

REPORT
THE WONDERFUL STORY OF LIGHTING
History, Current Technologies & New Challenges

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Editorial

EPIC Introduction



Guest editorial by Carlos Lee, Director General
EPIC – European Photonics Industry Consortium

It has been a pleasure to talk with DVN's Hector Fratty and confirm the important role of photonics, a key enabling technology in innovation in the automotive industry. Europe is a leader in numerous photonics components and technologies, which should be leveraged more by system integrators to enable new applications and retain a competitive edge in the context of global competitiveness. Photonics is an incredibly rich ecosystem in Europe, with 2000 organisations, mainly small companies of 20-50 employees. The industry is highly technology- driven with most companies being spun off from universities. 90% of the CEOs of these small companies are Ph.Ds. And it is a rapidly consolidating industry, with more than 100 acquisitions every year. I like to think of the photonics industry like the electronics industry, 20 years later.

Established in 2003, EPIC is the industry association to promote the sustainable development of organisations working in the field of photonics. On permanent staff are 14 highly competent employees who facilitate a vibrant ecosystem by maintaining a very strong network and act as catalysts and architects for technological and commercial advancement. EPIC publishes market and technology reports, organises technical workshops and B2B roundtables, supports EU funding proposals, sponsors

pavilions at exhibitions, develops standards and roadmaps, and is active in advocacy and lobbying, education and training.

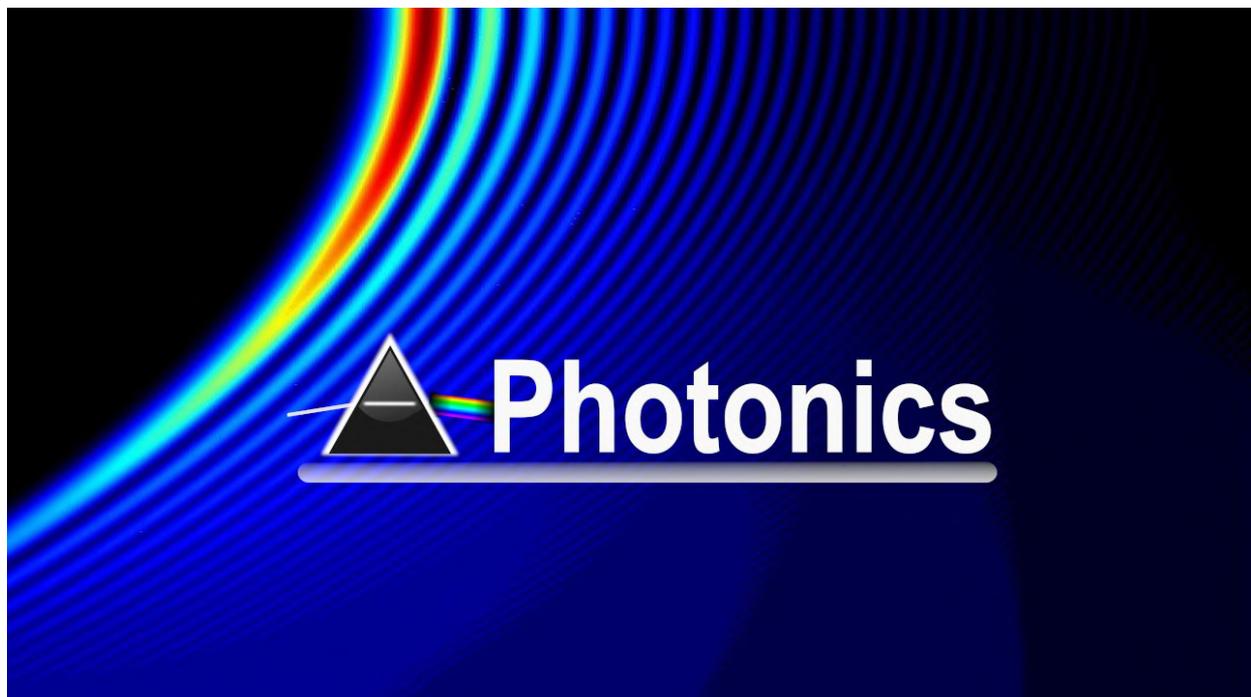
The European Commission has long recognised photonics as one of the six key enabling technologies—along with micro- and nanoelectronics, nanotechnology, industrial biotechnology, advanced materials, and advanced manufacturing technologies. Photonics was specifically mentioned in the European Commission's report, "New Industrial Strategy for Europe" published this past March. Not only on the strategic political level is photonics recognised, but also by international bodies such as UNESCO, notably in their celebration each year on 16 May the International Day of Light.

