Innovations in bonding technology paving the road for vehicles of the future

“Sika was the first company to provide both, structural assembly-line and body shop adhesives for bonding mixed materials such as steel, aluminum and composites – as are bonded together in the BMW 7series.”

– Urs Jaeger, Head Research & Development Sika Global Automotive. Page 10
FROM RPM TO ...

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The entry-level HARMAN Digital Cockpit can also seamlessly integrate with a user’s smartphone to bridge multiple personal assistants.

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What should be occupying the minds of many heads of OEMs and Tier 1 companies who are not planning to retire any time soon is the impact of what is known as Industry 4.0. “Bad strategy rather than tactics, such as misjudged new models, will kill several major automotive companies. They face a perfect storm of peak car, totally new technology, totally new markets and recession,” says Dr Peter Harrop, Chairman of IDTechEx.

There is support for his warning in a McKinsey report titled “Mobility’s Great Inflection Point,” which likens the digitization of everything to the way the world worked was changed by the Model T. “Electric and autonomous vehicles, more interconnected and intelligent road networks, new customer interfaces and services, and a dramatically different competitive landscape in which tech giants, start-ups and OEMs mix and mingle are just a few of the shifts in store,” says Asutosh Padhi, senior partner and global co-leader of McKinsey’s Advanced Industries practice.

He is backed by the Capgemini Research Institute, which found that automotive companies are “struggling” to innovate their business models. Capgemini found that just 28% of automotive companies have launched a new business based on digital technologies. Only 19% believe their digital platforms allow them to reach customers who would not be reached through traditional approaches.

Here they may well be heading down Harrop’s slippery slope to foreclosure. As Tom Arnold, Client Director (Automotive) of Axiom, says “the industry is all about infrequent, high-value, high-consideration purchases. Brands know it’s not just about engaging with customers once every few years, but across the growing number of connections brands and drivers have spanning the entire buying and ownership journey. Being able to use data ethically to understand and engage customers is a key battleground for all car companies”.

OEMs need their own intelligence in order to make sense of the conflicting messages. In contrast to the accepted wisdom that people don’t want to drive, Deloitte’s 2019 Global Automotive Consumer Study found that consumer trust in autonomous vehicles (AVs) appears to be stalling. The study, which surveyed over 25,000 consumers across 20 countries, found that consumers’ appetite for self-driving vehicles was lagging behind the industry’s pace of investment in advanced vehicle technology.

It also found that people are getting back into their cars. In 2018 only 12% of U.S. consumers used ride-hailing at least once a week, while those who use it “occasionally” reached 46%. This is compared to 23% who used it at least once a week in 2017 and 22% who used it occasionally.

The increase in “occasional” use supports pwc, which is predicting that more than one in three kilometers driven by 2030 could involve sharing concepts. At the same time the share of autonomous driving in overall traffic may reach as much as 40%. Europe and the US are expected to develop in parallel. China, it could happen much faster, making it the leader in the transformation of the automotive industry.

Harrop is urging industry leaders to literally think out of the box. Citing the example of Rolls Royce, which as far back as 1915 started manufacturing aero engines. “No emerging EV sectors are big enough to replace the huge car market. Automakers have to select and win at several taken from, for instance, electric aircraft, buses and trucks, energy independent boats, solar agribots, e-bikes, unmanned mining, or mobility for the disabled including exoskeletons. Another example is electrified construction vehicles”.

In short, what we do know is, as Yogi Berra said, “the future ain’t what it used to be”. To survive manufacturers will need to get really close to their customers, and to be much more flexible in terms of what they make and the markets they serve – which is what “Industry 4.0”is supposed to be all about. AI
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Feedback from the market shows that a disjointed approach to the provision of infotainment and vehicle-related information can lead to a sense of data overload or confusion for the driver and passengers. This has the potential of putting the brakes on the adoption of connected car technology. To foster consumer trust, and help drivers embrace the highly connected and autonomous vehicle experience, HARMAN says value is now being measured by experience-per-mile,” said Dinesh Paliwal, HARMAN President and CEO at GiMS 2019.

Automotive Industries (AI) asked Mike Peters, Executive Vice President and President, Connected Car Division at HARMAN International, to tell us more about Rinspeed MicroSNAP, which is HARMAN and Rinspeed’s vision of Level 5 autonomy.

Peters: HARMAN and Rinspeed have a long-lasting partnership on new vehicle concepts, and new mobility concepts. Level 5 autonomy means that, together with Rinspeed, we are not only the mobility provider, but also the enabler of mobility services. Therefore, our vision of Level 5 is going into ADAS (advanced driver assistance systems), supplying systems and enabling technology such as the digital cockpit, telematics, and connectivity systems. This is our vision and in our collaboration with Rinspeed we combine their concepts with our ability to develop highly integrated systems, including HMI (human-machine interface) and connectivity.

AI: How does your enhanced suite of sensing technologies help automakers and drivers to keep an eye on the big picture at all times?

Peters: The interesting thing is that, for Level 4 and Level 5 autonomy, you need sensors not only outside of the car, but also looking inside the car. It doesn’t help if you only know the
environment around the car. You have to learn the habits, and to know the status and the behavior of the drivers of the vehicle. We have been contracted by customers to develop sensing technologies, inside cameras, and sensors managing distraction and observing the driver. This kind of information is downlinked to the autonomous system, in order to improve responsiveness and the interaction between the driver and the vehicle.

**AI: How does HARMAN’s next level Surround View Sensor Intelligence deliver a safer driving experience?**

**Peters:** Being aware of what is happening around the car definitely increases safety by helping the driver to make more informed decisions. The important thing is that we have a unique technology where we use processing power in our central computing platform to enable surround views. Integrating this from a cost perspective, from integration perspective and from performance perspective is, in our opinion, the best solution.

**AI: How critical will HARMAN’s Cabin Monitoring System be to the human handover process in future semi-autonomous vehicles?**

**Peters:** Especially in semi-autonomous driving vehicles, the key to successful implementation is the ability to hand control back the driver. The idea of autonomous driving is that you can do other things like watch TV or movies, or read newspapers. This means the driver will probably be distracted. If there is some danger or obstacle that the autonomous system cannot handle then you have to hand control back to the driver as quickly as possible. But, you have to be sure that the driver is ready to take control. For that you definitely need sensing technologies like cameras, and also haptic devices like temperature sensors.

You can monitor many things, but then it is all about HMI, how to alert and bring the driver back. This is the most critical portion of semi-autonomous driving. From a complexity point of view the interaction with the driver at Level 4 is more complex than at Level 5 because you always have to think about bringing the driver back and that’s why many companies don’t touch Level 4 and want to go straight to Level 5. But, you still have to pass Level 4.

HARMAN’s Cabin Monitoring System uses sensors to capture the most important first-order biometric features of a driver, such as eye gaze, head position, and pupil diameter. The system can also analyze the auditory content and heart or breathing rates of occupants using proprietary and patented algorithms to provide second-order biometric signals such as emotional activity and cognitive load. The ability to analyze the state of the driver is an important milestone for preventive automotive safety features. While capable of working in lower levels of autonomy, HARMAN’s solution is able to ensure a seamless hand-over between car and human at Level 3 autonomous cars, and will therefore be critical to the success of semi-autonomous vehicles in the future.

**AI: How does HARMAN’s Digital Cockpit simplify vehicle display layouts?**

**Peters:** The Digital Cockpit is an integration solution where we drive multiple displays from one computing platform. This has a lot of advantages – cost, integration, performance and experience. It is scalable across the range, from entry-level to premium luxury vehicles. In its base-level configuration HARMAN’s Digital Cockpit simplifies vehicle display layouts to present both critical and ancillary information in an intuitive and cohesive layout. Capable of showing ADAS feature information, turn-by-turn navigation, multi-media player information, feature menus and more, the entry-level Digital Cockpit can also seamlessly integrate with a user’s smartphone to bridge multiple personal assistants (such as Google, Alexa and Samsung’s Bixby) while adding HARMAN-specific driver related skills into all the clouds.

**AI: How does the Premium Digital Cockpit integrate a vehicle’s cluster, infotainment and safety features?**

**Peters:** For drivers seeking the ultimate in-vehicle experience right from the factory, HARMAN’s Premium Digital Cockpit and Compute Platform with integrated modular hardware is an end-to-end package that seamlessly integrates a vehicle’s cluster, infotainment and safety features. With QLED and OLED display technologies for optimal color regardless of the time of day, the solution also features facial recognition for driver monitoring using our Cabin Monitoring System.

Basically, we have a platform in place developed for various customers where we have two Operational Systems (OS) in one platform dealing through a Hypervisor. You have infotainment core which could be for instance Android or Linux partitioning, and then you have functional safety core which is driving the cluster which is usually Linux Real Time (RT) system - two operational systems onto one platform truly decoupled so if something happens functional safety still exists.

**AI: What’s next for HARMAN?**

**Peters:** For starters, we are investing a lot into becoming a major player in the ADAS environment. We are sensing the market, and expanding our footprint there. Building on functional safety can be challenging, but we have the vision, investment, expertise, and partnerships in place to thrive in this space.

We will also remain a leader in digital consumer experience. Traditionally, a laundry list of vehicle features differentiated brands and models. Looking forward, consumers are far less interested in that, and in many cases, do not care to know all the features of a particular model. The future is all about experiences in the car. Having a pleasurable experience is the key, and therefore we think about this as experience per mile or EPM – In the past, we measured performance by kilometers per liter, or revolutions per minute. With the new era of electric and autonomous cars, performance will be measured by experience per mile.

The entry-level HARMAN Digital Cockpit can also seamlessly integrate with a user’s smartphone to bridge multiple personal assistants.
Automotive Industries (AI) asked Urs Jaeger, Head Research & Development Sika Global Automotive, for insight into what is driving some of the underlying design trends.

Jaeger: The need for fuel efficiency and EV range extension lead to lightweighting concepts which involve the bonding of mixed materials. Lightweighting technologies are now also being carried to and deployed in the mid-range and small car markets. An important topic gaining momentum and affecting the specialty chemicals sector is the trend towards lower emissions and reduced odor, driven on the one hand by stronger regulations, but also by consumer applications more than a decade ago – before it was requested by our customers. One of these programs yielded our Sikaflex® Ultra-High Modulus Polyurethane Adhesive technology which enabled structural bonding of the CFRP car body to the aluminum chassis of the BMW i3. A second pillar for our innovations is close cooperation with our development partners; customers, suppliers, peers and industry institutes. Understanding our customers plans and future needs are key to developing value-adding solutions.

AI: How different are the materials required for electric and hybrid car manufacturers from those already in use?

Jaeger: Electric cars offer many new applications for sealing and bonding when you consider the elimination of traditional powertrain components, and in design and assembly as both native or non-native BIW configurations. Unique materials are required not only to bond the battery boxes and other electrical components, but also components within them. In batteries, heat management is of utmost importance. Therefore, thermal conductive sealants and potting adhesives are needed to manage heat transfer. Further, batteries need to be protected against mechanical impact as well as against heat in case of an accident. Here is where our unique reinforcing solutions and intumescent fire rated coatings can make a big difference.

For comfort, the missing sound of the combustion engine allows road and wind noise to become dominant to vehicle occupants. In this NVH area our acoustic expertise contributes to achieve high levels of sound comfort through placement of our reinforcing, airborne noise blocking baffles and structure borne vibration damping solutions at the right spot.

AI: What technological breakthroughs has your company made in developing materials that make vehicles better?
Jaeger: Examples run far and wide. Sika was the first company to provide both, structural assembly line and body shop adhesives for bonding mixed materials such as steel, aluminum and composites – as are bonded together in the BMW 7series. Our Sikaflex® UHM assembly line adhesive technology was honored with an Automotive News Pace award, our SikaPower® MBX body shop adhesive technology was a finalist for the Altair Enlighten award, and our UltraLite damper was an Altair Enlighten award winner.

