DrivingVisionNews.com
Automotive lighting and driver assistance technologies

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Editorial

AV Dreams Return To Earth; Lighting Future Stays Bright

For the past five years or so, automakers have dreamed out loud of the rapid arrival of really self-driving cars, forecasting commercialisation of 100% autonomous cars by 2020. And it wasn't just automakers; everyone had the same idea: big tech, Lyft and Uber, automotive suppliers and equipment manufacturers, and regulators.

Well…here we are, it's 2020, and that dream has revealed itself to be much higher up on a much steeper hill; it's a promise that has been widely whittled down to partially automated driving in ultra-connected vehicles. The definition of the L^1 to L^5 autonomy scale was the prelude to a brutal return to earth and a realistic reassessment of the timeframe. 2020's most autonomous cars are L^3, and although Ford in 2016 said vehicle lighting would be a thing of the past ("our autonomous test vehicles can drive in the dark, with no lights"!), lighting is in fact alive and well, with a bright future as far as can be foreseen: better lights, brighter lights, more useful lights, and more polyvalent lights with ADB and new functions. “Light is now,the central to creating ambiance, providing

information, generating alerts and is playing an increasingly important role in the comfort and safety of everyone inside the car.”

Several lectures at the DVN Workshop in Munich showed this importance of lighting inside and outside the car. Inside, to help drivers and passengers to better enjoy their trip, to help them enter and make best use of their space and time in the car, and to arrive in the best condition thanks to dynamic lights.
Outside—a far cry from the no-exterior-lights predictions, instead there's ever smarter automatic switching and selection of functions and beams, ever more advanced lighting and signalling, and new functions in very active development. Progress on these innovations will be presented in detail at the next DVN Workshop in Tokyo, on 26–27 May this year.

In this week's newsletter, you will find an article celebrating the birthday of Thomas Alva Edison, inventor of the electric light bulb. We review ten highlights of history from the first electric lighting systems for vehicles in 1913, to modern lighting systems with ADB and new lighting functions.

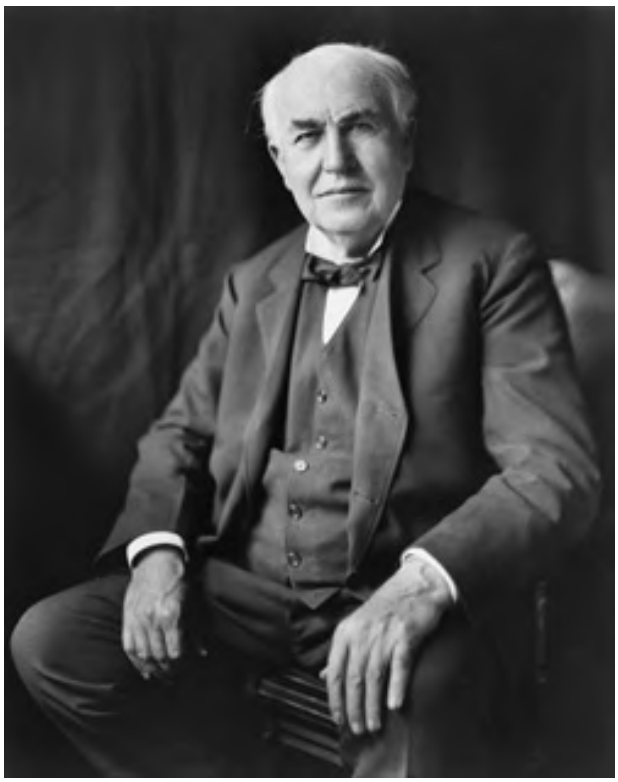
Sincerely yours

DVN President

In Depth Lighting Technology

Thank You, Mr. Edison!

Last week, it was the 173rd anniversary of the birth of Thomas Alva Edison. He was born on 11 February 1847 in Ohio, and grew up to become an inventor, scientist, and industrialist.
To celebrate it, here we highlight ten historic high points of how lighting has intermingled with automotive mobility.