I personally look forward to the opportunity of our members to collaborate with the impressive network of Driving Vision News, and to connect our respective communities!

*Carlos Lee, Director General
EPIC – European Photonics Industry Consortium*

In Depth Lighting Technology

What is Photonics?



Special to DVN by Dr. Eneka Idiart Barsoum, Senior Expert on Photonics

Photonics is the science of detecting, collecting, transmitting, amplifying, modifying, and generally mastering light. It is considered a "key enabling technology" by the European Commission.

It touches numerous areas of modern life—communications, life sciences, health, power generation, automotive, aeronautics, defense and security, precision agriculture, quantum computing, displays—and it provides solutions opening up new horizons.

The global photonics market is estimated around €525bn in 2020. The top producer is China (displays, photovoltaics); Europe is № 2 with 16% of global market share, then Japan and North America. 80% of European companies—about 5,000 of them—are SMEs (small and midsize enterprises), and 40% of them have been in business less than 10 years.

In Europe two main organisations have been representing the photonics ecosystem for 15 years:

Photonics 21 platform



Photonics²¹ represents the photonics community of industry and research organisations. Its role is to influence the European Commission's strategy for the photonics market, and thus the European collaborative project calls (such as Horizon 2020 then Horizon Europe ICT). Photonics 21 has a variety of working groups, and two years ago a new automotive and transport working group was formed.

EPIC (European Photonics Industry Consortium)



Carlos Lee, Director General



EPIC is the main photonics industry group worldwide, with more than 500 industrial members, and connections with analogous American and Asian organisations. Automotive member companies include Lumibird, Ibeo, Laser Components, Osram, Amplitude, Vixar, NIT, Hamamatsu, LG, Panasonic, and many others. Moreover, members with experience in displays, telecoms, and defence and security markets have technologies that could be transferred to automotive, in particular for AVs and EVs.

Exterior photonics technologies

Photonics is an enabling technology, with strong potential to influence safety, communication with pedestrians and other vehicles, decision assistance, and geolocation. To achieve these potentials, the main technical functions are :

- Perception and understanding of environment (microLED matrix, solid-state lasers, photonics sensing, visible and IR cameras, lidars...)
- Optical communications with users (projections on road for pedestrians and other vehicles; connectivity through LiFi technology...)
- Coöperative lighting (joining camera, lighting, and smart infrastructures)
- Autonomous vehicle security (quantum cryptography, enhancing artificial intelligence safety, sensor cleaning by lasers...)
- Exterior styling (new colours, surface structuring by laser, painting...)



Photonics technologies for EVs

This area is emerging for photonics technologies.

A lot of research is still to be conducted.

Of course photovoltaic energy could be used as a complementary source of energy, in particular to feed external sensors or lighting components. Another application could be to replace classical position sensors by optical ones, to increase precision. But the main interest of photonics technologies could be to go beyond current physical limitations of existing systems—mainly due to heat production—and thus eliminate costly and bulky cooling systems.

Coming from space, defence, or telecoms technologies, optical solutions could serve—without emitting heat—issues including propulsion, and energy storage, commutation, and transport.

What is coming next for external photonics technologies?

Some highlights from Photonics²¹'s automotive working group analysis (2019) are:

Lidar and Photonics sensing

Eye safety solution (wavelength, power)

Novel emission and detection components and systems, towards "final" lidar technologies

Self-diagnosis of system conditions

Adverse environmental conditions (weather, dust, spraying, higher level self-immunity...)

Integration and packaging Sensor / lidars/ lighting integration: novel architectures, additional functionalities

Industrialisation aspects (cost, scalability, integration...)

Affordable ADB for mainstream vehicles

Cooperative lighting schemes with sensors improving capabilities

Link to V2X, IoT as enablers for headlamps

Affordable industrialised units for mainstream requirements (link to road safety)

Warranty and repair costs analysis from a sustainability perspective.

