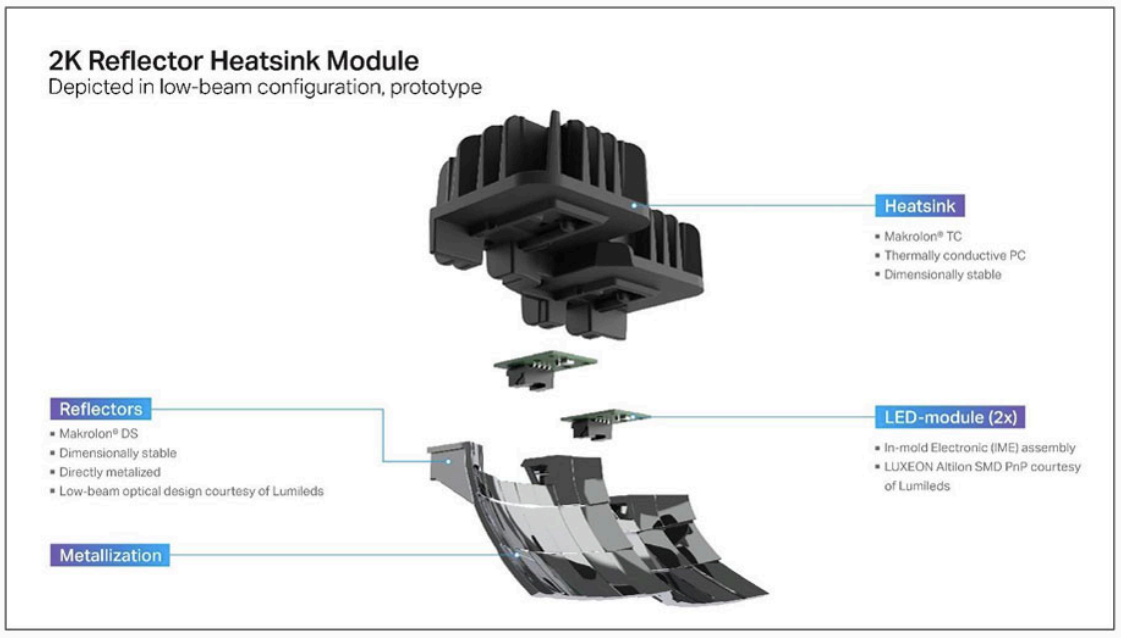
© Covestro

PC-Heatsink

Covestro has developed with partners an integrated solution for low beam / high beam optical system :

- No Fasteners or Thermal Interface Material (TIM) : LED chip are directly integrated in injection tool (insert molded electronics)
- No aluminum : aluminum heatsink is replaced by PC-heatsink made of Makrolon© TC
- All-in-one heatsink and reflector injection in a 2K shot
- Possibility to use recycled PC

This solution is offering similar thermal dissipation properties compared to aluminum with possible weight reduction and cost savings.



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Diffusive EL Polycarbonate

Covestro has developed a transparent Polycarbonate grade that become milky / opalescent when we apply light from the edge. Different transmission values can be obtained

This concept can be implemented in a lot of design proposal for position lamp application

© Covestro

© Covestro

© Covestro

Laser welding technology for headlamp

Covestro have investigated with Branson / Emerson laser welding to replace the “state of the art” headlamp assembly (PC lens, PP housing and glue between both components).

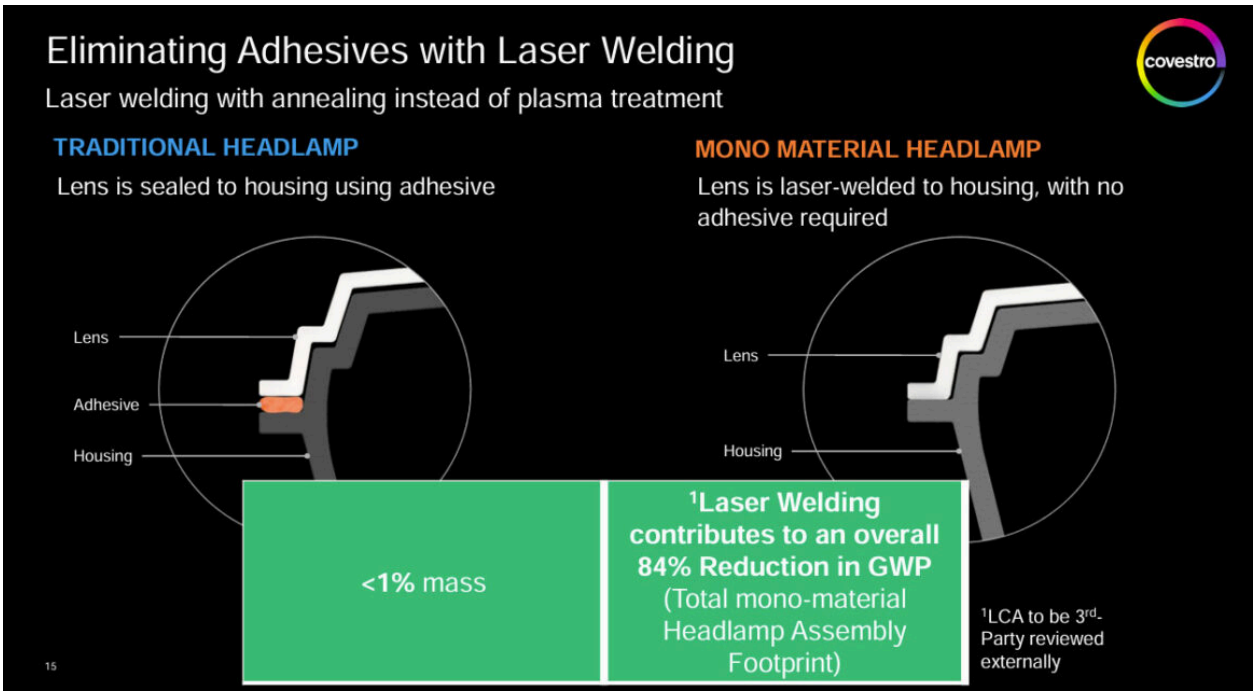
© Covestro

© Covestro

By replacing PP by PC/ABS, laser welding is feasible. Advantages can be summarized as below :

- Improved cycle time
- Enhanced recycling (no need to separate lens, housing ang glue for refurbishing)
- Better geometry of final product
- Elimination of pre-treatment on PP
- No need to hide the gluing channel by hood / bumper / fender components
- No risk of glue outgassing
- Potential dis-assembly of lens and housing using an “un-welding” process

Preliminary testing shows good impact resistance, no air leakage, and acceptable burst strength of the welded headlamp.