Edison, age 75 in 1922

Edison's light bulb, applied to automobiles, was step number two in the effort to turn night into day for drivers. We've previously **reported** on step number one—the acetylene headlamp—and that's a story worth review to understand just how revolutionary electric headlamps were. Now follow along with us as we present ten breakthroughs in a chain touched off by Edison's invention.

1. Electric light bulbs

A vintage Vauxhall

In 1913 Bosch put out a generator for car engine mounting to bring electricity to cars. Add two light bulbs and some optics, and: the world's first electric headlamps.

2. Dual-filament bulbs

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Bilux or Duplo bulb

- European Code bulb

From 1936, the Bilux (Osram, Germany) or Duplo (Philips, Netherlands) bulb with two filaments was located in the reflector of the headlamp, giving two different beams selectable by the driver. This technology was updated enormously in 1957 with the "European Code" bulb, designed to produce the new European Code asymmetrical low beam. Its greater output and dimensional accuracy quickly made it the overwhelming standard in the European market, and its fundamental design was kept for its successor H4 bulb arriving in 1968.

3. Standardised sealed-beam headlamps

In 1940 a 7-inch round sealed beam, one per side, was adopted as standard equipment on all vehicles sold in the USA. The hermetically sealed unit solved problems of tarnished silver reflectors and proliferation of headlamp components that had been making repair parts difficult to stock and buy. An alternate system of 5.75-inch round SB, one high/low and one high beam per side, was permitted in all US states in 1958. The sealed beam standardisation was adopted into US federal law in 1968. By 1976, 200 mm × 142 mm

(one per side) and 165 mm × 100 mm (two per side) rectangular sealed beams were also permitted. The U.S. sealed-beam mandate lasted until late 1983.

4. Halogen bulb

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  Citroen DS
  The first car using H1

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H1 bulb

In 1962 came the world's first halogen headlight bulb: the H1. Two more single-filament bulbs arrived shortly after, the H2 in 1964 and the H3 in 1966. A high-pressure halogen gas fill allowed much greater efficacy for brighter, whiter light at night. And unlike conventional incandescent lamps, the bulb glass was not darkened by vapourised tungsten deposits. The world's first 2-filament

halogen headlight bulb, the H4, was first commercialised in Britain in 1968 and gained European approval in late 1971. In a very short time, the H4 light became the world's most popular headlight bulb, and that is still the case today. A version of the H4 was legalised in the USA in 1992.

5. High Intensity Discharge

BMW 7 Series: 1st Xenon lights

In 1991 came HID ("Xenon") headlights—a first step beyond Edison's glowing-filament technology for lighting drivers' way at night. HID bulbs gave a giant leap in efficacy, producing 3,000 lumens at 38 watts of electrical power, versus about 1,000 lumens at 65 watts for halogen. Optical technology evolved to provide HID high beam, as well as the initial low beam, about 8 years after the introduction. Xenon was truly a revolution in headlighting safety performance, but the system was expensive and never yet met the optimistic initial volume predictions.

6. LEDs

Lexus with LED headlamps

In 2006, Lexus unveiled the first LED headlamp at the Paris Mondial motor show and started production in 2007. The system was made by Koito and had 3 projector modules and one reflector module with Nichia LEDs, all to produce only the low beam (high beam used a halogen bulb). LEDs only require around a quarter of the energy of halogen lamps. In addition, they are very durable.

Audi R8 with full LED

One year later, Audi unveiled the first full LED headlamp in the R8. For the first time, all light functions of a serial headlamp were done in LED technology: low and high beam, daytime running light, turn signal, and position light.

7. Laser lights

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Audi R8 LMX

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BMW i8

In 2014, BMW and Audi unveiled the laser technology. Laser light now enabled ideal light distribution in every situation, increasing the visibility distance to 600 metres and permitting scanning beam for ADB.

