Tue, 9 July 2024
Weekly Newsletter

DVN Lighting

NEWSLETTER #863



# Editorial

## Doing Our Part: Sustainability & C02 Footprint Reduction


Sustainability and $CO_2$ footprint reduction are major topics throughout industry and society, and they aren't going away. Younger generations, urgently active on these matters, widely see older generations as having made a horrendous mess which stands to render Earth uninhabitable, and so everyone must do their part to ameliorate the problem.

In the automotive sector, action has started with BEV development and application of sustainable materials. Across wide swathes of consumer industry, new rules are coming—like the Right to Repair legislation from the European Commission, aimed at stopping corporations making their products technically or legally unfixable by the end user or their choice of repairer.

Everyone is part of the problem, so everyone must be part of the solution—including those of us here in the vehicle lighting community. We must embrace a change of

mindset. When we think about $CO_2$ footprint, we think about recycled materials and reduced power consumption as the main contributors. Those factors are relatively easy to tackle; tier-2s are identified, solutions are known, this is manageable by R&D teams at the automaker level, and OEMs can put pressure on their suppliers.

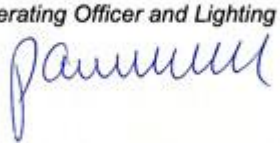
But zooming out for a broader look, the circular economy is complex and difficult to set up. It stands to disrupt the entire automotive value chain, over the complete life cycle of every product, and requires a complex ecosystem which is developing, but does not yet fully exist—and this has to happen *fast*.

There are positive signs that things are moving in the right direction. In this week's DVNewsletter, for example, you'll find coverage of an interesting initiative from GM with Llink to rebuild collision-damaged headlamps. And Valeo participated in the Remade Circular Economy Tech Summit last month in Washington, DC, to talk about headlamps in the circular economy. Founded in 2017, the Remade Institute is a public-private partnership established and funded in part by the U.S. Department of Energy's Office of Advanced Materials and Manufacturing Technologies. Remade is the only national institute focused entirely on developing innovative technologies to accelerate the U.S transition to a circular economy.

I have decided to summarize my understanding of Valeo's presentation, including additional information I collected during our DVN Munich sustainability session; ISAL 2023, and the recent DVN Detroit event (with presentation from L1 earth, Volvo Cars, and Covestro).

