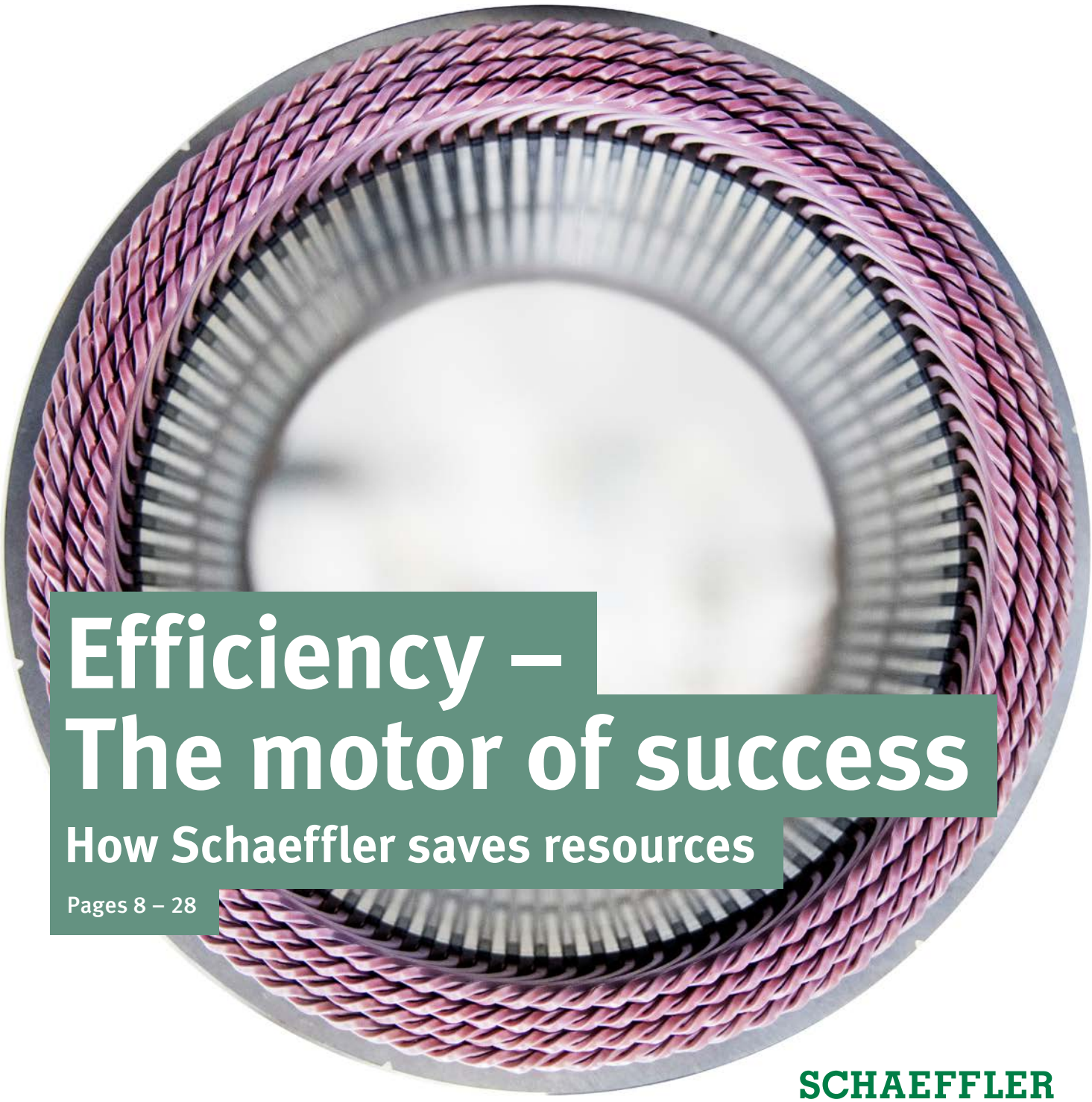
Issue 03/2021

today

Magazine for
Schaeffler Employees



Efficiency – The motor of success

How Schaeffler saves resources

Pages 8 – 28

SCHAEFFLER

#FollowUs

Teamwork in production: In this case, a robotic arm is the perfect helper for our colleague at Schaeffler's plant in Romania. The cobot (collaborative robot) is used to load and unload a CNC milling machine. Working quickly and precisely, it helps to reduce machine downtime and makes the production process more efficient. However, the employee has the final say by checking all parts afterwards. #Schaeffler #behindthescenes #inspection #qualitycontrol #robotics #cobot #automation #Wepioneermotion

Schaeffler tomorrow
Exciting stories from the world of technology can also be found in our external online magazine Schaeffler tomorrow. Simply scan the QR code.

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Contents

Focus

Efficiency

Internal

Worldwide

Team

TOP 10

A newly appointed CFO, a new SHARE in America and a realignment of the DTM with Schaeffler: Here are ten pieces of good news from the Schaeffler world summarized for you.

1 New Chief Financial Officer

The Supervisory Board appointed **Claus Bauer** (55) to the Board of Managing Directors of Schaeffler AG as **Chief Financial Officer (CFO)**, responsible for Finance & Information Technology, effective September 1, 2021. He succeeds Dr. Klaus Patzak (56) who left Schaeffler AG at his own request effective July 31, 2021. Claus Bauer joined the Schaeffler Group in 1998 and has been its Chief Financial Officer Americas since 2016. He has been working at Schaeffler's American headquarters in Fort Mill, South Carolina, since 2002, initially in the role of Chief Financial Officer North America. Previously, he was Head of the Tax Department and Chief Accounting Officer at INA Werk Schaeffler oHG in Herzogenaurach. The business graduate and certified tax advisor spent his first professional years from 1991 to 1997 with Rödl & Partner in Nuremberg.

2 New Regional CEO Europe

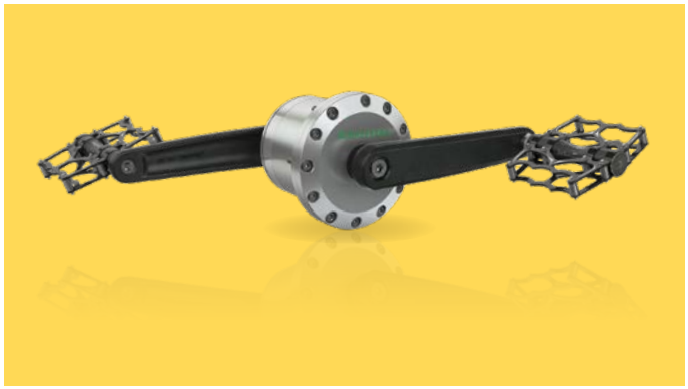
Sascha Zaps (46) was appointed **Regional CEO Europe**, effective September 1, 2021. In his new role, he succeeds Jürgen Ziegler (62) who retired effective July 31, 2021. Sascha Zaps has been with Schaeffler since 2019 as CFO Industrial and Senior Vice President of Business Development of the Industrial division. His previous appointments include a variety of management positions at various companies such as senior vice president at McKinsey & Company, CEO and managing director at Telefonica Global Services, as well as CFO and managing director of private-equity investments.

3

“Our 100-percent return service makes sense both environmentally and commercially.”

Dr. Stefan Spindler, CEO Industrial, at the Railsponsible Supplier Awards 2021 ceremony

(see page 17)



4 Chainless cycling

Schaeffler presented its **chainless electric drive system Free Drive** at Eurobike 2021. The “bike-by-wire” system features a robust and flexible pedal generator which sets the constant resistance on the pedal while simultaneously absorbing the rider's pedaling power. The regenerative solution is a serial hybrid drive that converts the mechanical energy generated during pedaling into electric energy, which in turn is converted back into mechanical energy in the wheel hub motor. Excess energy is stored in the battery. In 2022, the application for cargo bikes is expected to go into small-scale production.

5 Schaeffler strengthens its service business

Schaeffler has acquired **BEGA International B.V. (Bega)**, a leading manufacturer of special tools for mounting and dismounting rolling bearings. This marks another step in the expansion of Schaeffler’s lifecycle service portfolio. The acquisition means that Schaeffler is increasing its product range of mounting and dismounting tools. Access to the IIoT platform created for Schaeffler’s OPTIME condition monitoring solution also opens up new possibilities for Bega’s intelligent maintenance tools. Customers will benefit in the form of a common user interface which will help ensure a seamless user experience across the rolling bearing lifecycle, from installation to monitoring and maintenance, right through to bearing repair.

A new SHARE at Ohio State University: Jeff Hemphill, CTO Americas (middle), symbolically cuts the ribbon with Dr. Giorgio Rizzoni, director Center for Automotive Research.

(Edit.: The photo was taken in compliance with local Corona regulations.)

Schaeffler Hub for Advanced Research program launched in North America

Schaeffler and **The Ohio State University Center for Automotive Research (CAR)** have collaborated to launch the first **Schaeffler Hub for Advanced Research (SHARE) Program in North America**. The program focuses on solid-state electrolyte (ASSE) battery development and fuel cell research and development. The SHARE program uses the "company on campus" concept that includes a dedicated office at the university for full-time Schaeffler employees to collaborate with university researchers, Ph.D. candidates, and students. As part of the initial program, Schaeffler is also sponsoring a Ph.D. student to join Schaeffler's on-site team.

At the Schaeffler Hubs for Advanced Research (SHARE), Schaeffler employees are joining forces with scientists, doctoral candidates, and students to research joint future subjects in the areas of automated mobility, hydrogen technologies and renewable energies, digitalization, robotics, and Industry 4.0. The aim of this intensive exchange is to achieve mutual knowledge gains in the development of innovations that will move the world. The SHARE program has evolved as a key lighthouse project in this endeavor since 2013 and is now present across the globe, from East to West – in Europe, Asia-Pacific, China, and America.

7 Early extension of contract

The Supervisory Board of Schaeffler AG **renewed** the **contract** with **Uwe Wagner, Chief Technology Officer,** early for another **five years** until September 30, 2027. Uwe Wagner has been with the Schaeffler Group in various functions since 1993. Before his appointment as Chief Technology Officer of the Schaeffler Group in October 2019, the mechanical engineer was Head of Research and Development of the Automotive and Industrial divisions.

8 Schaeffler joins ARENA 2036

Schaeffler has joined the **ARENA 2036 research campus**, with a view to co-developing pioneering production technologies with 40 partners from science and industry paving the way for semi-autonomous production. ARENA 2036 is one of many initiatives in which Schaeffler specifically collaborates with research, startups, or other innovative companies. The research focus includes adaptive production processes, various approaches to digitalizing production, 5G, artificial intelligence, and big data.

9 Presentation of fully electric race car

Schaeffler has terminated it engagement in the Formula E. Now, as a series and innovation partner of the **DTM**, the company is revolutionizing the world's most important touring car series and developing the **electric drive systems** for the new, **fully electric race touring cars** planned to be fielded there. The development car is equipped with Space Drive steer-by-wire technology, plus an integrated vehicle dynamics control system for actuating the four motors.

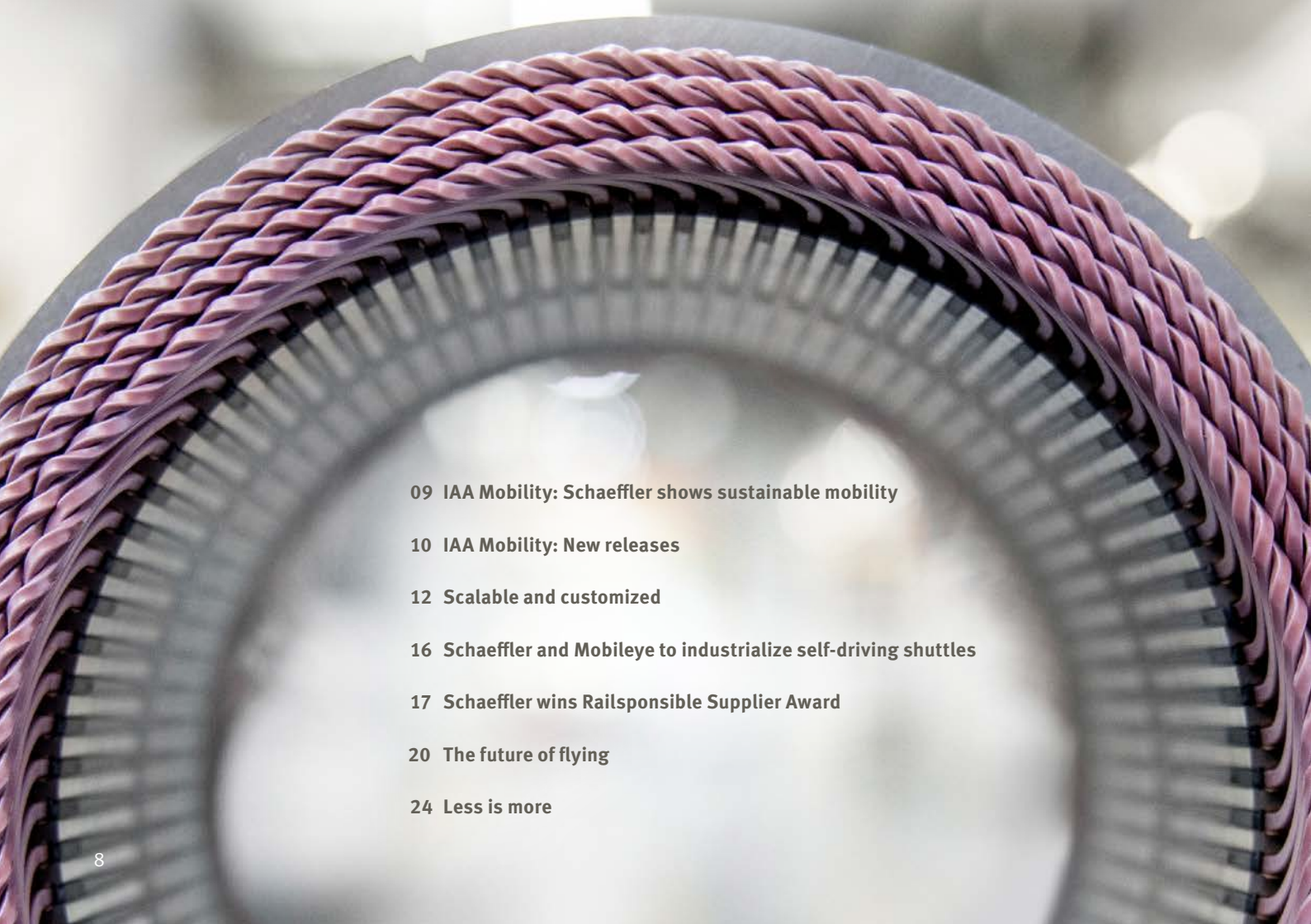
10 B20 Final Summit

Schaeffler had key input into the recommendations on the **"Digital Transformation"** priority in this year's **B20 process** – the dialogue of G20 group of the world's leading economic nations with the business sector. As part of the B20 Final Summit, the B20 task forces recently presented their recommendations on important socially relevant topics to G20 political leaders. CEO Klaus Rosenfeld emphasized in his address at the summit that sustainability and digitalization must go hand in hand.

Focus

Efficiency: The key to a sustainable future

The quest for improving efficiency – in other words, achieving a goal in the most resource-friendly way possible – has been a driving force for our company for over 70 years. On the following pages, you will find a number of stories about “efficiency”– for example, how Schaeffler is further increasing the overall efficiency of electric cars or how repairs in garages are becoming even more efficient. We present solutions that make flying more energy efficient and sustainable and we show how Schaeffler experts prevent friction losses that are detrimental to materials and efficiency.



IAA Mobility 2021: Schaeffler shows sustainable mobility

From September 6 to 12, Schaeffler presented solutions for sustainable future mobility at the IAA Mobility 2021 in Munich.

What will sustainable future mobility look like? Schaeffler provided answers to this question in its “On Track to Sustainable Mobility” showcase at IAA Mobility. “Here at Schaeffler, we take environmental and social responsibility seriously. Sustainability is hardwired into our DNA and is an integral part of our Roadmap 2025,” commented CEO Klaus Rosenfeld. “By leveraging our innovative powertrain, chassis and alternative mobility technologies and our comprehensive understanding of the energy chain, we are making a major contribution to achieving global climate targets. In doing so, we are sustainably pioneering motion to advance how the world moves.”

A delegation including Angela Merkel visited Schaeffler’s booth during the opening tour (left to right): Andreas Scheuer, German Federal Minister of Transport and Digital Infrastructure, Klaus Rosenfeld, CEO of Schaeffler AG, Georg F. W. Schaeffler, Family Shareholder and Chairman of the Supervisory Board of Schaeffler AG, Federal Chancellor Dr. Angela Merkel, Markus Söder, Bavarian State Prime Minister, Hildegard Müller, President of the German Association of the Automotive Industry, Matthias Zink, CEO Automotive Technologies of Schaeffler AG, and Winfried Kretschmann, State Prime Minister of Baden-Württemberg.

Schaeffler sees the transformation currently taking place in the automotive industry as a major opportunity. “The trend towards electric and alternative mobility concepts is a key driver of innovation for our products and business models,” said Matthias Zink, CEO Automotive Technologies. “We are building our position as our customers’ preferred technology partner by harnessing our expertise in components and systems to develop innovative, customized solutions for shaping this transformation.”