So photonics technologies are really key enabling technologies, moving fast toward further capacities for exterior lighting and autonomous guidance. A lot of companies in Europe are providing these photonics technologies. A main challenge, besides automotive integration, is to support these SMEs to ramp up their production, in order for them to come onstream at scales and volumes helpful to the automotive industry.

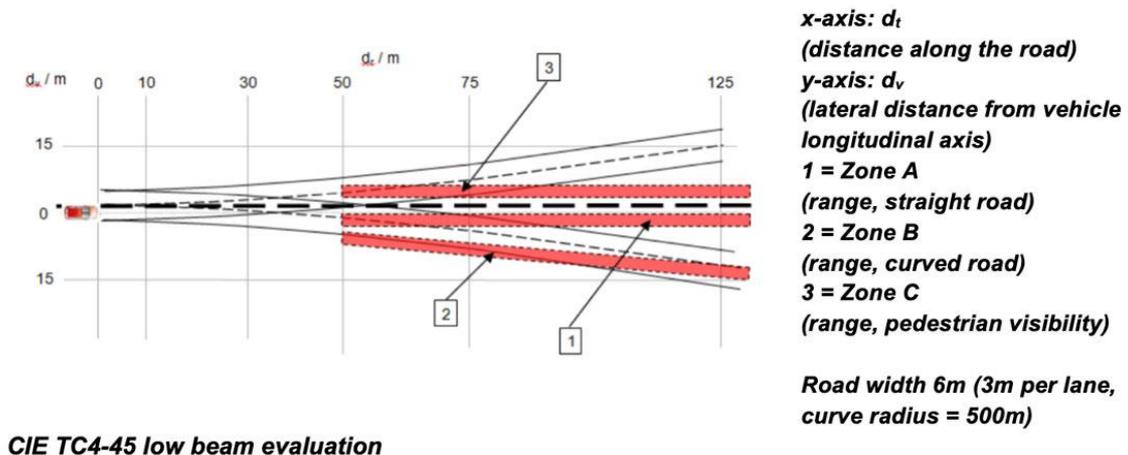
Dr. Eneka Idiart Barsoum is in charge of Eneka Consulting is an innovation consulting firm dedicated to Photonics technologies. It provides services in technologies expertise, innovation strategy and management, collaborative projects, photonics and

innovation ecosystems intelligence. It covers applied industrial markets as automotive, defense and security, communications, quantum technologies, digital health,...

Some industrial references : Ariane Group, Thales, Safran, Corning, Valeo, Schneider Electric, Sanofi, Orange.

Lighting News

Prof. Khanh and Dr. Neumann on ADB Headlamp Rating System Proposal



The existing CIE evaluation method, referred to as TC4-45, defines the range of the light distributions on low and high beam in defined zones, such as the right and left edge of the road, lateral illumination at different distances, etc.

In the newly proposed method, the same zone criteria from TC4-45 allow an absolute evaluation of the range gain from glare-free high beam (ADB). The criteria Zone A (range at right-hand edge of road), Zone B (range in curves) and Zone C (range at left-hand edge of road) are particularly suitable for this purpose.

This new method is based on the recognised evaluation principles from the CIE standard TC 4-45 and the legal requirements according to U.N. Regulation 123. The evaluation is based on an extensive database of a wide range of headlamp systems and test series, so that in conjunction with the extensive ADB database developed, reliable results are achieved for all systems.

The four takeaways of the proposed evaluation are:

- The proposed rating system makes possible, for the first time, qualitative evaluation of not only static low and high beam, but also the glare-free high beam.
- The objective result quantifies the safety performance achieved by the headlamp system.
- The method, based on laboratory measurements, thus leads to representative results that allow a direct and objective comparison of different headlamp systems.
- The classification into different classes (Standard ... Premium+) allows to present the safety performance of a headlamp system in a manner accessible and understandable by non-experts.

Questions to Prof. Khanh about the rating system



With his Ph.D in optical spectroscopy, Prof. Khanh headed photometry and colourimetry laboratories at companies in Berlin and Munich. From 2000 to 2006, he was project leader at Arnold & Richter in Munich. Since 2006, he is Chair of the Laboratory of Lighting Technology at TU Darmstadt, and in charge of the renowned International Symposium on Automotive Lighting.