Sika has developed many other innovations and industry leading products, such as dampers with the best sound performance to weight ratio and our high strength bonded (HSB) Polyamide reinforcements for maximizing improvement of the crash performance of steel structures. We also play a leading role in Monomer or VOC reduced adhesive systems and were the first to introduce a VOC free direct glazing system, through deployment of water based pretreatments. We lead the industry in repair and our Sika PowerCure system, enabling windshield replacement in less than 30 minutes and our unique 2C-Epoxy adhesive for car body repair, which combines the highest modulus (stiffness) and impact peel (crash resistance). We are soon introducing a new generation of proprietary 2C-PUR adhesives branded Cure-on-demand technology where we are able to manage open time and curing speed separately, and of course the entire innovation pipeline remains full.

AI: Tell us a little about the role Sika’s adhesive products have had in car manufacture/assembly.

Jaeger: Sika solutions are developed to meet real industry needs, and not just to offer me-too products. Sika was the first company to introduce black primer-free direct glazing adhesives, followed later on by Sika HydroPrep® water-based systems. We enabled the successful combination of antenna suitability combined with direct fixation of windscreens, structural bonding of mixed substrates and classification-free hotmelt lamination adhesives, just to name some.

Introducing innovations requires a close co-operation with the customers, since innovation means change and not just replacement. The customer must be involved in the whole development process in order to understand the benefits and risks of the new systems very well in order to change. We call this Courage for Innovation because it requires commitment, we call our results Value Added Solutions.

AI: Similarly, how have your acoustic applications been impacted by the changing demands of the automotive sector?

Jaeger: There are several dozen baffle and damper parts in the modern car which contribute to noise reduction. Sika continues to bring innovations to the market such as lighter weight baffles with highest sealing performance and new ultra-lightweight constrained layer dampers, which enables weight savings up to several kilograms per car compared to standard systems.

Our acoustics innovation is not only in our materials but also in core competencies of acoustic engineering and parts design. Sika experts in our modern acoustic technical centers can help our customers through extensive full body testing to exact placement of the parts to achieve maximum noise reduction while our engineers create best possible optimized parts designs, many of which are now and remain patent protected.

AI: What technologies are in the early stages at Sika’s R&D division?

Jaeger: Usually we do not talk about our chickens before they are hatched, but I can assure you that we are continuously creating future technologies. We spend over 25% of our development time on future technologies, many of them years away. Based on the identified megatrends we are working on further solutions for e-vehicles, and a range of products curing at lower e-coat oven temperatures or over shorter oven duration times. We also are pushing hard to develop a new platform of polyurethane adhesives with a new set of properties, having a big impact on assembly bonding applications.

AI: How are your R&D programs affected by regional requirements?

Jaeger: Requirements differ between customers and sometimes even at the same customer between the regions. There are both different regional government regulations, and customer expectations. What is also important to consider is global availability of raw materials as we formulate the future. Customer requirements also differ in EHS related issues (which and how much VOC, emissions, odor, etc. are allowed). Assembly process related differences also can present a challenge. Fully automated and climate-controlled environments have different needs compared to a manually applied processes in a hot and humid region without climatic control.

A key Sika differentiator is proximity to customers. We have strong development teams established in every region who collaborate regularly within our networks. So, even if a big part of our business is global, regional or local adaptations and interfaces are readily enabled. We maintain close and good collaboration between these development teams, which is crucial to roll out our technical innovations fast and successfully.
Preparing the **charging infrastructure** for EV rollout

By: Nick Palmen

There is, at present, a chicken-and-egg situation in the rollout of electric vehicles across Europe, and elsewhere in the world.

In some countries, charging infrastructure is being installed ahead of demand, while in others it is lagging behind. A European Union study recommends that there should be a ratio of one public recharging point for every 10 EVs (electric vehicles) on the road. According to the study, at present there is an average of five EVs on the road per public charging point. By 2020, the ratio will be around 10 EVs per charging point, or around 220,000 chargers.

There will also be good coverage of fast chargers along the European motorway network with about 1,000 ultra-fast (150-350 kW) charging sites planned for 2020. These sites will allow drivers to replenish up to 400 km of driving range in only 15 minutes. Additional, 50 kW fast charging deployment will complement these sites with more than 2,500 sites existing today and nearly double this set to be operational by 2020. This translates into one recharging point every 34 km along the strategic TEN-T Core Network – more than sufficient to support the early market.

One of the leaders in the rollout is IONITY. The joint venture between the BMW Group, Daimler, Ford Motor Company, and the Volkswagen Group (including Audi and Porsche) has the goal of building a high-power charging network for electric vehicles along major highways in Europe.

“The power of charging at 350 kW is the power to stop, drink a coffee, and go. At maximum speed, you can be on your way within minutes. Competing networks provide less power, and charge points in cities are even slower. So the first time you use...
A 350 kW IONITY charger will give drivers just enough time to drink a cup of coffee before the vehicle is ready to go.

The first step is to secure the location where you want to build the stations. That was the reason why we reached out to a lot of strategic site partners, both large and small early on to be able to cover the dedicated countries. Just to name a few like Shell, Circle K, Gotthard Raststätte, MFG, ENI and others. Also, like here in Switzerland, it is more location by location business because its privately or company owned and it’s not one person or institution owning the whole network. There is just a handful of sites missing. However, we are very confident that we will be able to secure all the locations very soon.

Of course, you want to know which hardware you want to build and what the target design might be and might look like and we started with three suppliers which are ABB, Tritium and Bosch. We are now ramping up the network with two suppliers, and our finale design charger will be ready at the end of summer.

AI: How do the IONITY's charging stations eliminate the bottleneck of directly converting AC power to DC before transmitting into the car's battery at full velocity?

Hajesch: We are directly connected to the transmission net. We then we set up our own transformer station and power outlets deliver DC energy to the outlet in whatever amount is necessary.

AI: What's next for IONITY in the near and mid-term future?

Hajesch: First of all, we have to complete the network, and get it running in terms of reliability. We are discussing “what is next,” but first of all our focus is to achieve the target of 400 outlets and make e-mobility across Europe a reality.

What is always important for me personally is the people delivering results. These include the workers assembling and installing the systems, and the people helping us out with the network – be it directly or indirectly, or in partnerships.

All of us at IONITY are driven by the belief that powering an EV across Europe should be so carefree that soon you'll never even think about range again. Over the next few years, driving an EV will increasingly mean freedom for everyone. Freedom to power your dreams across borders. To travel anywhere in Europe. To hop in, and only then decide where you’re going.

AI: How important is to have Combined Charging System (CCS) as the most widely supported charging standard in Europe?

Hajesch: It is a central issue. We come from a past where there were no standards in the e-mobility space, and no clear path forward. Now it is clear that the European focus is on the use of combined charging system (CCS). In the European Union according to Directive 2014/94/EU [28] all high-power DC charging points installed after November 18, 2017 shall be equipped for interoperability purposes at least with Combo 2 connectors.

The Combined Charging System (CCS) is the most widely supported charging standard in Europe, with nearly universal inclusion on all electric car models past, present, and future. In addition, from a cost-saving point of view, it is always good to have one standard instead of several - so we want to push this one across Europe and beyond.

A 350 kW IONITY charger will give drivers just enough time to drink a cup of coffee before the vehicle is ready to go.

An electric Mercedes at a bank of IONITY chargers.
Wireless connectivity is fast becoming a critical element for any new car or commercial vehicle entering the market. So much so that European telecom major Transatel describes automotive OEMs as “the next telcos”. Vehicle assemblers therefore need to gain full control of the connectivity component of their service offering. “Whether for telematics, pay-as-you-go insurance, autonomous driving or infotainment, connecting vehicles means adding new revenues streams, but also new costs—those of the SIM card, airtime, platform management, services and technical integration. It also means potential lock-in with cellular carriers,” says the company.

Transatel recently launched a consumer-focused brand, Ubigi, which is dedicated to providing wireless services for the Internet of Things (IoT). Ubigi, an eSIM-compatible service, was deployed starting 2018 by Microsoft Surface (US, Europe, and Japan), Asus (Europe), Acer (US, Europe), Vaio (Japan), and by Lenovo in the US under the Lenovo Connect brand. Transatel is offering Ubigi services to several manufacturers of laptops, tablets and automobiles in Europe, Japan and the USA.

“By: Nick Palmen
Jacques Bonifay, co-founder and Chief Executive Officer of Transatel.

“At this point in our development, we believed it was necessary to create a brand dedicated to the Internet of Things. Ubigi embodies this positioning, as relevant for laptops and tablets as it is for automobiles,” said Jacques Bonifay, Chief Executive Officer of Transatel.

The company’s capabilities have been increased through its acquisition by NTT Communications Corporation. NTT helps enterprises to overcome complexity and risk in their ICT environments with managed IT infrastructure solutions. Transatel is a mobile virtual network enabler or MVNE. The service offers the same advantages to the car industry as it does to the consumer electronics sector, namely: integrate once to deploy globally. Thanks to a zero-rating facility, vehicle manufacturers can perform over-the-air software updates at no cost to the end user, according to the company.

The first vehicles to be equipped with Transatel’s technology in the Jaguar and Land Rover ranges, and have been available since June 2018. The two companies signed a Master Services Agreement for a global cellular connectivity solution aiming to cover Jaguar Land Rovers’ connected car passenger applications: internet browsing and navigation services from the vehicle console, as well as on-board Wi-Fi, according to a Transatel release.

Transatel said it would be providing a data plan from 2018 for Jaguar and Land Rover models in the UK, Italy, and Germany. Extensions, with a selection of local and European plans, are available for selected models. Transatel will be providing the service, managing customer and retailer relations, providing customer and retailer support, and ensuring the payment process for the purchase of data bundles by end users.

Transatel says the design of the customer journey for this connected car service is the result of over 18 years’ experience in marketing telecom offers to end-users in European territories. Clients seamlessly manage their accounts via a self-service application, accessible with any device connected through the car’s Wi-Fi. The multilingual selfcare application enables account management, user registration and payment method registration, among other features.

“We’re excited to be launching our second European connected car project with such a prestigious and renowned company as Jaguar Land Rover. This time not for telematics, but for passenger applications. We’ve been evangelizing the market for more than a year now, explaining to car OEMs worldwide how to avoid major lock-in risks and answering their concerns about security, among others. It seems the superiority of our platform and business model has now become apparent to some major players of the automotive industry,” said Philippe Vigneau, Vice President - Business development at Transatel.

The application is also being used in commercial fleets. In December 2018 Transatel and Giesecke+Devrient Mobile Security (G+D) partnered with truck maker Scania for its embedded telematics units with global connectivity. “Scania already provides its customers with a telematics service, but is now going one step...
further, as it is looking to deploy worldwide. In this context, Scania needed a fully eUICC-compliant solution (provided by G+D), supported by a global, flexible and secure technical platform. Transatel will offer Scania its competitive data prices worldwide, as well its core value proposition for all IoT players: a one-time integration for a global deployment,” said the company.

The solution deployed for Scania’s telematics services is also suitable for the truck manufacturer’s other projects, in which trucks will be generating and exchanging different types of data flows. Transatel’s versatile platform allows for a variety of projects and SIM usages to be operated within the same account and environment.

Transatel says that as security is one of the major concerns for any truck manufacturer, it further guarantees connectivity security via a private APN and secure authentication. The solution presents built-in, end-to-end security mechanisms compliant with connected car and remote-control services standards. Technically, the profiles are stored in Transatel’s SM-DP hosted by G+D Mobile Security and are transferred to the G+D eSIM via the Scania SM-SR platform, also hosted and operated by G+D Mobile Security.