Product innovations and new mobility concepts

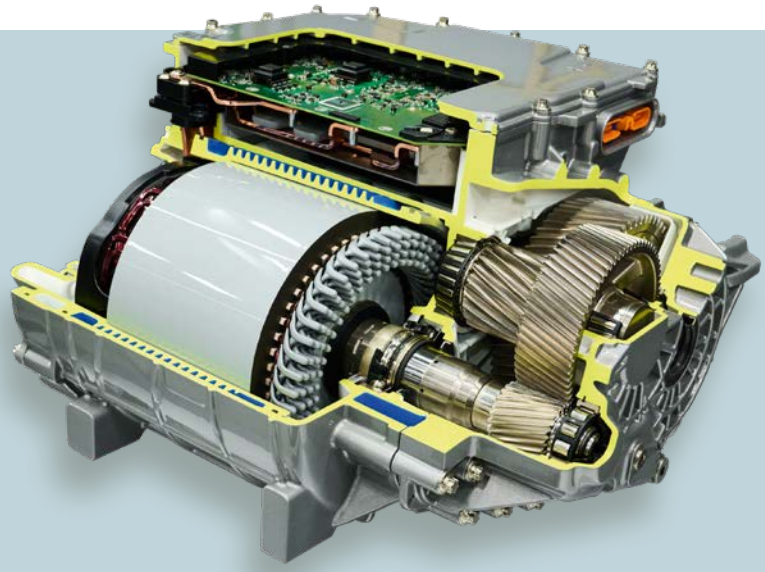
Along with product innovations such as 3-in-1 electric axle systems, thermal management technology, and 800-volt power electronics, Schaeffler presented a modular rolling chassis as a platform for completely new urban mobility concepts – and it announced its cooperation agreement with Mobileye. Further technological innovations came from the field of chassis systems, such as the third generation of the Space Drive steer-by-wire system. Schaeffler also made it clear at IAA Mobility what role it sees for hydrogen technology in achieving a carbon-neutral future. A fuel cell stack with metal bipolar plates made using high-precision forming and thin-film coating was on display.

In addition to product innovations and fascinating exhibits, the visit of German Federal Chancellor Angela Merkel and the company’s press conference were further highlights for Schaeffler at IAA Mobility. (ld)

Schaeffler demonstrated its vision of sustainable mobility at its trade show booth.

IAA MOBILITY

New releases 2021

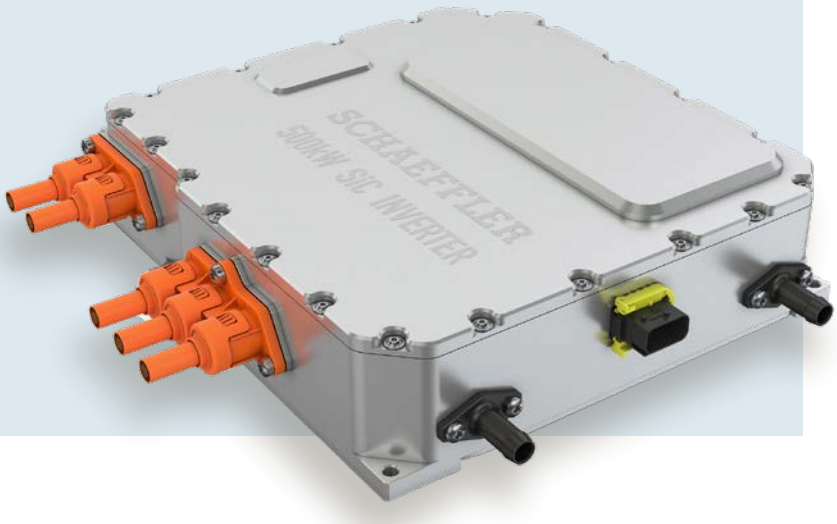


High-voltage power electronics complement the product range

As a new release, Schaeffler is presenting an in-house 800-volt power electronics system for electric axle applications in high-performance vehicles. The scalable solution enables continuous outputs of up to 330 kW and short-term peak outputs of up to 500 kW. The achievable power density of up to 70 kW per liter denotes small housing dimensions and consequently advantages in integration. Power electronics make a decisive contribution, alongside the motor, to powertrain efficiency. Schaeffler has opted to use the latest silicon carbide wide bandgap technology in the 800-volt on-board power supply, which will significantly reduce power losses compared with conventional silicon IGBT technology and enable efficiencies of over 99 percent in defined load ranges. As a result, the overall range of electric vehicles will be noticeably increased. Furthermore, the charging speeds achievable with the 800-volt voltage class are considerably higher than those achieved with the 400-volt voltage class that has been widely used to date. An in-house motor control solution is also used, which enables various modulation processes and variable switching frequencies.

Highly integrated 3-in-1 electric axle

Using its 3-in-1 electric axle, which combines the electric motor, transmission, and power electronics in one system, Schaeffler demonstrated how performance electronics blend into the overall system. Signal processing and control of the drive is performed by proprietary Schaeffler software. Featuring a transmission with excellent torque density, the performance electric axle from Schaeffler makes a convincing case and is characterized, above all, by its compact dimensions, high performance density, high system efficiency, and excellent acoustic behavior. Thanks to a modular structure, the system can meet different usage requirements and can be used for various vehicle platforms.

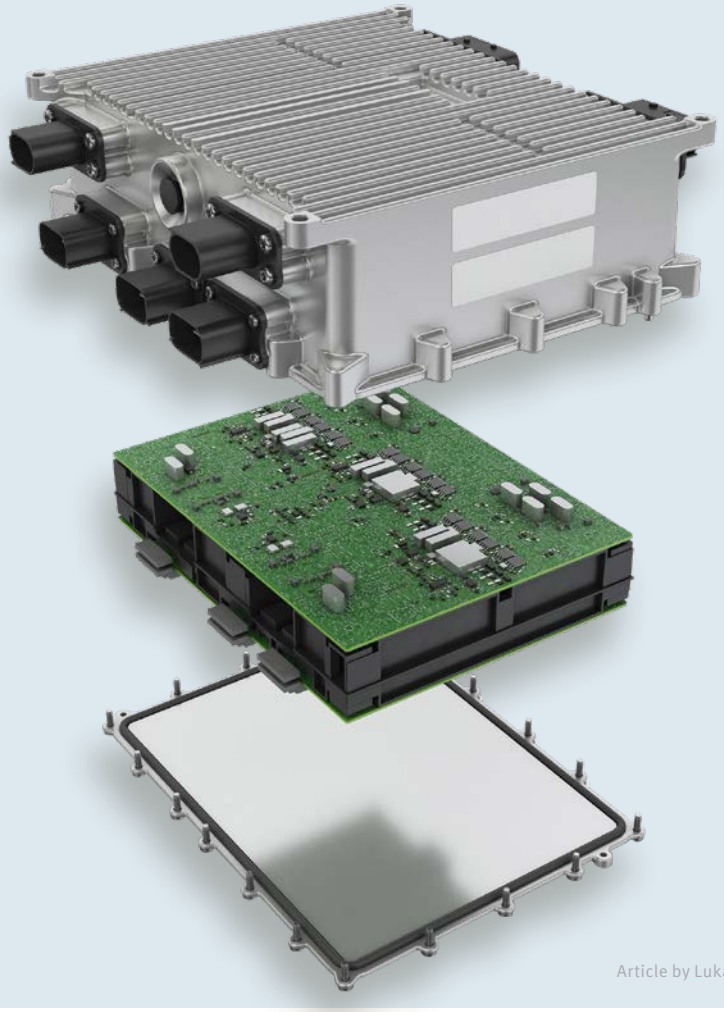


Thermal management in a single system for the first time

Thermal management is crucial for the range of electric vehicles. In order to achieve a high level of efficiency, the Schaeffler thermal management system continuously regulates the temperature – particularly of the battery but also of the electric motor, and the power electronics – which is adapted to the ambient and operating conditions. The system also controls the temperature in the interior of the vehicle and simultaneously ensures the best possible vehicle range. Two electric water pumps, the central electronic unit for the pumps and valves, and a refrigeration circuit interface are all integrated in the central control unit for coolants and refrigerants. Compared with conventional, non-integrated systems, this reduces the required installation space by up to 60 percent and, with its hydraulically optimized design, lays the foundation for a high degree of overall system efficiency.

Space Drive ready for production

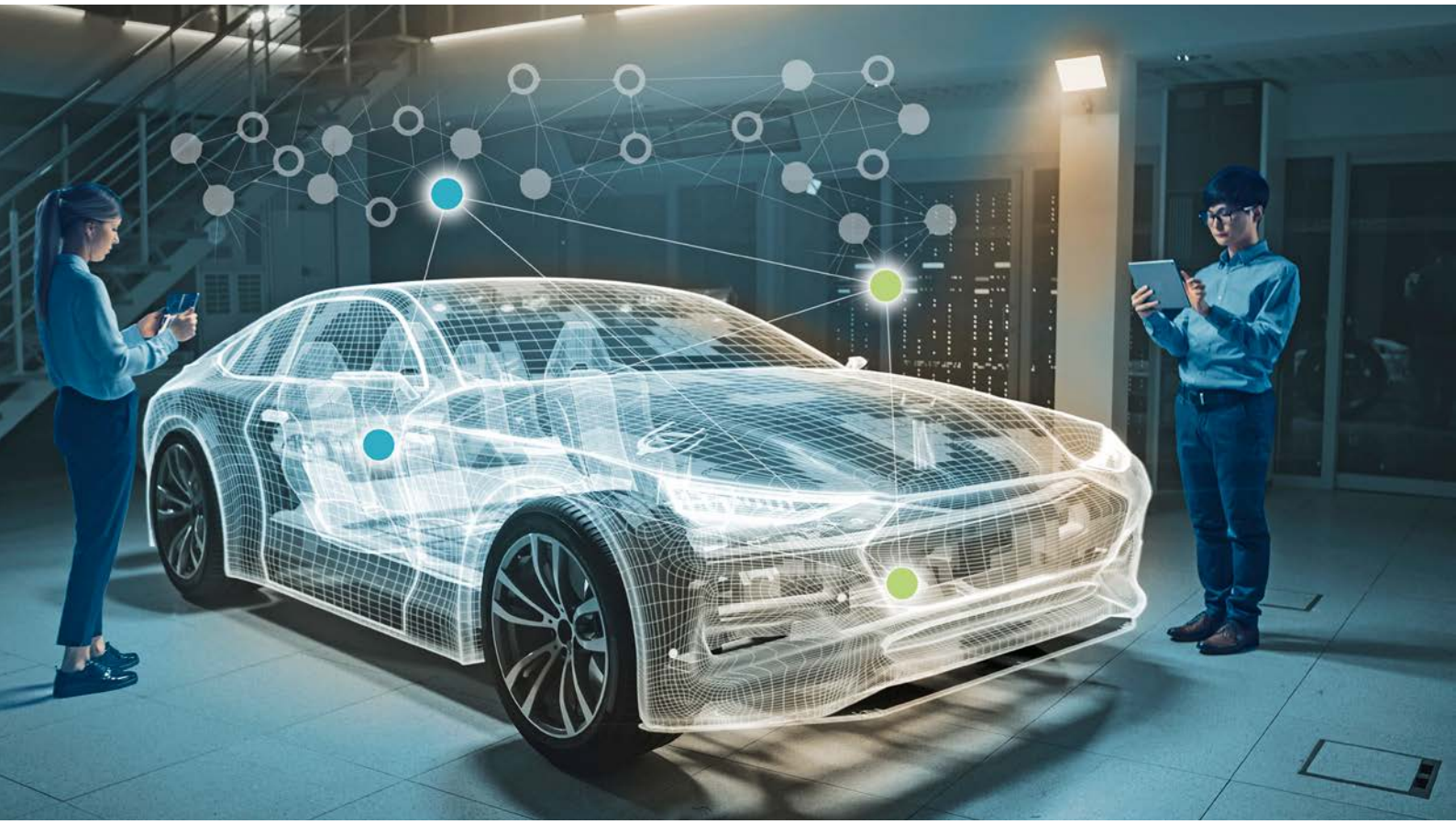
Schaeffler presented the latest generation of its steer-by-wire system Space Drive 3 Add-ON, which is ready for small-volume production. The system is triple redundant for maximum safety and meets the exacting functional safety requirements of ISO 26262. Generation 3 is based on the AUTOSAR software standard, meaning it can interface directly with vehicle electronics and onboard communication and network architectures, enabling it to be integrated into existing vehicle assistance systems. What's more, the system can record every steering parameter, which in self-driving vehicles enables feedback for the advanced driver assistance system (ADAS).



Article by Lukas Dehling

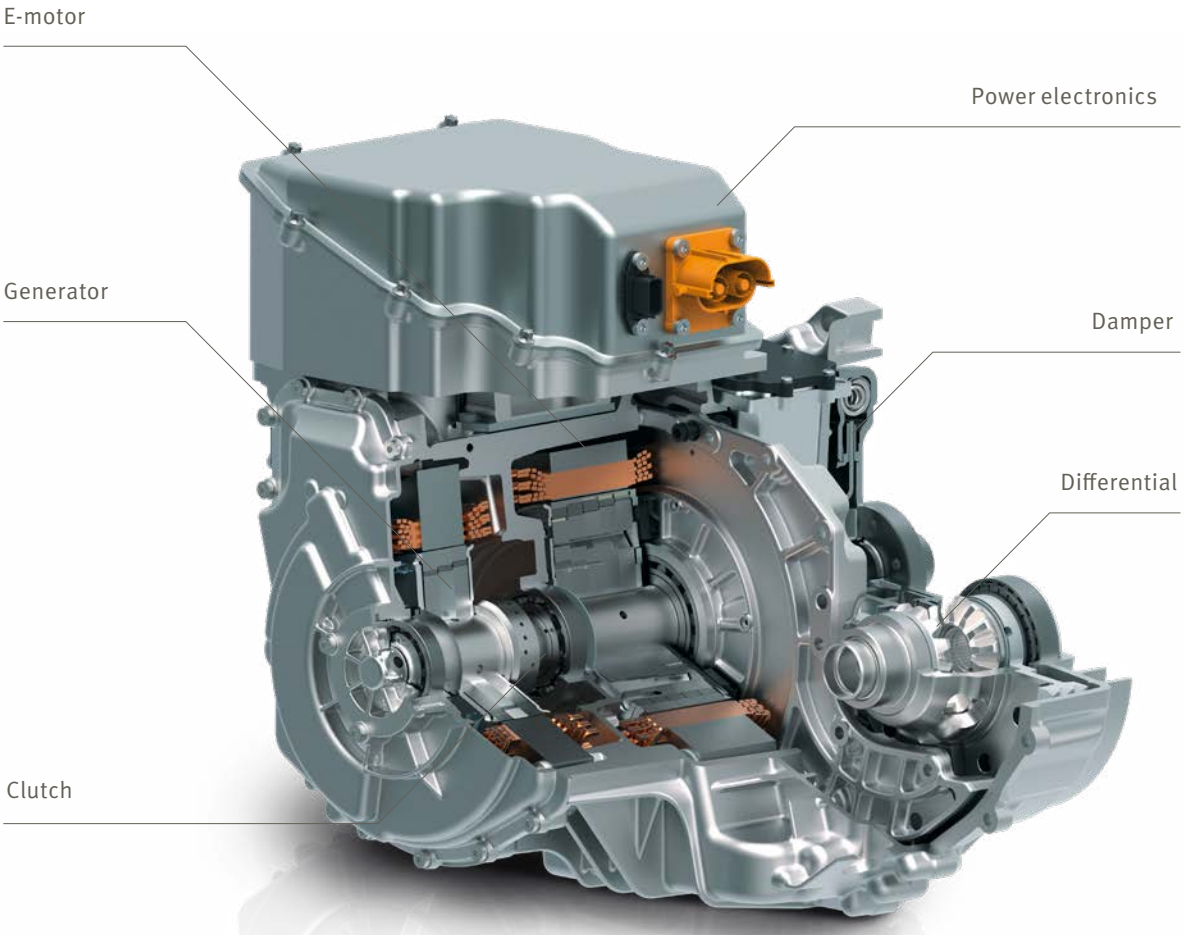
Scalable and customized

The variety of the vehicle market is matched by the diversity of the required propulsion solutions. Schaeffler's extensive electric modular system portfolio comprehensively meets these needs. The supplier offers automotive OEMs the entire output range, from 20 to more than 300 kW for battery voltages between 48 up to 800 volts.



After more than two decades of research and development work and the formation of a dedicated business division three years ago, at the beginning of 2018, Schaeffler's consistent commitment to electric mobility is reflecting significant success. Numerous delivery contracts awarded by automotive OEMs across all electrification levels prove that Schaeffler has successfully established itself in electric mobility. "We have achieved a lot and continue to be on a very good path," says Dr. Jochen Schröder, President of the E-Mobility business division. "With our modular product portfolio, we are now in a position to offer a production solution tailored to any customer wish." Another advantage of Schaeffler as the preferred go-to partner for its customers is that the Group is able to fully cover the entire industrialization of its components and systems in-house. Everything comes from a one-stop shop. Here are some examples from Schaeffler's extensive modular e-mobility portfolio for environmentally compatible vehicles.