DVN: As one of the leading developers of the new rating system, what do you consider the most important from this assessment?

Prof. Khanh: First I have to say that the vehicle lighting industry has been dealing in the last 20 years with light sources, headlamp technologies (free-form optics, pixel light) and design of the light units. Now, the main substance of the research and technological development is (and should be) the automatic generation of new light distributions—not only low or high beam, we need the flexibility of ADB—changing dynamically in accord with the actual traffic situation in the traffic space in front of the vehicle, and evaluation of these dynamic light distributions. We go more to the light and less to the technology. For this primary aim, we need a new rating system with safety as the key parameter. The main point of this new rating system is to keep the principle of CIE 4-45 and to expand the evaluation to the ADB context based on weighting the use frequency of ADB. This new rating system has been validated with 17 different headlamp types.

DVN: Do you think it's possible to make more progress before the ViSION congress in October?

Prof. Khanh: yes, a number of automakers and set makers will have a task force group meeting in September in Darmstadt. We have to optimise, improve, and numerically correct the evaluation by a collection of a number of headlamp luminous intensity curves (in IES-format) from different manufacturers and to evaluate them.

And we have to validate this evaluation by real test drives this August-September. With selected headlamps with well-known lighting distributions, we from this task force will start a series of night time driving tests and the test drivers and members of motor journals should evaluate subjectively the impression regarding contrast (visibility level and distance) and the brightness of the light distribution close to the car (3 to 32 m in front of the car) and beside the own lane.

DVN: The special session on rating systems you will chair will be an important part of the VISION congress. What do you expect from this session?

Prof. Khanh: with German manufacturers and with some automakers with research and production activities in Germany, the consensus has been achieved this past January-February by a first meeting with more than 25 experts in Darmstadt. More

tests and evaluations are needed, and the test results should be reported in this VISION session to give attendees from over the world an understanding and basis for acceptance of the new rating system and to recognise the advantages of ADB-Technology.

DVN: Do you think it will be possible to convince the lighting community of this rating system's merits? What should be next action?

Prof. Khanh: The problem with CIE 4-45 was that this topic stayed in the frame of CIE and within a small group of experts. In the last decades, the evaluation and rating of lighting distribution was not the focus of the community. This situation has been changed in a positive manner. Yes, rating of the light is important for car makers and car users and now an important marketing and technological argumentation. The mental condition in the vehicle lighting industry has achieved a new dimension. With the new rating system, we have to communicate with important countries like the USA, China, Japan and South Korea in the frame of GTB/GRE and also outside between experts. I do not see big content problems between this new rating system and the current activities in the similar direction in China or Korea.

Questions to Rainer Neumann about the rating system



Dr. Rainer Neumann started in 1984 at Bosch then moving to MM. He joined Visteon and became VP Global Technology. Rainer Neumann is Member of Scientific Committee in VISION, ISAL, ISOL, and IFAL. He was awarded as the Personality of the year in Automotive Lighting by DVN in Paris in 2014.

Rainer Neumann chairs the research WG SVP in GTB, is Co-chair of the WG Strategy and belongs to the international Automotive Lighting and light- Signalling Expert Group (GTB)

DVN: As one of the leaders of the new rating system, what are for you, the main data coming from this assessment?

Rainer Neumann: The new rating system is taking into account the safety relevant photometrical data to be able to detect objects and being able to react accordingly

in time and avoiding accidents in night time driving. It is taking into account for the first time the important adaptive driving beam system (ADB), which works automatically and results in an optimized illumination of the road ahead without glaring other road users.

DVN: Do you think possible to convince the lighting community at this rating system? What should be next action ?

Rainer Neumann: We have already a big support of the new headlamp safety Performance Rating system from the automotive lighting industry in Europe. First publication by the university in Darmstadt (lighting Technology group of Prof. Khanh) will be published in ATZ in the next month. Additionally, we also need to communicate and involve automotive journals in the public our new rating system to get support and to create awareness and acceptance.

DVN: The intention of GTB is to establish a working group to develop a globally acceptable NCAP assessment for Lighting. Where are you in this process ?