Sincerely yours,

**Paul-Henri Matha**
*DVN Chief Operating Officer and Lighting General Editor*

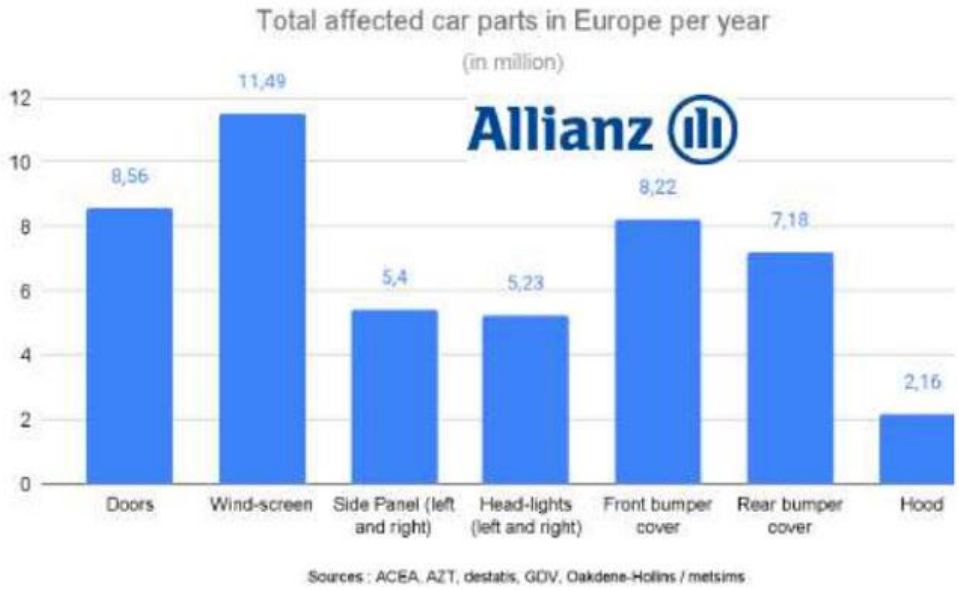


# In Depth Lighting Technology

## Circular Economy: Stakes for Lighting Ecosystem

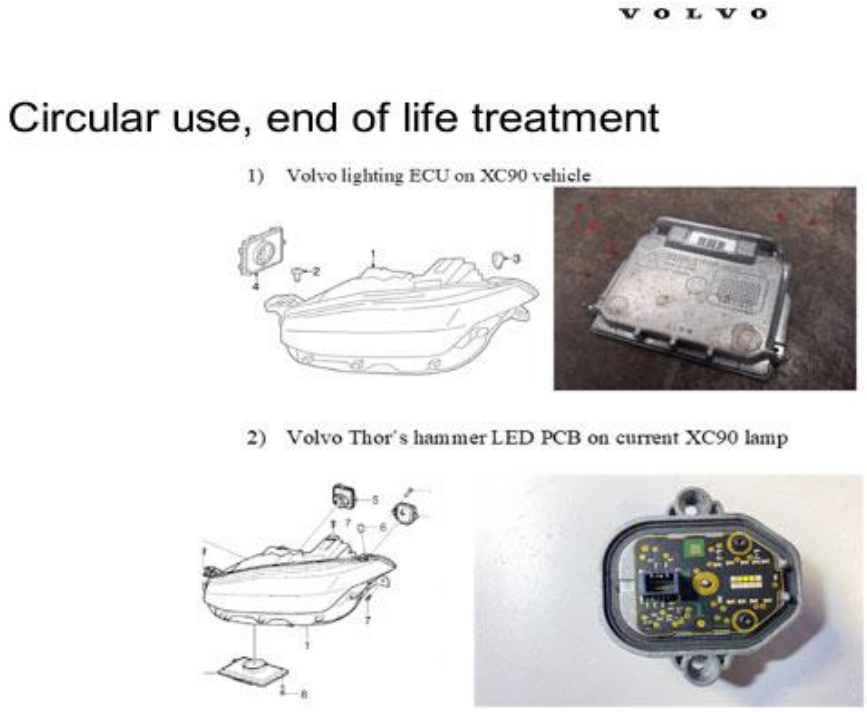

Valeo presented a lecture last month at the Remade Circular Economy Tech Summit and Conference in Washington, DC.

The circular economy is emerging as a most promising approach for the automotive industry to reduce resource consumption, and is one of the key pillars of Valeo's 4R strategy—Robust Design, Repair, Remanufacturing, Recycle/d.



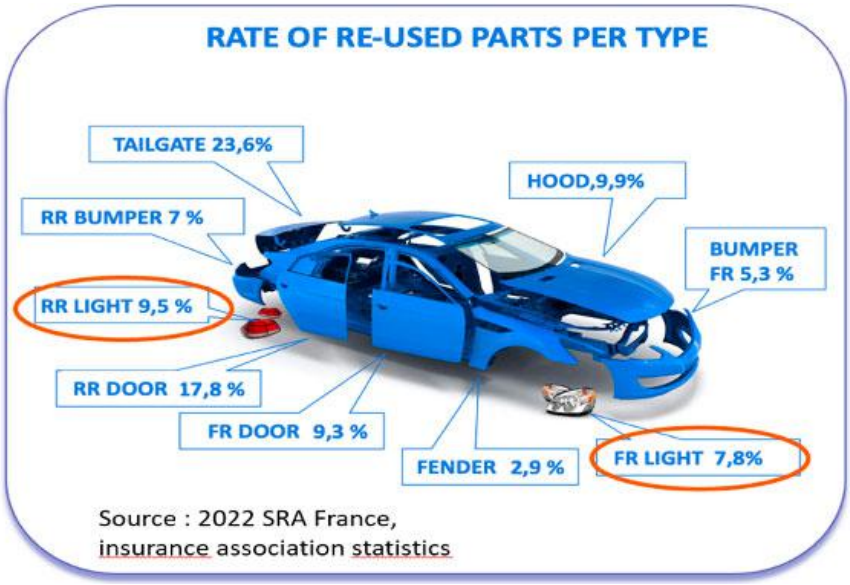

Valeo consider that headlamps must be designed to be integrated into the circular economy. Headlamps are often damaged—5.3 million headlamps are changed per year in Europe due to accidents—and they are becoming more and more expensive

with product LEDification, ADB, and other new features. From €300 to more than €2,000 nowadays.
Insurance companies are pushing automakers to offer repairable products, which is not really the case today.
During IFAL 2022, Volvo Cars presented some lamp concepts on the market with exchangeable components like ECUs or PCB units. These solutions exist, but this is not always the case, and actually we could go further with optimizing design for exchanging internal subcomponents as well.




Graphic from Volvo Cars IFAL 2022 presentation

During the DVN Munich event, L1 Earth founder Sebastien Samuel presented figures about the reuse of the lamp as a possible solution. Lighting is one of the most important components that can be reused on a car; 10 per cent of lamps are replaced with used ones, according to SRA France. This is possible when you have no software connection between the vehicle and the lamp. If there is a software connection, there can be issues with car configuration compatibility. This could be addressed on new vehicle models with CAN / LIN lamp interfaces, versus previous vehicles with hardwired interface.