Thanks to global connectivity, and to the comprehensive connectivity management platform, Scania will be able to offer its telematics services consistently around the world – services such as fleet management, remote control, predictive maintenance and over-the-air software updates. At one end, Scania will be able to better optimize the operational costs of its fleets engaged in leasing contracts. At the other, Scania’s customers will be able to benefit from smart connected services and manage their own fleets with better efficiency.

Automotive Industries (AI) asked Bonifay how Ubigi helps streamline connectivity.

Bonifay: Users can connect all their devices to the internet via the Ubigi SIM card provided with their vehicle. The SIM card also enables the navigation and connectivity features of their vehicle’s infotainment system. Ubigi transforms the driving and passenger experience, as users maximize their vehicle’s capabilities, staying connected, informed and entertained. Furthermore, car OEMs can send software updates in “push” mode, fully transparent to the end users. Ubigi’s network identifies vehicle model, specs, and local market upon first connection to automatically load the appropriate initial data plan. This capability enables the use of a single stock of SIM cards. The data plan catalogue display is dynamic and adapts to the local market.

AI: How do you see Ubigi changing the face of connected cars for both OEMs and consumers?

Bonifay: Ubigi’s platform and associated services offers the advantage of serving both car-centric, as well as passenger-centric applications thus covering all a connected car’s needs from the same platform, including mandatory security services such as eCall, bCall, etc.

From a car-centric standpoint, Transatel has been supplying M2M/telematics connectivity since 2011. The company also has an MVNO activity track-record of over 19 years, which counts for extensive marketing, regulatory, and service experience in the commercialization of connectivity to end users worldwide.

At the other end of the spectrum, visible to the end-user, and therefore passenger-centric by design, is Ubigi, Transatel’s new brand for cellular services in the IoT. It is at the service of device manufacturers wishing to offer global, secure connectivity to their end users. It provides a solution for manufacturers which may not wish to become service providers themselves, negotiate roaming agreements and/or associate their brand name with a wireless service. For any device, operating via a single platform, Ubigi is their fully packaged, ready-to-go service for instant-on, plug & play connectivity anywhere in the world.

AI: How wide is your coverage?

Bonifay: Ubigi benefits from coverage in more than 35 countries in Europe, including all EU member states – which means that you will not be charged roaming fees when you are driving between them. Ubigi’s network identifies vehicle model, specs, and local market upon first connection to automatically load the appropriate initial data plan. This capability enables the use of a single stock of SIM cards. The data plan catalogue display is dynamic and adapts to the local market.

Ubigi operates seamlessly and consistently worldwide. That’s because Transatel leverages on the privilege of an international mobile network code (MNC 901-37), supported by agreements signed with more than 140 Mobile Network Operators around the world. More than two years of agile development at Transatel were needed to make Ubigi the most versatile, secure, dependable, flexible and cost-effective cellular service on the market for the IoT today.
The company used CES 2019 to showcase a full range of electrified powertrain configurations and to challenge the traditional approach to seating configuration at its “Welcome to Mobility” booth. Visitors found through a combination of full-scale demonstrations and a VR experience, how long road trips, cargo transport services and mobile meetings can be transformed through technologies like module / inverter and the transmission. Since 2012, Magna has supplied Volvo with the electrified rear axle drive system (eRAD) featured on the Volvo V60 and S60 plug-in hybrid models.

Automotive Industries (AI) asked Swamy Kotagiri, Chief Technology Officer and President Powertrain, Magna International, to tell us more about the company's CES stand.

Kotagiri: We showcased our view of the future where electrification, autonomy and smart mobility are intertwined. We also showed how multiple powertrain configurations with scalable electric power for hybrid and electric vehicles are applied to meet the varying consumer demands for efficiency, performance and dynamics.

Additionally, we had LiDAR object detection in action on a display screen, which shows how Magna will master the complexity of autonomous driving through modular, scalable configurations for any vehicle architecture and autonomy scale.

AI: Tell us about the role seating will play in the cars of the future.

Kotagiri: New seating configurations will enable vehicles to be used and shared differently by making them more adaptable...
to varying needs and infrastructures. Seat positioning will enable passengers to create a flexible space where drivers can move cargo, get work done and interact with accompanying passengers. As the functional basics will remain the same, we are creating innovative seating solutions focused on delivering the ideal user experience. This approach has essentially helped us create seats that adjust to the consumer, instead of having the consumer adjust to seats.

**AI:** What are some of the trends affecting vehicle design?

**Kotagiri:** With brilliant and disruptive thinking everywhere, the question isn’t about when things like driverless cars are coming or when all vehicles will be fully electric. The question is about who is ready for these transformative shifts. In addition, the next generation of mobility and the requirements for mobility as a service are being defined by new class of service providers (i.e. Lyft, Waymo, May Mobility etc.). Cities are beginning to dictate requirements for powertrain (EVs) and autonomous capability.

In many cases sharing of mobility and making it multifunctional is the next step in improving city access and passenger movement. Partnerships with OEMs and these future service providers provide valuable insight and data into use cases, future design requirements and the direction consumers and customers are thinking for future mobility products and services.

**AI:** What is Magna's strategy in the development of powertrain technologies for electric and hybrid vehicles?

**Kotagiri:** It is not just the impact of EVs, but rather the overall impact of the shift towards full electric. What was once six or so basic powertrain architectures (FWD, RWD, 4WD, AWD, AT, MT) will balloon to over 50 by 2025. Magna is focused on the development of scalable building blocks to support such proliferation. Especially important will be the building blocks for eMotors and inverters (48V and high voltage), as well as software.

At Magna we have complete vehicle system knowledge through our vehicle engineering and assembly operations experience at our Steyr Group. Our knowledge of powertrain systems from our transmission and driveline leadership position, as well as experiences in full EVs and PHEVs systems, form the basis for key scalable building blocks for powertrain variants needed going forward including the path to full electrification.

**AI:** Where do you see the growth for your powertrains coming from?

**Kotagiri:** Our expectation is that pure EVs will account for about 5% of the global sales in 2025, with an additional 10% in the HEV/PHEV space. About 33% will have 48V mild hybrid systems on board. This leaves the remaining 50% or so with traditional ICE engine-based powertrains.

In the next 3-4 years we expect to see the introduction and significant expansion of 48V Mild Hybrid systems, especially in Europe. The MHEV (Mild Hybrid Electric Vehicle) improves the operating efficiency of powertrains with ICE engines, thereby reducing CO2 emissions. For Europe this will be an important feature to offset the effect of lower penetration of diesel engines, which have a better CO2 performance than gasoline engines.

We also expect to see further expansion of DCT transmissions globally, as this product is the most efficient automatic transmission and can reduce CO2 compared to traditional automatic transmissions. Our 7DCT300 is a base DCT which enables our OEM customers to upgrade to a P2.5 mild as well as full hybrid (including plug-in) without impacting installation / packaging in the vehicle. This is a really important feature for our OEM customers: a modular, scalable product enabling the flexibility of base ICE, mild hybrid and full hybrid functionality.

By 2025, in addition to further expansion of the 48V systems, we anticipate the introduction of so-called post-transmission 48V products. Given the base investment of a 48V board, network and battery, there is opportunity to provide additional CO2 benefits, as well additional driving functions / features such as electronic traction assist, highway speed engine-off sailing, and enhanced 4WD with front to rear torque vectoring to further improve stability.

We are ready to support our OEM customers with a developed portfolio of these new products. We also expect significant proliferation of high voltage systems in passenger cars and light trucks. These systems will include High Voltage P2.5 Hybrid DCTs, again a scalable product where we simply install a higher power (75 kW for example), high voltage eMotor inside our base DCT transmission.

This enables all the benefits of pure hybrid functionality, as well as plug-in hybrid capability, when the OEMs install sufficient battery capacity to enable zero emission operation for periods of 50 miles for example.

All OEMs globally will introduce full electric vehicles. The demand for such vehicles will especially be seen in China, where legislation for New Energy Vehicles (NEVs) will require EVs and PHEVs be present in OEM fleets. Our expectation is that pure EVs will account for about 5% of the global sales in 2025, with an additional 10% in the HEV/PHEV space. About 1/3 (33%) will have 48V mild hybrid systems on board. This leaves the remaining 50% or so with traditional ICE engine-based powertrains (many of which will feature low cost start-stop systems as an efficiency / CO2 improvement).
In addition to doing the necessary training, simulation allows developers to test edge cases — the unlikely and unexpected scenarios that pop up while driving — without the risk of a physical accident. The development of simulation systems has been given a boost by the partnering of Dassault Systèmes of France and Israeli company Cognata to embed Cognata’s Autonomous Vehicle Simulation Suite into Dassault Systèmes’ 3DEXPERIENCE platform. The partnership provides a first-of-its-kind solution for autonomous vehicle makers to define, test and experience autonomous driving throughout the development cycle.

“Simulation is key at all stages of cyber systems engineering. Billions of miles must be virtually run before a car can be considered safe. AI-powered experiences that combine vehicle behavior, sensors and traffic models allow alternative designs to be tested in the concept phase to identify the optimal engineering solution,” said Philippe Laufer, CATIA CEO. “Integrating Cognata’s accurate and comprehensive offering into the 3DEXPERIENCE platform creates a unique solution to help our customers greatly reduce the time to market of safe autonomous vehicles, he added.”

“The partnership with Dassault Systèmes will hasten the development of autonomous vehicles, by making simulation an integral, seamless component of the engineering process,” says Danny Atsmon, CEO and Founder of Cognata. “The earlier simulation is utilized, the easier it is for engineers to modify each component of the autonomous vehicle and test it through a virtual environment, to see how it works once incorporated in the vehicle and confronted with unexpected edge cases.”

Dassault Systèmes’ 3DEXPERIENCE platform provides industry solution experiences such as smart, safe and connected to the transportation and mobility industry that transform the way next generation vehicles are designed, produced, delivered and operated. Cognata’s full product simulation solution leverages deep learning to enable autonomous vehicle manufacturers to run thousands of different scenarios based on various geographic locations, traffic patterns, and weather conditions. By incorporating the Cognata simulation suite into the 3DEXPERIENCE platform and leveraging CATIA best in class systems engineering roles and applications, the two companies say they can now deliver a one-stop-shop, outstanding environment to engineers for accelerated autonomous vehicle design, engineering, simulation and program management.

In March, Cognata has announced a partnership with Nvidia over the Drive Constellation platform for simulation Hardware in the loop testing. “NVIDIA and Cognata share the vision of using large-scale, cloud-based, open simulation to thoroughly and safely train and test self-driving cars under endless challenging situations” said Zvi Greenstein general manager at NVIDIA. “This offering will help accelerate the safe deployment of autonomous vehicles.”

Cognata recently raised US$18.5 million in a funding round led by Scale Venture Partners to finance the development of its technology. Atsmon says the company will use the money to double its staff from the current 28, and expand commercial operations. Cognata wants to increase its international presence, specifically into the U.S., Germany, China and Japan, he added. Existing investors Emerge,
The company, which received a US$100,000 grant and a Nvidia DGX Station personal AI supercomputer, has two full-time and two part-time employees. Founder Dan Yanson said: “What makes this win special is that the judges recognized the value and potential in us. The prize money will give us a big push but the DGX workstation will lead to significant acceleration and dramatic impact on our activity. “Despite being a small country, Israel is a huge force in the artificial intelligence industry,” said Bill Dally, the head of Nvidia’s 200-strong international research center when he made the award.

The company says the environmental perception of autonomous vehicles earned Israeli start-up TheWhollySee the Inception Award at the 2018 NVIDIA GPU Technology Conference.

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TheWhollySee STRADA automatically augments real-world data to generate high-fidelity, high-diversity mixed-reality data that does not require human labelling or post-processing. “Our image augmentation technology can generate annotated datasets of real-world imagery with automatic instance-level object segmentation in complex multi-object scenes. Edge cases and various object combinations can be specified as augmentation scenarios,” says Yanson.