Rainer Neumann : We are at the very beginning ! Based on the scientific based continuation of TC 4.45 we need to explain in an easy understandable way, that the objective criteria which the rating system indicates are also reflecting the real impression of a driver when driving at night.

We plan to install a data base at a neutral, objective place (university), where all new approved headlamps with the new rating system can be stored and distributed and published.

DVN : What is your feedback about the IIHS and the Consumer Report rating systems?

Rainer Neumann: IIHS has presented a simple model by taking just the vehicle from the dealer and checking glare and detection measurement points. It is simple and has been successfully introduced in the market. The fact, that the evaluation is arbitrary and influenced by a lot of parameters, which have nothing to do with the headlamp light quality is obviously not that important.

Same with the consumer report rating, which is very popular in US :

For our targets we can learn that good marketing and simple communication tools are necessary and important to be successful in the future.

STM Join Zhaga Consortium



STMicroelectronics have become an Associate member of the Zhaga Consortium to advance the deployment of NFC (near-field communications) technology in the industrial lighting market.

The Zhaga Consortium is a global industry organisation that aims to standardise interfaces of LED luminaires. ST's membership seeks to facilitate the integration of NFC in lighting products and accelerate the emergence of new standards. One of the key benefits of NFC technology is the ability to improve flexibility and efficiency of LED-driver manufacturing lines.

STM's head of marketing and application for NFC tags and readers Sylvain Fidelis says "With the Zhaga Consortium, the lighting industry is paving the way towards harmonised and interoperable usage of NFC technology, driving new opportunities to enhance lighting-equipment connectivity. Our solid know-how in connectivity and lighting technologies is key to building the bridge between NFC standards and lighting-industry requirements".

ZKW Seek Super Startups



ZKW are looking for startups offering innovative solutions in the areas of sensors and auxiliary lamps as the "Drive Light & Sight" startup competition from ZKW and StartUs is launching its second round. Submitted ideas will be evaluated by a professional jury and experts from ZKW.

Prize money totaling €30,000 and a space in the ZKW Partnership Program are up for grabs for a maximum of four of the most innovative startups selected by the jury. In addition, the winning concepts will be put into practice alongside innovation experts from ZKW and presented to clients like AUDI, BMW and Porsche at a road show. Applications can be submitted through 31 May.

Specifically, ZKW are looking for technologies to optimise the use of sensors in lighting systems and make them safer. These include, for instance, systems for cleaning, coating, calibrating, and validating sensors, as well as hybrid solutions. The

second field of the competition is looking for both new solutions for existing lights as well as for new lights. All new lighting systems will be essential, although these systems have not yet been taken into account in mobility concepts. In addition, new lighting systems that can be integrated, for instance, into third brake lights, turn indicators, and rear lamps will be relevant.

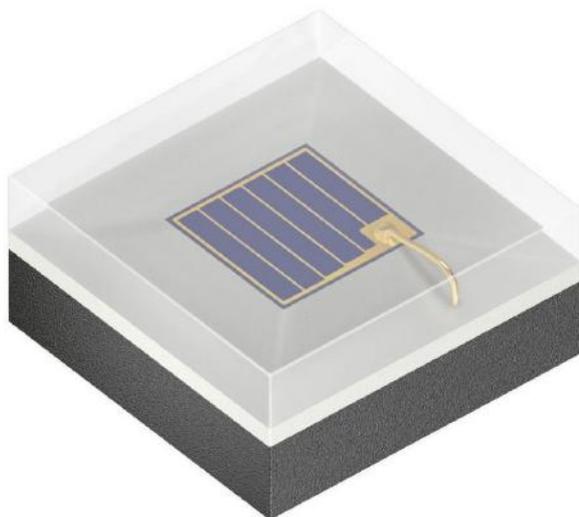
After all applications have been received, a ZKW expert team will select the best ideas and invite nominated teams to a kickoff event this Autumn. During the event, startups will be able to present their innovations to an expert jury and discuss the relevant details of their ideas with ZKW specialists in workshops. The winners of the kickoff event can then implement their concepts in practice through close collaboration with ZKW.

Driver Assistance News

Osram IRED For In-Car Gesture Control



Automotive interior displays are getting larger, the number of manual controls is decreasing, and customisable lighting solutions are creating a feel-good atmosphere. ADAS and technologies previously designed for mobile devices, such as facial recognition, eye tracking, and gestural control, are increasingly making their way into the automotive sector.