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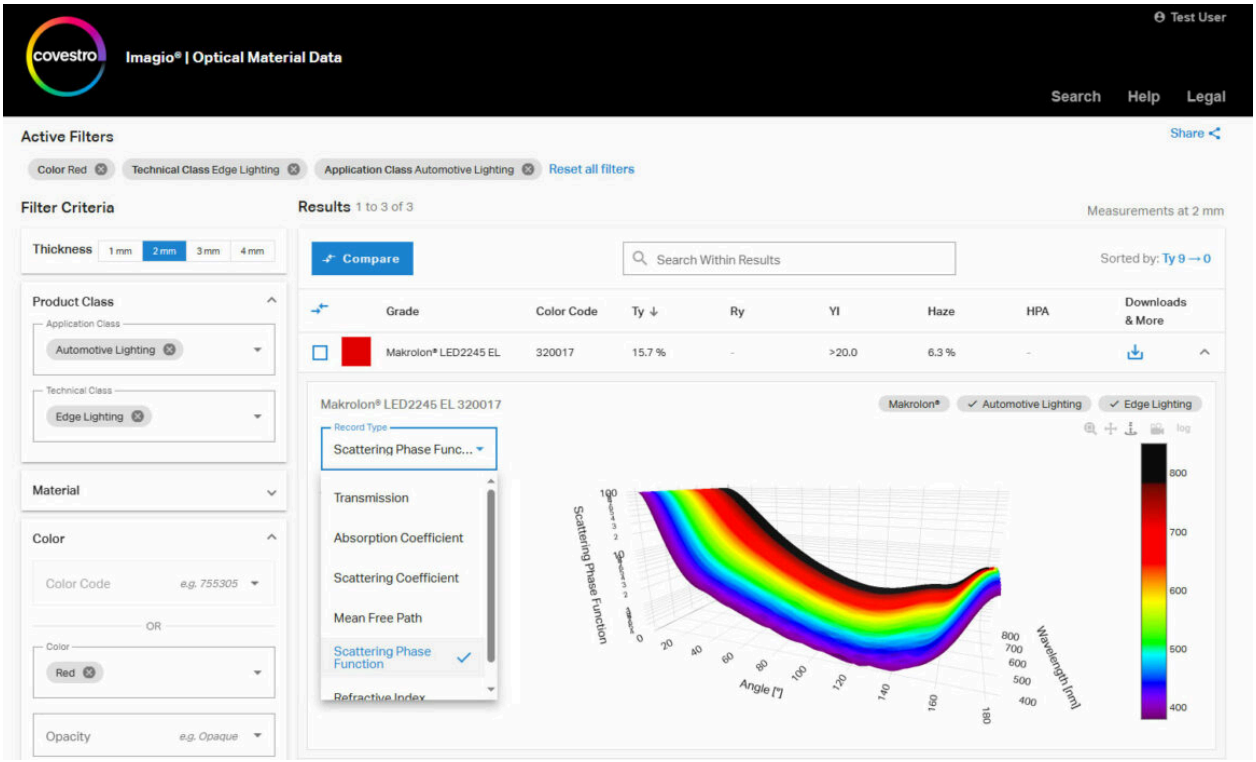
Imagio® OMD

Covestro has developed a database to accelerate optical simulation and give more speed from design to production.



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Imagio® CQ program enables customers to make a material decision more quickly and generate and visually evaluate sample parts in the early stages of development. This saves time and costs during specification, and the suitability of more sustainable plastics can also be tested at an early stage. In the three dimensional space of color, material and finish (CMF), the possibilities are almost unlimited. The backbone of the digital solution is X-Rite/Pantone's Total Appearance Capture (TAC) technology, which captures optical properties such as color, gloss, transparency, translucency or texture of a specific material sample using an optical appearance measurement device. The data is stored in a special data format. This is supported by leading rendering software tools that Covestro customers

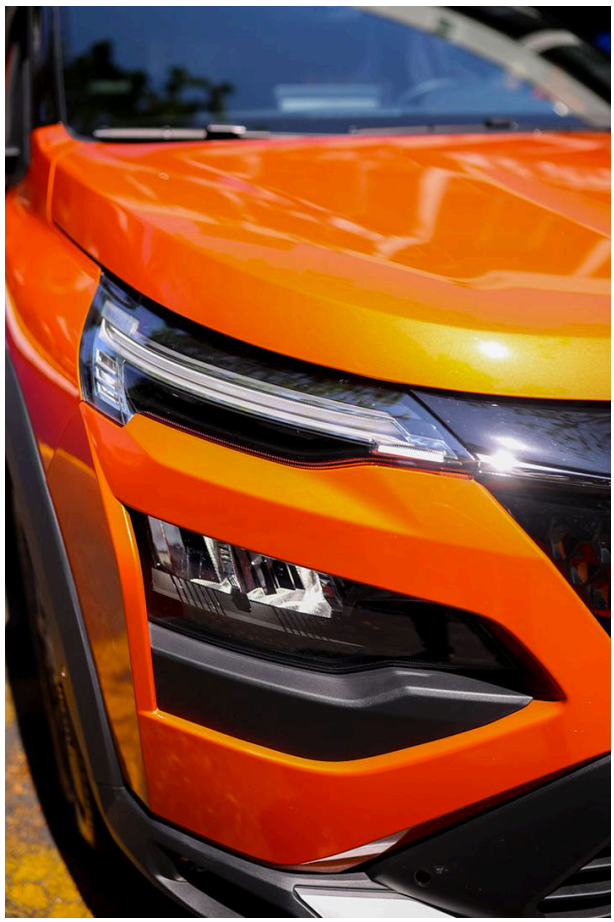
use for their design and marketing visualization. Covestro's Color & Design Centers (CDCs) in Filago, Italy, Newark, USA, and the Caojing and Guangzhou facilities in China are already equipped with the technology to create digital twins of materials. A new tool for sales and marketing to search for color combinations – the Imagio® Color Finder (ICF) – also serves to achieve this goal. Overall, Covestro expects a shift from costly color matching requests in the CDCs to existing color codes with a better search experience. The Imagio® CQ family has now been expanded to include a module called Imagio® Optical Material Data. The target group here are experts from the field of development and simulation of optical components, i.e. vehicle headlights and interior lighting, as well as general lighting. The module is already being tested with customers and will be the first Imagio® module to be available after the required registration. **On the one hand, it will be possible to search specifically for optical material properties in our EP portfolio, and on the other, Covestro will provide the necessary data for optical simulation programs such as Ansys Speos, Optis LightTools or customers' own simulation solutions**.

Lighting News

Marelli lamps on Renault Kardian

LIGHTING NEWS

Marelli are producing the front lamps on Renault's Kardian, a model produced at the automaker's Curitiba plant in Brazil. The Kardian uses LED light sources for the low and high beams and the DRLs.



ZKW Partner With LG in India

LIGHTING NEWS

The ZKW Group have entered a cooperation with LG Vehicle Solutions and LG Soft India to benefit from the expertise of LG's software division. LG Electronics employs nearly 1,100 experts in India who develop software for a wide range of applications, including automotive ones. The aim of the collaboration is to develop software for premium lighting systems and 'intelligent' lighting functions. ZKW CEO Dr. Wilhelm Steger says, "The synergies with LG Soft India open up a great opportunity for ZKW to develop robust software of the highest quality for our customers together with the highly qualified specialists on site. This is an important step towards the Software Defined Vehicle".