The company says the environmental perception by autonomous vehicles is powered by deep neural networks that need hundreds of thousands – if not millions – of examples to learn the appearance of common and not-so-common objects that they could encounter in real-world traffic. For supervised machine learning, one needs masses of annotated or labelled data, in which images are categorized by object labels and the precise pixels occupied by those objects.

The safety of autonomous agents is predicated on their flawless environment sensing and perception, which require verification and certification using their sensor-specific data. However, the scene diversity and variety of edge cases achievable with physically driveable mileage are insufficient for fully autonomous driving certification.

High-fidelity image datasets for training and certifying the artificial intelligence (AI) “brains” of autonomous vehicles earned Israeli start-up TheWhollySee the Inception Award at the 2018 NVIDIA GPU Technology Conference.

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Maniv Mobility and Airbus Ventures, as well as newcomer Global IoT Technology Ventures, participated in the round.

Automotive majors like AID (A Fully owned subsidiary of AUDI AG) are partnering with the company. In June 2018, Autonomous Intelligent Driving (AID), selected Cognata as its autonomous vehicle simulation partner in a multi-year agreement. Cognata recreates cities from around the world, allowing an expanded range of testing scenarios, including AI-based traffic models simulating real-world traffic conditions. The simulation engine reproduces sensor input by emulating the specific sensors’ interactions with real-world materials.

Most of the OEMs have a fleet of test vehicles running the latest version of their self-driving software. The OEMs AV team develops the full software stack from AI and Machine Learning for perception and prediction to localization, trajectory planning and interface to sensors and computers. With Cognata’s simulation platform they can connect all of these modules at the software level and train their stack ahead of time.

Cognata is headquartered in Rehovot, close to the Weizmann Institute of Science.

Automotive Industries (AI) asked Atsmon why machines need to learn from machines.

Atsmon: Every autonomous vehicle developer faces the same challenge — it is really hard to generate the numerous edge cases and the wide variety of real-world environments. Rand Corp estimates that, in order to get to a human level with high confidence, autonomous vehicles need to validate their software for 11 billion miles. This would take hundreds of years in real life. Our simulation platform rapidly pumps out large volumes of rich training data for the AI algorithms.

AI: How will simulation save?

Atsmon: Cognata’s simulated testing and evaluation environment shaves years off the validation time, and eliminates the safety concerns, high costs, and limited scalability of road-testing in the physical world. Our scalable cloud layer runs millions of instances of its simulation software simultaneously to provide full coverage in only a few weeks.

AI: What can you tell us about your new product?

Atsmon: We are working on launching several products that we cannot expose yet with top tier OEMs, and are also working on integrating our software with partners such as Dassault systems and others.

AI: How important will your technology be in introducing self-driving technologies faster and more cost-effectively?

Atsmon: Self-driving is composed of a cutting edge set of sensors, maps, AI and processing technologies. Cognata is providing the proving ground to stress test, and to enable a fast development, verification and validation cycle.

AI: Are OEMs other than Audi showing interest?

Atsmon: Cognata is in touch with large number of OEMs worldwide. Due to confidentiality we cannot disclose the names of our clients.

Simulation is key at all stages of cyber systems engineering. Billions of miles must be virtually run before a car can be considered safe.”

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Before fully autonomous vehicles are allowed on the roads at commercial scale, the developers will have to prove that their artificial intelligence systems have “learned” hundreds of millions of critical driving scenarios. One of the companies leading the development of “GigaScale” intelligent verification framework for intelligent autonomous systems (IAS), with an emphasis on Autonomous Vehicles (AVs), is Israeli start-up Foretellix.

The company’s vision is to make autonomous vehicles safer. The company is founded by a team of verification experts and thought leaders from the VLSI chip design and SoC world.

Foretellix founder and CTO Yoav Hollander, and co-founders CEO Ziv Binyamini and Gil Amid, VP Operations and Business Development, have spent decades developing advanced verification solutions. They come from semiconductor and software industry heavyweights such as Intel and Cadence Design Systems.

Foretellix’s verification process automates safety testing in self-driving vehicles, including hundreds of millions of potential safety scenarios. It also develops an open language that can serve as a standard for describing autonomous vehicle scenarios.

Automotive Industries (AI) spoke to co-founders Binyamini and Amid.

AI: Please describe how Foretellix came about?

Binyamini: A while back, there was a sort of a crisis in the semiconductor industry – chips became very complex and the testing/validation methods of the time were not up to par with level of complexity. This crisis led to the birth of Verisity – a company founded by Yoav, and which I joined in an early stage. Verisity underwent an IPO and was later sold to Cadence. After we helped to shape the way chips are verified today with tools and methodologies used by semiconductor giants, Yoav decided to find his next challenge, and started investigating autonomous systems. He has been looking into this field for the last six years and realized that the methodology called Coverage Driven Verification used to verify complex chips, together with the right adaptation and tools, could be very effective in verifying AVs and ADAS. About a year ago Yoav decided to found Foretellix and I joined him to help overcome the biggest barrier to AV deployment – safety.

AI: What has been the main challenge in developing Foretellix’s verification process?

Binyamini: Since we come from semiconductors, we had to work hard to understand the needs and complexities of the automotive market. We are continuously improving our tools, learning from the car makers we are working with on the subtleties of verifying AVs and ADAS. On the positive side, during this learning process we are constantly reassured our tools provide real value to AV stack and ADAS creators in complete, measurable and efficient verification.

Amid: On the operational side, as a small startup that has a lot of demand for its products, we struggle with expanding the team at a pace that fits the demand. Good SW and Algorithm engineers are not easy to find, but we are getting there.

AI: How do you see this technology being deployed and utilized by carmakers, regulators and service industries?

Amid: We hope that more and more carmakers will see the great benefits our methodology and tools bring when it comes to covering the huge scenario space required to truly verify the autonomous vehicle behavior. We believe that the ability to achieve measurable safety and transparency is something that is lacking in the automotive industry today when it comes to AV and ADAS development. With our tools, regulators could set the bar for what is considered safe while car makers, insurance companies, certification bodies and all of the ecosystem will be able to assess one AV stack vs another based on scenario coverage and measurable metrics.
Inspired by Mother Nature

Taking their cue from Mother Nature, engineers today are building aircraft, satellites, drones and cars in amazing lightweight designs, and faster than ever before, in order to minimise use of materials and energy resources. K 2019 will showcase ways of producing lightweight components, among other innovative trending topics. Around 3,200 international exhibitors will be offering you the latest in research and development from the global plastics and rubber industry. Welcome to the show!

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In response to the growing demand Mitsui Chemicals and its group company Prime Polymer co-announced in May 2018 that it would set up its first European PP compound production facility. Mitsui Prime Advanced Composites Europe is based in the Netherlands, and is scheduled to start operations in June 2020. Mitsui Chemicals Group currently operates eight production bases around the world (Japan, the U.S., Mexico, Europe, Thailand, China, India and Brazil) and has five research bases (Japan, the U.S., Europe, Thailand and China).

Mitsui Chemicals increased its automotive technology base through the January 2018 acquisition of vehicle designer and mold maker, ARRK Corporation for 30 billion yen. The two companies have committed to put each other’s technologies to use for achieving continued growth in the global market. ARRK will utilize the diverse range of Mitsui Chemicals products and materials technologies in carrying out design, prototyping and analytical activities. Meanwhile, Mitsui Chemicals will use the strengths of ARRK to broaden the range of business domains for its own products and services, strengthen its ability to market and offer solutions in the mobility domain and reach further commercialization.

Automotive Industries (AI) asked Tsutomu Tannowa, President & CEO, Mitsui Chemicals, how the company has realigned itself over the past few years.

Tannowa: First of all, it was important to consider how materials can contribute to the CASE (Connected, Autonomous, Shared, Electric) and MaaS (mobility as a service) set of trends, which represent the mobility needs of the future. Looking at connectivity, for example, Mitsui Chemicals is developing sensing and semiconductor materials. As autonomous driving continues to make its presence felt the industry will have a growing need for lenses and other optical materials, as well as for the coatings used on these.

In addition, we’re going to see a significant shift in the approach to making cars comfortable, which will drive changes to the kinds of lighting and displays in cars. We are re-evaluating the materials we offer to the market for these applications. And then changes in powertrains are going to put greater emphasis on complex countermeasures to noise.

One constant in the industry is the improvement of fuel efficiency – in other words, lightweighting solutions. Our work here includes an eight-base global system for PP compounds. To make sure we can cater to the quick-moving global strategies of automakers, Mitsui Chemicals is currently working to increase production capacity and bolster marketing capabilities across each of our locations.

We’ve recently received strong feedback for design qualities that enable not only lightweighting but also complex designs and a move away from painting. MOSTRON™-L, a long glass fiber reinforced plastic is already beginning to replace metals in automotive rear doors, and we are increasing production capacity globally. Elsewhere, we’ve been expanding capacity for the likes of MITSUI EPT™ – a high-quality synthetic rubber made using a proprietary metallocene catalyst – and ADMER™, an adhesive resin able to help with both lightweighting and freedom of design for gasoline tanks.

We’ve also paved a path going forward for MILASTOMER™ – a lightweight and luxurious material for automotive interior surfaces – by establishing a system of nine bases around the world. A new grade which offers an attractive uncoated appearance is finding increased adoption in airbag covers.

Mitsui Chemicals provides a range of other materials to the auto sector. Examples are our TAFMER™ elastomer, which holds unlimited potential for next-generation of automobiles. By: Alan Tran
Chemical industry holds unlimited potential for next-generation of automobiles

By: Alan Tran

Modifier, urethane materials that are used in seat cushions and soundproofing, as well as coating materials that help to improve vehicle design. Then we help to reduce weight through a range of carbon fiber composite materials, including carbon fiber sheet molding compounds and UD (unidirectional) tapes.

These include AURUM™, a thermoplastic engineering plastic, which is seeing increasing use around engines; ARLEN™, a modified polyamide 6T material used underneath bonnets; and LUCANT™, a lubricant for gear oil applications that serves to boost fuel efficiency. POLYMETAC™, a technology for the integration of metals and resins, is being adopted for water-cooled lithium-ion module parts by European OEMs for their 2019 model ranges.

**AI**: How will your first European production plant help boost business in the region?

**Tannowa**: Having a European base is a crucial part of supplying to European OEMs. While Mitsui Chemicals has had sales operations in Europe for some time, the continent has traditionally made up only a very low proportion of sales in our broader global business. But by establishing a research base in 2014, we’ve made ground in strengthening our relationships with European OEMs. This has given us a better understanding of solutions in the field, and the expectation is that our products will be increasingly adopted by the various European OEMs going forward.

Our initial plans are centered on the Netherlands, where we hope to begin operations in 2020 with a production capacity of 30 kilotons per year. But we intend to expand our regional capacity as required. By integrating production, sales and research – and setting up a system to supply European OEMs with lightweighting solutions – we hope to steadily expand our European business.

**AI**: How has your acquisition of ARRK helped boost Mitsui Chemical’s position as an automotive supplier?

**Tannowa**: As a global development assistance company, ARRK is able to work on the design, analysis, molding and prototyping of vehicles, and has a system that allows it to support a customer’s product development from the concept stage. Mitsui Chemicals’ ideal for OEM work then is a setup in which we work right from the material stage to provide the solutions required by OEMs.

Integrating ARRK with Mitsui Chemicals will therefore tie into improved marketability in the area of lightweighting as the industry continues its trend toward resin-based auto parts. The move works from ARRK’s perspective as well, allowing it to provide development support services that have high added value going all the way through to materials.