L1 Earth graphic from DVN Munich 2024

Reused parts are an interesting solution, but they may be imperfect, and they generally come with little or no warranty.

Another idea is to disassemble the lamp and reuse some components, rather than the complete lamp.

Remanufacturing at Valeo is an industrial process in which used or damaged products called 'cores'—rebuildable components from garages after repair operations, or removed from end-of-life cars—are restored to as-new condition and function.

Ultrasonic cutting of a headlamp not optimized for dismantling

Valeo have identified which components can be recovered: levellers, PCBs, ECU drivers, lighting modules, and suchlike. In order to do so, they must be removable from the lamp with a dismantling operation. The headlamp's gluing process makes disassembly difficult, requiring cutting, melting, and softening operations. This is time consuming, and there is a very high risk of damage to internal components.

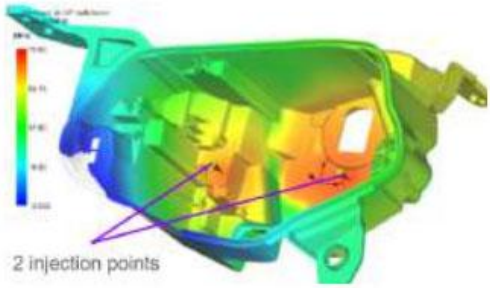
After disassembly, Valeo have a validation plan with test procedure to restore a lamp to as-new condition and function.

The best solution for the next generation of headlamp is to completely rethink the design of the lamp, to make it easy to:

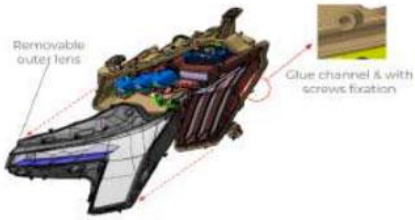
- repair the lamp
- reuse some components
- reduce the weight of the lamp (weight optimization with advanced moldflow analysis)
- use more recycled material or bio-source materials
- reduce the power consumption during usage

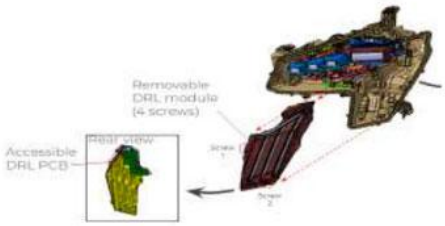
A main focus has always been the weight reduction and the use of recycled raw materials. Target value is 25 per cent recycled or bio-source materials for forthcoming vehicles.

Valeo have also shown examples to reduce weight, like minimizing overlapping area between two material layers for outer lens, or reducing housing thickness by increasing the injection point number and reducing cycle time. These strategies allow Valeo to reduce lens and housing weight by 15 per cent.

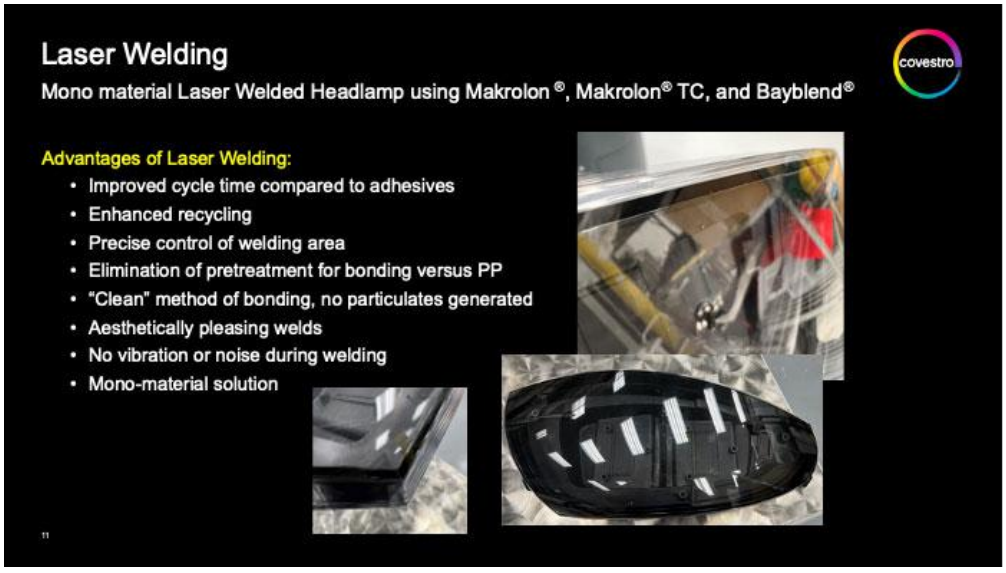

Effort must be made to facilitate disassembly for repair and reuse: replacing glue by dismantlable seals, clips, and screws.