8. Glare-Free High Beam (ADB)

The driver's dream is now realised—one can now drive all the time in high beam; slices and spots of light are selectively shadowed out in the precise direction of opposite and leading cars. Low beam glare with high beam seeing. This technology was introduced in the Volkswagen Touareg in 2010 and is now available in all the premium cars and as an option in many generalist cars.

9. OLEDs

OLEDs—organic light-emitting diodes—are used in smartphone displays and other suchlike. Making the jump to automobile lighting has been a challenge, but they're here. Audi presented a design study as early ago as 2013, which makes it possible to replace conventional lighting functions with an integrated monitor at the rear. The material is applied very thinly to the body. When an electrical voltage is provided, the molecules emit photons and the surface lights up. Because of their transparency, individual OLEDs can be placed one behind the other to mix colours. A swarm of luminous particles, for example, elegantly depicts the turning of the car at the rear. The swarm is also intended to indicate the speed of the car and the strength of the braking process.

Audi Digital OLED presented at the DVN Munich Workshop

And in the future…

10. New lighting functions

• Communication by light for safety: car to driver (own-other)

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Guidance light function

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Warning functions

- **Vehicle to vehicle-vulnerable road user**

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• **Autonomous driving status indication**

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The lighting community are working to thoughtfully create lighting functions to help everyone in the traffic environment, improving everybody's safety and comfort.

Lighting News

IIHS awards fewer vehicles with Top Safety Pick+ over tougher criteria for headlights

The Insurance Institute for Highway Safety continues to add requirements to qualify for the Top Safety Pick and Top Safety Pick+ awards, as the overall number of vehicle models awarded rises. IIHS said vehicles must have «good» or «acceptable» as standard equipment to qualify for the 2020 Top Safety Pick+ award. Headlights rated "good" or "acceptable" may be optional for the Top Safety Pick award, the institute said. Vehicles must also offer "advanced" or "superior" front-crash prevention technology to win either award.

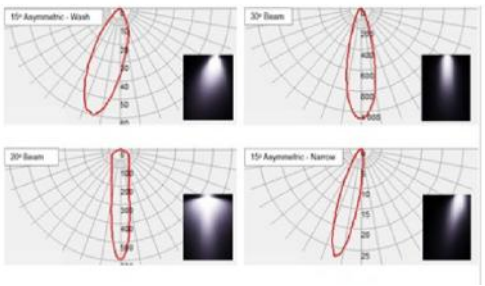
34 vehicles received the Top Safety Pick+ award, down 7 from 2019. IIHS President David Harkey told *Automotive News* that the decrease came from more-stringent criteria for headlights.

To earn a 2020 Top Safety Pick+ award, vehicles must have "good" ratings in IIHS' passenger-side small overlap front, moderate overlap front crash, side crash, roof strength and head restraint tests.
- Hyundai Motor Group, including the Genesis and Kia brands, won 14 Top Safety Pick awards and three Top Safety Pick+ awards
- Five Mazda vehicles are 2020 Top Safety Pick+ winners.
Harkey said Mazda stood out in awards this year because it applied "good" or "acceptable" headlights across its entire fleet..
In addition to the Top Safety Pick+ winners, another 41 vehicles