Software is a key component of ZKW's current innovations, such as 'intelligent' and adaptive front-lighting systems with highly complex algorithms. Animated rear lights also rely on
software-based electronics that enable a wide range of functions and control options. Together with LG Soft India, platform developments for new products and technologies are now to be driven forward.

Polestar visit @ ZKW Wieselburg

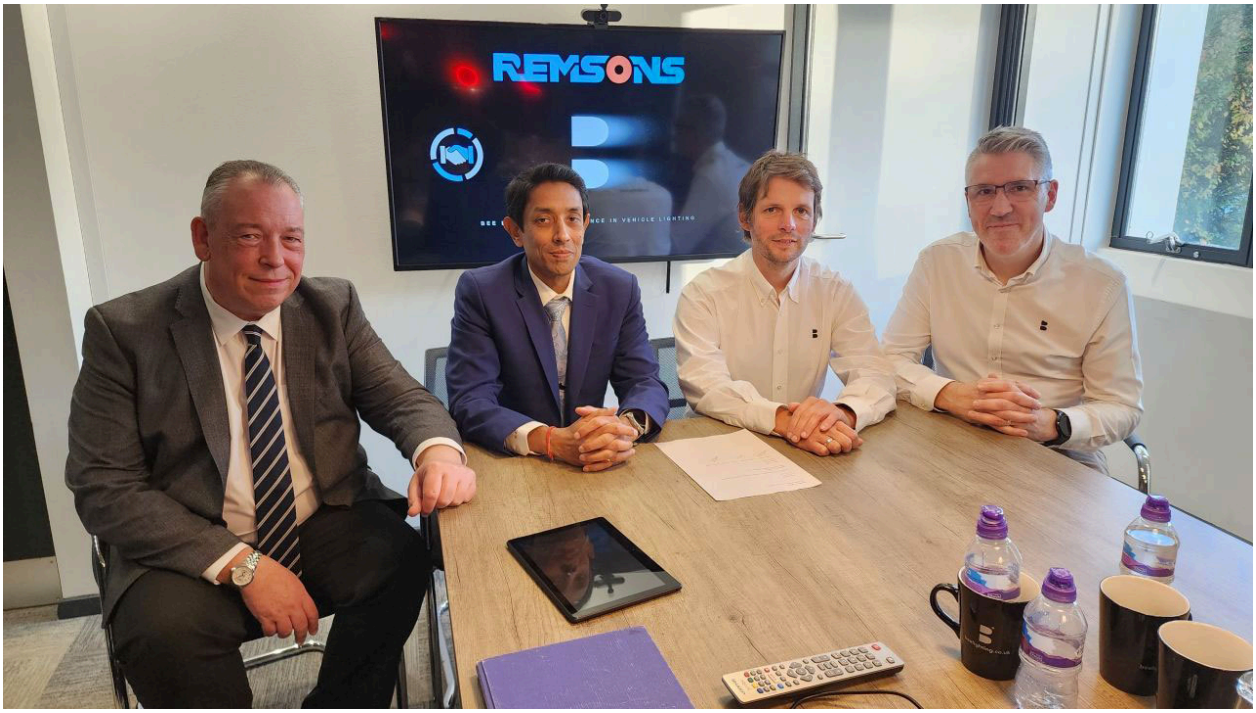
LIGHTING NEWS

ZKW supply the headlamps for Polestar's 2 and 3 models, and a team from the automaker were invited to visit the ZKW plant in Wieselburg.

Headlamps are not just a visual feature of Polestar cars, but above all an important safety element. In the Polestar 3, 1.3 million tiny mirrors combined with the front camera ensure that other road users are not dazzled and that the light beam is focused precisely and seamlessly.
The collaboration with ZKW is an example of how Polestar are working with strong partners to realize their vision of climate-friendly and forward-looking mobility.

Remsons Buy Bee Lighting

LIGHTING NEWS



Remsons Holding, a subsidiary of Remsons Industries, have bought a 51-per-cent equity stake in Bee Lighting. This move marks Remsons' entry into the vehicle lighting market, expanding their product portfolio to include Bee's expertise in Luxury, super/hypercar, and EV lighting solutions.

Rahul Kejriwal, Executive Director of Remsons Industries, says he is "thrilled to welcome Bee Lighting into the Remsons family. This acquisition enhances our product offering and brings significant expertise and innovation, propelling us forward in delivering comprehensive solutions to our customers".

Bee Lighting, founded in 2006, specialize in headlamps and rear lamps. Founders Paul Crees and Colin Fulford say, "We're proud of our achievements at Bee, and look forward to the future with Remsons. This collaboration opens new opportunities to reach global customers and drive further product innovation".

Koito S1-24 Figures Published

LIGHTING NEWS

(¥ millions are rounded down)

1. Consolidated Results for the First Half of Fiscal 2024 (April 1, 2024 to September 30, 2024)

(1) Consolidated Operating Results (¥ millions; percentage figures represent year-on-year changes)

First Half	Net sales		Operating income		Recurring profit		Profit attributable to owners of parent	
Fiscal 2024	444,073	△5.1%	18,067	△44.4%	19,871	△46.2%	11,282	△55.8%
Fiscal 2023	468,153	12.6%	32,513	64.3%	36,909	64.7%	25,524	263.3%

Note: Comprehensive income: September 30, 2024: ¥△10,156 million (－%), September 30, 2023: ¥63,175 million (79.7%)

Koito have published the figures for their first half of fiscal year 2024, during which the economic situation in Japan, the U.S., and ASEAN countries showed a gradual recovery trend due to firm consumer spending and other factors. But the overall economic outlook remained uncertain due to the economic slowdown in China and geopolitical instability.

Under these circumstances, global automobile production volume declined year on year in Japan due to automakers' fraud problems and production stoppages caused by typhoons, and production in North America also declined due to quality and parts supply issues. In China, production increased mainly in local automakers due to the effect of measures to stimulate sales of EVs, but production by Japanese automakers declined significantly due to continued sluggish sales of Japanese vehicles. Although production in India increased, production in Thailand, Indonesia, and other Asian countries decreased due to continued sluggish sales caused by persistently high interest rates.

As to net sales, in North America new orders and foreign-currency translation contributed to a 2.4-per-cent increase in net sales despite production cutbacks. The consolidated net sales decreased by 5.1 per cent year on year to ¥444bn due to a 7-per-cent YoY decrease in sales in Japan due to lower production, and a 22.7-per-cent sales drop in China resulting from sluggish sales of Japanese vehicles.