Article by Volker Paulun

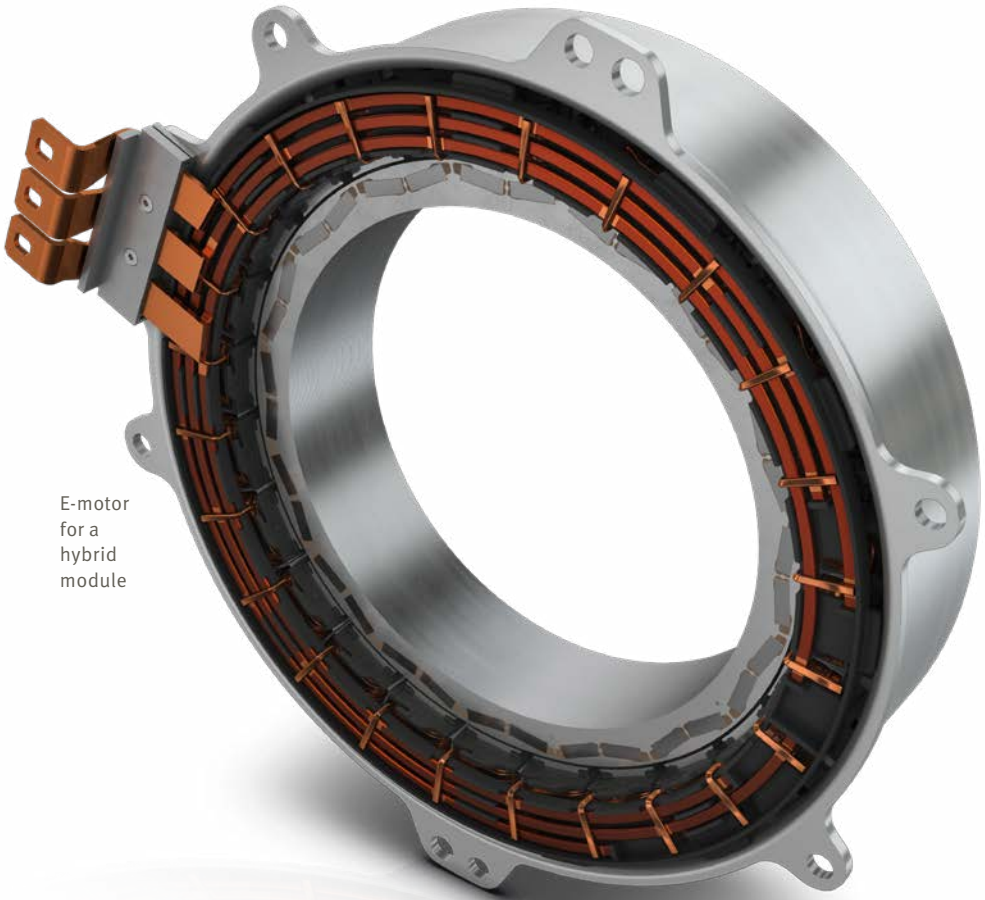


“We will be involved in shaping electric and sustainable mobility decisively going forward. For this purpose, we are developing highly innovative solutions – with high vertical integration, modularity and scalability.”

Matthias Zink
CEO Automotive Technologies

Dedicated hybrid transmission

Dedicated hybrid transmissions (DHT) are **highly integrated solutions** that have been developed exclusively for use in hybrid electric vehicles. The electric motor is intelligently integrated into a simplified transmission – this saves space and weight, plus it’s cost-efficient in high-volume production. **Power output** typically ranges **between 80 kW and 140 kW**. The electric motors of the DHT operate in combination with the IC engine as an additional propulsive force or they produce electric power as a generator, depending on the operating mode of the transmission or powertrain. In 2020, Schaeffler was awarded a record contract for dedicated hybrid transmissions and from 2025 on will deliver an entire drive unit with two electric motors (system output: 120 kW) and transmission-integrated power electronics.



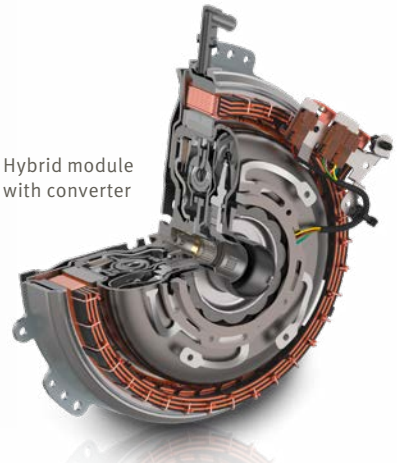
E-motor for a hybrid module

Hybrid modules

The hybridization of conventional IC engines is a major **key to efficient, more sustainable and needs-based mobility**, at least during a transition period. For 2030, Schaeffler expects a worldwide market share of 40 percent for all newly registered passenger cars with hybrid powertrains. For this vehicle category, Schaeffler offers a modular solution with powerful electric auxiliary drive units, so-called hybrid modules. As electric motors in these applications, highly efficient permanent magnet synchronous and asynchronous motors are used. The modular hybrid system **is flexible and can be adapted precisely to various transmissions and motors**, for instance as a hybrid module with an integrated torque converter or as a hybrid module with a triple clutch.

Hybrid module, 48 volts with disconnect clutch

Hybrid module, high-voltage (HV) with triple clutch



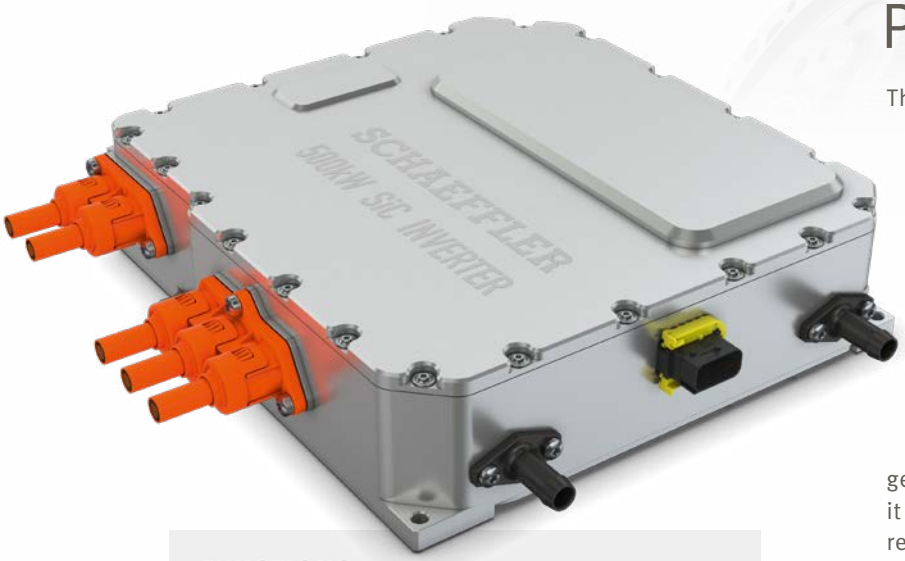
Hybrid module with converter

E-axle transmissions

Since 2017, e-axle transmissions from Schaeffler have been mass-produced successfully, ensuring **optimal gear ratios and power transmission from the electric motor to the wheels** for a wide range of applications: In the Audi e-tron, e-axle transmissions from Schaeffler are used in different designs (see illustrations) on both axles for an all-wheel drive system. In the Porsche Taycan, a **highly efficient coaxial e-axle transmission** from Schaeffler provides the right gear ratios at the front axle – an award-winning innovation: In 2020, Schaeffler was recognized with the prestigious PACE Award that's regarded as the benchmark for successful automotive projects worldwide.

Transmission, parallel-axis

Transmission, coaxial



FUNCTIONS

Model-based software platform, complying to AUTOSAR standards; for flexible integration of OEM software components

Integrated control of hydraulic actuator systems (electric oil pump, valves and sensors)

Extensive safety and monitoring measures with online thermal management and flexible derating

Modulation methods with random switching frequency strategies to optimize efficiency and NVH

Power electronics

The power electronics unit is the brain of an electric or electrified powertrain. Its main purpose is to control the current flow between the battery and the motor using a so-called inverter. It does so in two directions: During propulsion the motor has to be supplied with the right voltage and while braking, the flow direction reverses, the motor recuperates energy and charges the battery with it. The inverter converts the DC voltage (battery) into AC voltage or vice versa. In addition, the power electronics unit acts as the "reverse gear" of an electric vehicle. For driving in reverse, it reverses the polarity and thus the rotational direction of the electric motor. Schaeffler is now presenting a **proprietary 800-volt power electronics unit** for application in e-axles of high-powered vehicles. The scalable solution can handle permanent power outputs of up to 330 kW and short-term peaks of up to 500 kW – in spite of small housing dimensions. The utilization of special semiconductors ("wide-bandgap silicon carbide technology") enables **efficiencies of more than 99 percent** in defined load ranges. This increases the overall range of electric vehicles considerably. Moreover, due to the 800-volt voltage class, clearly higher charging speeds are achieved than in the previous widely used 400-volt voltage class.

Schaeffler and Mobileye to industrialize self-driving shuttles

One of the highlights at the IAA Mobility: Schaeffler and Mobileye announced that they will be joining forces to drive forward the industrialization of autonomous vehicles.

The Rolling Chassis from Schaeffler is a flexible, scalable platform for new, driverless mobility solutions.

Automotive and industrial supplier Schaeffler and Mobileye, an Intel Company and leading provider of automated driving solutions, have agreed on a long-term cooperation.

“Rapid regulatory and technological change, increasing urbanization and growing social awareness of mobility are increasing the need for alternative, novel concepts such as autonomous people or logistics movers,” says Matthias Zink, CEO Automotive Technologies at Schaeffler AG. “They play a crucial role in sustainable mobility and are a future field in our Roadmap 2025. With the partnership with Mobileye, we want to develop autonomous shuttles to series production.”

The rolling chassis from Schaeffler, a modular platform for new mobility concepts, is to be combined with the Mobileye Drive™ self-driving system. The goal is to develop a new, flexible platform for self-driving shuttles and other vehicle products at full automation level 4 and to offer customers worldwide solutions for Mobility-as-a-Service (MaaS) and Transportation-as-a-Service (TaaS).

“Mobileye Drive™ is a versatile, scalable solution that enables any vehicle type to become self-driving. The new and innovative Schaeffler rolling chassis vehicle platform equipped with Mobileye Drive will enable broad deployment of autonomous shuttles and other driverless transportation solutions starting in the next couple of years,” says Johann Jungwirth, Vice President of Mobility-as-a-Service at Mobileye.

Autonomous transport solutions from 2023

By combining Mobileye’s AV technology with Schaeffler's rolling chassis, both companies can offer an autonomous, highly flexible and adaptable vehicle platform that meets automotive safety standards with the necessary redundancies and thus enables the rapid scaling of autonomous transport solutions from 2023. Mobility service providers and freight transportation companies will thus pave the way for the introduction of autonomous shuttles economically viable, as operating times and efficiency can be significantly increased.

The Rolling Chassis from Schaeffler is a flexible, scalable platform for new, driverless mobility solutions for the transport of people or goods or for special applications such as mobile charging solutions or pop-up stores on wheels. The modular platform shows the wide range of technologies from Schaeffler and offers a flexible architecture: Regarding steering and drive, a wide variety of variants can be implemented depending on customer requirements – from a simple drivetrain via an e-axis and central steering to the use of four “Schaeffler Corner Modules”. The corner modules, which each allow a steering angle of up to 90 degrees, have been further developed in the direction of series production and scalability. They include the wheel hub motor, the wheel suspension including air suspension, which makes it possible to lower the vehicle for entry, the actuator for the electromechanical steering, and a brake. (ld)

Schaeffler wins Railsponsible Supplier Award 2021

At the Railway Forum 2021 in Berlin, Europe's top railway industry conference, Schaeffler received the Railsponsible Supplier Award in the category "Climate Change and Circular Economy" for its digitalized 100 percent return service for axlebox bearings.

Dr. Stefan Spindler, CEO Industrial, accepted the award on behalf of the company in Berlin on September 7. From left: Dr. Levin Holle, CFO of Deutsche Bahn AG, Stephan Pfuhl, Head of Supply Chain Management SBB, Dr. Stefan Spindler, CEO Industrial Schaeffler AG, Marcus Eisenhuth, President Industrial Europe Schaeffler AG, and Dr. Michael Holzapfel, Senior Vice President Rail – Industrial Europe Schaeffler AG.

(All applicable sanitation requirements for the containment of the corona pandemic were met.)

Railsponsible is a sustainability initiative by the railway industry that fosters and celebrates companies in the rail transport industry that make a special contribution to protecting the environment and benefiting society.

Reconditioning bearings reduces both costs and CO_2 emissions

The 100 percent return service for axlebox bearings enables rail transport operators to significantly increase the availability of their rail vehicles, while maximizing mileage and hence reducing CO_2 emissions.

As part of this service, Schaeffler carries stocks of reconditioned spares, combining the cost savings from bearing reconditioning and reuse with the time savings made possible through immediate availability. Using reconditioned axlebox bearings is much less water, energy and carbon intensive than manufacturing new bearings. (jk)

Central to Schaeffler's 100 percent return service is a unique data matrix code (DMC) that is etched onto each axlebox bearing during manufacturing. The DMC can be used to capture important manufacturing, operating and maintenance data for each product over the course of its service life, creating a comprehensive digital twin.

Visitors to the virtual showroom had access to three showcased topics: “Market-Centric”, “Future-Proof”, and “Remote Support”. In addition to Schaeffler products and solutions, the focus was on Schaeffler’s innovative strength.

Automechanika DIGITAL PLUS – new format, new opportunities

Following the pandemic-related cancellation of Automechanika 2020, this year the world's leading trade fair for the automotive aftermarket was held outside the usual two-year cycle – and as a hybrid event for the first time. A new trade fair experience for both exhibitors and visitors.

“The hybrid format gives us the opportunity to leverage the best of both worlds – online and offline.”

Jens Schüler
CEO Automotive Aftermarket

A lot was new at this year’s Automechanika DIGITAL PLUS: The exhibition opened for only three instead of the usual five days. And instead of featuring a large on-site presence, there were fewer and smaller booths for exhibitors at the Frankfurt exhibition grounds. Of course, our colleagues from the Automotive Aftermarket division were there once again: with a small but superb booth in Hall 3 and a virtual showroom that had been designed especially for the hybrid format.

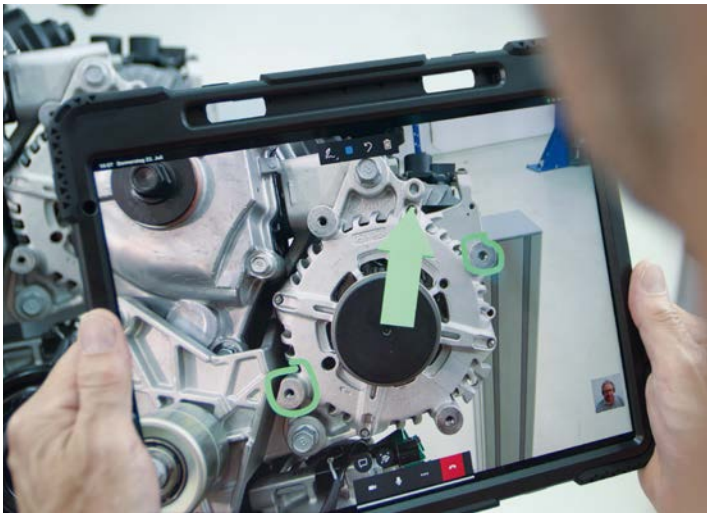
Market-driven solutions for today’s and tomorrow’s aftermarket

With its digital display, Schaeffler Automotive Aftermarket presented itself as a supplier and partner for distributors and garages that generates business opportunities from new technologies. Staff dealt with central questions surrounding the automotive aftermarket of the future: How will technological transformation affect the future spare parts business? How can garages continue to carry out professional, profitable, and efficient repairs? Such questions and more were answered at the trade show booth.

A focus on innovative solutions

The digital showroom was divided into three areas: “Market-Centric”, “Future-Proof” and “Remote Support”. The “Market-Centric” area included all those products and solutions that demonstrate how Schaeffler focuses on its customers’ needs for profitable and sustainable repair solutions.

The “Future-Proof” section focused on the Automotive Aftermarket’s innovative strength – which is a crucial advantage against the backdrop of trends such as digitalization and e-mobility. After all, the industry is undergoing one of the greatest transformation processes in its history. An all-electric DTM vehicle, which Schaeffler helped to create, was on display in this part of the showroom, as was a presentation of drive products for electric vehicles in which Schaeffler products are used.

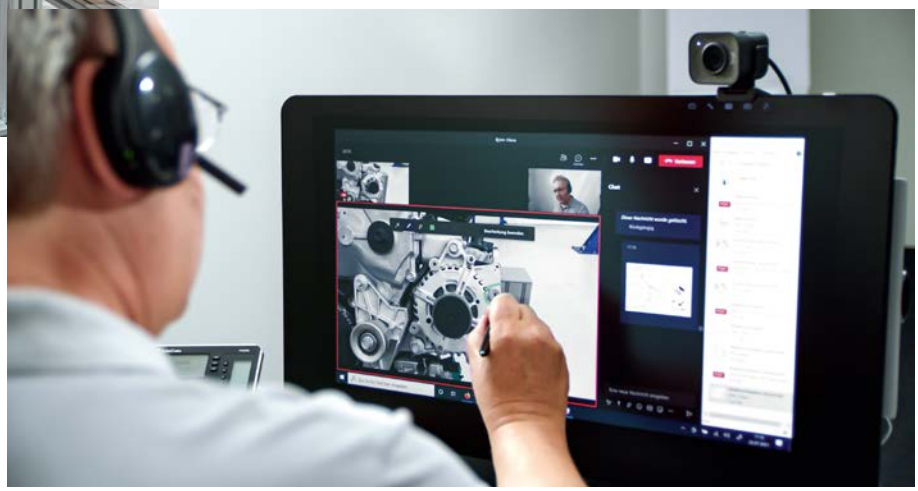


“Remote Support” enables Schaeffler’s REPXPERT specialists to provide independent garages with real-time assistance during difficult repairs via cell phone or tablet.

Remote Support: Help from a distance

The biggest highlight, both live on site at the trade fair and in the virtual showroom, was the new Remote Support. With this solution, Schaeffler REPXPERT technical specialists will very soon be able to provide real-time assistance to staff of independent garages via cell phone or tablet when it comes to difficult repairs. Watching a live video of the repair as part of a Teams meeting, the REPXPERT employees will be able to see the problem for themselves and can instruct garage professionals regarding the next repair steps via a screen.

For instance, they can make markings on their screen, which the mechanic will then immediately see on his own screen. Many visitors tried this out in the exhibition hall with great enthusiasm. Guided by REPXPERT employees, they were able to carry out a belt replacement on the spot. Visitors to the digital platform were able to follow the repair live on their screens. (kg)



“Remote Support” live: Visitors to the exhibition booth had the opportunity to carry out a repair themselves with the support of a technician using a tablet.

The future of flying

Flying after the pandemic? Yes, but only in more energy-efficient and sustainable ways than before. That's the name of the game for policymakers and the aviation industry, and a number of interesting concepts exist to support these goals.