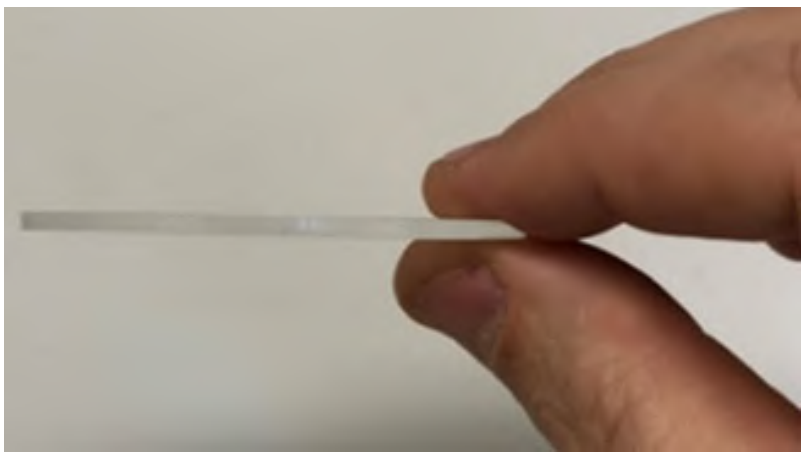
earned IIHS' Top Safety Pick award.
- Ford, Volvo, BMW won Top Safety Pick awards, but no Top Safety Pick+ awards,
- GM, besides the XT6 winning a Top Safety Pick+, won a Top Safety Pick for the Chevrolet Equinox.
- Fiat Chrysler and Mitsubishi failed to have any vehicle model earn either award.
- Nissan won a Top Safety Pick+ for the Maxima and a Top Safety Pick award for the Altima.

The 64 vehicles that made the 2020 Top Safety Pick+ and Top Safety Pick lists, up seven from 2019, **can be found here**.