These solutions are not new, they already exist in Japan—as presented at ISAL and CES.

During DVN Detroit 2024, Covestro showed interesting and promising methods to replace glue seals by laser welding a polycarbonate outer lens to a polycarbonate housing, rather than traditional PP-TD or PP-GF housing materials. This would simplify the recyclability of the lamp itself, and may also simplify pedestrian impact management for energy absorption.




Covestro graphic from DVN Detroit presentation: Laser PC-PC welding

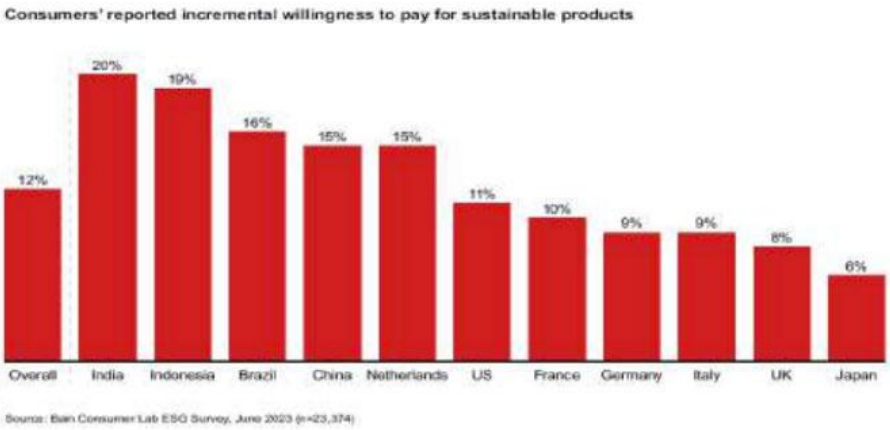
For this purpose, Valeo have defined some design rules for disassembly and recycling.


Figure 13 : Design For Disassembly


Figure 14 : Design For Recycling

Circular features are innovation and to implement all these solutions, the tier-1 supplier needs to build a premium pricing with the OEMs based on sustainable attributes of the products.

Cradle to gate $CO_2$ footprint may be reduced by 30 per cent, according to Valeo estimates. On top of that, customers seem ready to pay for a more sustainable product (+12 per cent).




Valeo estimate that economic viability can be obtained if around 167,000 headlamps can be collected of a global production of 1 million units (16.7 per cent of total production volume); that seems in line with the average headlamp replacement rate of around 2 per cent per year in France (value between 2016 and 2021).

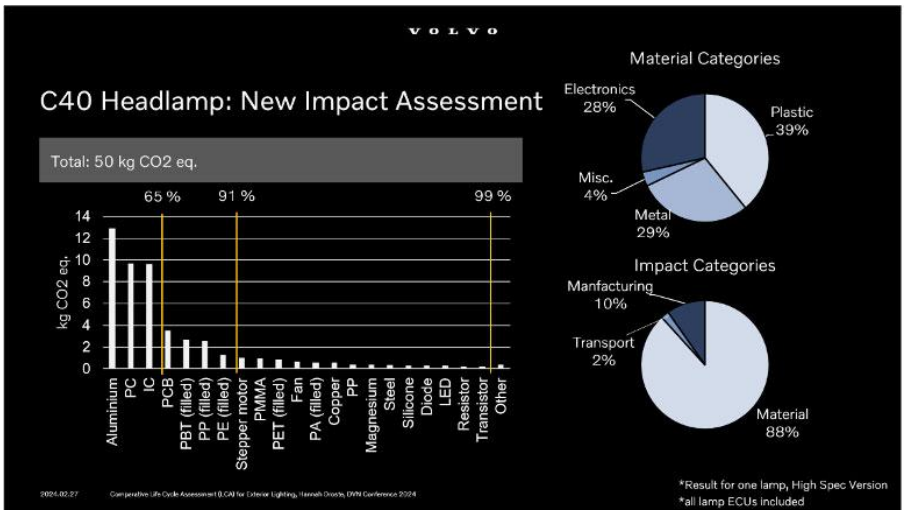
So, Valeo are showcasing ideas and concepts to develop a circular economy for headlamps. We should support all these sorts of initiatives, including creation of new standards and ways of dismantling; development of the needed ecosystem to collect used lamps after vehicle disassembly or repair, and all the apposite logistics.

What to do with the used component is also a question. Will we develop reconditioned lamps, like reconditioned smartphones? What sort of warranty will they have. All these questions are totally new for the vehicle lighting community.

Coöperation between industry and government is crucial for progress, including innovation, supportive policies with incentives such as tax abatement for remanufactured products, and a consumer mindset shift.

Appendix:

The circular-economy idea is only one of the pillars to reduce $CO_2$ output. Average value for a headlamp $CO_2$ during pre-use phase is around 50 Kg $CO_2$ equivalent, depending on lamp complexity, production location, etc.