The Flying V's fuselage shape is energy-efficient (-20% compared with an Airbus A350) and offers plenty of space for carrying huge hydrogen tanks.

Flying, but greener – that's what the future of aviation has to look like. There's no other option considering the current footprint of air travel on the global climate. Airline CEOs and policymakers agree on this point. The aviation industry has committed to cutting its net CO_2 emissions in half compared to 2005 by 2050. Scientists say that 2050 is too late and are pressing for change by 2030. Air travel accounts for 3.5 percent of human-induced global warming, according to an international study led by Manchester Metropolitan University with participation of the German Aerospace Center (DLR) that was published in September 2020 and provides the most comprehensive insight into the climatic impact of aviation to date.

CO_2 emissions, which have been the key metric for the environmental impact of aviation, account for only one third of it, whereas other effects account for two thirds of the climatic impact of aircraft. Nitrogen oxide (NOX) emissions at altitudes below 12,000 meters (39,000 feet) promote the undesirable formation of ozone. Undesirable because ozone does not block UV rays in these layers of the atmosphere but, like CO_2, has the effect of a greenhouse gas. On the other hand, depending on weather conditions, soot particle emissions as cloud condensation nuclei contribute to cloud formation (in the form of the generally known contrails, among other things). These clouds reflect thermal radiation from the Earth and therefore contribute to global warming as well.

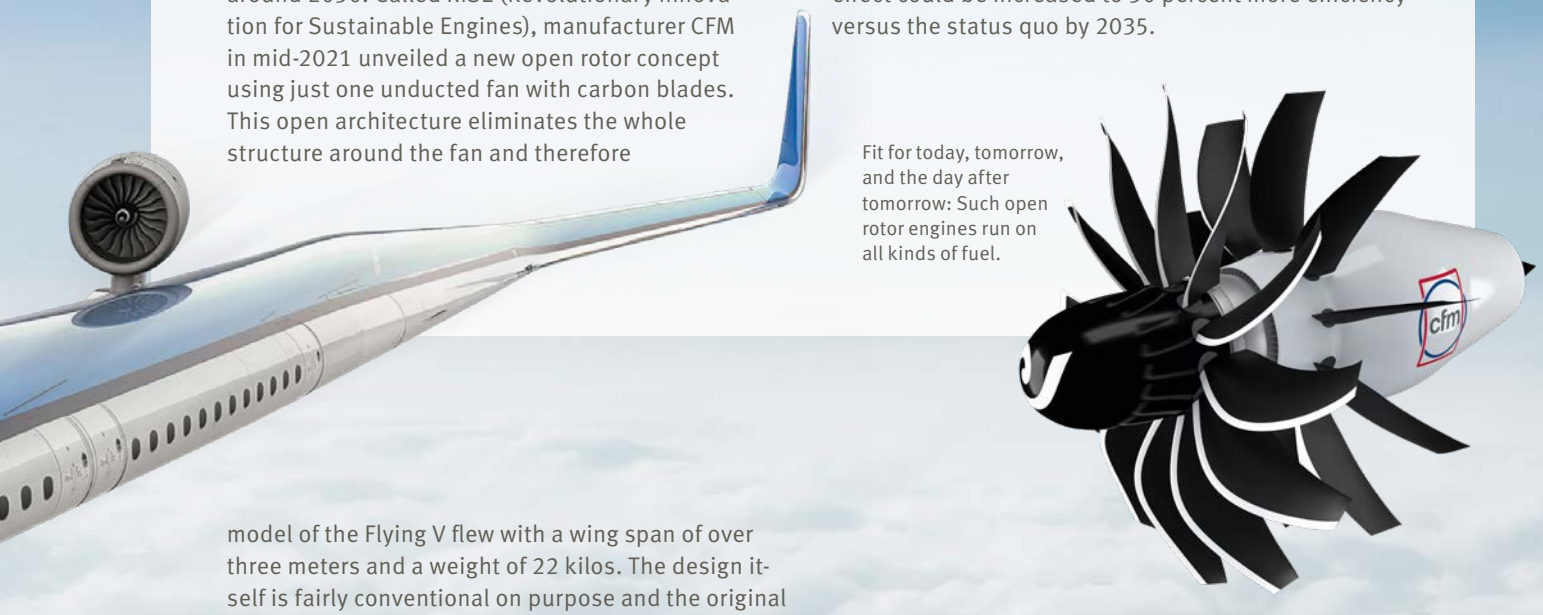
In this article, we present some interesting ideas of how aircraft and their propulsion systems might become more environmentally friendly going forward and which sustainable energy sources could be tapped for this purpose:

Traveling more efficiently in a flying wing

To gain efficiency in flying, new aircraft designs have to be studied. Flying V (pictured above) is a V-shaped concept consisting basically only of a wing, put forward by the Technical University of Delft in the Netherlands, supported by KLM and Airbus. "If this configuration indeed becomes the next long-haul aircraft, it would be the most revolutionary change we have seen in aviation since the introduction of jet engines," says project leader Roelof Vos. In 2014, a first model of the flying wing took to the air for tests. Since then, the Technical University of Delft has further refined the aircraft concept and in July 2020, a 1:5 scale

Efficiency through open fan-blade architecture

A new generation of aircraft has to be at least 20 percent more efficient than the preceding one, and that's only possible with radical changes to propulsion such as open rotor engines that were first unveiled as far back as in the mid-1980s. Two openly exposed, counter-rotating fans with sword-like blades looked spectacular but caused many problems – from noise to vibrations. Almost three and a half decades later, the successor model could turn into a big leap forward by being available as propulsion for an anticipated replacement of the Airbus A320neo family around 2030. Called RISE (Revolutionary Innovation for Sustainable Engines), manufacturer CFM in mid-2021 unveiled a new open rotor concept using just one unducted fan with carbon blades. This open architecture eliminates the whole structure around the fan and therefore a lot of weight and drag, so enabling ultimate propulsive efficiency. The diameter of the unducted engine shrunk to nearly four meters, similar to the dimensions of current turbofan engines including their casing, for example on the A320neo or the Boeing 737 MAX. The key advantage is that RISE can run on all kinds of fuel, be it up to 100 percent SAF (sustainable aviation fuel) or even hydrogen. The RISE engine is supposed to reduce fuel burn by 20 percent and that, says the manufacturer, is only one component of the overall efficiency of the concept. With further improvements to the aircraft itself, the total effect could be increased to 30 percent more efficiency versus the status quo by 2035.



Fit for today, tomorrow, and the day after tomorrow: Such open rotor engines run on all kinds of fuel.

model of the Flying V flew with a wing span of over three meters and a weight of 22 kilos. The design itself is fairly conventional on purpose and the original is supposed to be slightly smaller than today's Airbus A350, currently one of the most efficient airliners. Flying V can use existing airport facilities and haul the same number of passengers and cargo volume as the A350 – while burning 20 percent less fuel. "And this just comes from the fuselage shape, maybe we will be able to gain even more efficiency by improving propulsion technology," Vos hopes. Potentially, the aircraft could be powered by hydrogen in the form of fuel cells or e-fuel. Hydrogen needs huge tanks that conventional jets could hardly accommodate. "This would be much easier in the outer wings of the Flying V than in the thin wings of current aircraft," says the professor from Delft.

"Green" fuels as a bridge to the future

To make flying more environmentally friendly, alternative sources of energy are needed, and currently sustainable aviation fuels (SAFs) are the focus of attention. As the growing of biomass can lead to competition with the cultivation of food crops, the production of biomass as a basis for sustainable fuel is limited to exploiting food or wood waste and even used cooking oil. This naturally limits the amount of bio-kerosene that can be produced. In the pre-corona year of 2018, about 15 million liters (4 million gallons) of aviation bio-kerosene were produced globally – not even 0.1 per cent of the total aviation fuel required. For larger volumes, pilot projects are already using so-called methanol-to-synfuel synthesis. However, to produce one kilowatt hour (kWh) of synthetic, electricity-based fuel today by means of the power-to-liquid method, two KWh of electricity are needed. 52 large wind turbines, each with a rated capacity of 4.6 megawatts, would be necessary to cover the daily synthetic kerosene demand of an Airbus A350, according to calculations by the Hamburg University of Applied Sciences (HAW). But the flight of an aircraft solely using such fuel would be carbon-neutral because it would emit only CO_2 previously extracted from the atmosphere. Synthetic kerosene is currently used only in small quantities blended with fossil-based kerosene as so-called drop-in fuel. To increase its share, many countries are now imposing minimum quotas for the amount of SAF that has to be used for flying. Germany is planning to require 0.5 per cent starting in 2026 and two per cent in 2030, while Neste Oil, one of the biggest manufacturers, considers a share of five percent by 2025 and ten percent by 2030 to be realistic in Europe.

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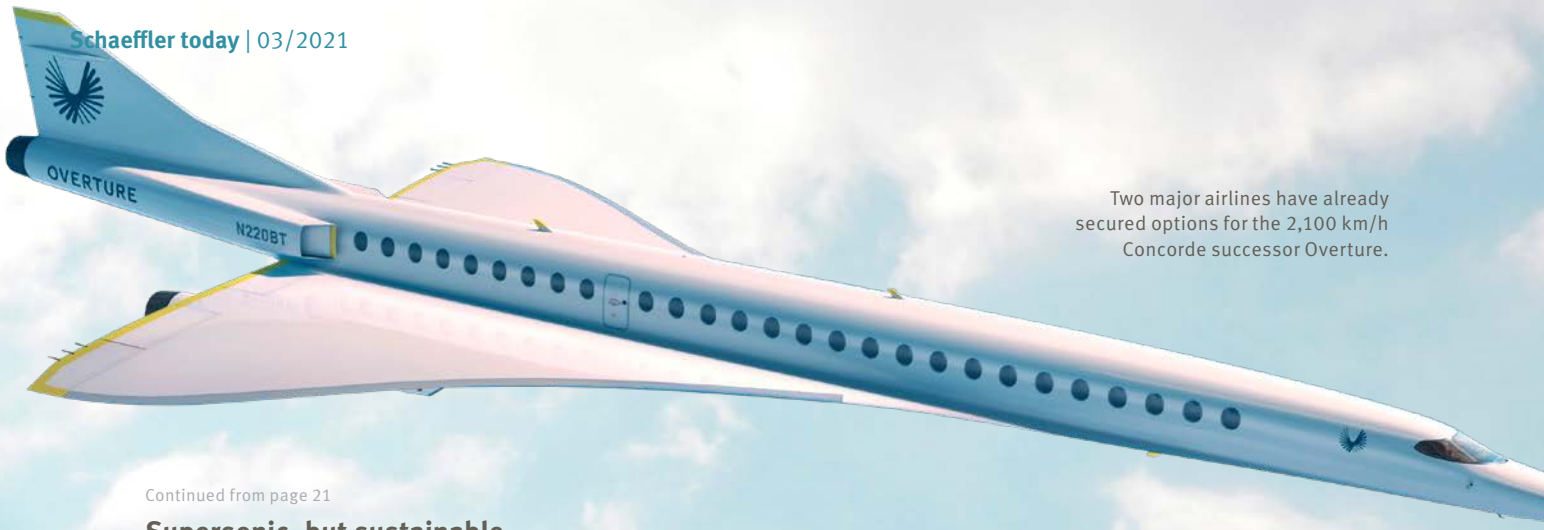

Two major airlines have already secured options for the 2,100 km/h Concorde successor Overture.

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Supersonic, but sustainable this time around?

Since the end of Concorde in 2003, there have been no more supersonic passenger flights. Due to their extremely high energy consumption, the inevitable sonic boom, and emissions at high altitudes, such flights would no longer be appropriate today. Even so, a new supersonic era might begin soon: Boom Supersonic from Denver is planning to reintroduce supersonic flights by the end of the decade with its Overture aircraft as a smaller successor to Concorde, in more sustainable ways and causing a less noisy boom. United Airlines, the world's fourth-largest airline, in June 2021 announced its intention to purchase 15 Overture aircraft and Japan Airlines holds options as well. Starting in 2029, it's supposed to fly passengers at 1.7 times the speed of sound (2,100 km/h), which is significantly slower than Concorde that achieved Mach 2.02 (2,494 km/h). Although accommodating only 50 to 60 passengers – fewer than Concorde used to with its one hundred seats – the new airliner would emit three to five times more CO_2 per passenger than a subsonic aircraft flying the same route. Plus, according to estimates by independent scientists of the International Council on Clean Transportation (ICCT), it would burn five to seven times more fuel per passenger. So far so bad. But Boom is planning to enable Overture to fly with 100 percent SAF as the first airliner ever. However, the supply of greener fuel is still far too scarce. The 15 United Overture aircraft alone might require twice the amount of SAF that will be available in all of the EU at the end of the decade, estimates the ICCT.

"Since the beginning of aviation, engineers have been striving to continuously improve the efficiency and safety of aircraft. Only as a result of these efforts have aircraft become the safest means of mass transportation. And only few people know that a fully occupied Airbus A319neo requires just two liters of kerosene per passenger per 100 kilometers. The next goal pursued by the aviation industry is zero emissions. This goal can only be achieved with a technology mix for the various applications. I can imagine a world in which short hauls in regional aircraft will be battery-electric. For distances of up to 2,000 kilometers, hydrogen is the suitable energy source, either as carbon-neutral fuel burned directly or by powering electric propulsion systems via a fuel cell. For long-haul flights, I do not see any alternative to synthetic fuels produced from renewable energies in the next few decades. These developments result in outstanding opportunities for Schaeffler Aerospace going forward. Aviation has its own exacting standards and we see ourselves in a position to transfer our very good in-house development and production know-how in the area of electric drive systems to this sector."

Armin Necker
Managing Director Schaeffler Aerospace

Does hydrogen work wonders?

By 2035, Airbus is planning to bring the first “zero-emissions” airliner to market. Independent scientists have dismissed this announcement. Dieter Scholz, a professor at HAW, says that zero emissions will never be possible. The aircraft manufacturer from Toulouse has presented three different concepts, among them a conventional-looking jet and a blended-wing body, of which one is supposed to become reality, most likely the turboprop variant. The idea to use hydrogen instead of kerosene as an energy source for aircraft engines is difficult to realize. So far, there is a lack of hydrogen aircraft concepts that could cope with everyday flight operations and be economical at the same time. Establishing the infrastructure on the ground required for storing hydrogen and refueling aircraft is a complex proposition as well. Hydrogen is not easy to handle: It offers three times the energy density of kerosene, which is a major advantage over batteries, and only weighs a third, but requires up to four times more volume. And space on board of aircraft is notoriously scarce. Additionally complicating things is the fact that hydrogen is a so-called cryogenic fuel: a gas that only liquefies at minus 253 °C and can be used for propulsion only after having been compressed under high pressure. Hydrogen can be used on aircraft in different ways: for direct burn in modified gas turbines, converted to electrical energy in fuel cells, or as synthetic kerosene produced in combination with CO_2. The startup Universal Hydrogen has developed a simple capsule system for delivering hydrogen to turboprop aircraft. On the ground in between flights, hydrogen capsules measuring two meters in length would be replaced in the aft of the aircraft to produce in-flight energy in a fuel cell powering two electric motors. The first airlines have already ordered the technology and are planning to use it for nearly emission-free operation in existing aircraft such as the ATR-72 and Dash-8 starting in 2025.

The P-Volt electric aircraft is planned to start all-electric short-haul service in Norway in 2026.

Plug-in engine power

Electric propulsion could be ready for use in hybrid regional aircraft of up to 50 seats on short routes in the next few years. The Swedish startup Heart Aerospace received a huge boost in July 2021 by US giant United Airlines ordering up to 200 units of the biggest fully electric aircraft under development so far, the ES-19. Finnair also cooperates with Heart and has secured up to 20 of the 19-seaters. It’s supposed to fly as far as 400 kilometers before the batteries have to be recharged, which will take a 1-MW charger on the ground about 40 minutes. After about 1,000 cycles, the batteries have to be replaced. The very first electrical aircraft for passenger flights could be in service in Scandinavia by the middle of the decade. In Norway, regional airline Widerøe, engine maker Rolls-Royce, and Italian aircraft manufacturer Tecnam have teamed up. The trio is aiming to put the nine-seat P-Volt (pictured above) into service in about five years as the first passenger aircraft solely powered electrically.

However, the principal problem of electric propulsion still lies in the energy density of today’s batteries. 200 to 250 Wh/kg are the maximum that can be achieved, while kerosene offers an energy density of 12,000 Wh/kg. The available efficiency of lithium batteries, though, is increasing by five to eight percent every year and NASA expects them to achieve an energy density of 350 Wh/kg by 2030, enabling a 30-seater electric aircraft for short-haul flying. The car manufacturing industry is now working on solid-state batteries of up to 400 Wh/kg and there are even plans for vehicle batteries with 1,000 Wh/kg. In aircraft, though, fully electric propulsion will only be viable for smaller propeller aircraft even in the mid-term future. For bigger regional jets with about one hundred seats, hybrid concepts, i.e., a combination of electric motors and conventional jet engines, are the most suitable approach. This would enable a much longer aircraft range, while an added electric power source, mainly during takeoff and landing, would lead to significant reductions of fuel burn, emissions and noise.

Article by Andreas Spaeth

Less is more

The operation of machines generates friction, which entails friction losses at the expense of material and efficiency. Experts attribute approximately a fourth of the worldwide energy requirement to these losses: reason enough for delving deeper into this subject that's anything but superficial.

Humans recognized the phenomenon of friction including its side effects early on – and learned how to put it to use. For instance, to generate heat for starting a fire. Often, though, friction proved to be a hindrance: To reduce the physical exertion involved in pulling heavy loads, early tinkerers as far back as in the Neolithic Age 5000 BC came up with rolling logs and using sleds. The first machines that generated friction were bow drills and potter's wheels. Pre-Christian finds prove that lubricants were used to minimize friction as far back as in Ancient Egypt and China.