Remote Optics from Fusion Optix

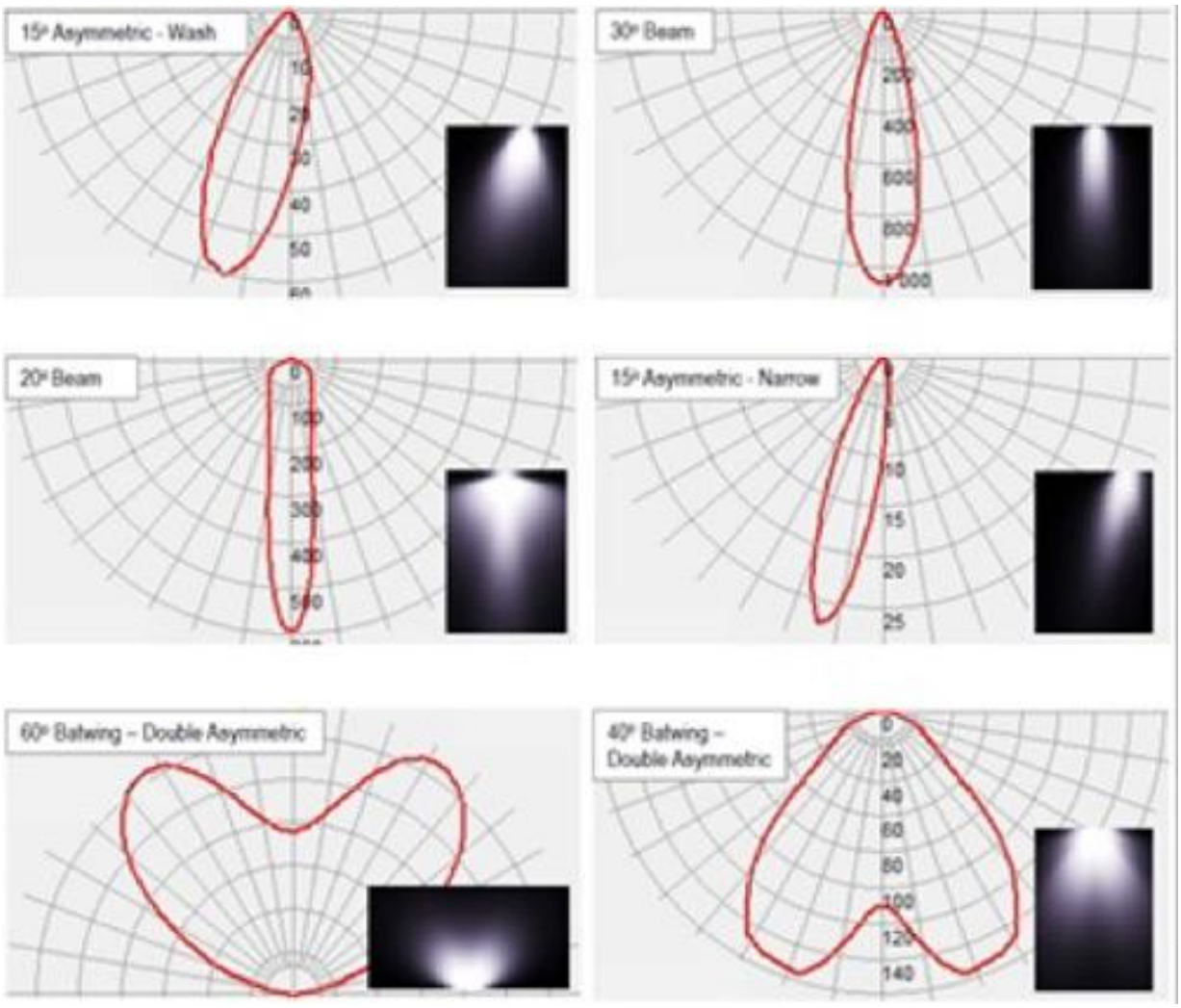


Fusion Optix are excited about their FlatLENS range of remote optics for asymmetric and symmetric beam shaping to enable high-performance, energy-efficient diffuse light in linear LED lighting applications. A wide selection of profiles and materials give a broad range of light management properties with easy to implement snap-in or slide-in features. Fusion say their ColorSure technology gives enhanced colour reliability, and reflective "booster" films increase efficiency by up to 10%.



The FlatLENS products are based on a patented platform of planar micro-optic technologies to enable the encoding of a range of

refractive, diffractive, and scattering functions in optics that are both thin and flat. This provides those developing LED fixtures with a wide range of light management properties with easy to implement snap-in or slide-in features.



ON Semiconductors' LED Drivers for Cars

Car lights are moving away from simple on/off operation to much more sophisticated operation with movement and variable intensity within rear combination lamps, and other externally modulated LED clusters to give clearer and highly visible warnings to other road users. To harness and control this dancing light, there are new LED drivers and current controllers from ON Semiconductors.

The devices provide an array of configurability options, including illumination level control, current regulation, sequencing

functionality, and channel combination. The NCV7685 incorporates an 8-bit I2C interface with CRC8 error detection for individual output current adjustment via PWM, and a dedicated diagnostic pin is also available.
The NCV7691 provides a regulated wide current range for driving LEDs in one or multiple strings, with only an external NPN bipolar transistor and a feedback resistor. The driver provides design flexibility to add additional single channels to multichannel systems, and supports a dimming function via its PWM input. The NCV7691 includes open string, short circuit, and thermal shutdown, ensuring safe and reliable operation of essential lighting.

Fully Addressable µLED From Compound Photonics & Plessey

Compound Photonics and Plessey Semiconductors have announced the results of their collaboration, the first fully addressable µLED display modules bonding Plessey’s GaN-on-Si µLED array wafer to CP’s high-performance 3µm pixel 1080p Backplane wafer.

Engineering teams from both companies have fabricated functional µLED display modules combining CP's high speed digital low-latency display backplane with Plessey's GaN-on-Silicon monolithic µLED array technology.

Plessey produced the µLED array wafer bonded to CP's backplane wafer at their facility in the UK, and Compound Photonics assembled and packaged display modules from the bonded wafer pair in the USA.
And now they are both working on performing initial characterisation work at Compound Photonics' facility in Washington, USA.

Initial samples of a 0.26" diagonal, full HD (1080p) µLED display module integrated with display driver are expected to be available in the coming months.