It’s also worth noting that ARRK sees 60% of its business coming from Europe – much of this from subsidiary P+Z Engineering – and is deeply involved in supporting the development of prominent OEMs in the region. At JEC 2019 we leveraged the technological synergies of both companies, producing a mock-up to use for exhibition. In creating the “hour’s Pod” concept car, we’ve marketed the potential for a range of auto parts to switch over to resin.

The hour’s Pod serves to market the potential uses of thermoplastic UD tape that has gone through various production methods; lightweighting by way of the polymetac technology for metal–resin integration; and new concept seats that contribute to comfort, among other things.

If Mitsui Chemicals were alone, it would have been difficult to come up with a concept car on this sort of scale. But by joining forces with ARRK, I feel that we’ve been able to significantly alter the way in which we communicate, and that we’ll see a major boost to our client-oriented capabilities going forward.

The rise of autonomous driving is bringing a new turning point in both the automotive world and widespread notions of what a car is. As all sorts of things mingle with technology, conventional notions and models are being overturned. But then the chemical industry’s always been at the intersection of such innovations – and so we’ll continue to watch for signs of change while providing solutions for the mobility of the future.
New era for autonomous vehicle detection of the “unexpected”  
By: John Larkin

A key challenge facing the industry in the rollout of self-driving vehicles is the detection of “unexpected” objects. Roads are full of “unexpected” objects that are absent from training data sets, even when those sets are captured while travelling millions of kilometers. Thus, systems that are mainly based on deep neural networks fail to detect the “unexpected”. In response to this Israeli company VAYAVISION has introduced VAYADrive 2.0, an autonomous vehicle perception software engine that fuses raw sensor data together with artificial intelligence tools to create an accurate 3D environmental model of the area around autonomous vehicles.

“Most current generation autonomous driving solutions are based on ‘Object Fusion’ architecture, in which each sensor registers an independent object, and then must reconcile which data is correct,” said Youval Nehmadi, CTO and co-founder of VAYAVISION. “This provides inaccurate detections and results in a high rate of false alarms. The industry has recognized that to reach the required levels of safety, more advanced perception paradigms are needed – such as raw data fusion.”

VAYAVISION specializes in combining the environmental data received by the self-driving car from different sources — such as LiDAR (light detection and ranging), radar, and camera — to create a comprehensive model of what’s going on around the vehicle. “This launch (of the system) marks the beginning of a new era in autonomous vehicles, bringing to market an AV (autonomous vehicle) perception software based on raw data fusion,” says Ronny Cohen, CEO and co-founder of VAYAVISION. “VAYADrive 2.0 increases the safety and affordability of self-driving vehicles and provides OEMs and Tier 1s with the required level of autonomy for the mass-distribution of autonomous vehicles.”

The company’s system generates precise 3D modelling of the vehicle’s environment using a fusion of raw data from multiple sensors; LiDAR, cameras and RADAR. Integration of deep understanding of the data, machine vision algorithms and deep neural networks provides better cognition essential for SAE level 3 or higher autonomous cars. The result is fewer missed detections and less false alarms by the auto-piloting platform, says the company.

VAYAVISION says no single type of sensor can be relied on to detect objects in the road. Cameras don’t see depth, and distance sensors such as LiDAR and Radar possess very low resolution. VAYADrive 2.0 up-samples low-res samples from distance sensors and assigns distance information to every pixel in the high-resolution camera image. This allows autonomous vehicles to receive crucial information on an object’s size and shape, to separate every small obstacle on the road, and to accurately define the shapes of vehicles, humans, and other objects on the road.

In 2018 VAYAVISION received US$ 8 million funding from Viola Ventures, Mizmaa Ventures, and OurCrowd, together with strategic investment from Mitsubishi UFJ Capital and LG Electronics. The company used the capital injection for marketing efforts and to focus on building partnerships across the world. The launch of VAYADrive 2.0, is expected to give a fillip to the company as more automotive OEMs scout for effective autonomous vehicle technologies.

Automotive Industries (AI) asked Cohen how VAYADrive 2.0 will help autonomous vehicles ‘up-sample’ from AV levels 3 and 4, to level 5

Cohen: For Level 5, perfect environmental perception is required – one that has detection rates of 100% and close to zero false alarms. The technology behind VAYADrive 2.0 is exactly what is required to “up-sample” and provide the required level of performance by taking a different approach from the rest of the industry. With our raw data fusion and up-sampling technology, we create an accurate HD 3D RGBd model that is the base for DNN (deep neural network) and non-DNN detection algorithms that run in parallel and achieve the desired Level 5 performance levels.
AI: What is the real breakthrough?
Cohen: The technology is able to detect small obstacles and “unexpected” objects. It has inherent redundancy and addresses the need for safety. As a result, vehicle perception can now be much better and more accurate than human driver perception.

AI: How does the “brute force” solution of current sensing systems compare with one such as yours?
Cohen: People are trying brute force solutions that use multiple costly sensors, and then process each sensor separately before fusing the data together the processing results. This process uses a lot of computing power, thus incurring high solution prices. VAYAVISION has analyzed the underlying scenarios and issues and used its extensive collective background in physics, AI, computer vision, and mathematics to come up with a solution based on raw data fusion and up-sampling that can use low-cost sensors and minimal computation power, while reliable and accurate.

AI: How successful was VAYAVISION’s participation in this year’s CES 2019?

Creating an accurate 3D environmental model of the area around autonomous vehicles.

Cohen: CES 2019 was a significant time for both VAYAVISION and the AV industry, as we released our first product, VAYADrive 2.0, which is the first AV perception software with full environmental model to use raw data fusion and up-sampling. We received a lot of interest and appreciation from the industry for our innovative technology, which exhibits high performance rates. People were amazed at VAYADrive 2.0’s ability to detect small obstacles no matter their shape or location – something that is unattainable when relying on the DNN (which requires a lot of training that is inadequate regardless, as it is virtually impossible to train for all objects). The show generated for us many leads and opened the door for many exciting opportunities.

AI then asked Nehmadi how close cars are to Level 5 of autonomous driving.
Nehmadi: We do not yet see the level of maturity required for level 5 autonomous driving. However, we do see that restricted Level 4/Level 5 driverless public transportation services will happen soon, and are in fact already being announced. Specifically, this includes shuttles, robo-taxis and the like that move along predetermined routes at low speeds, thus circumventing maturity issues and meeting required safety levels. We trust that our technology can bridge the gap, allowing for more use cases and expanding the use of Level 4 and 5.

AI: How does your technology “detect the unexpected”?
Nehmadi: Our approach incorporates inherent redundancies that comply with functional safety. We have two sets of algorithms executed in parallel: One is AI-based (DNN that requires training) and the other is Non-DNN. A good example of this approach is the detection of “unexpected” objects that were not in the training set (of the DNN), thus preventing DNNs from detecting them should they appear on the road “unexpectedly.”

Our non-DNN approach uses an accurate and dense 3D RGB-D model to detect and locate objects, and identify if they occupy the free space through which the AV will drive. This is critical for safe autonomous driving. The solution tolerates automatically and continuously malfunctioning sensors or temporarily missing data from one of the sensors. Since the solution fuses together raw data from sensors and tracks the data over time, it can tolerate failures.

How the VAYAVISION software categorizes objects in the road.

Traditional sensor processing technologies first process each sensor separately and then fuse the object data together, rendering them incapable of “seeing the big picture.” It is harder for AVs to make decisions when multiple sensors are processed separately, as this may produce different and contrasting outputs on whether free and drivable space exists or not.

AI: How does VAYAVISION plan to expand its global footprint?
Nehmadi: VAYAVISION is using its funding to expand its international presence, work with additional global OEMs and Tier 1s, and roll out its product to the market.

“Vehicle perception can now be much better and more accurate than human driver perception.”
Risk has been reduced for the manufacturers and users of advanced driver assistance (ADAS) and ultimately autonomous vehicles by the development of a windshield-mounted LiDAR system that is protected from dust and dirt.

It is the result of partnership between solid-state LiDAR (Light Detection and Ranging) technology provider XenomatiX and AGC, creator of multi-functional automotive glazing technology. "Integrating XenoLidar behind front and rear windows is an important step towards higher levels of automation for mass production cars," says Filip Geuens, CEO of XenomatiX. "We are proud AGC selected XenomatiX for a collaboration related to their LiDAR-optimized Wideye™ windshield."

"Very well together with the Wideye™ windshields offering zero IR absorption combined with a clear view.

Automotive Industries (AI) asked Geuens why LiDAR does not work behind standard auto glass windscreens and rear windows.

Geuens: ‘Traditional’ windshields have IR-filters. Visible light is allowed to pass to ensure the human eye and visual cameras can see around the car. However, near-infra red light is blocked to increase passenger comfort. NIR light heats up the interior of the car. Blocking part of the light spectrum makes it easier to control the air temperature inside the car, specifically in summer.

The difference between cameras and LiDARs is the fact that cameras rely on ambient light, while LiDARs send out their own light. Nobody wants the light of the LiDAR to be visible as this would create confusion and distraction. Hence LiDARs use invisible NIR light with a wavelength above the cut-off wavelength of filters that are included in automotive glazing.

AI: Apart from protecting the LiDAR units from the elements what are the advantages of fitting the system inside the vehicle?

Geuens: LiDARs replace the human eye when evolving to higher levels of automation. Obviously, these eyes need a clear view at all times and throughout the lifetime of the vehicle. Glass is a very durable material and the infrastructure (such as wipers and spray systems) is already available for assuring an unobstructed view in all circumstances. Moreover, the function of the glass can be extended with coatings, e.g. a coating to heat the windshield for quick defrosting or a coating to reduce the adhesion of dirt, or coatings to improve the performance of the LiDAR. Last but not least, sensors that stick out don’t make cars beautiful. Placement inside the body is far more attractive from an aesthetical point of view.

According to AGC Automotive Europe CEO Jean Marc Meunier, Wideye™ is the first windshield which is transparent to infrared LiDAR light. “This way we tackle multiple concerns from car manufacturers on LiDAR integration, like cleaning the sensor, protecting it, wiring it efficiently, etc. XenomatiX’ concept matches very well with our Wideye™ windshield. Bringing together our expertise will enable car manufacturers to add LiDAR to cars in a clean and trustworthy way."

Geuens says the true solid-state nature of XenoLidar, XenomatiX’s high-performance LiDAR, enables seamless integration behind a vehicle’s windshield. An absence of moving parts, low power consumption and a multi-beam concept go very well together with the Wideye™ windshields offering zero IR absorption combined with a clear view.

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Automotive Industries (AI) asked Geuens why LiDAR does not work behind standard auto glass windscreens and rear windows.

Geuens: ‘Traditional’ windshields have IR-filters. Visible light is allowed to pass to ensure the human eye and visual cameras can see around the car. However, near-infra red light is blocked to increase passenger comfort. NIR light heats up the interior of the car. Blocking part of the light spectrum makes it easier to control the air temperature inside the car, specifically in summer.

The difference between cameras and LiDARs is the fact that cameras rely on ambient light, while LiDARs send out their own light. Nobody wants the light of the LiDAR to be visible as this would create confusion and distraction. Hence LiDARs use invisible NIR light with a wavelength above the cut-off wavelength of filters that are included in automotive glazing.

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Geuens: LiDARs replace the human eye when evolving to higher levels of automation. Obviously, these eyes need a clear view at all times and throughout the lifetime of the vehicle. Glass is a very durable material and the infrastructure (such as wipers and spray systems) is already available for assuring an unobstructed view in all circumstances. Moreover, the function of the glass can be extended with coatings, e.g. a coating to heat the windshield for quick defrosting or a coating to reduce the adhesion of dirt, or coatings to improve the performance of the LiDAR. Last but not least, sensors that stick out don’t make cars beautiful. Placement inside the body is far more attractive from an aesthetical point of view.
AI: With the widescale introduction of autonomous vehicles still some way down the track what are the current applications for the integrated XenoLidar-Wideye™ technology?