Volvo Cars presentation at DVN Munich 2024, about LCA C40

However, the usage phase is and will remain the most critical part. If we consider a vehicle with usage 50,000 hours, exterior lighting power consumption around 50 Watt (DRL by day, low beam + position lamp by night), use phase represents around 600 $KgCO_2$ equivalent.

| | C40 recharge | Lamps under study |
|---|---|---|
| WLTP power consumption of the HL and RL | 63 Watts/car | 30 Watts/car |
| Energy consumed for lifetime | 1260 kWh/car | 600 kWh/car |
| Emissions of the lamps use phase by average power consumption of the lamps, considering a global electricity mix | 721 $kgCO_2eq$ | 343 $kgCO_2eq$ |
| Adding the emissions for the weight of the lamps, considering a global electricity mix | 60 $kgCO_2eq$ | 48 $kgCO_2eq$ |
| **Total** emissions of the lamps use phase, considering a global electricity mix | **780 $kgCO_2eq$** | **391 $kgCO_2eq$** |
| **% lamps use phase from the whole car's use phase emissions** | **3,3%** | **1,6%** |

Volvo Cars presentation at ISAL 2023 about LCA C40 & average power consumption vs kg $CO_2$eq emissions

Efforts of power consumption reduction including EE management (thermal loss), optical system efficiency must not be neglected. In the Valeo paper, they mentioned for the low beam and ADB module a power reduction by 50 per cent between two generations in two years. Great job, you are on the correct trend!

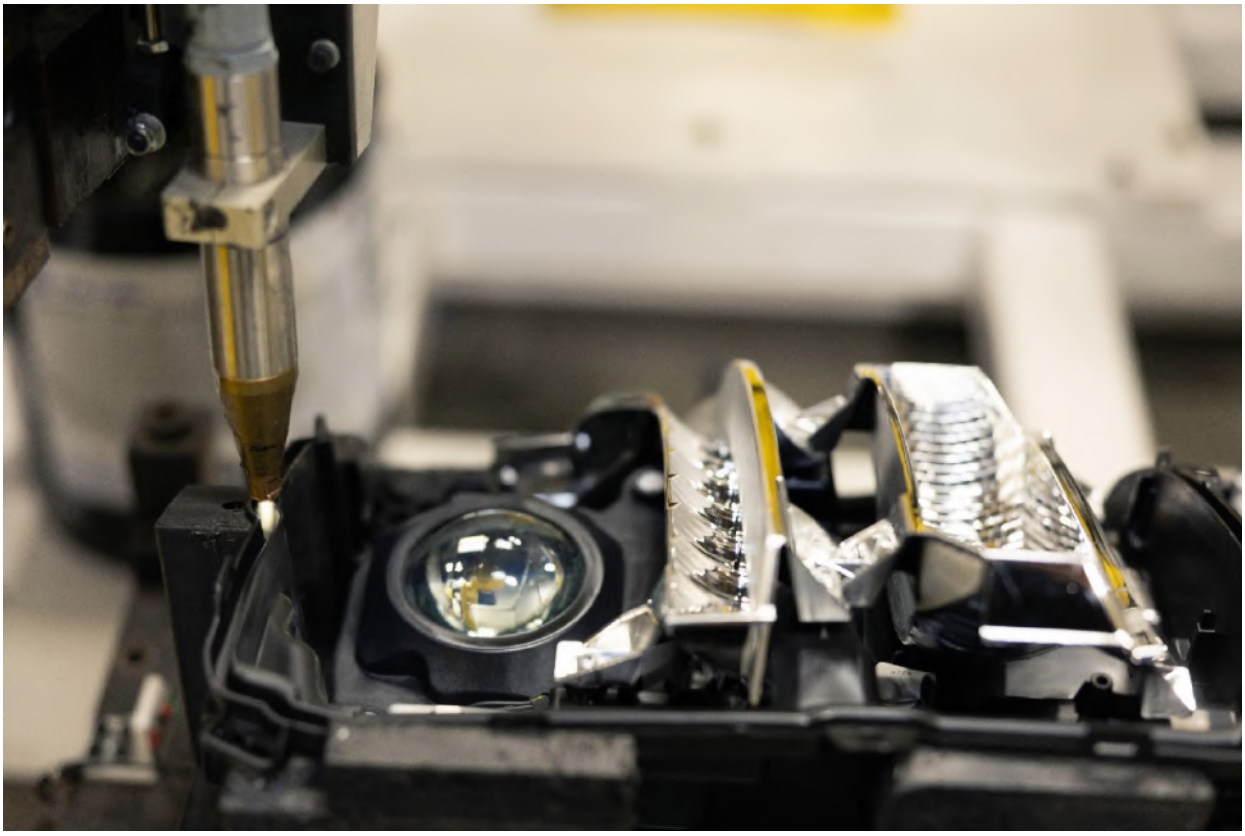
Table 2 : Specification comparison between Thinlens gen1 and Ultra Thinlens