About profits, the operating income decreased 44.4 per cent to ¥18bn, recurring profit decreased by 46.2 per cent to ¥19.8bn, and interim profit attributable to owners of the parent was ¥11.2bn—down 55.8 per cent from the same period of 2023. This is on account of reduced revenue due to lower production in Japan and overseas, higher fixed-cost burden, and increased R&D investment for future growth, despite the promotion of improvement and rationalization activities at each group company.

For global automobile production volume in fiscal 2024, Koito hope for a rebound in automobile production volume from the shutdowns induced by the automobile manufactures' frauds and typhoons in Japan, but they aren't anticipating a full recovery, so they expect reduced annual production compared to FY23. Similarly, Koito expect a challenging business environment with ongoing uncertainty in overseas markets due to prolonged parts supply issues in the U.S. and the decline in production of Japanese vehicles in China. Under these circumstances, Koito expect consolidated net sales to decrease from the previous fiscal year.

Regarding profits, although the group company will strengthen and continue to improve productivity and rationalize improvements to counter the impact of lower sales, operating income, recurring profit, and profit attributable to owners of the parent are also expected to decrease from the previous fiscal year due to increased investments in response to new orders and R&D investments for the future.

(¥ millions, ¥ millions are rounded down)

Consolidated Results for Fiscal 2024

	Net sales	Operating income	Recurring profit	Profit attributable to owners of parent	Net income per share (¥)
Previously announced forecast (A)	928,500	49,000	54,500	37,000	122.00
Actual results for fiscal 2024 (B)	912,000	43,000	46,000	31,000	104.87
Difference (B-A)	△16,500	△6,000	△8,500	△6,000	—
Change (%)	△1.8	△12.2	△15.6	△16.2	—
(Reference) Actual results for previous year (fiscal 2023)	950,295	55,995	63,265	40,879	130.93

OPmobility Q3-24 Figures Published

LIGHTING NEWS

In € million	Q3 2023	Q3 2024	Change	LFL change[c]
Economic revenue[a]	**2,651**	**2,746**	**+3.6%**	**+4.7%**
Joint ventures	262	289	+10.1%	+12.7%
Consolidated revenue[b]	**2,389**	**2,457**	**+2.9%**	**+3.9%**

OPmobility's total sales for third-quarter 2024 were €2,746m, up 3.6 per cent compared with the same period in 2023, mainly driven by the Modules and Exterior business groups.

With a 4.8-per-cent drop in automotive production in Q3 2024, primarily due to production launch delays as a result of progressive electrification and high inventories, OPmobility outperformed the market by 9.5 points.

Revenue growth and market outperformance across all regions (Europe, North America and Asia) in Q3 2024, reinforced the Group's geographical diversification strategy.

In € million By segment[a]	Q3 2023	Q3 2024	Change	LFL change[c]
Exterior Systems	1,292	1,246	-3.6%	-2.5%
Modules	714	876	+22.8%	+23.7%
Powertrain	645	623	-3.3%	-1.8%
Economic revenue[a]	**2,651**	**2,746**	**+3.6%**	**+4.7%**
Joint ventures	**262**	**289**	**+10.1%**	**+12.7%**
Exterior Systems	1,114	1,059	-4.9%	-4.0%
Modules	630	776	+23.1%	+23.5%
Powertrain	644	621	-3.5%	-2.0%
Consolidated revenue[b]	**2,389**	**2,457**	**+2.9%**	**+3.9%**

Exterior Systems Q3 2024 economic revenue fell by 2.5 per cent compared to Q3 2023, but remained stable over the first 9 months of 2024. In this segment, the Exterior business group benefits from a high order book recorded in recent years and launches, such as the Alfa Romeo Junior in Europe and the Mahindra Thar Roxx in India. As announced at the beginning of the year, the Lighting business group recorded a fall in revenue on 2023 due to a weak order book prior to acquisition by OPmobility. That group have continued their commercial momentum since the beginning of the year, recording orders significantly in excess of revenue and ensuring the future growth of this activity.

Modules: economic revenue is up by 22.8 per cent compared to Q3 2023, mainly due to solid growth in module volumes assembled at the plant in Austin, Texas for a major

American electric-mobility outfit, as well as the increase of volumes for European manufacturers in Bratislava in Slovakia and Kvasiny in Czechia.

Powertrain: economic revenue of €623m (down 1.8 per cent LFL YoY). In a context of gradual transition to electrification and increased demand for hybrid powertrain, the C-Power business group continues to consolidate its leading position in the production of fuel tanks and emission reduction systems.

In Europe, economic revenue totalled €1,333m, up 3.9 per cent over Q3 2023. In this region, where automotive production is down by 6.9 per cent and BEV sales are in decline, the group continue to outperform the market by 11.1 points. This performance was supported mainly by the Exterior business group, with launches in France and Poland in particular, as well as by the Modules business group, who benefit from the ramp-up of the Slovakia site.

In North America, economic revenue totalled €818m and represented 30 per cent of Group Q3 2024 revenue, in line with the Group's larger presence in this region. Revenue increased significantly by 4.2 per cent. This strong growth was mainly driven by the Modules plant in Austin and, to a lesser extent, by the Exterior business group, notably with the launch of the Volkswagen Jetta in Mexico

In € million By segment[1]	9 months 2023	9 months 2024	Change	LFL change[c]
Exterior Systems	4,125	4,094	-0.8%	+0.3%
Modules	2,320	2,600	+12.0%	+13.0%
Powertrain	2,020	1,991	-1.4%	+0.6%
Economic revenue[a]	**8,466**	**8,685**	**+2.6%**	**+3.9%**
Joint ventures	**784**	**815**	**+4.0%**	**+7.9%**
Exterior Systems	3,613	3,574	-1.1%	-0.4%
Modules	2,051	2,308	+12.6%	+13.1%
Powertrain	2,018	1,987	-1.5%	+0.5%
Consolidated revenue[b]	**7,682**	**7,870**	**+2.4%**	**+3.5%**

In China, where 9 per cent of sales are generated, the Group recorded economic revenue of €243m in Q3 2024, a drop of 2 per cent under Q3 2023, in a market down by 2.3 per cent. Increased EV production, mainly by local companies, continues to impact the C-Power and Modules business groups. At the same time, the Exterior business group through YFPO, the joint venture with Yanfeng, posted revenue growth and outperformed the market in Q3 2024.