Geuens: Of course, we all dream about a self-driving car solving all our mobility worries. We make ourselves believe we will be working in our car all the time. Well, on my way to CES this year, only a very small minority of the passengers were doing real work, even while they did not have to fly the plane themselves and it was comfortable and stable. I was preparing this interview, but gaming and watching movies is still far more popular. So, I’m a little reluctant about the “gain of time” self-driving cars will bring to humans.

Getting to Level 5 is a step-by-step process. The technology will have to prove its performance and the audience will have to get used to it. Although we like the benefits, most people are not ready yet to hand over the vehicle control to computers in complex traffic situations. So, I expect a more gradual evolution. LiDARs will dramatically increase the performance of ADAS applications. LiDAR can add detection reliability in all ambient light conditions. So, all traditional applications that are covered by camera and/or radar today (such as ACC, ALC, AEB), will become more effective when LiDAR is added.

LiDARs will also reduce damage to cars, especially when maneuvering. As LiDARs are 3D measurement systems they can more precisely locate obstacles such as high curbstones and low poles in time and with high precision. Last, but not least, LiDARs will improve ride comfort by adding intelligence to active suspension.

AI: What has been the response from OEMs?

Geuens: Based on past experience and requirements from mechanical LiDARs some OEMs are still under the impression that it is not possible to put a LiDAR behind the windshield. The most powerful division of the OEMs is the design division. They have been apprehensively seeing how prototype self-driving cars have been equipped with sensors sticking out of the car body. This has been done to give the sensors a clear and unobstructed view, but also because windshields influence the performance of the LiDAR.

In addition to the absorption of light the challenge is the diffraction the glass causes, especially on moving laser beams. This diffraction changes the laser beam direction, and as such affects the precision of detected objects in azimuth and elevation direction. The combination of the XenoLidar sensor and the Wideye™ windshield doesn’t suffer from these problems.

A high location of the LiDAR system in the vehicle is favorable for detection of objects at larger distance, requiring an unobstructed field-of-view. The top of the windshield is the highest possible sensor location that respects current esthetical limitations. For all the above reasons, OEMs are positive about this type of LiDAR integration.

They have raised some practical challenges: In many cars, the central part of the windshield has already been taken by cameras or rain sensors. This creates some competition for space in that part of the vehicle. This will be overcome in several ways:

• As sensors become smaller, a single module may host different types of sensor. Our XenoLidar solution for instance, is based on a CMOS detector and is capable of capturing visual 2D images combined with 3D LiDAR pointclouds.
• The LiDAR does not have to be located in the center of the window. It can be put alongside the camera or even in the corner of the windshield, as long as it is within the wiped area.
• I even imagine a sensor bar at the top of the windshield over the entire width of the car, creating enough space to accommodate the sensing technology required for higher levels of automation.

AI: Where do you see the technology first being deployed on a production scale?

Geuens: I expect this solution to be in the next generation of mass production cars. The car does not have to be 100% self-driving to benefit from this technology. The introduction of radar was a nice step forward in terms of active safety. Understanding the distance and relative speed to object and other road users is an essential element. Radar is doing this with a single wave. LiDARs will be doing this with several tens of thousands of individual beams. With so much more detailed data, more tasks from the human driver can be taken over.

AI: You said earlier that LiDAR could improve passenger comfort. Please expand.

Geuens: XenomatiX is working on comfort improvement by digitizing the road ahead of the car using a high-precision short range LiDAR. Short range means 75m. For this we work together with manufacturers of active suspension systems. By digitizing the full width of the road, our LiDAR builds up a rolling carpet revealing the geometry of the road. From this, the height profile for each of the wheels is calculated and made available in real-time to the suspension controller. Based on this preview data, the suspension has enough time to adjust and keep the body stable. Basically, a preview LiDAR turns an active suspension into proactive suspension.

“Based on past experience and requirements from mechanical LiDARs some OEMs are still under the impression that it is not possible to put a LiDAR behind the windshield.”

XenoLidar, XenomatiX flagship LiDAR.
Automotive Industries (AI) asked Tadashi Murano, General Manager of Mobility Development Office from AGC Automotive Company, and Jean-Marc Meunier, CEO of AGC Glass Europe, to give us the background into the development.

**Murano:** The Tokyo-based AGC Group is a world-leading supplier of flat, automotive and display glass, chemicals and other high-tech materials and components. In automotive glass, it specializes in production of windows (OEM and replacement) and interior glass for vehicle manufacturers. It also provides ready-to-assemble systems (fixation and design are the main issues for autonomous vehicles adoption. Based on its strong glass expertise, Wideye™ believes that glass is the ideal material to meet the safety and design requirements from all actors in the sector: LiDAR manufacturers, OEMs and Tier 1s.

**AI:** Why is glass the safest option for LiDAR?

**Murano:** Glass provides LiDAR with a strong protection to dust and dirt. Unlike other transparent materials, glass boasts a high light transmission and is durable: it is highly resistant to scratching, impact, ageing, chemicals, color distortion by UV radiation, etc. Furthermore, glass easily lends itself to different treatments such as heating (for de-icing/defrosting), hydrophobic coating (for evacuating water droplets), etc.

Finally, glass is to be found in the upper part of the vehicle (windshield, back and sidelites, sunroofs), all around it. It occupies the ideal places to position LiDAR, providing it with the safest unobstructed views. LiDAR can then truly play the role of human eyes. All these factors may contribute to ensuring and preserving the cleanest and safest visibility to LiDAR.

**AI:** And what about glass and design?

**Murano:** Wherever LiDAR can be fitted glass can serve as a protection cover since it can be processed (colors, shapes, thickness, reflection, etc.) so as to integrate seamlessly into the vehicle’s body. Designers can get rid of unaesthetic LiDAR sensors that stick out of the vehicle’s body.

**AI:** With so many advantages, why has glass not been adopted earlier as a solution to accommodate LiDAR?

**Meunier:** The only drawback to standard automotive glass, especially the windshield, is that it blocks near infra-red radiation [see article XenomatiX on p. 14], invisible to the eye, to reduce heat inside the vehicle and ensure passenger comfort. However, LiDARs operate at near infrared light frequency. Wideye™ has overcome devices, higher value-added functional systems (antennas, sensors, heating elements) and enhanced property glazing (improved thermal, sound and vision comfort).

The AGC Group employs some 50,000 people worldwide and generates annual sales of around US$13.7 billion through business in about 30 countries. With the advent of autonomous vehicles and the need to extend sensor technologies, including LiDAR, AGC has created a specific task force, Wideye™, which is fully dedicated to developing (disruptive) solutions for these vehicles.

**AI:** What were the assumptions behind the development of the application?

**Murano:** The Wideye™ task force is convinced that LiDAR will be the key enabler for autonomous vehicles. Combined with other sensors it is able to provide optimal safety to drivers. Both safety and design are the main issues for autonomous vehicles adoption. Based on its strong glass expertise, Wideye™ believes that glass is the ideal material to meet the safety and design requirements from all actors in the sector: LiDAR manufacturers, OEMs and Tier 1s.

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this obstacle by developing the Wideye™ glass for the first-ever infrared transparent windshield. This IR transparent glass was initially developed for very large touchscreen panels in which glass had to be transversally crossed by infrared light and for which very high infrared transmission qualities were required. This breakthrough made it possible to fit the LiDAR unit behind the windshield and to benefit from the wiped area, the unobstructed view and all the advantages provided by using glass as a protector.

AI: To what extent have you been able to demonstrate the validity of your solution?

Meunier: Together with the world leader in LiDAR sensors, Velodyne, AGC showcased this windshield-mounted Lidar at CES in 2018 and 2019. It also partnered with LiDAR technology providers such as XenomatiX (see p. 14), Ouster and other actors of this industry to promote this integrated solution in which those LiDAR manufacturers strongly believe. As evidenced by the variety of partnerships, this solution is device-agnostic: whatever the LiDAR technology, it fits with our glass solution.

AI: What prospects does this breakthrough open?

Meunier: Thanks to this IR transparent glass, Lidar no longer needs to be mounted externally. It also means that with this proven technology, LiDAR sensors can be located all around the car and benefit from the same advantages that glass windshield offers: in glass trims, side and backlites, sunroofs and any other place fitted with a glass cover. It is an important step forward on the way of ADAS applications and self-driving cars.

AI: How can Wideye™ assist with the integration of LiDAR in vehicles?

Meunier: Wideye™ expertise and contribution can develop at three levels:

Design
We can help our customers (LiDAR supplier, Tier 1 or OEM) to (co)design their solutions for the use of LiDAR, by appraising the concept while meeting the optical, mechanical and aesthetic requirements. This approach includes simulation based on an advanced realistic rendering tool, prototyping and sampling, design validation and testing, industrialization. For all this, we can rely on our proven expertise as glass supplier (Tier 1) to demanding OEMs for which we do not only provide high value-added multifunctional glass but also ready-to-assemble modules.

Glass hardware
We can provide customers (LiDAR supplier, Tier 1) with glass hardware (IR transparent glass and fixation devices) for industrial scale up, from the largest to the smallest part (windshield, LiDAR covers, glass trims, etc.)

Global LiDAR integration with partners
Based on AGC experience as a glazing Tier 1, Wideye™ aims at being a global LiDAR integrator through appropriate partnerships and providing the “eyes of the autonomous vehicle” in end-to-end managed projects.

We are also open to support the development of some promising players in this field, as we have already done – as long as we believe in the same solution of glass-covered sensors.

AI: What are the next steps for Wideye™?

Meunier: We want first to capitalize on the generation of windshields presented at CES 2019. We will pursue our programs of LiDAR-mounted windshields with partners, while leveraging the numerous technical breakthroughs to come in this field. The market urgency also pushes Wideye™ to launch glass cover products in the short term, based on the recognized value of functional glass by automotive actors.

Bringing the best of optics to the automotive world is a must for actors willing that the sensor technology should meet harsh automotive standards. 360° integration of LiDARs will lead Wideye™ to demonstrate its extensive integration ability through additional prototypes. Let’s keep our eyes (Wide) open!

For more information go to: www.agc-automotive.com and www.wideye.vision
Tomorrow’s vehicles will have at least one thing in common with those of today – they will need a propulsion system, even if the steering wheel and other controls disappear.

What they may well not have in common is the type of propulsion system. Internal combustion engines will still be with us for some time to come as much of the world simply does not have the infrastructure to support electrification of the country’s entire fleet. One of the global leaders in the provision of propulsion systems is BorgWarner, As BorgWarner recognizes in its 2018-2019 Sustainability Report, companies survive and grow because their business is sustainable, as well as their business practices.

Automotive Industries (AI) asked Lissalde how well the company is prepared for the electrification of powertrains. Lissalde: We have been identifying market needs for years in order to deliver the right solutions at the right time, resulting in a very broad portfolio of solutions for electric vehicles. Therefore, we are well prepared to meet the challenges that come with this emerging trend.

BorgWarner supplies four out of five key technologies for electric vehicles – electric motors, transmissions, power electronics and thermal management – thus supporting our customers with a broad range of products and our vast expertise. This positions us as a reliable partner for vehicle manufacturers all around the world.

Continuous research work and the optimization of existing technologies allow us to provide systems that work as efficiently as possible. An example is our 2018 PACE Award-winning S-wind wire forming technology which enables the mass production of high-voltage electric motors from 48V up to 350V. This new manufacturing process offers advantages such as space-saving design and high-power density for high-voltage electric and hybrid vehicles.

Additionally, we provide one of the broadest 48V portfolios in the industry as a crucial step towards the electrification of vehicles. This includes technologies such as our motor generator with integrated
electronics (MGI), which provides higher system efficiency and improved energy recovery capability to meet increasing power demands. With our product portfolio we support the move towards a cleaner and more energy-efficient world.