These technologies are based on infrared light. The smaller and more powerful the required components, the easier they are to integrate into complex designs. Osram's Oslon Piccolo now offers an extremely compact IRED (infrared emitting diode) that packs enormous power in a small package.

An AV will have a fundamentally different interior design than current models. The classic dashboard will be replaced by other user interfaces and options for communication.

Gesture recognition is bringing new ways of using displays. For example, when navigating to a destination, the vehicle displays a map with the corresponding route. With the help of gesture recognition, menu items are only shown when the driver moves his hand towards the display, allowing the route to appear on the whole screen.

The Piccolo IRED's very small dimensions of only 1.6×1.6 mm mean it can be installed easily in a small space. With a DC power of 1.15 W at 1 A and very fast switching times of 10 ns, the component is suitable as both a constant light source for camera-based applications and for 3D image acquisition with modulated or fast pulsed light.

Pony.ai, Faraday Future and Canoo to equip their autonomous vehicles with Nvidia systems



PONY.AI AIMS TO DEVELOP A FLEET OF ROBOT TAXIS EQUIPPED WITH NVIDIA'S DRIVE

Nvidia announces new partners in the field of AV. The American company won over Pony.ai, Canoo and Faraday Future with its Drive AGX platform designed by Nvidia for ADAS and AV.

Pony.ai, focused on developing the software and infrastructure necessary for an AV, has announced that it wants to equip its vehicles with the Drive AGX Pegasus system. The start-up explains that it made this choice because this platform meets the significant IT needs inherent in the deployment of a fleet of taxi robots as well as industrialization requirements.

Canoo, which develops its own electric vehicles and wishes to market them from 2021, intends to equip them with the Drive AGX Xavier system from Nvidia. Drive AGX Xavier also makes it possible to provide vehicles with driving assistance options such as alerts when a vehicle arrives behind, pedestrian detection and visualization of blind spots, cruise control and the system for maintaining on the way.



SUV FF91 FROM FARDAY FUTURE

Faraday Future will also equip its FF91 vehicle with Drive AGX Xavier. This electric SUV, whose deliveries must begin at the end of the year, has 36 sensors allowing it to offer advanced driving assistance systems.

The software present on Drive AGX Xavier also allows the vehicle to have more advanced functionalities such as lane change systems, recognition of traffic lights and bypassing stopped or slower vehicles, specifies Nvidia. Lidars-May 2020.

Clarion Malaysia to Make LeddarTech Sensors



Canadian lidar specialists LeddarTech have a volume production plan for their Pixell lidar module: it's to be made by Clarion Malaysia, a member of Faurecia Clarion Electronics.

The Leddar Pixell is based on 3D solid-state flash lidar to reach a field-of-view of 180° designed and tested for off-road, shuttles, robotaxis, delivery, commercial and heavy industry vehicles in addition to other robotic and automated applications.

LeddarTech have strengthened their partnerships with automotive component and solution providers in Asia; they announced their collaboration with Chinese optical component maker Sunny Automotive Optech last month. And now they will work with Clarion Malaysia for volume manufacture of lidar modules to accelerate the uptake of autonomous driving technology and ADAS.

Nuro: AV For Home Shopping Delivery



A new AV has won approval by NHTSA for use on the public streets of Houston, Texas. The aim is home delivery of online shopping for between USD \$5 and \$10 per delivery, and with high vigilance on safety.

According to its designers—former employees of Waymo (Google's AV project), the Nuro is a venture to extend the benefits of robotics to everyday life for the difficult last mile by facilitating delivery to traders, restaurateurs, and suchlike.

The AV—1.3 m wide, 2.7 m long, and 1.9 m high, can travel at 40 km/h with a payload of up to 190 kg (about 54 shopping bags).

Experiments are taking place with partner distributors in Texas such as Walmart, Domino's Pizza, and the first Houston deliveries by Nuro were done for the Kroger supermarket chain.

The coronavirus will not slow down its deployment. On the contrary, the autonomous delivery startup obtained a recent exemption from the authorities as an "essential delivery service". In total, the American startup—which raised \$940m from SoftBank Vision Fund in 2019—have been authorised to run up to 5,000 autonomous vehicles on Texas roads.