In the Late Middle Ages, the precision of observations relating to friction clearly increased. In the 15th century, Leonardo da Vinci gathered initial scientific findings about static friction, in other words the force that keeps two contacting objects from sliding against each other. In addition, he determined the force that's needed to cause an object to slide on a horizontal plane: dynamic friction. Scientists subsequently described various physical laws around friction. Sir Isaac Newton (1643–1727), for instance, investigated the adhesive force that's generated by molecular interactions of the interfacial layer of surfaces. This adhesive force causes a protective film to stick to the display of a cellphone, for example.

Friction as a science in its own right

Even though the research of friction began more than 500 years ago, the scientific term for it, tribology, wasn't coined until the nineteen-sixties. Tribology derives from "tribein," an Old Greek word for rubbing and wearing. "As the study of friction, lubrication and wear, tribology is a cross-sectional technology of macroeconomic importance. It enables energy efficiency and sparing use of resources by reducing friction and wear," says Prof. Dr.-Ing. Tim Hosenfeldt, Senior Vice President, Corporate Research and Innovation & Central Technology at Schaeffler and Honorary Professor of Surface Technology and Tribology at University of Erlangen-Nuremberg.

Engineers today distinguish between the following terms for friction, depending on the state of contact: solid friction, boundary friction, mixed friction, fluid friction and gas friction. In this context, scientists not only look at the tribological objects rubbing against each other, namely the base body and the

mating body, but also investigate the elements acting between the surfaces such as lubricants, particles and even air. The ambient medium, be it liquid or gaseous, is decisive as well. The ambient air, for instance, produces chemical effects that promote lubricant aging. To be considered as well are aspects such as viscosity and aging of a lubricant that evaporates under excessive loads. Furthermore, service parameters affect tribological behavior: the type of motion, load, speed, temperature and duration of friction. Plus, there are some other factors.

Enormous efficiency potential

Even in a single component assembly – for instance in a passenger car, a commercial vehicle or a train – significant friction losses can be measured. That raises the question of how massive the total effect of all friction losses must be, considering that such products are used day in day out in hundreds of millions of units worldwide. A scientific engineering study calculated these effects in 2017: Tribological contacts account for 23 percent of the world energy consumption of which 20 percent serves to overcome friction and 3 percent to recondition components and spare parts that are worn in the process. In terms of absolute numbers, this 23 percent corresponds to 119 exajoules (EJ). That's 33,055 billion kilowatt hours (kWh), in other words nearly ten times the primary energy consumption of Germany.

This incredible amount of energy requires high capital expenditures, is produced in complex ways, has adverse effects on the environment and climate – and is ultimately lost to friction. And the smallest part of that is intentional, for instance due to applying the brakes. Kenneth Holmberg and Ali Erdemir, the academic authors of the aforementioned study, performed further calculations showing that friction and wear could be reduced in the long term by up to 40 percent by means of new surfaces, materials and lubrication solutions, which roughly equates to potentially improving the global primary energy requirement by 8.7 percent. The transportation sector accounts for a fourth of these savings and energy production for a fifth, according to the study. Both of these are areas in which Schaeffler is intensively involved with its Automotive and Industrial divisions. With forward-thinking tribological technologies, 3,140 metric megatons of CO2 and 970 billion euros could be saved in the long term, according to the study.

"Surface technology is a key enabling technology"

Not least in view of these figures, Schaeffler intends to use its tribological know-how to minimize friction with the objective of enhancing efficiency as well as increasing the service life of products through wear protection and corrosion protection. As early as in 2007, the group opened its "Surface Technology" competence center at its headquarters in Herzogenaurach and has successively been extending the development capacities at the site. The researchers and developers there are highly motivated, telling us that surface technology is no less than one of the key enabling technologies in industrial countries.

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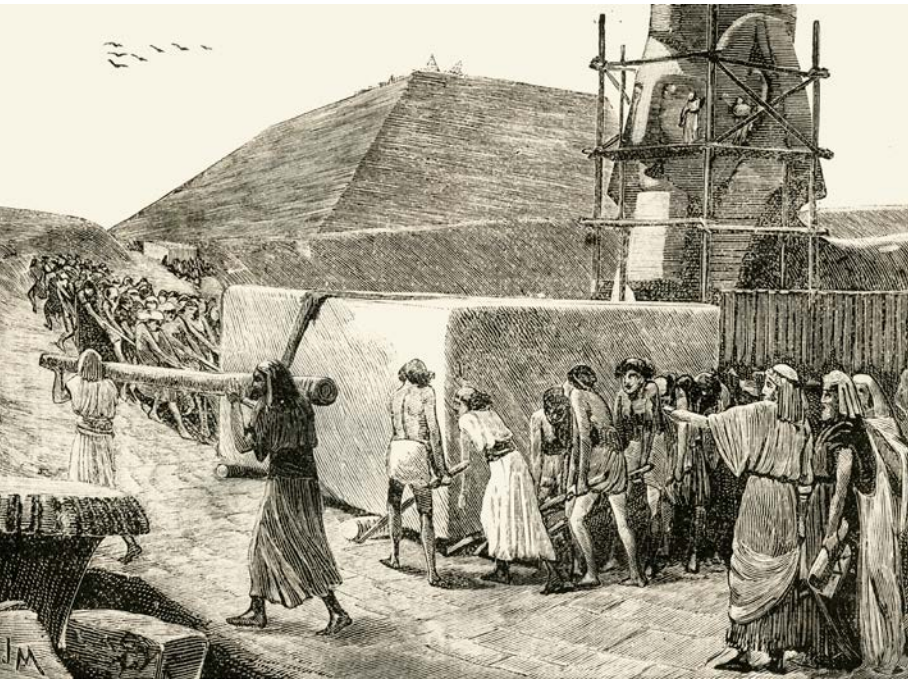
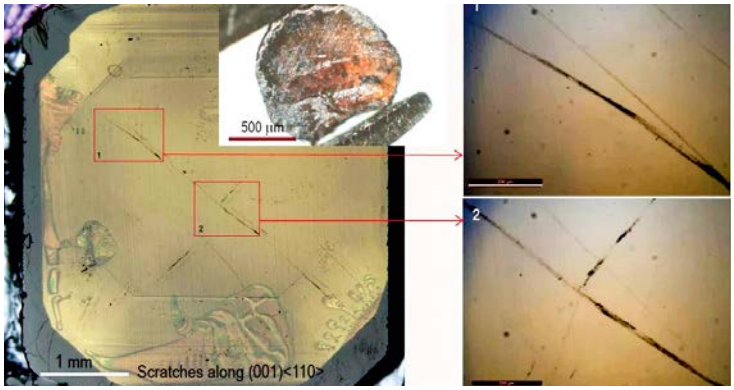


Even long before the birth of Christ, rolling logs were used to reduce friction, like the Egyptians did for building pyramids as shown here. Universal genius Leonardo da Vinci is regarded as the inventor of the ball bearing. Depicted above is a replica based on original drawings.



This picture from a microscope proves the scratches that AM-III inflicted on the surface of a diamond.

11,522.4

Vickers hardness (HV) is achieved by a carbon-based glass recently developed by researchers at Yanshan University in China. The material called AM-III is 30 times harder than stainless steel and can even scratch diamonds (10,000 HV). In addition, AM-III is semi-conductive and therefore suitable as a viable silicon alternative in the field of photovoltaics.

Continued from page 25

Due to its expertise in coating technologies and in the fundamentals of tribology and nanotechnology, Schaeffler has acquired a position of worldwide leadership in functional surfaces and coatings. This field has long ceased to be strictly about optimizing the surfaces of heavy-duty rolling bearings, for instance in wind turbines or aircraft engines, with innovative coating technologies. In fact, coatings from Schaeffler have already made it into automotive powertrains, for instance in the engine's valve train. And the performance of bipolar plates in fuel cells and electrolyzers for the utilization and production of green hydrogen applications is raised to new levels by the tribological know-how of the automotive and industrial supplier as well.

Schaeffler has developed a Coating Toolbox enabling the company to offer its customers tailored solutions. The toolbox covers these five main requirements: corrosion protection, wear protection, friction reduction, current insulation and sensors, as well as any intersections between them.

One of Schaeffler's fortes is the transformation of complex niche applications into mass production with corresponding requirements such as first-rate reproducibility to meet exacting quality standards and, of course, in consideration of strict cost requirements. The extremely thin application of the heavy-duty layers is an art in itself, considering that we're talking about ultra-fine layer thicknesses, often in the nano range. All the more astonishing is their

"There is a clear trend toward custom-developed multifunctional and sensorial coatings."

Prof. Dr.-Ing. Tim Hosenfeldt
Senior Vice President, Corporate Research and Innovation & Central Technology at Schaeffler

robustness: Schaeffler offers so-called Triondur coatings that easily withstand heat of up to 600 degrees centigrade. In terms of hardness, peak values of more than 4,000 Vickers hardness (HV) are currently achieved. For comparison: Standard bearing steel peaks at 700 HV and diamonds as the hardest natural mineral reach 10,000 HV.

The future: Plasma coatings and multifunctional surfaces

In addition to electrochemical techniques (galvanic), painting and thermal spraying, plasma-assisted chemical vapor deposition (PACVD) and physical vapor deposition (PVD) are playing increasingly important roles also at Schaeffler, especially with multifunctional thin-film coatings. Plasma surface technology is particularly environmentally friendly and truly a multi-talent with a performance range far exceeding the areas of friction reduction and wear protection. This technology, for instance, can be used to clean and activate surfaces for enhanced adhesion of paints and adhesives or for icing prevention. Furthermore, it enables the provision of surfaces with additional optical, electrical or chemical functions.

"There is a clear trend toward using precise layer systems as design elements with multifunctional and mechatronic properties," says Prof. Tim Hosenfeldt. Here's another number that underscores the importance and diversity of tribological plasma technology: Plasma is utilized in 14 of the 17 "Future Fields" identified by the German Federal Ministry of Education and Research, ranging from the hydrogen economy to medicine to biotechnology.

Up to 80 percent less dry friction compared to steel: Triondur-coated barrel rollers in a spherical roller bearing from Schaeffler

5 key areas of tribological research and development in the field of thin-film technology

- Innovative coating methods and processes
- Tribological and corrosion-protection coatings for mobility and energy
- Coatings for sensorial and bionic applications
- Coatings for optical and electronic applications
- Coatings for energy storage devices and converters

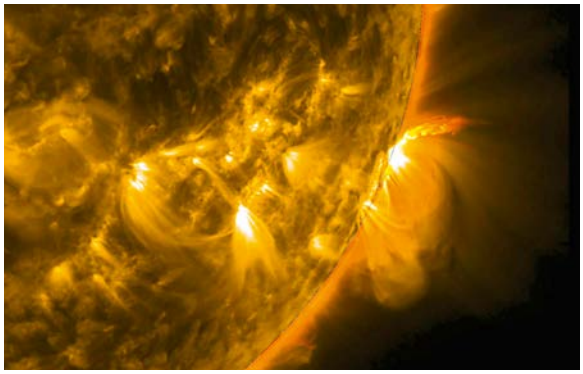
That's because PVD and PACVD have a crucial advantage: The technologies are suitable not only for use with metals but with most polymers and even with many organic substances as well. Highly effective membranes or individual fibers can be treated with plasma technology too, for instance to produce specialty yarns. Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, for instance, has developed a plasma-polymeric coating for sealing elements made of rubber. The coating reduces friction and wear of such seals that serve to prevent lubricant oil leakage. Schaeffler was involved as a partner in this project called "Poseidon." In tests on a model test bench, the scientists were able to reduce friction by 23 to 55 percent – depending on the oil used and its additives. With fully additive-enhanced production lubricants in wheel bearings, the coefficient of friction in laboratory tests was reduced even by up to 71 percent.

Continued on page 28

Continued from page 27

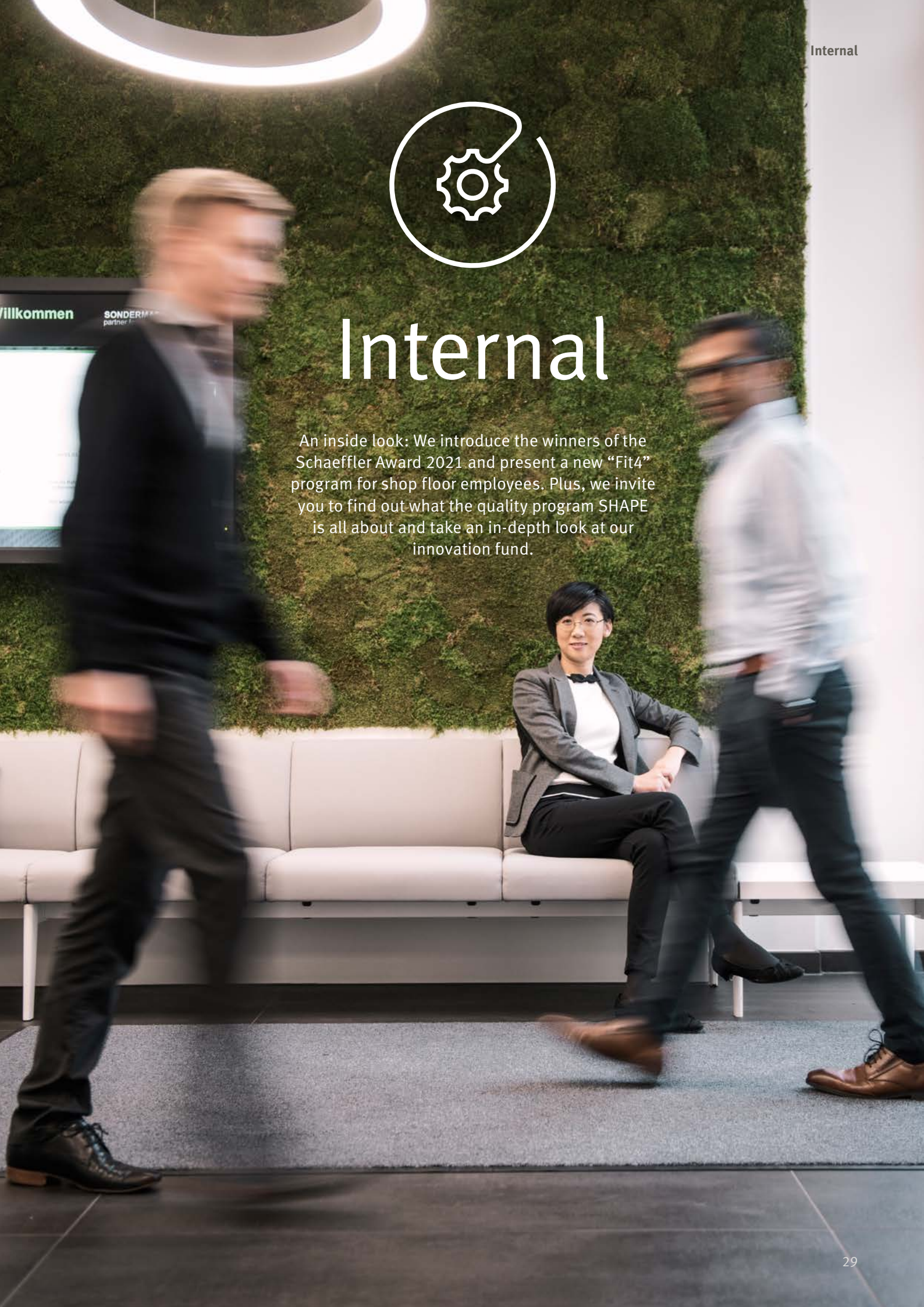
Coatings with sensory properties enable experts to determine and analyze the in-service wear behavior of components to improve products or better yet: to directly and proactively intervene to prevent wear. In addition, such data make it possible to calculate residual service life precisely, thereby optimizing lifecycles and maintenance intervals, which saves resources. At the same time, unplanned downtimes can be minimized. Ideally, surfaces regenerate their friction-induced substance loss automatically and tribologists are already working on such wear- and friction-reducing "healing processes" as well. So, the subjects of surfaces and friction will continue to inspire our ingenuity – just like they did with our forebears thousands of years ago.

Article by Volker Paulun & Alexander von Wegner



99 %

of the universe is plasma. The Sun, like all stars, consists of plasma, as do natural phenomena such as polar lights and thunderbolts. **Plasma is one of the four fundamental states of matter besides solids, liquids and gases.** The addition of a sufficient amount of energy to gas results in a mixture of particles consisting of ions, free electrons, and typically neutral atoms or molecules as well, which is called plasma. Unlike gases, ionized plasma is conductive.



Internal

An inside look: We introduce the winners of the Schaeffler Award 2021 and present a new “Fit4” program for shop floor employees. Plus, we invite you to find out what the quality program SHAPE is all about and take an in-depth look at our innovation fund.

Executive Meeting 2021: “Leading our Transformation”

This year’s Executive Meeting took place under the motto “Leading our Transformation”. Over 270 top executives participated in the two-day event, which was held digitally for the first time. The focus was on the Roadmap 2025 and the execution program developed for implementing this roadmap.

Georg F. W. Schaeffler, Family Shareholder and Chairman of the Supervisory Board, welcomed the top managers to the Executive Meeting and tuned them in for the event motto “Leading our Transformation”.

Georg F. W. Schaeffler, Family Shareholder and Chairman of the Supervisory Board, welcomed the executives and introduced them to the motto “Leading our Transformation”, saying Schaeffler was right in the middle of transformation. “A year ago, as part of our Roadmap 2025, we presented a comprehensive package of structural measures which we refer to internally as SPACE. It was the largest package of measures in Schaeffler’s history, with 4,400 jobs being cut, primarily in Germany. I am aware that this was not an easy task for our employees and employee representatives. And I would like to thank you for your positive and constructive cooperation and hope we will maintain it in the future.”

He expressed his confidence that “we will cope with all future challenges and steer the company safely through the next phase of our history.”