**AI:** How is BorgWarner positioned globally regarding electrification?

**Lissalde:** BorgWarner already has a broad product portfolio suitable for electrified vehicle in all markets. What also puts us in a strong position is that we are able to support our global customers at local level with our strong global footprint of technical centers and manufacturing facilities. Engaging with leading engineers across our expansive customer base also gives us tremendous insight into future trends, so we can always be investing in the right technologies for the future.

**AI:** What do you think the impact of electrification will have – both on your business as well as the industry as a whole?

**Lissalde:** Regarding the future of the automotive industry, one thing is clear: there will always be a need for propulsion systems. Every vehicle, regardless of the propulsion type, will have to move from point A to point B. We have evolved our company to become balanced across combustion, hybrid and electric propulsion architectures.

As we supply technology solutions for all types of powertrains, we see the emerging trend of electrification as an opportunity to strengthen our business. We offer the whole range of products and services that help our customers on this journey, which is why we are well positioned regarding electrification.

In addition to individual components we support our customers with complete modules. An example is our fully integrated drive module (iDM), which combines advanced transmission and electric motor technologies as well as specially developed power electronics in a single module for simple installation, reduced size, weight and cost.

We furthermore drive electrification with innovations like our P2 module, which allows for pure electric driving and several hybrid features, such as stop/start and regenerative braking. This cost-effective technology solution can easily be implemented into existing drivetrains and reduces CO₂ emissions significantly. As you can see, we are well positioned regarding future developments on the market and are ready to deliver highly efficient propulsion solutions that are cleaner than ever and thus protect the environment and improve the world that we live in.

**AI:** What job opportunities do you expect electrification to generate?

**Lissalde:** Electrification is as much of a challenge as it is an opportunity for the automotive industry. This trend is still in its beginning stages and offers new and different possibilities. As automakers are currently searching for multiple ways to get their engines more clean, efficient and powerful, we believe that research and development departments will grow. We expect a compound annual growth rate of 41 % for hybrid vehicles and of 36 % for electric vehicles from 2017 to 2023. BorgWarner will keep on broadening its portfolio for electrified vehicles, and this is likely to create new job opportunities.

"Regarding the future of the automotive industry, one thing is clear: there will always be a need for propulsion systems."

**AI:** After taking over in August 2018 how have you tweaked BorgWarner’s corporate strategy for powertrains?

**Lissalde:** I have been with BorgWarner for more than 19 years, and a member of our strategy board since 2011. Therefore, I was involved in establishing our current corporate strategy. Regarding the future, my focus will be to accelerate the execution of this strategy to be a leader in combustion, hybrid and electric propulsion systems.

**AI:** How are environmental legislations across the developed world impacting drivetrain technology?

**Lissalde:** Changes in regulations are driving a change in the mix of combustion, hybrid and electric vehicles. More stringent regulations drive more electrification. It is very difficult to predict exactly how the markets will evolve. There is uncertainty in the regulations, the consumer acceptance and the timing and volume by region of different propulsion technologies. The beauty of our strategy is that we are there to support our customers, the end consumers and the governments with whatever mix of technologies they need. This will allow us to grow regardless of how the markets evolve.

**AI:** What are some of the new powertrain and transmission technologies BorgWarner is likely to unveil soon?

**Lissalde:** In addition to the iDM, we are winning a number of contracts for our high-voltage heaters. Used as a cabin heater they create a comfortable interior using core temperature sensing abilities and dual-zone heating. They also increase functionality by quickly defrosting windows without generating excess waste heat. Similarly efficient, the fast response time of our compact and lightweight battery heater enables optimal cabin and battery temperature management. BorgWarner’s technology enhances the performance of the battery by keeping its operating temperature within an optimal range and providing a consistent temperature distribution inside the battery pack and its cells.

To see Frédéric Lissalde talking about BorgWarner’s future strategies please use the QR code.
Breakthroughs in the formulation of automotive coatings are helping OEMs to use less energy, increase throughput and reduce emissions.

New coatings are also essential for the successful introduction of autonomous and semi-autonomous vehicles, as well as for lithium-ion batteries. A recognized leader in the field of coating development is Pittsburgh-based PPG, which provides industrial coatings for automotive parts and accessories such as rigid and flexible exterior trim systems, steel and aluminum wheels, body panels, bumper and break systems, hitches, shocks, axles, coil springs, under hood/body parts, and sway bars.

Automotive Industries (AI) asked David Bem, PPG Vice President, Science and Technology and Chief Technology Officer, how the new paint shop technologies help “green automotive manufacturing.

Bem: Our award-winning B1:B2 Compact Paint System cut out an entire step in the coatings process by eliminating the primer layer. The B1 and B2 layers are applied wet-on-wet, which reduces the time to paint a vehicle by up to 90 minutes. This increases vehicle throughput while simultaneously reducing emissions and energy consumption. Some PPG customers have reported energy savings of up to 30%, a 40% drop in carbon dioxide emissions and a 7% reduction in volatile organic compound emissions.

In 2018, we introduced technology that eliminates the curing step after the polyvinyl chloride (PVC) is applied to a car’s exterior and underbody. This 4-Wet sealer technology allows for the sealer, two coats of paint and clearcoat to be applied wet-on-wet with just one final curing step.

We recently introduced a low-energy paint process which was developed through Project LEAPP™. The process uses PPG-developed waterborne crosslinking chemistry that cures at 80% degrees Celsius – compared to 140% C for current systems. This significantly lower curing temperature which, combined with faster flash and dehydration times, can help reduce energy consumption by up to 39%.

AI asked Jean-Marie Greindl, President EMEA, PPG, to tell us about PPG’s Supplier Added Value Effort (SAVE) process.

Greindl: The SAVE program provides customers with innovative solutions at all levels. This includes driving value within ongoing business process improvements in areas such as logistics, operations, inventory management and general business administration practices. Technological innovation helps customers to differentiate their products in the marketplace.

AI: What is your presence in China?

Greindl: PPG is the leading automotive OEM supplier in China. We are currently building a new R&D/technical facility in Tianjin that will further our positioning and preparedness for taking on the emerging area of new electric vehicles (NEVs), which have heavy emphasis in China.

AI asked Dr. William L. Brunat, Technical Director EMEA, Automotive Coatings, what new processes are in the pipeline.

Brunat: With the switch to electric vehicles (EVs), coatings go beyond providing protection and beauty to also powering the vehicle. Lithium-ion batteries use coatings to store and transfer their electric charges. We have developed a binder and resin system that eliminates N-Methylpyrrolidone (NMP), a toxic solvent currently used in all electrode binders.

AI: How is PPG’s low-cure system changing the OEM automotive paint processes?

Brunat: We were able to completely reinvent paint technology through an 18-month Project LEAPP-supported partnership with Ferrari to provide the full spectrum of required colors at a 100 o C. This provided Ferrari with significant benefits, such as energy savings, reduced emissions and the ability to coat low temperature substrates like polypropylene or carbon fiber-reinforced plastics (CFRP).

AI: What other trends and technical breakthroughs in automotive is PPG working on?

Brunat: Automotive innovation is being driven by the push for improved sustainability and the development of autonomous and electric vehicles. Smart coatings will be fundamental to the effective and safe functioning of these new vehicles and surrounding infrastructure.

Some of the key technologies will be LiDAR technologies, battery coatings and easy-to-clean coatings. The latter may just seem like a convenient function, but it could become fundamental to the safe running of an autonomous vehicle by keeping the sensors and cameras clear of obstructing dirt that could result in unsafe ineffectiveness.

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Now, 133 years later, the next generation of disruptive mobility technology is being developed in Benz’s birth-place of the German state of Baden—Württemberg. “We are now about to cross the threshold towards a major disruptive change: electrification, digitization, autonomous driving and flexible user concepts offer new opportunities for the automotive industry but, at the same time, major challenges,” says Prime Minister Winfried Kretschmann.

“The State Government has therefore initiated a strategic dialogue for the automotive sector, which includes all these stakeholders. These challenges can only be faced if we stand together. Baden-Württemberg is the cradle of the automobile. Therefore, our objective must be a mobility of the future made in Baden-Württemberg,” he adds.

Benz laid the foundation for a vibrant automotive industry that employs more than 440,000 people in the state. The region has retained its technological lead, and three-quarters of the turnover of the more than 300 companies directly involved in automotive manufacturing is achieved in export business. As the center of the German automotive industry Baden Württemberg is home to over 1,000 parts suppliers.

It is characterized by a tightly meshed network of vehicle manufacturers and a strong parts-supply industry with mainly small and medium-sized enterprises, as well as by production equippers, service providers, universities and research institutions, all of which specialize in the automotive sector. This interlocking networked structure, which facilitates cooperation, is one of the building blocks on which the state’s success as a manufacturing location is based. There are more than 20 clusters and networks that actively promote innovation and bundle

When Karl Friedrich Benz received the patent for what is seen as the first “practical” motor car on January 29, 1886, there was little or no understanding of how fundamentally the technology would disrupt the existing transport order and society as a whole.

“Everything is contested. You can say that mobility is currently being re-invented, and this at a never before experienced pace. There is a lot at stake for Baden-Württemberg, including our technological leadership, our economic power, our jobs and the protection of our natural livelihood against the consequences of climate change. All stakeholders have to assume responsibility on this issue – the automotive industry, public transport, science, politics and the civil society.

Winfried Kretschmann, Prime Minister of the State of Baden-Württemberg.

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diverse synergies. With global players such as Daimler, Porsche and Bosch, the Stuttgart region is by far the most important automotive cluster within Europe.

The automotive sector is one of the most innovative in the state and invests nearly eight billion euros a year in research and development (R&D). This is half of the annual total R&D investment by Baden-Württemberg industry. With more than 70 universities and over 100 non-university research institutions, Baden-Württemberg is one of the top science locations in Germany.

Innovation is supported by strong academic support in the form of numerous mobility-related degrees and diplomas such as technical design, process engineering, vehicle technology and automotive information technology. This ensures there is a constant supply of newly qualified engineers.

The academic institutions are also heavily involved in research. It is estimated that the state has the highest concentration of R&D in Europe. Some 5.1% of Baden-Württemberg’s gross domestic product is ploughed back into research and development. In order to focus this investment on the new age of mobility Baden-Württemberg has established a coalition of politics, industry, universities, employee associations, consumer organizations, environmental associations and general society.

Citizens help shape the future

The technological transformation leading to electrified, highly energy-efficient and smart mobility solutions will not only dramatically change the car, but also the manufacturing and energy sectors, amongst others. In order to meet the challenges, the state government has broken the strategic dialogue for the automotive sector into six areas covering the whole value chain. They are: R&D, production and suppliers; Sales and aftersales; Energy; Digitization; Traffic Solutions; and Research and innovation environment.

An additional cross-cutting topic – Society and Mobility – links all the areas. The goal is to get citizens involved in the process, to encourage the inclusion of socially relevant subjects like health and environmental protection issues. The government has provided a platform for its citizens to voice their opinions, values and needs to contribute to the development of sustainable public and private mobility systems. The objective is to cast a new light on the interactions between technological innovations and social mobility change in rural and urban areas, as well as considering and balancing the consequences of the mobility revolution on other economic sectors.