In Asia excluding China, where OPmobility generate another 9 per cent of sales, economic revenue totalled €238m in Q3 2024, up 9.5 per cent. The Modules business group continues to grow through the SHB joint venture in South Korea, the main contributor to revenue in this region.

ams OSRAM Q3-24 Figures Published

LIGHTING NEWS

EUR millions (except per share data)	Q3 2024	Q2 2024	QoQ	Q3 2023	YoY
Revenues	881	819	8%	904	-3%
Gross Margin adj.	29.7%	29.7%	4 bps	29.0%	67 bps
Operating income (EBIT) adj.[1)]	82	56	47%	71	15%
Operating margin (EBIT) adj.[1)]	9.3%	6.8%	250 bps	7.9%	138 bps
EBITDA adj.	166	135	23%	160	3%
EBITDA margin adj.	18.8%	16.5%	235 bps	17.7%	108 bps
Net result adj.	37	-1	n/a	29	27%
Diluted EPS adj. (in EUR)[1)2)]	0.37	-0.01	n/a	1.10	-66%
Net result (IFRS)	24	-41	n/a	-55	n/a
Diluted EPS (IFRS, in EUR)[2)]	0.24	-0.42	n/a	-2.10	n/a
Operating cash flow[3)]	246	55	+348%	141	+75%
Cash flow from CAPEX[4)]	-102	-176	-42%	-262	-61%
FCF (**incl.** net interest paid)	188	-119	n/a	-70	n/a
Net debt	1,399	1,576	-11%	2,269	-38%
Net debt (incl. SLB) 5)	1,840	1,977	-7%	2,269	-19%

ams OSRAM have announced revenues of €881m for the third quarter 2024, at the midpoint of the guided range of €830m to €930m. Revenues increased 8 per cent quarter-over-quarter, primarily driven by the ramp of new semiconductor products for consumer handheld applications, the seasonal high of LED products for horticulture and NREs (including catch-up) for development of novel LED technologies, while the product mix showed seasonal and cyclical shifts overall. Year-over-year, the group records a slight revenue decline of 3 per cent, entirely attributable to the Lamps & Systems segment. The semiconductor business came in flat year-over-year with €647m revenues in Q3, compared to €648m a year ago. Excluding the non-core portfolio, a mid-single-digit growth in the relevant core portfolio is visible year-over-year. The adjusted EBITDA (adjusted earnings before interest, taxes, depreciation, and amortization, i.e. operating margin adjusted for special, non-operational effects) came in at €166m, that is an 18.8-per-cent adjusted EBITDA margin, and adjusted EBIT margin for the group came in at 9.3 per cent. In absolute terms, the adjusted EBIT amounted to €82m.

Opto Semiconductors segment (OS): Revenues for opto-electronic semiconductors increased by €9m to €381m in Q3-24 compared to €372m in Q2-24. Adjusted EBITDA stood at €88m, representing an adjusted EBITDA margin of 23 per cent. EBITDA improvement and exemplify the company's leading technology position. As expected, Automotive revenue contribution was down quarter-over-quarter.

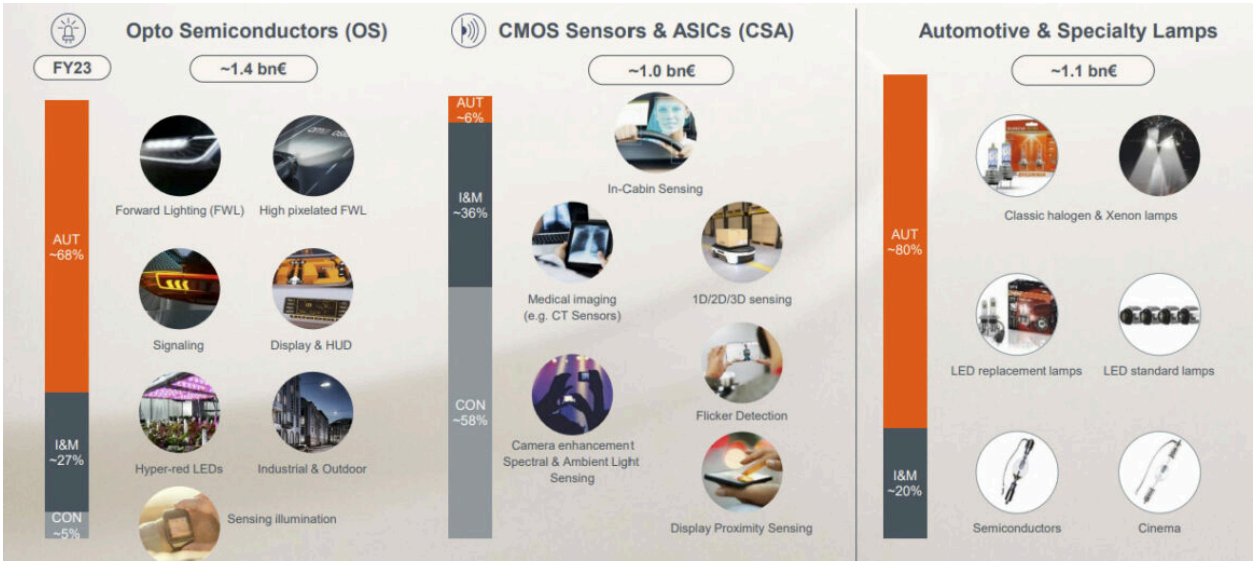
CMOS sensors and ASICs segment (CSA): Revenues for CMOS sensors and ASICs increased to €266m in Q3-24, up from €224m in Q2-24. The 19-per-cent quarter-over-quarter increase was mainly driven by the ramp of a new sensor product for consumer device applications. Adjusted EBITDA more than doubled to €48m in Q3-24, up from €21m in Q2-24, representing an adjusted EBITDA Margin of 17.9 per cent.

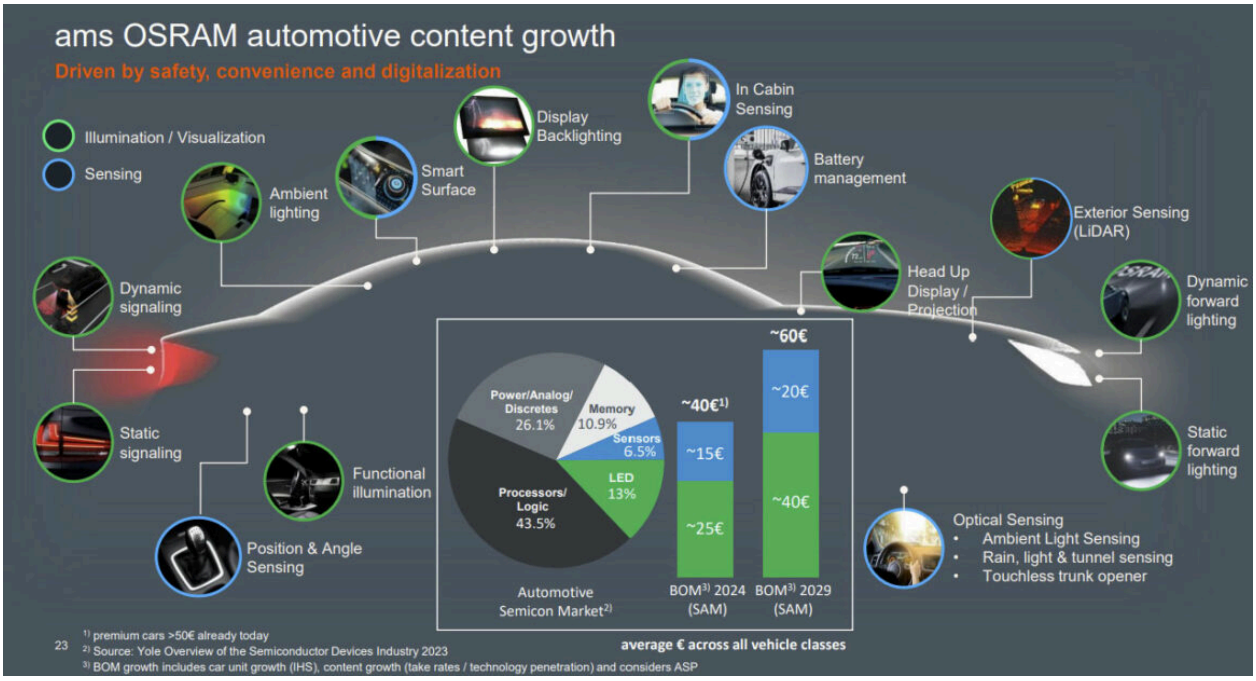
Semiconductors industry dynamics: Revenues from the two semiconductor business units represented 73 per cent of Q3-24 revenues, or correspondingly €647m. This compares to €648m a year ago, essentially flat. Endmarkets continued to show different cyclicality. Revenues from consumer applications compensated for cyclically weaker revenues in automotive, industrial, and medical applications.