During his address, Georg F. W. Schaeffler also bid farewell to Jürgen Ziegler, Regional CEO Europe, and thanked him for his outstanding services rendered to the Schaeffler Group. Mr. Schaeffler also reminded the audience of the upcoming change at the top of the Automotive Aftermarket division at the end of this year when Michael Söding will hand over the reins to Jens Schüler. In addition, he welcomed Claus Bauer as the new Chief Financial Officer and Sascha Zaps as Regional CEO Europe.

CEO update – “This is our transformation together”

CEO Klaus Rosenfeld followed next with his CEO update during which he tuned the participants in to the challenges of the next few years: “Today we will be talking about transformation. But not just any transformation, but our very own! Our transformation means that we are all responsible for it. We as a team. We cannot delegate this responsibility. It is our collective transformation. We are the ones who must implement it.” Rosenfeld added that Schaeffler is well prepared for this transformation with its Roadmap 2025. “We have a strategy and we have an underlying plan: our 2025 execution

CEO Klaus Rosenfeld welcomed the 270 participants to the Executive Meeting and explained how the company's transformation can succeed with the execution program and what responsibility the executives have in the process.

program, with its seven subprograms, three divisional vertical and four cross-divisional horizontal programs, with a total of 86 initiatives."

The network structure of the execution program also provided the basis for the Executive Meeting program, which was led by Elena Müller, Head of Venture Management: With three marketplaces representing the three vertical divisions Automotive Technologies, Industrial and Automotive Aftermarket – and the four panel discussions representing the four horizontal departments of Innovation & Technology, Digitalization & IT, Sustainability & Engagement, and People & Culture.

12 marketplaces – The voice of the customer

In 12 digital marketplaces and using interactive formats, the executives exchanged views on which challenges Schaeffler is facing in its customer business with the respective account managers and sales experts of selected Schaeffler customers and other participants. Four specific customer examples were represented from each division. Each marketplace addressed one main action point that had emerged from the mid-year customer survey. The aim was to raise awareness of how customer relationships can be improved and customer business further enhanced on a sustainable basis.

The executives were very close to the customer during customer talks with DMG Mori and Volkswagen: Matthias Zink, CEO Automotive Technologies, Dr. Jochen Schröder, and Wendelin Backes spoke with Dr. Karsten Bennewitz, Head of Powertrain & Energy System Development Volkswagen. For Dr. Bennewitz, it is clear that there will not be only one solution for powertrain concepts in the future, but that a variety of concepts will continue to coexist depending on the market and the customer.

Dr. Stefan Spindler, Chief Industrial Officer, spoke with Christian Thönes, CEO of DMG Mori. Thönes aims to digitally optimize manufacturing processes and business operations, create new service-oriented processes and business models, and expand man/machine interaction. In doing so, digital technologies should always offer customer benefits and improve production.

CEO Talk – In conversation with Melissa Di Donato

The CEO Talk saw Klaus Rosenfeld speaking with Melissa Di Donato, CEO of SUSE, a Nuremberg-based open source software company that went public at the beginning of 2021. Di Donato, who formerly worked for

Continued on page 32

Matthias Zink, CEO Automotive Technologies, spoke with Dr. Karsten Bennewitz, Head of Powertrain & Energy System Development Volkswagen.

Dr. Stefan Spindler, CEO Industrial, spoke with Christian Thönes, CEO of DMG Mori.

Continued from page 31

companies such as IBM, Salesforce, and SAP during her impressive global career, is one of the "power women" of the global software industry. She talked about her experiences with transformation situations, practiced leadership principles, the challenges of the current market environment, and why mentoring is necessary to lead a global company into the future. In addition, her comments on the women's quota and the importance of women in leadership positions were particularly noteworthy.

Panel discussions

The four panel discussions focused on current topics from the horizontal subprograms of our Roadmap 2025: Innovation & Technology, Digitalization & IT, Sustainability & Engagement, and People & Culture.

In the **Innovation & Technology** panel, led by Dr. Christian Gabriel, Head of R&D Management, panelists Prof. Dr. Robert Schlögl, Katharina Reiche, and Sander ten Hoopen looked into the potential of hydrogen to tackle the climate crisis. All participants agreed that hydrogen is indispensable and that the technology and infrastructure should be realized as soon as possible. Moreover, it was also important to build a global hydrogen network, as the energy transition could only be solved globally, not regionally.

During the **Digitalization & IT** panel, Jürgen Henn, Head of Strategic IT and Digitalization, discussed with his guests Prof. Sabina Jeschke, Prof. Boris Otto, and Franziska Gerner the importance of data and how they can be used even better: The industry has a treasure trove of data that is currently not being used optimally. To improve this, however, organizational structures and ways of thinking need to change: Data are there for everyone, everyone uses them. And the more people use and analyze data, the more data gain value – that goes for Schaeffler, too.

In the **Sustainability & Engagement** panel, Thomas Fußhöller, Head of Sustainability, and his guests Saori Dubourg, Matthias Kopp, and Alena Useinovic debated the importance of sustainability as a game changer for future

Chief Technology Officer Uwe Wagner opened the Innovation & Technology panel.

Chief Operating Officer Andreas Schick was the sponsor of the Digitalization & IT panel.

Thomas Fußhöller, Head of Sustainability, hosted the Sustainability & Engagement panel.

business success and how to manage the effects along the entire value chain. The conclusion: We are in the age of intelligent resource use and must create real value for companies and society.

In the **People & Culture** panel, hosted by Dr. Helen Schropp, Senior Vice President HR Strategy, the focus was on the future of working in the office and on the shop floor. Panelists Dr. Ernesto Marinelli, Prof. Dr. Inaki Lozano, and Steffen Lömmer agreed that hybrid working will become the norm.

The reasons for coming to the office have changed: Exchange, innovation, and collaboration are set to take place in the office, while telephone conferences will rather be attended from the home office. Hybrid working is also possible in production: Since the outbreak of the coronavirus pandemic, shop floor meetings also take place digitally, and more flexibility in shifts is desired.

Our brand ambassadors

During the Executive Meeting, big wave surfer Sebastian Steudtner was introduced as a new Schaeffler brand ambassador. Schaeffler brand ambassador Sophia Flörsch was a guest as well and provided insights into her daily training routine.

Saxony's Prime Minister Michael Kretschmer sent warm greetings from Dresden, wishing the participants all the best and every success.

Schaeffler Award

The highlight of this year's Executive Meeting was the final of the Schaeffler Award. Eight finalist teams presented their pitches virtually in the categories "Sustainability", "Excellence", "Innovation", and "Passion". You can find a detailed report on page 34. (ak)

Corinna Schittenhelm, Chief Human Resources Officer, opened the People & Culture panel.

Schaeffler Award final: And the winner is …

The winners of the Schaeffler Award 2021 have been chosen. The final was held in digital form during this year's Executive Meeting. The winners were announced by Family Shareholder and Supervisory Board Chairman Georg. F. W. Schaeffler and CEO Klaus Rosenfeld.

The winners of the Schaeffler Award 2021 were selected by live online voting at this year's Executive Meeting and were announced by Family Shareholder and Supervisory Board Chairman Georg. F. W. Schaeffler and CEO Klaus Rosenfeld. The award show was moderated by the project lead, Philipp Stritzke (right), and was conducted in accordance with all applicable pandemic public health requirements.

This year, the annual Schaeffler Award competition took place for the third time. As in 2020, the Final and award ceremony were held in virtual form because of the coronavirus pandemic. The following teams were chosen as the winners of the Schaeffler Award 2021:

- Category "Sustainability": "Less is MORE" from Thailand
- Category "Excellence": "Guided Quoting – Time is Money!" from Germany
- Category "Innovation": "The Power of Simplicity" from Germany, China, Japan, and Korea
- Category "Passion": "The Green Clean E-Machine" from USA/Germany

This year, 613 applications were submitted for the award. "That speaks volumes about the immense talent we have here at Schaeffler across all our locations worldwide," said Family Shareholder and Supervisory Board Chairman Georg F. W. Schaeffler. "In all categories, the quality of the projects submitted was remarkable and shows the key role played by our four corporate values: Sustainability, Excellence, Innovation and Passion. The Schaeffler Award is very important to my family, and I personally am extremely proud that we are able to hold this ceremony today despite all the difficulties caused by the pandemic."

Schaeffler CEO Klaus Rosenfeld also addressed the audience. "With their inspired ideas, the highly dedicated teams competing in this final round are the epitome of our brand claim, 'We pioneer motion'," he said. "They are further proof that we are well on the way to making our company, Schaeffler, even better and stronger." The Schaeffler Award will continue next year. (jp)

The winners

Savoring their victory: The team from Thailand presented the project "Less is MORE".

Johannes Kröckel (left) and Gillian Fong-McMaster presented their project "Guided Quoting – Time is Money!" during the final competition round.

Kathryn (Katie) Burns (left) and Eric Dubendorfer received the Schaeffler Award 2021 for their project "The Green Clean E-Machine" and share a moment of excitement at their win.

Stefan Glück, who pitched "The Power of Simplicity" project at the final along with Alexander Seybold, shows wide-eyed disbelief at winning the Schaeffler Award.

Integrity and fairness

The Schaeffler Group takes its corporate responsibility seriously and has updated both its corporate and supplier codes of conduct. Value-based action takes priority and is the benchmark for all employees and the company as a whole. All business partners, particularly suppliers, should also observe and comply with Schaeffler's ethical and legal principles.

Corporate responsibility

The Corporate Code of Conduct reflects not only the values and behavioral principles of each individual at Schaeffler but also the corporate culture and leadership principles. "The Code of Conduct provides all employees with orientation regarding our actions and at the same time represents an important promise to the outside world," says Klaus Rosenfeld, Chief Executive Officer of Schaeffler AG. "Integrity, fairness, and mutual respect are the cornerstones within the Schaeffler Group upon which our actions are based. Schaeffler lives up to its corporate responsibility and thereby creates the prerequisites for the company's sustained success."

In addition to the Corporate Code of Conduct, the Schaeffler Group has also updated its Supplier Code of Conduct. The global automotive and industrial supplier works with an international supply chain. Schaeffler aims to make it even more accountable. In doing so, the company will better meet its obligations with respect to protecting the environment and will also have a stronger focus on social aspects, especially human rights. "We consider sustainable procurement to be a key issue," says Klaus Rosenfeld. "This includes responsible management of critical materials as well as human rights and environmental and social standards." (jp)

The Corporate Code of Conduct and the Supplier Code of Conduct reflect Schaeffler's ethical and legal principles and provide all employees and business partners with guidance in their business dealings.

Awards

Pioneering innovations, technological progress, and superb quality: The editorial team has compiled a small selection of awards that Schaeffler has received in recent months.

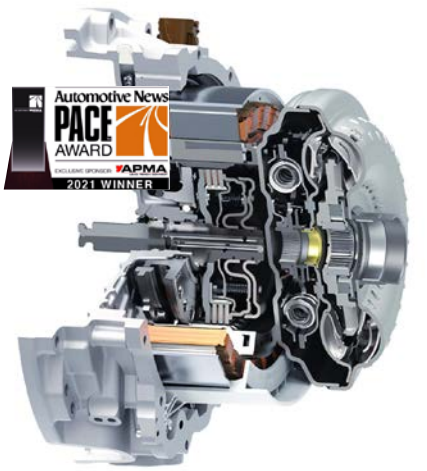
Winner of the Future Technology Award, which was presented for the first time in 2021: Professor Dr.-Ing. Stephan Tremmel from the University of Bayreuth

"Future Technology Award" for Prof. Stephan Tremmel

The **Schaeffler FAG Foundation**'s €100,000 **Future Technology Award** went to Professor Stephan Tremmel at the University of Bayreuth. Professor Tremmel and his team are researching methods for conducting stray electrical currents away from rolling bearings. "This is a highly innovative line of research," explained Andreas Hamann, the chair of the foundation's executive board and Head of HR Europe at Schaeffler. "It is a highly speculative venture, and the likely outcomes are unclear – just the sort of thing the Future Technology Award was created for." Regardless of design type, rolling bearings fulfill a vital function in all systems that have rotating parts. They are integral to wind turbine gearboxes and all manner of mobility and motion applications. However, the growing electrification of many applications is creating new challenges. One problem is parasitic voltage, which results in stray electric currents that can cause damage to many different machine components – including rolling bearings.

Schaeffler wins 2021 Automotive News PACE Award

Schaeffler was honored for its **P2 hybrid module** used in rear-wheel-drive transmissions at the **2021 Automotive News PACE Awards** ceremony, which took place online this year. Furthermore, the company, together with Ford Motor Co., also received the **Innovation Partnership Award in recognition of their successful collaboration in the development of the system**. Both awards provide further confirmation of the success of Schaeffler's e-mobility strategy. The PACE Awards recognize automotive suppliers for groundbreaking innovations, technological advancement, and corporate performance. Automotive News presents this award to automakers that do an exceptional job of collaborating with a supplier to drive innovation.



An Automotive News PACE Award winner: Thanks to its compact design, Schaeffler's hybrid module can be used on different vehicle platforms.

Top quality and delivery performance

Ashok Leyland presented Schaeffler India Ltd. with its **"Special Award for Sustained Business Alignment for a Decade"**. The Schaeffler plant in Hosur has been supplying the Indian commercial vehicle manufacturer with products such as clutch units since 1997.

Schaeffler Brasil manufactures various products, including clutch sets, for **Honda Automóveis do Brasil**. Schaeffler's Sorocaba plant recently received the **"Quality and Delivery Award"** for meeting the agreed quality and delivery targets in 2020.

Subaru of Indiana Automotive (SIA) presented Schaeffler with its **"Excellent Performance Award"**. The award recognizes Schaeffler for meeting SIA's stringent quality and delivery goals. Manufactured at its Cheraw location, Schaeffler supplies SIA with mechanical roller tappets that are fitted in Subaru engines with high-pressure direct injection fuel systems.

Excellent product quality

Since 2006, Schaeffler's Hosur plant has been supplying **Toyota Kirloskar Auto Parts** with bearings for a 6-speed manual transmission installed in SUVs – meeting zero-defect quality standards in 2020. Toyota Kirloskar Auto Parts recognized this excellent performance by presenting its **"Zero PPM" award**.

The Chinese wind turbine manufacturer **Envision** honored Schaeffler with its **"Star of Quality"**. Schaeffler has been manufacturing spherical roller bearings of outstanding quality for Envision at its Nanjing location since 2014.

ChangAn recognized Schaeffer Trading Shanghai for delivering **first-class quality**. Schaeffler has been supplying ChangAn with hydraulic pivot elements and camshaft phasing units since 2016.

GM honors Schaeffler plants

General Motors (GM) presented the **"GM Supplier Quality Excellence Award"** to the Schaeffler plants in Ansan, Changwon, and Jeonju (Korea), Brasov (Romania), Cheraw and Fort Mill (USA), Calais (France), Hirschaid, Homburg (IWH, SWH), Lahr, and Steinhagen (Germany), Irapuato and Puebla (Mexico), Rodisa (Spain), Sorocaba (Brazil), Szombathely (Hungary), and Thailand. All these plants met or even exceeded GM's very strict quality criteria in 2020.

Schaeffler supplies GM with a wide range of products including clutch systems, strut bearings, idler pulleys, needle roller bearings and cages, drawn cup needle roller bearings, chain drive systems, tappets and roller tappets, camshaft phasing units, hydraulic pivot elements, finger followers, ball and tapered roller bearings, planet shafts, wheel bearings, and clutch release bearings.

Excellent cooperation

The **Shaanxi Automobile Group Co, Ltd.** presented Schaeffler with its **"Technical Innovation Award"**. Tapered roller bearings have been manufactured for the Chinese commercial vehicle manufacturer at Schaeffler's Nanjing location since 2015.

Zhengzhou Yutong Bus Co., Ltd. honored the Schaeffler plant in Nanjing with the **"Cooperation of The Year Award"**. Schaeffler received this award in recognition of its outstanding product quality and excellent cooperation with the customer. Tapered roller bearings for the Chinese bus manufacturer have been coming off the production line in Nanjing for over ten years.

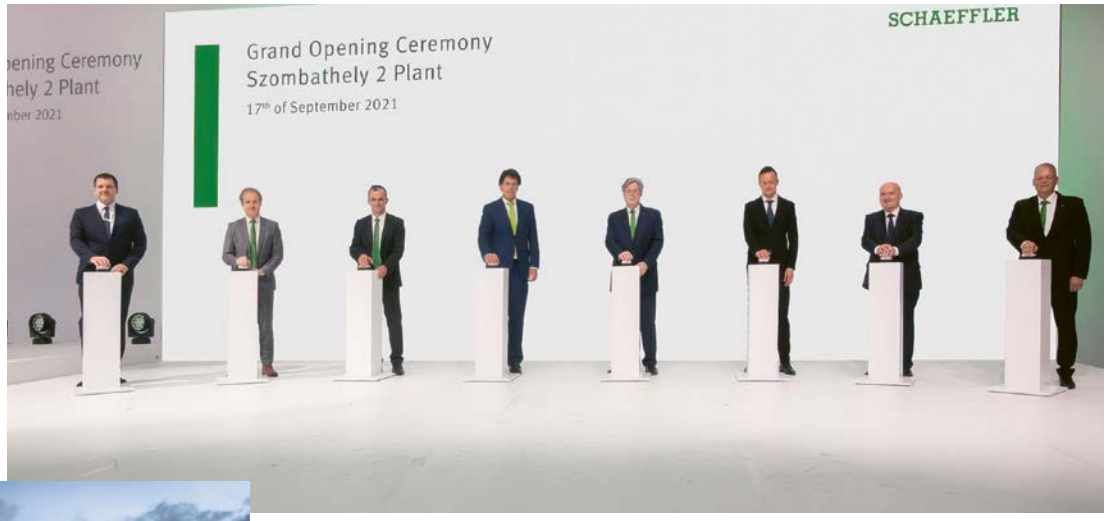
SAID ...