Marelli Opens New Location in Turin for R&D

Marelli will open in Turin, Italy, a new site that will host the R&D center of Marelli Automotive Lighting devoted to Lighting and Body Electronics (LBE), and an area devoted to Sensors development aimed at ADAS.
By combining different capabilities in one location, the hub will be central to supporting Marelli Automotive Lighting activities across Lighting and Body Electronics, which are long-lasting core competences of the company.

Covering a surface of over 3,000m2, the hub houses more than 130 employees and will be a critical competence center in the field of Body Electronics, where Marelli has over 20 years' experience developing body computer modules (BCM), gateways and onboard applications like door modules and trunk modules.

Another area of Marelli Automotive Lighting activity in the R&D hub will be devoted to the development of Electronic Control Units (ECU) for the management and control of lighting systems in the vehicle, that have become increasingly relevant in the last years following the evolution of lighting technologies.

ZKW's New Development Laboratory

ZKW are expanding their company headquarters in Wieselburg, constructing a new development laboratory at the same time as they build their logistics centre. The project covers an area of 2,500 m2 and represents an investment of around €7m over the next two years. The new laboratory and logistics building will open in the summer of 2021. CEO Oliver Schubert calls Wieselburg "the biggest driver" of ZKW's long-term corporate success.

To be well-equipped to face the future demands of the automotive industry, ZKW are expanding their expertise in electronics and in development and testing technology, in addition to their existing electronics plant in Wiener Neustadt. The new development laboratory will be located on the ground floor of the new logistics centre. It will be equipped with testing equipment for headlight systems, and provisions for testing electronic components such as to test for EMC. The company is investing in automated test monitoring and modern equipment including CT scanners to screen and measure components. ZKW's General Plant Manager Stefan Hauptmann says "The new features we have added to the development laboratory allow us to increase our testing capacity and significantly shorten reaction times for developing future products".

Ralf Klädtke, ZKW CTO

LED Active Cooling Solutions

High temperatures can cut the lifespan of an LED light in half. Temperatures over the rated maximum rated can quickly weaken the lumen output and the color quality of LEDs.

So thermal management is a key factor in lumen output. To maintain the desired lumen values without big heat sinks, active cooling can effectively disperse the heat produced by LED components. Active cooling solutions are a new contender in LED thermal management systems. Dissipating heat directly from the core of the modules allows for less thermal resistance, making the entire assembly more efficient. Active cooling technology offers thermal capabilities that are superior to passive heat sinks and can raise performance while significantly reducing the size of the lighting fixture.

With industry-leading German-engineered compact fans and American-designed assemblies, ebm-papst say they can provide the perfect cooling solution for any LED application.

Driver Assistance News

Connected Cars to Solve Road Congestion

The UN predicts that by 2050 around 68% of the global population will live in urban areas. This will make positive traffic management even more critical to delivering efficient and effective inner-city transportation. One of the prerequisites for managing this increase is to be able to predict, evaluate and prevent road congestionWe succeed by becoming more connected and using insight from data to drive efficiency.

Connected cars are one of the fastest growing, sending and receiving real time information. They may be connected to other cars, to the driver's information systems, to road safety systems or other control systems.
Connected vehicles can direct drivers towards available parking spaces, identify the cheapest road tariffs, and in the future will be able to make parking payments through the dashboard.
More importantly, connected digital parking and permitting services can be deployed to generate insightful big data that will help solve mobility challenges.

Lexus Brings Digital Mirrors to Europe

Cameras instead of exterior mirrors! According to Lexus, the camera/monitor combination offers improved visibility of the area behind and immediately next to the vehicle under all driving conditions, while eliminating blind spots. Thanks to the automatic wide-angle function, turning and reversing becomes more comfortable and safe.

The cameras are mounted in slim aerodynamic housings significantly smaller than conventional mirror housings. This helps to reduce wind noise and increases the driver's field of vision at an angle to the front. An integrated heating function prevents freezing and fogging, and the arrangement protects against raindrops and snowflakes. The driver can activate the de-icing function at the touch of a button. The system also has an automatic dimming function to reduce glare from following vehicles in the dark.