| | Thinlens Gen1 LB | Ultra Thinlens LB | Thinlens Gen1 MxB | Ultra Thinlens MxB |
|---|---|---|---|---|
| |  |  |  |  |
| Lens height (mm) | 30 | 15 | 30 | 15 |
| Power consumption (W) | 40 | 20 | 63 | 39 |
| Maxi (Lux) | 55 | 55 | 110 - 24 segments | 110 - 20 segments |
| # Parts | 7 | 4 | 20 | 5 |
| Mass (g) | 270 | 270 | 480 | 380 |

# Lighting News

## GM Reman Headlamps Prevent Trash, Save Money

LIGHTING NEWS



A GM headlamp being rebuilt: robotic plasma treatment in prep for lens/housing adhesion

Headlamps are commonly damaged in collisions. Often the damage is minimal in context of the lamp's overall content (broken mount tabs or a cracked outer lens), generally the whole assemblies are replaced—often with cheap-imitation aftermarket parts. The driver gets inferior safety performance, fit, and durability, and many usable parts go to landfills.

Seven years ago, General Motors saw an opportunity to do better on this, and began developing a headlamp remanufacturing process with supplier Llink Technologies. Each headlamp's housing and lens are replaced with new ones, while undamaged internal components are reused—electronics, fans, LED arrays, and other suchlike—and each assembly is tested for compliance with GM's OE specifications and MVSS 108 requirements.

In 2021, the program went live. First on offer: remanufactured headlamps for the high-selling 2016-'19 Chevrolet Silverado pickup truck. The reman lamps met with great favour by end users and insurance companies alike, proving the concept, and the '16-'19 Silverado headlamps continue to sell well, along with ones for the 2018-'20 Chevrolet Equinox. The plan is to gradually expand the program to cover additional vehicles

The GM remanufactured headlamps carry a two-year GM Parts warranty, and are cost-competitive with the notoriously inferior aftermarket headlamps.

A Llink worker tests a remanufactured lamp to GM and MVSS108 requirements

GM and Llink initially meant to reclaim 25 per cent of reusable components in the headlamp, and wound up doing much better than that; GM say the program in its present form diverts 95 per cent of headlamp waste from landfills. Llink can reuse between 70 and 90 per cent of each rebuildable headlamp. The lens and housing are always replaced with new ones; the old ones along with any other unusable parts are recycled. And for an additional nudge toward circularity, the packaging foam and boxes in which the rebuildables are sent in are reused for shipping the remanufactured headlamps out.

Llink Technologies CEO Jeff Goulet says, "With the initial program launch alone, we've salvaged and repurposed headlamp components that would fill more than 100 semi-truck trailers"; he adds that up to 80 per cent less energy is consumed by remanufacturing compared to aftermarket manufacturing.

GM Global Remanufacturing manager Tod Stump says, "We set out to do something new in the industry that was good for business, and that helped drive us toward a more sustainable future. Since 2021, more than 13,000 headlamps have been remanufactured, and there are plans to expand the program. We're excited to be the first to create a headlamp remanufacturing program that can be a model for other programs in our industry".

# New Bentley Continental GT

LIGHTING NEWS


The new Continental GT Speed is the first car to use Bentley's Ultra Performance Hybrid powertrain. The exterior lighting is all-new. The headlamps have a new eye-and-eyelid design set to become a defining feature of Bentley's front ends. The rear lights are designed as a set of wide oval lamps, spanning the quarter panel/decklid seam. They're done with an all-red-look lens. The jewel-like design of the front and rear lights' internal design carries on, presenting at the same time luxury and a technology-halo. Deliveries of the new Continental GT will start in Autumn, with prices starting from around €280,000.

# Reichle Scoop Two SPE Awards

LIGHTING NEWS


A jury under the aegis of the Society of Plastics Engineers' Automotive Division has bestowed two awards on Reichle Technologiezentrum, together with their partners Lucid Motors and Forvia Hella.

## First Prize: Lucid Gravity Tail Light

Lucid won a first-place SPE Award in 2021 together with Reichle for the one-piece Air rear light. Now they've picked up another first-place award for the combination rear light for the Gravity, which impressed the jury by being the largest one-piece combination rear light in the world, and also by not requiring an external lens. The light guide, which weighs several kilograms, brings elegant æsthetics, impressive homogeneity, and high efficiency. These outstanding properties are made possible by a diffuser optic specially developed by Reichle, who tooled it with their highly specialized laser technology.