"OUR INTENTION IN THE FUTURE IS TO MANUFACTURE VOLUME-PRODUCTION ELECTRIC MOTORS ON AN INCREASING SCALE AND THUS PRODUCE THE MOST ESSENTIAL DRIVE COMPONENTS FOR ELECTRIC AND HYBRID VEHICLES WITH THEIR OWN ADDED VALUE."

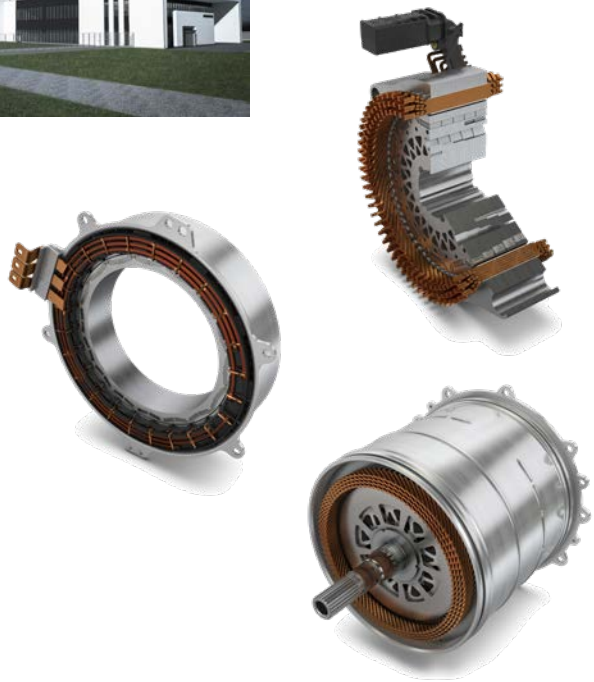
Dr. Jochen Schröder

Head of Schaeffler's E-Mobility business division

AND DONE!



The establishment of Szombathely II in Hungary highlights Schaeffler's ambitions for growth in electric mobility.



€ 2-3 billion

of new orders are expected to be generated from Schaeffler's e-mobility business from 2022 onwards.

Schaeffler opened a new production facility at its Szombathely location in the west of Hungary on September 17, 2021. It is the group's first production plant worldwide that is fully dedicated to electric mobility. Together with its role as a new center of excellence for the production of components and systems for electrified powertrains, the new plant highlights the Schaeffler Group's ambitions for continued growth in electric mobility. Szombathely II provides around 15,000 square meters of space for the production of innovative powertrain components and systems, such as electric motors and hybrid drives. Designed as a "factory for tomorrow," the plant features a high degree of automation, modular production buildings, and end-to-end digitalization.

Strongest growth rates in e-mobility

"Schaeffler has not only secured its place in electric mobility, but is actively helping to shape it," said Dr. Jochen Schröder, President of Schaeffler's E-Mobility business division. Evidence of this is provided by a variety of volume-production nominations across all levels of electrification, both in passenger cars and commercial vehicles. "We have met or even exceeded the targets set for the E-Mobility business division so far, especially in terms of order intake. Starting in 2022, the Schaeffler Group expects to receive orders worth 2 to 3 billion euros in this area," explained Dr. Schröder. The headquarters in Bühl and the lead plant for electric motors at the location manage Schaeffler's e-mobility activities in close alignment with the new plant in Szombathely. (ts)

The latest Schaeffler Academy news

The Schaeffler Academy realigned its structures, a new Fit4 program is available for shop floor employees, and 300 young people recently started apprenticeship training at Schaeffler in Germany.

Reorganization of Apprenticeship Development

Schaeffler provides apprenticeship training at 48 locations worldwide. But what qualifications will ensure that future employees have the right skills? And what challenges does our apprenticeship system need to overcome in order to provide those qualifications? Determining these things is the job of Klaus Studler, Global Head of Apprenticeship Development since December 2020, and Uwe Kando, new Head of Apprenticeship Development Germany since June 2021.

Last year, the Schaeffler Academy realigned its structures. Among other things, this involved a review of Schaeffler's global apprenticeship strategy. As a consequence, the newly created role of Global Head of Apprenticeship Development was filled by Klaus Studler at the end of 2020. "In order to maintain and continuously improve the high-quality vocational training that Schaeffler provides to its approximately 2,700 apprentices and students, we need to establish global standards and agile systems," explains Hanna Peter-Regar, Head of the Schaeffler Academy. To facilitate this, Klaus Studler and his team meet with the apprenticeship managers for all four regions on a regular basis to discuss current tasks and challenges and relevant trends. Together, these stakeholders formulate strategies to ensure that self-directed learning, digital learning methods and other important considerations such as diversity and inclusion are part of the apprenticeship landscape in the regions. Furthermore, Uwe Kando took over as Head of Apprenticeship Development Germany on June 1 of this year, seamlessly taking up the mantle from his predecessor, Paul Seren. Kando first joined Schaeffler as an apprentice industrial mechanic in 1992. He then worked as a technical trainer in Schweinfurt from 2004 up until 2008, when he was made head of training at Schaeffler Mexico. From 2011 up until this year, he was in charge of Schaeffler's training operations in Eastern Europe and in this role, he laid the foundations for vocational training based on the German dual-track model in Brasov and Kysuce. Now his key objectives include modernizing the apprenticeship courses through targeted investment in new technology and ensuring continuing professional development for Schaeffler's instructors. The pandemic has accelerated the pace of digitalization with regard to apprenticeship training. A wide range of e-learning offerings and digital communication channels now form a vital part of the training process and will continue to play a key role in Schaeffler's success as an organization. "Hybrid, agile learning capabilities will be integral to the Schaeffler apprenticeship model in which training personnel will take on the role of facilitators of the learning process. Our transformation has already begun," says Uwe Kando. (ak)

Fit for the production of tomorrow

The production environment is changing faster and faster and needs to be adapted to new products and challenges. The leveraging of data and its evaluation are gaining importance, machines are becoming increasingly interconnected, and augmented and virtual reality and cobots are now part of our everyday routines. To systematically prepare shop floor employees at Schaeffler for such ongoing change, the Schaeffler Academy has developed the new, strategic qualification program “Fit4Production”.

To establish the training courses and offer training that meets the necessary requirements, a comprehensive needs analysis was conducted more than a year ago, closely supported by experts from the various divisions, plants, and areas. In the process, a total of around 480 topics were identified that will now be progressively covered in the training courses. For example, the training course “Stakeholders 4.0 – Fundamental Principles of Digitalization/Industry 4.0” was developed to make digital transformation and the importance of change tangible for employees by means of a business game. The training course “Principles of Technical Cleanliness for Electromobility” teaches the importance of technical cleanliness and uses the example of the electric axle drive to illustrate threshold values and the effects of non-compliance.

In addition, robotics training, offered by the Schaeffler Academy in partnership with renowned robot manufacturers, is currently being trialed at some pilot locations. It covers topics like robotics, programming and maintenance and is designed for beginners and experts alike. Following the pilots, the training will be available to book from the catalog from early 2022.

Within the “Fit4Production” program, the Schaeffler Academy is offering various training courses specifically designed for shop floor employees.

You can find further information in Schaeffler CONNECT under the search term Fit4Production. (mm)

Schaeffler welcomes new apprentices

This fall, for the first time, dual students are starting a computer science degree program with a focus on cyber security in Herzogenaurach. Another new course of study being offered is electrical engineering with a focus on power engineering.

At the beginning of the current training year, a total of around 300 young people started their professional lives at Schaeffler in Germany. “For us, this means 300 times new impetus for Schaeffler’s future, 300 times a breath of fresh air in our apprenticeship teams, and 300 times discussing expectations, goals, and personal development,” says Uwe Kando, Head of Apprenticeship Development Germany at Schaeffler. At numerous German locations, Schaeffler offers apprenticeships in commercial and industrial/technical fields to young employees. In addition, a number of school graduates are undertaking a dual study program or a “Two in One” study program, which combines an apprenticeship with acquiring a technical degree. This brings the total number of people undergoing training at Schaeffler in Germany to more than 1,200. (mbo)

“Today, perfection is the norm”

Walter Süß, Head of Quality, retired recently after 39 years with Schaeffler. His successor, Daniel Niess, will lead our work on quality into a new era. Read on to find out about the new quality program SHAPE and how the famous Schaeffler quality promise has changed over the years.

Info

1982: Helmut Kohl is Chancellor of Germany, the first Commodore 64 home computer has just been released, and in Herzogenaurach, a young engineer by the name of Walter Süß is starting his career with Schaeffler. He was fresh out of engineering school in Nuremberg, with a degree in control and measurement systems. At Schaeffler, quality was to become his life’s work, and by 2007, he had worked his way up to Head of Quality and his name became synonymous with quality at Schaeffler.

Over the years, Schaeffler has used programs such as “Fit for Quality” and “Quality for tomorrow” to further improve its already legendary performance on quality, constantly adapting it to the demands of technological change and building quality into a USP. Schaeffler’s mission in terms of quality is to be not merely good, but outstanding. This is one of the pillars of our company’s success and therefore a core part of the Roadmap 2025 strategic framework.

Mr. Süß, you’re stepping down after 39 years with Schaeffler. When you first started out, did you have any idea that you might be spending your entire working life with Schaeffler?

Oh, yes. I felt valued and supported right from the start and was always given room to grow and develop. So, I always felt Schaeffler was the place for me. In all those years, I was never bored. There were always new and exciting tasks or challenges to master.

Do you still remember your first day at Schaeffler?

I remember it very well. I joined Schaeffler as a measurement and control engineer under what was then known as the junior engineers program. Nowadays, it would be called a trainee program and come under talent management. The difference was that, initially, I was not assigned any specific tasks. Instead, the idea was for new hires like me to find our own assignments, to prove ourselves and to grow and develop. Some of the young coworkers I got to know during those early days are still with the company, and that really says it all.

What was it that sparked your interest in quality?

Quality is universal. You don’t want to do things just any old how. You want to do them well, to a high standard of quality. And that’s true whatever the task, whether it’s a product, a new factory, or a process. Quality concerns everyone, it’s all-encompassing.

You are known affectionately by many as “Mr. Quality” – what do you make of this honorary title?

I’m sure you are exaggerating! *(laughs)* But seriously, I’d say it stems from the “Fit for Quality” program that we launched in 2006 to integrate quality more closely into the culture of the company. We wanted to make sure that the reality of our products and services better reflected our ambitions around quality. And that means foreseeing, quantifying, and managing risks, no matter how complex the product. In the years following the launch, we achieved a dramatic reduction in the number of defect complaints – a trend that continues to this day.

How have customer expectations changed over the years?

Expectations around quality, like market expectations generally, have increased steadily. Today, perfection is the norm. Our customers will accept nothing less. And because of our unique quality mindset, we have always been able to meet these expectations.

Walter Süß

Now, after 39 years, you are retiring, but we're sure you will find plenty of ways to keep busy. What are your plans for the next few years?

We've all heard of product creation processes, or PCPs, right? Well, for me, PCP from now on stands for "personal creation project". The first such project – PCP #1 –will involve building a house – just as a member of a team, mind you. This will no doubt be followed by another project, so watch this space …

Employees gathered at the Quality Conference in April to farewell Walter Süß.

Daniel Niess

Mr. Niess, SHAPE has realigned Schaeffler's approach to quality. What are the program's core elements?

SHAPE comprises a range of central and divisional elements, all of which are predicated on our "failure free – no matter how complex" approach.

The program has four focus areas. Firstly, there's development and enhancement of our capabilities around quality, particularly our technological capabilities in relation to our new products and services (electric mobility, hydrogen and Industry 4.0). Secondly, the program focuses on improving processes and harnessing the power of digitalization – by implementing a new CAQ system, for example. Thirdly, there is a push to improve baseline quality and heighten awareness of quality. And finally, there's the need to ensure that our thinking and actions around quality are geared towards sustainability. SHAPE, I should note, is part of the execution program for our Roadmap 2025.

New technologies are being developed at an ever-increasing pace, most notably in the areas of e-mobility, hydrogen, and renewable energy. In these areas, Schaeffler is pushing ahead systematically with innovations across all three of its divisions. What are we doing to ensure that our new products, integrated systems and services – particularly those of the digital variety – conform to our high standards of quality?

The answer to that question is SHAPE. SHAPE is our quality program for the next five years. And, of course, there's also "Fit for Quality," one of the cornerstones of quality here at Schaeffler. When it comes to digital products and services, it's vital to design for quality from the outset. Here, too, SHAPE plays a vital role by ensuring that our products and services meet the quality standards demanded by customers and mandated by norms and laws. This includes ensuring that our production processes include all the necessary testing and inspections.

Interview conducted by Martin Maerten

Delivering impressive innovations

Participants at this year's R&D conference discussed which technologies Schaeffler is using to shape the future and how innovation processed can be made more efficient. At the EMO in Milan, Schaeffler presented innovative products such as DuraSense, a monitoring solution that allows machines and systems to be subsequently digitalized with minimal effort.

Chief Technology Officer Uwe Wagner welcomed around 300 participants from all four regions to the R&D conference. The event took place in a hybrid form, with the majority of participants attending digitally.

What technologies will Schaeffler use to help shape the future? What are the challenges involved? And how can innovation processes be made more efficient? These were the central themes at this year's R&D Conference. In his address, Uwe Wagner set out exactly how Schaeffler plans to manage the current technological change process. "Our 4x4 program is the mainstay of our research and development efforts to do with technology transformation. It defines Innovation, Technology, Performance, and Processes as the four critical success factors that set Schaeffler apart." Wagner also highlighted the importance of innovation clusters in developing ideas into innovations.

EMO, the world's leading trade fair for machine tools and metalworking, is held every two years in Hannover and every six years in Milan. In compliance with current Corona protection measures, EMO Milano 2021 was held purely as a presence event. Schaeffler was on site with a trade show booth presenting mechanical components, electric drives, and sensorized components.

Ralf Moseberg, Head of Industrial Automation at Schaeffler, emphasized that the automation solution market is growing steadily and driving increasing demand for rolling bearings, linear guideways and integrated systems and services. (ak/jk)

DuraSense was one of the products Schaeffler presented at EMO Milano 2021 for the first time. The monitoring solution is suitable for simple retrofitting and makes it possible to subsequently digitalize existing machines and plants with minimal effort so that operators can benefit from higher availability and productivity.

Schaeffler honors its top suppliers

More than 500 participants from important strategic suppliers were represented online at the digital edition of Schaeffler's Supplier Day. During the event, 17 suppliers received the Schaeffler Supplier Award. Sustainability is central to Schaeffler's supply chain and procurement operations.

As an international automotive and industrial supplier, Schaeffler maintains a supply chain that spans the globe. Thousands of companies supply production materials and services to the group's 70-plus factories in 50 countries worldwide. Sustainability is central to these supply chain and procurement operations, as Chief Operating Officer Andreas Schick explained: "We believe that success in business goes hand in hand with a duty to act responsibly towards the environment, people, and society."

Andreas Schick, Chief Operating Officer of Schaeffler AG, stressed the need for sustainable supplier partnerships.

That is why Schaeffler seeks out relationships with suppliers who are committed to the same goals, acting as true partners for performance. Reliable partners are integral to ensuring that Schaeffler's supply chain remains agile and efficient despite the current challenges facing the global market.

Andreas Schick presented awards to Schaeffler's top-performing supply partners at the recent digital edition of the company's Supplier Day, which was attended by over 500 representatives of strategic subcontractors. "We and our partners are committed to innovation and state-of-the-art technology across our entire supply chain," he said. "We aim to create a sustainable long-term partner network with our strategically important suppliers." Seventeen supply partners received the Schaeffler Supplier Award in recognition of their excellence as partners for performance. Seven of the awards went to German companies. Andreas Schick told the attendees that Schaeffler was anticipating a significant increase in its overall procurement volume. "We and our partners will meet this challenge head-on through innovation and state-of-the-art technology across the entire supply chain," he said. "We are also committed to building a sustainable long-term partner network with our strategically important suppliers." Schaeffler and its partners are continually optimizing their cost base in order to remain competitive and strengthen each other's market position in accordance with the principles of fairness, transparency, and sustainability. (mm)

Info

The award winners

Shandong Golden Empire Precision Machinery Technology Co., Ltd., Sin Nan Hwa Bearings (Shanghai) Co., Ltd. (China); BASF SE, Deutsche Edelstahlwerke, Erich Derleth GmbH, Famecha GmbH, Saarstahl AG, Scherdel GmbH, Walter AG (Germany); Delux Bearings Pvt. Ltd. (India); Marcegaglia Carbon Steel S.P.A., Metelli Group (Italy); Uchiyama Manufacturing Corp. (Japan); NMC Dynaplas Ltd. (Canada); Jing Cheng Computer Co., Ltd. (Taiwan); Aslar Pres Döküm San. ve Tic. A.Ş. (Turkey); Worthington Industries (USA)

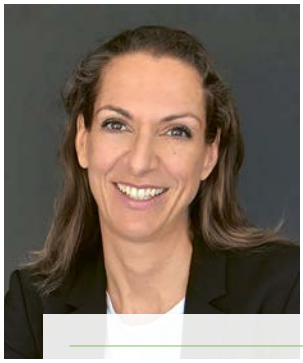
Third wave of image campaign launched

Schaeffler's global image campaign – launched in conjunction with the Roadmap 2025 – is entering its next digital roll-out phase. The third wave is aimed at encouraging viewers to take a closer look at the products and topics such as sustainability, digitalization, and corporate culture.

The first two waves of Schaeffler's image campaign reached approximately 600 million people in Germany, China, the USA, Japan, and India. A great success that has noticeably increased awareness of the Schaeffler brand. Schaeffler's share of voice – which takes into account all measurable mentions of the brand – increased by 12 percent compared to the time before the image campaign. "At a time when communication was predominantly digital, with so many people working from home, and when many major industrial brands were very constrained in their advertising, we took a consciously digital and countercyclical approach," explains Nadja Lemke, Senior Vice President Global Branding & Corporate Marketing. The figures show that Schaeffler outperformed the benchmark of comparable global image campaigns within the industry. For example, click rates were up to 100 percent above expected levels. With Italy and France, two new, relevant target countries where Schaeffler aims to grow its brand awareness have been integrated in this latest wave.