“For all citizens, mobility is so much more than just a technological solution to get from A to B. Mobility is an essential need, inseparably connected for many people with values like

Support agencies

Baden-Württemberg International (bw-i) is the first point of contact for international investors, and is the state’s center of competence for the internationalization of business and science. It supports Baden-Württemberg’s companies, clusters, universities and research institutions in all issues relating to internationalization.

e-Mobil BW is the innovation agency of the State of Baden-Wuerttemberg. It is positioned as the central office for contact and advice for all matters related to electric mobility and fuel cell technology. The agency actively supports and shapes the technological and social transition to the sustainable mobility of the future.
freedom, independence and wealth. At the same time, increasing mobility is the root cause in our society of environmental and health problems. We therefore believe that it is of great importance to integrate individuals and citizens organized in civil action groups in the strategic dialogue for the automotive sector in Baden-Württemberg in this highly sensitive area,” says a state government release.

**Addressing the challenges**

Energy efficient and connected data-sharing vehicles will determine the product portfolios of the future. Production, development and sales processes will become shorter, more direct and connected. How can industry and research in Baden-Württemberg optimally adjust to these trends in order to benefit? What is the strategic value and job potential to be developed against the background of car and ride sharing and Big Data?

Participants from industry, science and politics are working together in formal groups to analyze the central issue of how to enhance system competence and innovative strength in the automotive industry. Subjects like skilled labor and qualification are important focuses areas. The target is to establish public and corporate policies to prepare today’s and future employees in the best possible way for the upcoming changes, explains a release from the State Ministry, Baden-Württemberg.

**Service station of the future**

A state government study identified that new energy supply sources for an electrically-powered traffic and transport sector would differ dramatically from the traditional service station. One of the task groups is looking at how energy for future mobility solutions can be made available in the required volumes and at the right place and the right time. Decisions on how to smooth the transformation are being guided by systemic analyses and tested in pilot projects.

Aside from electric battery-driven vehicles and their impact on the distribution grid, the role of hydrogen and fuel-cell technology as well as synthetic fuels is being taken into account. A reliable, environmental-friendly and economic energy supply based on renewable energies is the prerequisite for climate-compatible mobility and for exploring the huge potential of integrated energy.

At present, more than 94% of the traffic and transport sector is still powered by fossil fuel.

But, worldwide, powertrains are more and more electrified: 2018, more than four million electric vehicles had been registered worldwide. Baden-Württemberg holds a leading position in a national comparison of federal states with almost 1,800 publicly accessible charging points. Nearly one out of six of the nationally publicly accessible 13,500 charging points is located in the state (as of June 2017). The expansion of the charging infrastructure is actively promoted within the scope of State Initiative III “Market Growth Electric Mobility BW”, planning to provide a charging station anywhere in Baden-Württemberg within a radius of 10 km.

“Not only the vehicle as such will be profoundly altered through new technologies and digital possibilities, but sales processes and aftersales business will have to be modified accordingly. For example, 30% of used cars in 2016 were sold on online platforms and not established dealers. Even before approaching the sales people for the first time, buyers of new cars have gathered information from the manufacturer’s website.

This is just one of the many developments being discussed in the working group Dealers and Workshops. The focus is not only on changes in sales, but also aftersales services with alternative vehicle concepts for workshops and the digitization of more processes and new technologies in the parts processing, such as additive manufacturing. The target is ultimately to keep the strategically important interface to the end-user intact, even with the new business models.

The state government is also looking at faster implementation of new solutions in order to keep Baden-Württemberg’s industry competitive. It hopes to use digitization focused local communities and municipalities, since they play a central role as the operators of digital infrastructures, connected mobility services and traffic systems. The other issue the government is trying to tackle is cutting CO₂ emissions with new traffic solutions.

“On the one hand, we are looking into effective measures and instruments at all levels of action which guarantee climate protection without regard of the technology. On the other hand, a discussion is held on how mobility may be meaningfully organized in the future for the benefit of all groups in the population and which vehicles and mobility services will be required to this end. Furthermore, pilot projects will be tested and implemented large scale throughout the state to give a hands-on experience of sustainable traffic solutions. This includes, e.g. ride sharing services as the new mainstay for public urban transport as well as automated bus lines,” says a ministry release.
HAPTICS CREATES REAL-WORLD SENSORY EXPERIENCES

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Thailand’s journey towards a greener environment was reflected at the 40th edition of the Bangkok International Motor Show, which in 2019 featured the event’s biggest display of electric vehicles.

Jaturont Komolmis, Vice Chairman of the 40th Bangkok International Motor Show (BIMS), says there is a fast-growing presence of electric vehicles on the island’s roads. “We see that more and more vehicles from the green energy segment have been introduced and sold lately by many brands.

“So, the highlights at BIMS 2019 were not limited to concept cars. All visitors were given the opportunity to gain first-hand experience of the latest innovations in the fields of pure electric vehicles, hybrids and plug-in hybrid. OEMs used the show as an opportunity to launch four new models of these eco-friendly machines,” he says.

More than 30 global manufacturers chose BIMS to launch more than 10 new models in total because “the Bangkok International Motor Show has been internationally recognized as the Greatest Motor Show of the Association of Southeast Asian Nations (ASEAN), and this is proven by the annual participation of various global leading automotive brands,” he says.

“Most of the exhibition spaces have been enthusiastically booked by car and bike companies as usual, even though the rent-out space in the Accessories Hall dropped by 40% because many small entrepreneurs have changed their business model to online platforms. However, there was no impact on the overall business turnover because the revenue generated from the event grow by 1.17% compared to 2018,” says Komolmis.

Over the past 40 years the show has reflected the changing face of the regional and global motor industries. “This year, we have come up with our new logo, elaborately designed to reflect the world of the modern day, which is full of innovations and technologies that lead us to the digital era,” says Eamlumnow.

BIMS 2019 also incorporated a range of digital technologies designed to enhance the experience of visitors and the return on investment by exhibitors. The organizers teamed up with Kasikorn Bank to sell entrance tickets online, with a special price...
for early adopters of the “K-PLUS” app. e-Tickets were issued via a “Car Buddy by GPI” app. In addition to driving on physical test tracks, visitors could get into the cockpit of virtual race cars, with Grand Prix International PCL officially launching the GPe-Racing Live Event at the 40th Bangkok International Motor Show as a part of its business development plan. The event featured online car racing of the well-known “GT Sport” game, which reproduces the famous racing circuits around the world for motorsports enthusiasts to compete against each other in the virtual reality.

This was all part of the theme of the show, which was “enjoyment of automobiles”. According to Komolmis the continued growth of the show, and the participation by the industry, prove that buyers still want to physically touch and feel vehicles before making a purchasing decision. In response to the growing SUV market, a specially designed SUV test drive ground was added to this year’s event.

“Despite the dramatic shift in consumer behavior from the physical world to online purchases, our research has found that consumers still want to see, test, touch and feel the actual vehicle before buying a car of their choice,” he says. The show featured 33 international automotive brands and 14 renowned motorcycle companies. “This year also marked the inaugural participation of the world’s finest supercar brand McLaren – for the first time in Thailand. This significantly reflects how important the 40th BIMS is as the event that strengthen the image and the growth of Thailand’s automotive industry in the international arena,” he says.

Japanese brands at the event included Toyota, Lexus, Nissan, Honda, Mitsubishi, Isuzu, Mazda, Subaru, and Suzuki. KIA and Hyundai represented Korean manufacturers, while European and American brands included Audi, Aston Martin, BMW, Bentley, Chevrolet, Ford, Jaguar, Land Rover, Lamborghini, Mercedes-Benz, MINI, Maserati, McLaren, Porsche, Rolls-Royce, and Volvo. FOMM and MIND were newcomers from the EV segment. Represented in the motorbike zone were 14 brands, including Honda, Yamaha, Suzuki, Kawasaki, Harley-Davidson, Triumph, Vespa, and GPX.

Eamlumnow is upbeat about the prospects for the Thai auto industry. “Thailand in 2019 will likely see the continuous growth of GDP after the positive outcome of the general election. This will strengthen investors’ confidence and help drive the economy forward. Infrastructural development under the Eastern Economic Corridor Development Plan or EEC is also progressing well. Thailand is expected to produce over 2.2 million units in 2019 – a growth of 4% from 2018. Around one million will be for domestic sales, while the remaining 1.2 million will be exported,” he says.

Dr Prachin Eamlumnow, CEO of Grand Prix PCL and the Chairman of the 40th Bangkok International Motor Show.

“The Bangkok International Motor Show has been internationally recognized as the Greatest Motor Show of the Association of Southeast Asian Nations (ASEAN), and this is proven by the annual participation of various global leading automotive brands.”

The Fomm Concept One is powered by two in-wheel electric motors with a top speed of 80 kph and Fomm says it can drive up to 160 km on a single charge.
The growing Hyperform range is the work of Spartanburg, SC USA-based Milliken, which is described as innovation company that has been exploring, discovering, and creating ways to enhance people's lives since 1865. Its scientists and engineers create coatings, specialty chemicals, and advanced additive and colorant technologies for applications ranging from automotive components to children's art supplies.

Milliken's range of nucleators is designed to help to create stronger, lighter parts by improving stiffness while retaining the same impact behavior as a non-nucleated resin. Their unique isotropic shrinkage behavior enables the development of dimensionally stable, non-warping, tailor-made PP and PE solutions in any color, even for demanding applications and environments.

Hyperform HPN nucleators by Milliken create new design opportunities by providing an excellent balance of physical properties.

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Milliken helps to invigorate polypropylene recycling

Milliken has partnered with PureCycle Technologies to restore used polypropylene (PP) plastic to “virgin-like” quality.

Less than 1% of polypropylene is believed to be recycled at present. It is used in automotive interiors, electronics, food and beverage packaging, consumer good packaging, home furnishings, and many other products. In contrast, about 20% of polyethylene terephthalate (PET), which is commonly used to make plastic bottles and other consumer goods, is recycled globally.

PureCycle’s patented recycling process, developed and licensed by P&G, separates color, odor and other contaminants from plastic waste feedstock to transform it into virgin-like resin. Milliken, whose additives will play a critical role in reinvigorating recycled polypropylene, has formed an exclusive supply relationship with PureCycle to help solve the plastics end-of-life challenge.

In addition, Nestlé is working with PureCycle to develop new packaging materials that help avoid plastic waste, in line with the company’s commitment to make 100% of its packaging recyclable or reusable by 2025. “These partners are helping us accelerate as we bring this solution to the market,” said Mike Otworth, CEO of PureCycle Technologies.

Bringing both consumer market knowledge and technical expertise, Milliken and Nestlé help PureCycle work towards delivering the world’s first virgin-like recycled polypropylene. “The use of Milliken’s additives will help to ensure that PureCycle’s Ultra-Pure Recycled Polypropylene (UPRP) is of the highest quality and adds the maximum value to brand owners and consumers,” continues Otworth.

“Milliken understands that creating a sustainable future requires meaningful collaboration with other industry pioneers,” said Halsey Cook, president and CEO of Milliken & Company. “We believe PureCycle’s technology combined with Milliken’s leading plastic additives provide a transformational opportunity to elevate the viability of recycled polypropylene and help solve the plastics end-of-life challenge.”

By allowing companies to improve and substitute materials, Hyperform HPN-20E nucleating agents for PP create exciting new possibilities and perspectives for new products and the redesign of existing products and components. The materials can improve the speed and efficiency of the operations, leading to reduced costs and better productivity.

Hyperform HPN-20E gives PP unique physical properties that balance bi-directional stiffness and impact resistance, while allowing for highly tuned resin systems that meet high shrinkage and thermal performance tolerances. It is ideal for demanding automotive exterior parts, such as zero gap bumpers. Other applications include appliances, bottles, caps and closures, food packaging and film, houseware, garden furniture and pipes.

The production of polypropylene products and processes can be enhanced with tailored benefits for injection molding, thin wall injection molding (TWIM), thermoforming and blow molding (extrusion and injection). Using Hyperform HPN nucleating agents, manufacturers can speed up production, achieve the right stiffness/impact balance, overcome warpage issues and improve product aesthetics. These additives make PP a more competitive, sustainable material and a viable substitute for PS.
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