When the driver uses the turn signal or engages reverse gear, the digital rear-view mirror system automatically provides an enlarged field of vision of the area next to and behind the vehicle.

For safe manœuvring of the vehicle, for example when parking, the monitors overlay guidelines when reverse gear is engaged, showing 20 and 50 cm lateral distance to the rear bumper and 50 cm distance to the sides of the vehicle. They are not only visible on the camera's live images, but also on the multifunction display, which shows a bird's eye view of the vehicle.

This display is also active at higher speeds. The help lines help to estimate the safety distance to other road users. If the car is travelling at up to 70 km/h, the lines show a distance of 5, 10 and 15 metres; at higher speeds there is an additional line for a distance of 30 metres. The market launch is scheduled for April. In Japan, Lexus has already had this technology in series production since 2018. Such setups remain illegal in the United States.

Continental's New American ADAS Plant

Continental have announced construction of a new plant in New Braunfels, in the US state of Texas. The purpose of the new building is to expand capacity for the production of radar sensors; Continental are one of the world's market leaders in this area.

Frank Jourdan (photo), Continental's Executive Boardmember responsible for the company's autonomous-mobility and safety business activities, says Continental "are benefiting from steadily increasing fitment rates in new vehicles. And in the future, too, we are anticipating major growth opportunities".

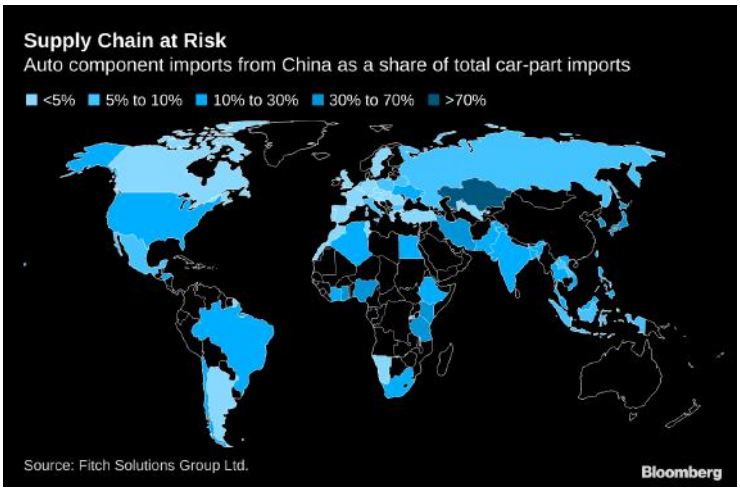
For the construction of the new plant in New Braunfels, Texas, Continental plans to invest about €100m over the next three years. At the 20,000-m^2 site ADAS will be manufactured. The scheduled production of radar sensors is planned to start in 2021. This will add another 130 new jobs in the region in addition to the 450 jobs already existing in development and production of driver assistance systems. These figures do not include further expansion stages of the new plant.

Sensors, software and intelligent connectivity form the basis of ADAS. Continental began research on these systems over 20 years ago. Over the past five years alone, the company have spent a high three-digit-million-Euro amount on this worldwide.

Frank Jourdan

General News

China car sales plunge as virus spreads



Retail car sales fell 22% to 1.71 million units, the biggest-ever drop for the month of January, the China Passenger Car Association said last week, as the coronavirus kept buyers away from showrooms. The group predicted a worsening outlook, saying February sales may drop more than 30%.
Sales were heading for an unprecedented third straight annual decline even before the virus forced authorities to lock down the epicenter of Wuhan and beyond.

Automakers are particularly vulnerable because Hubei is China's fourth-largest automaking hub and home to factories of companies ranging from Dongfeng Motor to Honda and General Motors.