## Second Prize: Forvia Hella FlatLight Technology

In close coöperation with Forvia Hella, Reichle spent several years developing, simulating, and optimizing special optics for the FlatLight technology. The design and development of the microöptics could be implemented only by using the world's most precise femtolaser technology. FlatLight offers maximum efficiency, great homogeneity, and compact packaging; presently it is applicable for daytime running lights and combination rear lamps.

As Europe's largest service provider in the field of laser texturing, Reichle Technologiezentrum have been applying their state-of-the-art technologies for twelve years now. Their close partnerships with Forvia Hella and Lucid Motors, and awards such as these, highlight Reichle's expertise and specialty in lighting development and application.

# VW's ID.Unyx: Personality Via Lightstyles

LIGHTING NEWS


The new VW ID.Unyx, based on Cupra Tavascan, is the first model in the ID.UX lineup. It brings a new look and feel to the Volkswagen brand in China; VW say it is aimed at 'customers seeking individuality, a personalized experience and engaging innovation'.

The overall shape is very similar to the Tavascan, but with VW design and style. The headlamps' eyelike design is reinforced by eyebrow-suggestive left and right extents of the fineline full-width light stripe. It passes well underneath the front VW logo, which will be lighted.

The LED taillights have a bold, boat-shaped theme and are tied together with a light stripe interrupted in the middle by a red-lit rendition of VW's logo.

VW have expressed a commitment to expand their line of EVs in China; by 2027, four ID.UX models are expected to be in  production at the ICV hub in Hefei, Anhui.

# IM LS6 Taillights to Change OTA in re Popularity Contest

LIGHTING NEWS


Since the launch of the IM LS6 in October 2023, many 'users' have suggested changing the two-strip 'Star-Ring' taillights to a single-strip design. IM, who call themselves a 'user co-creation enterprise', launched a survey to solicit preferences and opinions. The Star-Ring design found favour with 8.7 per cent of voters, while a single-strip 'Skyline' design won 91.3 per cent.

This modification can be done easily with an OTA software update to the Hasco Vision rear lamp ECU. No word on whether those who prefer the original 2-strip design will be allowed to keep it.

# Driver Assistance News

## BMW 7 Offers L2, L3 Combo in Germany

DRIVER ASSISTANCE NEWS

BMW say their 7 Series is the first car granted approval for having both an $L^2$ ADAS suite—called Highway Assistant—and an $L^3$ AD system, called Personal Pilot.

BMW describe their $L^2$ Highway Assistant as an additional function of the Steering and Lane Control Assistant for use on motorways with structurally separated carriageways. At speeds of up to 130 km/h, the driver can take their hands off the steering wheel, though they must keep their eyes on the road and be ready to resume steering control at any time.

While in partially-automated $L^3$ mode, the 7 Series can change lanes without the driver having to take hold of the steering wheel. This is possible by dint of the car's Active Lane Change Assistant, which performs the necessary steering movements and speed adjustments for an overtaking manœuvre. The system suggests a lane-change, and the driver can approve the suggestion and initiate the move by looking in the exterior mirror.

The $L^3$ Personal Pilot system lets the driver take their hands off the steering wheel and their eyes off the road, at speeds of up to 60 km/h. The highly automated system can completely take over the driving in specific situations, such as motorway traffic jams, while the human driver attends to phone calls, reads, writes messages, works, or streams videos. Nevertheless, the driver must always be prepared to resume control within a few seconds when they're prompted by the car—for example, in road construction areas.

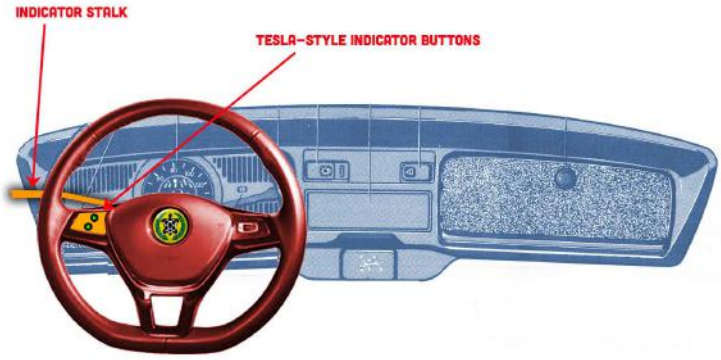
This combination of driving assistants and automated driving systems within a single vehicle represents a significant advance, according to BMW Group's Senior VP of Driving Experience Dr. Mihiar Ayoubi: "We are setting new standards in the automotive industry by combining both technologies in the new BMW 7 Series. In the process, we are underlining our commitment to offering our customers a safe, comfortable and innovative driving experience".