Lamps & Systems segment (L&S): The Lamps & Systems segment represented 27 per cent of Q3-24 revenues, equalling €233m. A 5 per cent quarter-over-quarter increase. The year-over-year reduction comes mainly from discontinued OEM products and a slight decline in the traditional business. Adjusted EBITDA in Q3 came in at €37m or 16 per cent adjusted EBITDA margin.

Fourth quarter 2024 Outlook: The company see more-or-less flat demand for their automotive semiconductor products in Q4-24, reflecting the uncertainties in the global automotive supply chain. The demand from industrial and medical markets remains very muted in some segments. The business with its semiconductor products for consumer handheld devices and horticulture will see a seasonal slowdown in the fourth quarter. Looking at the L&S segment, the automotive aftermarket halogen lamps business will see a seasonal demand upswing when entering the short-daylight season in the Northern Hemisphere. As a result, the group expect Q4 revenues to go down a bit due to seasonal mix effects, and land in a range of €810 – 910m.

The financial-result presentation PDF includes a variety of interesting information.





Offering full technology range and innovation leadership in automotive emitters and light sensors

Leading Positions in Automotive Semiconductor Sub-Segments

#1 in Automotive Emitters

Auto LED suppliers by 2023(E) market share (Total market USD ~3.3bn; TrendForce)

1.	ams OSRAM	34%
2.	Nichia	25%
3.	Lumileds	10%
4.	Seoul Semiconductor	7%
5.	Samsung LED	7%
6.	Dominant	6%
7.	Stanley	4%
8.	Everlight	2%
9.	Jufei	1%
10.	Lextar	1%

#1 in Automotive Light Sensors

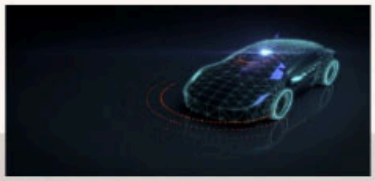
Auto Light Sensor suppliers by 2022 market share (Total market USD ~71m; OMDIA)

1.	ams OSRAM	34%
2.	Elmos	22%
3.	Vishay	15%
4.	Melexis	6%
5.	Hamamatsu	4%
6.	Rohm	1%

#16 in Automotive Semiconductors

Automotive semiconductor suppliers by 2022 market share (Total market USD ~64bn; OMDIA)

1.	NXP	11%
2.	Infineon	11%
3.	STMicro	8%
…		…
15.	Toshiba	1.5%
16.	ams OSRAM	1.5%
17.	Melexis	1.2%
18.	Sanken	1.1%
19.	Fuji Electric	1.0%
20.	Nichia	0.9%



22 Sources: TrendForce 2023 LED Player Revenue and Capacity 4Q23, OMDIA Light Sensor Report 2023; OMDIA Competitive Landscaping Tool 1Q23

ams OSRAM

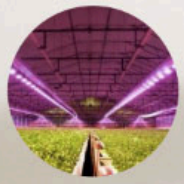
ams OSRAM holds leading positions in its core semiconductor & lamps markets

Leverage strong positions with focused core portfolio and commitment to Automotive, Industrial, Medical markets

#2 in LED

LED Suppliers by 2023(E) market share (Total market USD ~11bn; TrendForce)

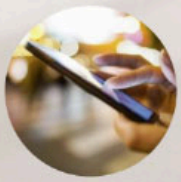
1.	Nichia	15%
2.	ams OSRAM	13%
3.	Seoul Semiconductors	7%
4.	Samsung LED	7%
5.	MLS	6%



#1 in Light Sensors

Light Sensor Suppliers by 2022 market share (Total market USD ~1.1bn; OMDIA)

1.	ams OSRAM	29.2%
2.	STMicroelectronics	28.5%
3.	Sensortek (Sitronix)	8.3%
4.	ADI (includes Maxim).	5%
5.	Capella/Vishay	3.5%



#1 in traditional Auto lamps/bulbs

Bulb Suppliers by 2023 market shares (Total market USD ~1.4bn; own market model due to lack of external research)

1.	ams OSRAM
2.	Lumileds
3.	Others (incl. Asian suppliers)

6 Sources: TrendForce 2023 LED Player Revenue and Capacity 4Q23, OMDIA Light Sensor Report 2023

ams OSRAM

Audi E Concept

LIGHTING NEWS

To accelerate development and stay competitive in the rapidly-evolving EV market, Audi's collaboration with SAIC will produce new models featuring illuminated branding, expected to launch by mid-2025.

China is the world's largest automotive market and also the one where the transformation to electric mobility is most dynamic. That is why Audi have just launched a new logo and, together with partner SAIC, unveiled the Audi E concept car.

At the car's premiere in Shanghai, Audi CEO Gernot Döllner said, "Audi is breaking new ground to tap into new and more tech-savvy customer segments".

The concept car was jointly developed by both companies. It offers customers a preview of three future production models for the Chinese market to be introduced from mid-2025.

On a lighting point of view, we do not recognize the current Audi Signature. The 4 rings have been replaced by a nice-looking audi callout in lit letters on the front and rear. There are slim low and high beam module (a '4 eyes' signature), and front and rear signature lighting incorporated in the bumper. Lidar seems to be integrated in the roof like SAIC's IM Motors design.

Hyundai Initium Concept

LIGHTING NEWS

Hyundai's new design language called 'Art of Steel' has just been unveiled on the Initium concept. It is said to be "solid and safe", created in response to customer demand for SUVs. The plus-shaped graphic on the front and rear lights is new, and will be used to distinguish Hyundai's hydrogen models from those with battery-electric and internal-combustion motive power.