CAAM estimates the coronavirus outbreak will disrupt production of more than 1 million vehicles, it said.
The outbreak has also endangered component supply. Parts manufacturers across China have suspended production through last week and in the case of Wuhan city and the surrounding Hubei province, factories are still largely closed.
Some parts suppliers may face bankruptcy, said Xu Haidong, a vice chief engineer at CAAM.
That leaves car plants at risk also outside China: South Korea's Hyundai and Japan's Nissan are among automakers that have

halted some production in their home countries because of component shortages caused by the virus.

Genesis Takes Top Slot in Reliability: J.D. Power

J.D. Power's 2020 Vehicle Dependability Study marks the first year Genesis, Hyundai's luxury marque, has been included in the survey.

Lexus, the top brand in the study the past eight years, fell to second place overall. Genesis, Lexus and Buick were followed in the top 10 by Porsche, Toyota, Volkswagen, Lincoln, BMW, Chevrolet, and Ford. In addition to the top 10 brands, Mazda, Cadillac, Hyundai, and Kia also fared better than the industry average.

The survey, conducted for 31 years, tracks problems per 100 vehicles during a 12-month period by owners of 3-year-old vehicles. Overall, J.D. Power said 2017 models averaged 134 problems per 100 vehicles studied, a slight improvement over 2016 models tracked in the 2019 study. Across all brands, the reliability of 3-year-old vehicles improved 1.5% from last year. Overall, 18 brands saw improvement, while 13, reported more problems.

"Despite the increased adoption of complex vehicle technology, dependability continues to improve," a JDP representative said in a statement. "There's no question that three-year-old vehicles today are better built and more dependable than same-age vehicles were in previous years. However, the rapid introduction of technology is putting increased pressure on dependability, so it would not be surprising to see problem levels plateau, or even increase, over the next few years".

Power said the 2020 survey is based on responses from 36,555 original owners of 2017 model-year vehicles after three years of

ownership. The study tracked 177 problems grouped into eight categories and was conducted from July through November 2019.

Geely Mull Merger With Volvo

Volvo Cars and their Chinese owner Geely are considering merging their businesses. Geely Holding Group wishes to merge the activities of Volvo Cars and Geely Automobile. The operation aims to create a stronger international group in the face of the current transformation of the automotive industry.

The future entity "would benefit from the size, expertise, and resources to be at the forefront in the ongoing transformation of the automotive industry," said the two groups in a joint statement. "Volvo Cars and Geely will create a working group to prepare a proposal to this effect to their respective boards of directors," they said. The new group could be listed on the Hong Kong Stock Exchange, where Geely Automobile Holdings are already listed, and then in Stockholm.

Acquired from the American Ford Motor Company in 2010 by Geely, Volvo Cars dramatically improved their accounts and their brand image. Their 2019 results show a net profit up 4%, for turnover up 8.5%, to 274 billion Swedish Kronor. The brand sold more than 705,000 vehicles in 2019, 10% more than the 2018 record, and forecasts "continued growth" for 2020. (AFP) 10/02**/2020**

Two Awards for Opel

Last week, , Michael Lohscheller, CEO of Opel received two awards from the renowned AUTOBEST jury: The MANBEST award for the best manager and the New Corsa and Corsa-e award for the “Best Buy car in Europe”

«Together, we are writing one of the most exciting comeback stories in the history of the automotive industry. Yes, we have had to overcome some obstacles. Yes, we have had to make some tough and painful decisions. However, we have every right to be optimistic. We have a clear plan. We are implementing it vigorously and we have exciting products» Michael Lohscheller said.

The Corsa is the first new Opel developed after becoming part of Groupe PSA. Bold and pure design, a state-of-the-art multi-energy platform, which allows electrification and matrix LED headlights are only a few of the highlights this car can offer.
The Corsa has been a mainstay of the Opel brand for over 37 years and the new Corsa will continue this journey.

AUTOBEST *is an organization & european auto jury which was established in 2000 regroupng* ***31 represented countries****, one journalist representing each country*.