The $L^2$ + $L^3$ combo is available only in Germany, for €6,000. Starting in August, already-built cars equipped with the optional BMW Personal Pilot $L^3$ can upgrade to the latest spec by adding the BMW Highway Assistant functions free of charge

# General News

## EVs Make Poor Showing in Quality Study

GENERAL NEWS




Tesla and Rivian tied with extremely poor results in J.D. Power's Initial Quality Study this year; Polestar's scores were even worse, and traditional-brand EVs weren't much better off. On average, EVs experienced 86 more problems per 100 units than their combustion-engine counterparts.

The Initial Quality Study evaluates the short-term quality of vehicles in terms of the number of problems owners and lessees experience in the first 90 days. For this year's study, J.D. Power surveyed 99,144 people and found that EVs had an average of 266 PP100 (problems per 100 units), which is 86 more than the 180 average for gasoline and diesel cars. Tesla's scores worsened from 257 in 2023 to 266 this year, and J.D. Power researchers say that is largely because of the removal of traditional in-car controls, such as replacing the turn indicator and windshield wiper levers with buttons on the steering wheel.

Just ahead of the notoriously problematic infotainment systems category, features, controls and displays were the second most problematic category in the study. From longstanding functions previously controlled by dependable physical switches to the more complex operation of automaker smartphone apps, this category is particularly problematic in EVs—more than 30 per cent more PP100 than in combustion-engine vehicles. This categorical difference is largely down to the continued popularity of Tesla vehicles despite steadily worse and worse controls, such as the brand's recent imposition of steering wheel buttons for horn and turn signal functions, a change that has not been well received by owners, not least because the buttons are not always in the same place. They move with the rotation of Tesla's widely-disliked steering yoke.

Rivian matched Tesla for 266 PP100—not a surprising result for a startup car company, and it is impossible to measure the progress they have made, for this is the first year Rivian vehicles have been evaluated. Polestar has fallen in the rankings, from 313 PP100 in 2023 to 316 this year. Polestar's parent company Volvo (owned by China's Geely) scored no much better than Polestar, with 242 PP100.

The average of the study, all brands combined, is 195 PP100. American Ram and Chevrolet brands came in with the best rankings of 149 and 160 PP100, respectively. Porsche achieved 172 PP100, likely more on account of their combustion-engine vehicles than the electric Taycan.

Toyota, despite their reputation, performed slightly above average, at 192 PP100. Ford received an average PP100 score of 179, though their electric F-150 Lightning is not directly mentioned in the study results.

# EU, U.S. Put Tariffs on Chinese EVs; Canada Mulls

GENERAL NEWS


The European Union and the United States have both steeply raised tariffs on Chinese electric vehicles, applying the brakes to what they see as China's attempt to deliberately drown the EV industry developing in Europe and America.

In Europe, the new tariffs vary by maker, ranging from 17.4 to 37.6 per cent, in addition to the previously-existing 10-per-cent duty for all EVs imported from China. The U.S. measure is an across-the-board 100-per-cent tariff on EVs made in China, no matter by what company.

EU officials say rising Chinese EV imports are powered by unfair Chinese-state subsidies allowing their EVs to be sold at much lower prices than ones produced in Europe, thus making European EVs artificially uncompetitive; a similar American assessment of the situation gave rise to the U.S. tariffs. A Bloomberg News **investigation** last Autumn gives every appearance of supporting that view, but China denies subsidizing excess production to flood western markets with cheap imports.

EVs sold by Chinese brands across the EU rose from just 0.4 per cent of the total EV market in 2019 to almost 8 per cent in 2023, according to figures from the influential Brussels-based green group Transport and Environment (T&E).

The European tariff rates were calculated based on estimates of how much state aid each firm received, and companies that coöperated with the probe got a break on their rates. The European Commission have set individual duties on three Chinese EV brands—SAIC, BYD, and Geely. Chinese state-owned SAIC, partner in that country to VW and GM, face the top tariff rate of 37.6 per cent. SAIC also own formerly British brand MG, whose MG4 is one of the top-selling EVs in Europe.

The new tariff tab for BYD is 17.4%, and the rate is 19.9 per cent for Geely, who own Volvo Car. Other companies, including European automakers operating factories or participating in joint ventures in China, also will have to pay more to bring EVs into the EU—the rate will be 20.8 per cent for those who coöperated with the probe, and 37.6 per cent for those who didn't coöperate.

US-based Tesla, the biggest exporter of EVs from China to Europe, have asked for an individually-calculated rate; EU officials have said it will be determined at the end of the investigation. Tesla also export cars from China to Canada, where the government is considering a Chinese EV tariff action of their own. Meanwhile, south of that border, Volvo—on account of the new tariff—have postponed this summer's planned U.S. launch of their Chinese-built EX30 electric SUV. Volvo now plan to expand EX30 production to Belgium, and start U.S. sales next year.