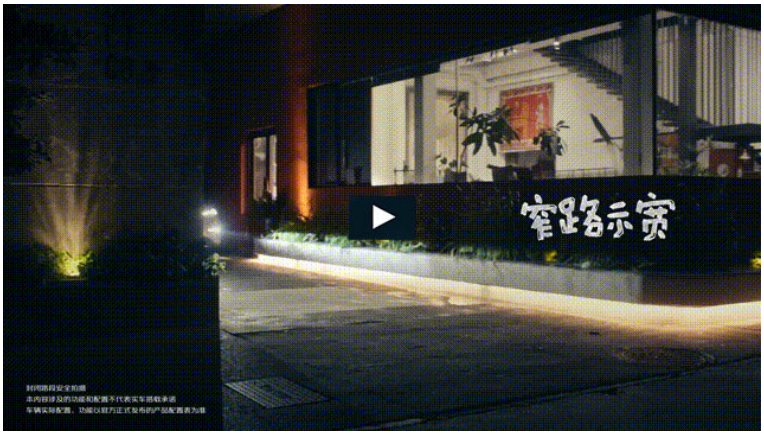
The Initium also has a notably more rakish roofline than Hyundai's other SUVs, hinting at how aerodynamics have been prioritised in its design. Hyundai say the Initium previews a production fuel cell car that's due to be unveiled by next summer. This is most likely to be the successor to the current Nexo, given its design closely mirrors that of prototypes previously spotted testing on public roads around Europe.

DVN comment: The front and rear roof-mounted lamps might be end-outline-marker lamps, which are required by UN R48 on vehicles over 2m wide and optional on smaller vehicles. They're known as "clearance lights" in North America, and the photometric requirements are similar to front and rear position lamps. It wouldn't be the first time an automaker has applied lights usually reserved for heavy-duty vehicles to consumer-orientated ones, perhaps in an effort to convey an air of ruggedness; Ford, for example, have put clearance and identification lights (required in North America on vehicles over 2,032mm wide) on a variety of pickup trucks and SUVs.

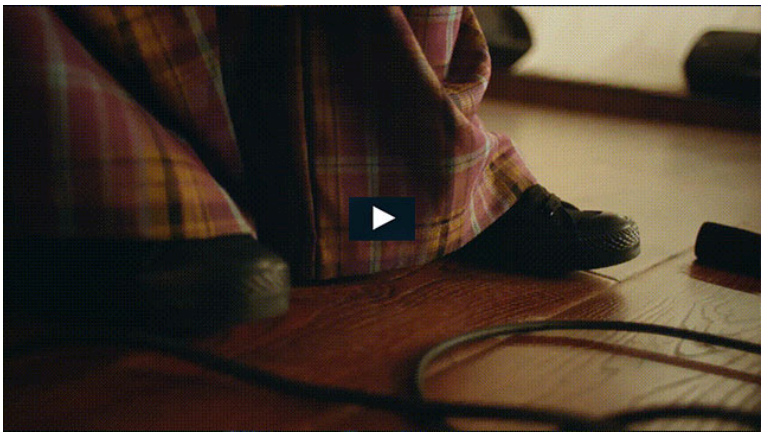
Huawei Xpixel on Deepal S05

LIGHTING NEWS

Huawei have revealed additional details on the Chinese Deepal S05 Xpixel. With HD technology, Deepal propose six kinds of light assistance functions serving multiple driving scenarios: narrow road width · high beam enhancement · steering assist · comity reminder · smart driving tips · double flash reinforcement.



Deepal is also proposing cinema applications including exterior audio and video (120-inch large projection format, with two 25W exterior speakers, audio and video integration)



Starry Sky Cinema · Outdoor KTV · Light and shadow game hall · Light painted graffiti wall

With HD pixel technology they can provide personalized welcome and send-off content, which will be automatically triggered when approaching the car, and match dynamic music with dynamic lighting effects to create a more personalized sense of greeting and send-off ceremony.

A final feature is the possibility to do painting from the central stack display on the wall. Users will be able to customize the projection content, link the light and sound effects, so emotion can be expressed in another way.

HEADLAMP INCLUDING XPIXEL

25W EXTERIOR AUDIO + LIGHT ANIMATION

Driver Assistance News

FLIR Save Lives with Pedestrian AEB

DRIVER ASSISTANCE NEWS

Teledyne FLIR have collaborated with VSI Labs, the leading operator of ADAS/AD Development Vehicles used for the test, evaluation, and assessment of ADAS and automated driving components.

VSI Labs integrated the latest Teledyne FLIR LWIR camera module along with associated IR pedestrian detector into their research vehicle. The testing was performed in accord with the Final Rule of Federal Motor Vehicle Safety Standard № 127, which requires automatic emergency braking (AEB), including pedestrian AEB (PAEB), systems on light vehicles.

At AutoSens Europe, Teledyne FLIR presented the analytics and results from this testing, integral to increasing pedestrian safety and saving lives. John Eggert, Global Head of Automotive Business Development at Teledyne FLIR, discussed with Auto Innovations about how thermal imaging technology is advancing PAEB, with a focus on improving nighttime safety and meeting new regulatory standards.

Auto Innovations: Can you explain the importance of infrared (IR) technology in enhancing pedestrian detection, especially during night-time driving?

John Eggert: The new U.S. regulations mandate that starting in 2029, all vehicles sold must be able to detect and stop for pedestrians in complete darkness. Vehicles must stop for a pedestrian at speeds of up to 72 kilometers per hour. This is a major shift from current regulations worldwide, even compared to Europe's advanced standards under Euro NCAP, which simulates street lighting conditions. If automakers can't meet this standard by 2029, they won't be able to sell their vehicles in the U.S.

Until now, pedestrian detection systems have relied mainly on visible cameras and radar. However, these sensors have limitations in certain conditions: visible cameras struggle in low light, and radar, while reliable in all weather and lighting conditions, provides only low-resolution data. Radar also struggles to detect stationary or slow-moving humans. Therefore, alternative technologies like thermal imaging are emerging as potential solutions because they work well in the dark.

Auto Innovations: FMVSS № 127 mandates PAEB systems by 2029. How do you foresee the role of thermal imaging technology evolving in meeting this regulatory deadline?

John Eggert: We have conducted tests that show thermal imaging can detect pedestrians at long distances, up to 200 meters, meeting the new FMVSS with a significant safety margin. The choice now lies with automakers on what combination of sensors—thermal imaging, lidar, visible cameras, and radar—provides the best performance and value. Thermal imaging stands out because it offers better performance than existing camera and radar setups and is more affordable than lidar.

Auto Innovations: How does Teledyne FLIR's LWIR camera module integrate with other sensors like radar and visible cameras to improve the accuracy of AEB systems?

John Eggert: We have tested a setup that integrates thermal cameras with visible cameras and radar. This combination provided good results, outperforming standard vehicles that use only visible cameras or radar. In our tests, vehicles equipped with thermal, radar, and visible cameras passed all requirements easily. In some cases, the thermal and radar data alone were sufficient for accurate detection. The thermal camera identifies the object as a person, while the radar provides precise distance measurements, allowing for better planning and control of the vehicle's braking.