General News

More WFH for PSA



PSA Group will expand the number of white-collar employees who work from home (WFH) even after coronavirus restrictions end. About 18,000 workers "regularly or occasionally" worked remotely in 2019, PSA said, compared with 2,500 in 2016. The new rules will affect nearly 80,000 of the group's 200,000 workers worldwide once they are put in place starting this summer.

PSA's main offices are in the Paris suburbs of Rueil-Malmaison (administration, including CEO Carlos Tavares) and Velizy (engineering and design). PSA is now planning to move those functions from Rueil-Malmaison to other sites, notably Velizy and Poissy, also near Paris.

Employees will be asked to spend one to one and a half days a week in the office in what PSA are calling "redesigned collaborative spaces" to "reinforce value-added interactions as well as collective energy."

The telecommuting rules are part of a broader PSA "New Era of Agility" initiative to rethink how work is conducted. The proposal has been presented to PSA's central workers' committee, and details will be discussed with unions in coming weeks.

Private Cars Over Public Transit to Avoid COVID-19 RINT



In areas where stay-home orders have been lifted and commerce has resumed, people are choosing their cars rather than public transit. They'd rather sit in traffic for an hour than spend half an hour risking virus exposure from strangers on a train or bus.

It's too soon to say whether this change is permanent. In some parts of Asia that reopened earlier than the rest of the world, people are venturing back onto trains. And it's unclear whether global gasoline demand will ever fully recover.

But on the streets of Beijing, Shanghai, and Guangzhou, morning traffic is now higher than 2019 averages while subway use is well below normal, according to data compiled by BloombergNEF. Volume on Beijing's metro system is 53 percent below pre-virus levels. Subway usage rates in Shanghai and Guangzhou are down 29 percent and 39 percent, respectively.

American motor fuel distributor Pilot Flying J have seen the trend. "People are thinking about their travel plans for this summer and many are considering road trips due to people feeling more comfortable driving," says the company's Chief Experience Officer Whitney Haslam Johnson.

A similar pattern played out in China during the Labour Day holiday in May. Over the first four days of the holiday, car trips in Beijing jumped 15 percent, while trips by plane and train in and out of the city fell 76 percent and 86 percent, respectively, according to government data.

VW Brakes Production on Weak European DemandT



Volkswagen Group will reduce output at their factory in Wolfsburg on four days this month as consumer demand for new cars remains weak in Europe.

The automaker will temporarily halt production on two assembly lines that make the Tiguan, Touran, and Seat Tarraco models, and cancel one shift at a separate line that produces the Golf hatchback. "We have to keep operating flexibly depending on customers' vehicle orders," the automaker said. While lockdown measures are easing, many customers still stay clear of showrooms as the economic fallout of the crisis has started to push up unemployment across the region.

VW say while sales in China exceeded the prior-year level in April, they will keep adjusting output to demand until sales in Europe pick up.

Supplier Recovery Worries Mount



European Association of Automotive Suppliers

European suppliers are feeling increasingly concerned about the impact of COVID-19 on their businesses, a new survey has found. The survey was conducted April 27-20 by the European suppliers' trade group CLEPA. More than 90% of surveyed suppliers expect revenues to fall in 2020, compared with 60% who said the same in late March. More than half of respondents said they expected to show a loss before taxes in 2020.

Suppliers are also more pessimistic about a recovery; 75% said it will take more than a year to return to normal business, up from a timeframe of six to 12 months in the March survey. One third of respondents said it will take two to three years to recover.

The survey, the results of which were aggregated by McKinsey and company, also found that 90% of suppliers said that demand volatility was the most pressing issue for the automotive supply chain. Suppliers are also concerned that production will restart at a very low level, which means that fixed costs increase much faster than turnover. "Their future perspective depends very much on consumer sentiment and demand picking up substantially", CLEPA said in a note published at the same time as the survey. The group has called for coördinated Europe-wide measures to stimulate demand, such as vehicle-scrappage incentive schemes.

Suppliers were also asked what steps they are taking to preserve cash and prepare for a recovery. Among their responses:

- 84% said they will cut investment, and 74% will reduce their workforce
- 50% said they will take those measures in the next six months
- 40% have already started to cut R&D budgets.