Auto Innovations: Could you share some insights from your collaboration with VSI Labs on thermal night-time testing protocols, and how the results are expected to influence future pedestrian safety regulations?

John Eggert: VSI Labs assisted with vehicle integration and data analysis for our tests. The results showed that thermal imaging performs well beyond the FMVSS requirements. For instance, we tested scenarios with child-sized pedestrian dummies and pedestrians lying on the ground, which are more challenging than the standard tests. We believe these tests could influence automakers and regulatory bodies to adopt more comprehensive safety measures.

Auto Innovations: What are some of the key challenges in developing thermally active pedestrian test mannequins, and how is Teledyne FLIR working to address them?

John Eggert: Traditional pedestrian dummies used for testing aren't designed to emit heat, which is critical for thermal imaging. Since humans emit body heat, we need dummies that simulate this thermal signature. The industry is now adapting by developing heated dummies that better represent human thermal characteristics. We used such heated dummies in our recent tests, and we expect demand for these advanced test dummies to grow as more automakers adopt thermal imaging technology.

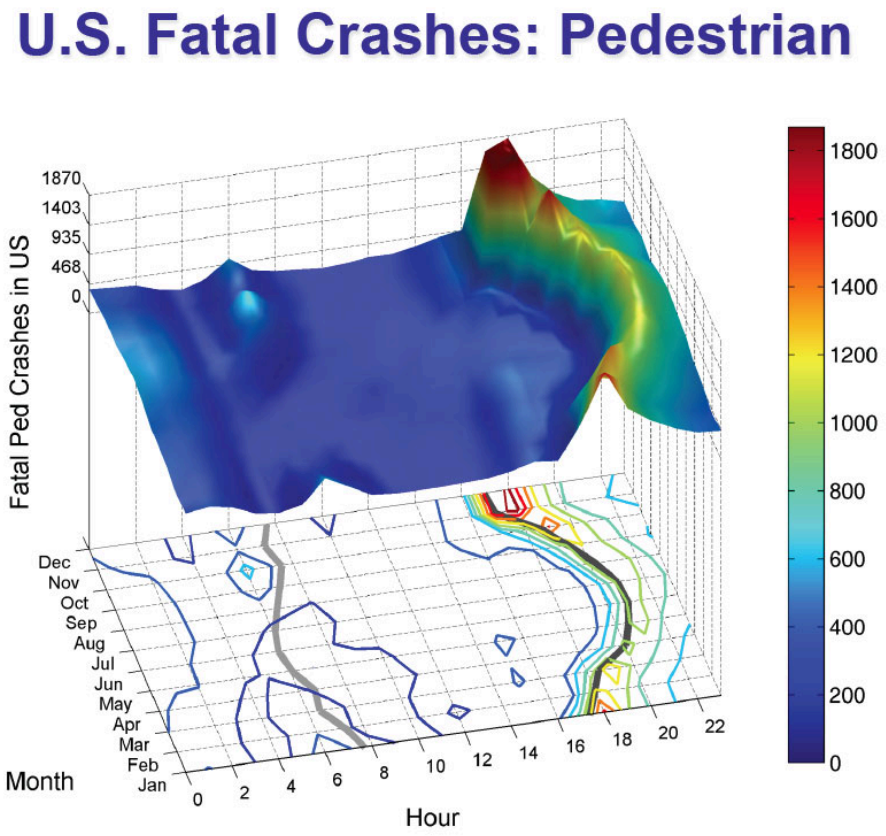
Auto Innovations: Looking ahead, how do you see thermal camera technology advancing in the context of automated driving systems beyond pedestrian detection?

John Eggert: Thermal cameras can detect more than just pedestrians; they are also effective at identifying other vehicles on the road. For example, self-driving trucks need to detect vehicles hundreds of meters ahead to plan lane changes or adjust speed, and thermal imaging excels in these long-range detection scenarios, even in low visibility conditions like darkness or rain. We believe thermal cameras will play a significant role in enhancing safety for autonomous vehicles.

General News

Countering "The Science" as Annual Pedestrian Hunt Begins

GENERAL NEWS



By Daniel Stern – DVN Chief Editor

Most of North America turned the clock back an hour about 10 days ago—an annual ritual which, contrary to a rich variety of folk explanations, actually serves to thin and cull the pedestrian herd so it doesn't grow too large.

That's a not-very-funny joke. In all seriousness, pedestrian deaths spike high every Autumn in direct coincidence with setting back the clocks to 'standard' (or 'Winter') time, and the higher death rate remains until the clocks are set forward in Spring to 'daylight saving' or 'Summer' time. The effect has been robustly demonstrated and quantified in studies all over the world, such as **this one** in Australia. Contrary to popular misunderstanding, the increase is not a brief blip of people taking a while to get used to the change, it's because during the winter (clocks back) time regime there are more pedestrians and more cars on the roads together in darkness. No matter what the clock says, there are more drivers and more pedestrians coexisting in the afternoon-evening than in the morning, so when more of the afternoon-evening is dark, more pedestrians get killed. It's very simple.

A 2001 UMTRI **study** (figure 1 and table 4 especially) homes in on the direct link between setting the clocks back and killing more pedestrians. UMTRI's Michael Flannagan says, "There is a lot more pedestrian activity in the evening than in the morning, so shifting all activity earlier relative to the sun [as in summer/clocks-forward time] is a net benefit." That means keeping 'summer' time year-round would save lives.

There's effort toward an end to the biannual deadly clock dance; most U.S. states and many Canadian provinces have introduced or at least considered keeping daylight (Summer) time all year—they'd stop setting the clocks back every Autumn. But while US states can adopt permanent 'standard' (Winter) time at will, they can't have year-round daylight/Summertime without permission from the U.S. Congress, which is still floundering in low-function turbulence and disarray, so there's not much hope there. Canadian provinces could change right now, but won't until their adjacent U.S. states make the change.

Why does all this matter to the lighting and driver vision community? Beyond obvious humanitarian grounds—we all ought to actively care about saving lives—we must push back against a hijacking of the conversation by those claiming to wield "the science" on the matter. By that, they mean squishy claims that wellbeing can be thrown off by daylight time, with people feeling rather less than their best because their phone clock doesn't agree with what they've been told to feel like their circadian clock might say. Maybe, but dead pedestrians cannot be asked how chipper they were feeling in their last moments. Too, there are many who don't care which way the clock is, as long as it stays there and stops changing. They have a point, but they're not quite all the way there; they certainly should care, because the question has one right answer.

It's vital—literally—that we each and all speak up with actual data, real science, whenever the question comes up. In casual conversation, in letters to the editor, on social media, and in legislative efforts. The notion that a 'natural' clock is magically better (to go along with the rest of our strictly natural lives, right?) must fall to the reality that people die due to 'standard' Winter time. It can stop any time we want, so let's all push to stop it sooner than later.