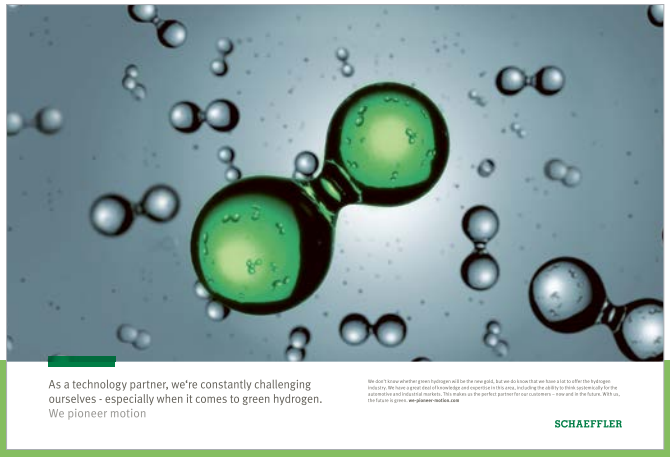
Broad mix of themes

Wave three focuses public attention on yet more themes associated with the Schaeffler brand. These include core strengths, such as quality, manufacturing excellence, systems expertise, and innovation, as well as other motifs specific to the Automotive Technologies, Automotive Aftermarket, and Industrial divisions. The top-performing motifs in terms of target audience response since the start of the campaign – such as digitalization – will remain an integral part of the campaign during the third wave. (mm)



"Schaeffler had a massive impact and increased its brand awareness dramatically."

Nadja Lemke
Senior Vice President Global Branding & Corporate Marketing



Success is not a question of size, but of agilty.
We pioneer motion

If you're going to succeed as a business in the long term, size alone is not enough. As markets become ever more dynamic, and technology ever more complex, you need to respond quickly to changing trends, so our costumers have the right solution at the right time. Responsiveness is not just a state of mind: It's in our DNA. **we-pioneer-motion.com**

SCHAEFFLER

Info Discover new aspects of Schaeffler for yourself at www.we-pioneer-motion.com. You can support the campaign, for example, by updating your email signature with motives from wave three. Further information can be found in Schaeffler CONNECT.

Sustainibility isn't only on our agenda.
It's at the heart of everything we do.
We pioneer motion

If you're to take sustainibility seriously, you have to approach it holistically, which is why we've made it a top priority. As our sustainibility reports show, this is true throughout the company: from products and production processes to selecting suppliers and raw materials, and throughout our corporate culture. **we-pioneer-motion.com**

SCHAEFFLER

In touch with the stars

The flying observatory SOFIA is arguably the most efficient way of looking into space. It combines the far-reaching vision of satellite-based telescopes with the comparably easy maintenance of ground-based observatories, plus very high versatility. At the heart of it is a reflecting telescope with a diameter of 2.7 meters and a Schaeffler bearing.

13.7 km

is the altitude at which SOFIA flies. There, at the lower edge of the stratosphere, 99 % of the water vapor in Earth's atmosphere is below it, and the infrared rays from space can reach the telescope unhindered.

3–4 times

per week. This is how often SOFIA normally embarks on its observing missions. The flights last 8 to 10 hours. SOFIA's home base is NASA's Armstrong Flight Research Center, Building 703, in Palmdale, California. But missions have also departed from New Zealand, French Polynesia, and Germany.

SOFIA flies at Mach 0.7 (870 km/h)

Elizabeth Ruth is the only woman in SOFIA's pool of pilots. The NASA employee has been flying the observatory jet since 2016.

SOFIA's major discoveries

- In 2017, SOFIA confirms the existence of a solar system that resembles ours. It's 10.5 light years away.
- In 2015, thanks to its flexibility, SOFIA is on the spot when, during a rare occultation, Pluto throws a fleeting shadow onto the Pacific, and gathers new findings about the small planet.
- Astronomers use SOFIA to investigate the magnetic field in the middle of our Milky Way and begin to understand the differences between active and quiet black holes.
- In 2019, thanks to SOFIA, the existence of the helium-hydride ion in space is proven for the first time. Our entire idea of the evolution of chemical elements and life the way we know it is based on the existence of this type of molecule in the universe.
- In 2020, SOFIA discovers water bound in the Moon's surface in an area exposed to sunlight that is 120 °C hot. The amount of water discovered corresponds to the contents of an 0.33-liter can dispersed on a football field.

The former lower passenger cabin accommodates the workstations of the astronomers and an area for guests (a maximum of 30 persons in total). Discernible in the tail section is the bulkhead separating the open telescope area from the cabin, including the telescope's mounting bracket (blue) and the flange-mounted measuring instrument in front of it.

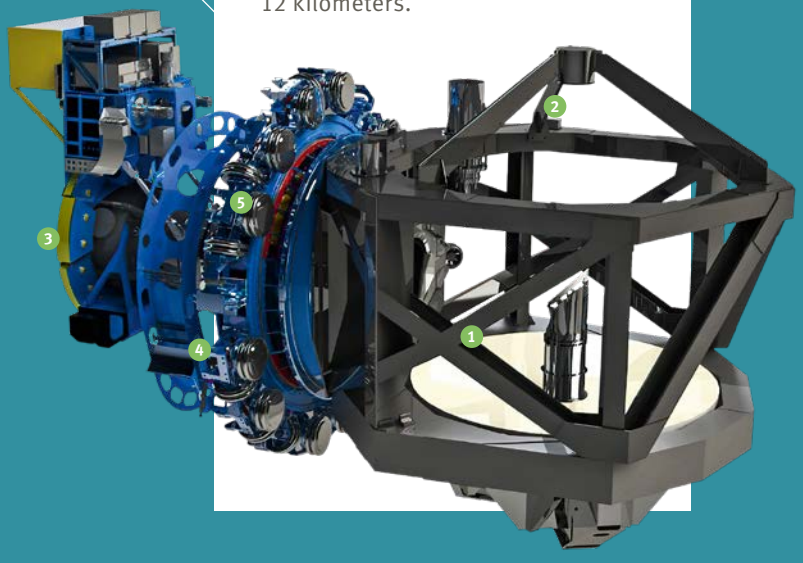
SOFIA's base jumbo jet was put into service in 1977 as a PanAm airliner. In 1997, NASA took over the jet. It's one of only 45 747SP types ever built. The "Special Performance" version with a length of 56.4 meters is 14.6 meters shorter than a standard jumbo jet. As a result of this shrinking, the short version can fly at higher altitudes than any other wide-body jet.

SOFIA's heart

The 17-metric ton telescope in the tail section is the most important passenger on board. It was made in Germany.

1 A tri-mirror system (primary mirror diameter: 2.7 m, weight: 750 kg) that 2 is mounted in a carbon fiber cage captures infrared radiation from space and deflects it to 3 the flange-mounted measuring instrument. Variations between six different instruments are possible, depending on the research purpose. A pressure bulkhead separates from the cabin the mirror elements exposed to the atmosphere. 4 A ring with 24 pneumatic spring-damper elements isolates the mounting bracket of the telescope from the aircraft's vibrations.

The actual bearing 5 is a hydrostatic, spherical plain bearing from Schaeffler (diameter: 1.2 m, weight: 600 kg). It provides isolation as well and ensures movability. In addition, twelve motor segments help orient and track the telescope so that external disturbance forces are compensated for. The whole interaction works so well that a laser pointer mounted to the telescope could accurately target and hit a coin on the ground from an altitude of 12 kilometers.



approx. €1.5 billion

is said to be the costs that have been incurred so far for the Stratospheric Observatory for Infrared Astronomy, which is SOFIA's full name.

The latest digitalization news

REPXPERT taken to a new level, a search engine that supports the quotation process, and a solution for digitalizing toolmaking: We have put together a small selection of new, digital solutions at Schaeffler that make working life easier.

Digital Innovation Days 2021: Harald Gießer, Jürgen Henn, and Marc Votteler (left to right) take a look at a visualization of climate data in the Museum of the Future. Susanne Grube of Deutsches Museum (right) led the IT managers and colleagues on the screens through the exhibition.

Digital Innovation Days show diversity

The 2021 Digital Innovation Days provided a stage for Schaeffler's digital innovations and looked at important digital trends extending beyond company boundaries. All regions participated in the event series. "We are pleased that all the regions are so active and that we are continually receiving more and more topics from all divisions," said Jürgen Henn, Head of Strategic IT. Topics were diverse, ranging from IT security and cloud technology through robotics and augmented reality to agile working and collaboration software such as Teams. In the Europe region, startups and cooperating research groups presented their collaborations with Schaeffler and provided fresh impetus. Even though the events this year could only be held in a virtual format, the European installment had two special highlights: the opening speech given by CEO Klaus Rosenfeld and the closing event which took place at the Museum of the Future in Nuremberg. In keeping with the event motto of "Discover our Future," the museum had several prototypes on display to show how the future might look. The exhibition changes constantly as new ideas and concepts arise. (cw)

Schaeffler is developing a solution for digitalizing tool manufacturing in collaboration with DMG MORI. The system is expected to bring about significant improvements in agility, efficiency, and response times within Schaeffler's global production network. The joint development from Schaeffler and DMG MORI is supported by the software developer up2parts GmbH and ISTOS GmbH. Andreas Schick, Chief Operating Officer of Schaeffler AG (fourth from left) and Christian Thönes, Executive Board Chairman of DMG MORI Aktiengesellschaft, (third from left), were among those to agree to the project.

Digitalization in production

As part of the Roadmap 2025, Schaeffler is consistently driving forward the transformation of its more than 70 production plants into semi-autonomous, digital and sustainable factories of the future. The groundbreaking development of an innovative, dynamically integrated production system for digitalizing tool manufacturing is an important step in this transformation. The automotive and industrial supplier will implement the new system in its plants worldwide in collaboration with DMG MORI Aktiengesellschaft. Both companies are starting a joint software development project for this purpose. The dynamic system automates the existing individual process steps of design, planning, and programming. The key to this is the creation of routing based on artificial intelligence, automatically generated operations scheduling, and reconfigurable work processes. (jp)

REPXPERT 3.0

Schaeffler has relaunched its garage portal in order to structure the amount of information more clearly and make the website frontend more user-friendly. With the new version, REPXPERT 3.0, Schaeffler makes everyday work easier for garages. The next-generation garage portal is intuitive to use, guides users quickly to the topics they are looking for and offers more technical content than ever before – already on the homepage. Currently, around 200,000 users from 36 country portals in 16 languages access REPXPERT. (kg)

A search engine made by Schaeffler

Cost Database Analytics (CDBA) is a digital solution for supporting Schaeffler employees during the quotation process. The software was developed by Corporate IT in collaboration with the Automotive Technologies division and is now part of the Schaeffler IT product catalog. CDBA can be regarded as a search engine and comparison portal in which all Schaeffler reference products can be found, analyzed, and compared. Reference types are Schaeffler products which are in volume production or have already been offered or costed. If a customer places an inquiry for a technical solution, CDBA can be used to identify similar reference types and serves as a starting point for the preparation of the quotation and ultimately the development of the product. (cw)

Digital beats 20/20 vision

Why travel across the world when you can visualize the project by wearing a high-tech headset while working from home? Welcome to augmented reality (AR). Examples from the Schaeffler world show how this digital-visual technology makes processes more efficient and can even enhance quality.

"Without using augmented reality, we couldn't have managed this project during the pandemic," Schaeffler quality expert Dr. Achim Donnermeyer is sure. He and his colleagues had to get two large-bearing test benches up and running for Schaeffler right in the middle of turbulent coronavirus times: one of them in China and the other one in Romania. The high-tech systems boasting the dimensions of a volleyball field had been custom-developed and built to meet Schaeffler's exacting specifications in one-off production by a specialized company in Israel.

Four countries (including Germany, where Donnermeyer and his colleagues are based), several thousand kilometers apart from each other, at a time when the coronavirus had brought travel to a standstill: "By using so-called HoloLens headsets, the AR system of our IT partner Microsoft, among other things, we managed to create on-site scenarios, so to speak. In this way, we were able not only to check the production of the machine in Israel in real time as needed, but also employed this technology during the entire acceptance process," explains Donnermeyer.

A workaround becomes an object lesson

Originally just meant to be a workaround, the solution proved to be truly beneficial during the course of the production process. "In problem-solving situations, we were able to respond not only faster but more precisely as well. Consequently, the list of adjustments that routinely emerge was shorter during the acceptance process than with similar projects in the past," says the Schaeffler expert. He provides an example to explain this kind of HoloLens use: "Let's assume a specific component is causing problems. It could be one in thousands of installed screws. Now, instead of laboriously describing which screw is meant exactly, we just mark the problem area on our monitor at

76.7 million

professional **VR headsets** are expected to be sold worldwide by 2024, ten times as many as in 2020. The market for virtual reality will grow by 30 % per year by 2024 and, in the best case, by as much as 57 % for augmented and mixed reality.

Forecast: Deloitte; source: marketing-boerse.de

home directly in the live image the colleague working on the machine at the site that's thousands of kilometers away has transmitted to us by HoloLens. Our marking is then displayed to him in real time as well so that he knows exactly where to take action. Such ad hoc solutions proved to be extremely efficient and helpful because we were able to make adjustments throughout the entire production process." The HoloLens again displayed these strengths when the test benches were set up in China and Romania. In spite of the Covid travel restrictions both systems were put into operation as scheduled. "Due to the HoloLens, I – alone – saved two weeks of on-site work and, obviously, that's a cost factor too," says Donnermeyer.

Deployed around the globe

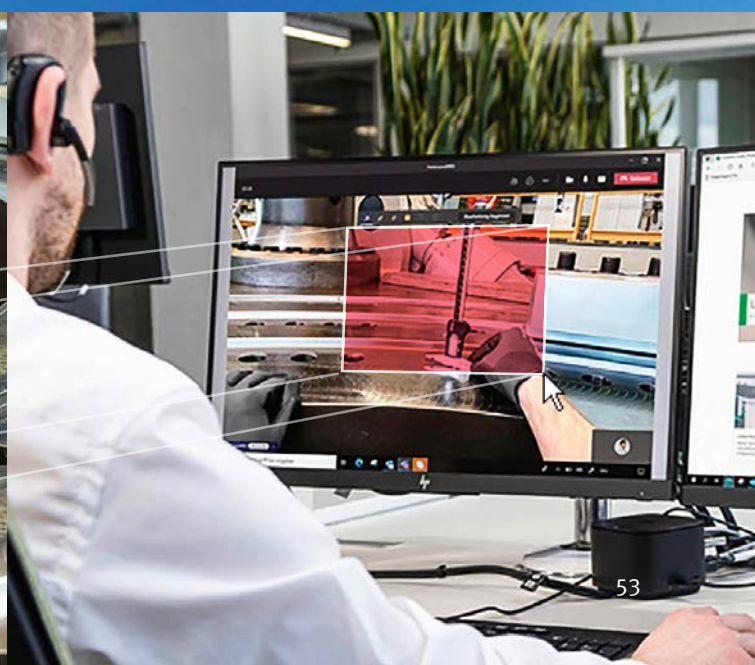
Schaeffler has been using augmented reality in many different areas for many years. Now, practically every location is equipped with HoloLens systems. The Automotive Aftermarket unit, for instance, is planning to increasingly employ such virtual animations and interactive elements of HoloLens technology for explaining to garage customers around the world in easily understandable ways how to use repair kits and specialty tools.

In the form of the Schaeffler Virtual Fitter, the Industrial division offers its customers fast, efficient and – again – globally accessible installation support using augmented reality. If needed, Schaeffler will send an AR headset to the customer for this purpose. The customer's employee will wear this set while inspecting a machine, joined remotely by a Schaeffler technician via a secure data connection. The live transmission of photographs and videos provides Schaeffler's experts with a comprehensive picture of the machine's condition, enabling them to assist in the on-site work with their expertise. Due to the projection of images into their field of view, the people performing the work have both their hands free to do the job.

This remote mounting service is usually available faster than a local Schaeffler expert would be, who would have to travel to the site in person. Plus, this time advantage saves hard cash because travel and personnel expenses are reduced and, in many cases, the costs associated with machine downtime are lower too. "Compared to on-site service, our customers save up to 50 percent of costs by using the remote service. In addition, the expert instructions transfer know-how to the customer," says Reinhold Daft, Head of Mounting Services at Schaeffler.

Article by Volker Paulun

Schaeffler Virtual Fitter: Due to the information recorded and transmitted via HoloLens, the Schaeffler expert is able to support on-site work by audio-visual instructions from his desk back home – in real time.



Worldwide

On the following pages, you can see what's happening in the four Schaeffler regions. Read about Schaeffler's contribution to the recent Mars mission and which racing series the company joined, find out which Schaeffler location recently celebrated a special anniversary, and learn how China relies on the power of the sun.

AMERICAS

A safe landing thanks to Schaeffler

Schaeffler Aerospace USA has been a part of every one of NASA's Mars surface missions dating back to 2002. Accordingly, the company is proud to highlight its contribution to NASA's latest mission to the Red Planet – which on April 19, 2021 included the historic flight of the **Ingenuity Mars Helicopter**, the first aircraft to complete a powered, controlled flight on another planet. Schaeffler supplied bearings critical to the descent/landing system that successfully placed the Perseverance rover (with Ingenuity attached to its belly) on the Martian surface. These state-of-the-art bearings were selected based on their construction materials, exceptionally high level of precision, low drag torque capability, and high load-to-weight capacity as well as an ultra-filtered space-grade lubricant. These latest "newcomers" now join the other Schaeffler Aerospace USA super precision bearings that have been hard at work on the surface of Mars for many years. (pl)

cti symposium US
AUTOMOTIVE DRIVETRAINS
INTELLIGENT
ELECTRIFIED
8 - 9 September 2021 I Digital Edition

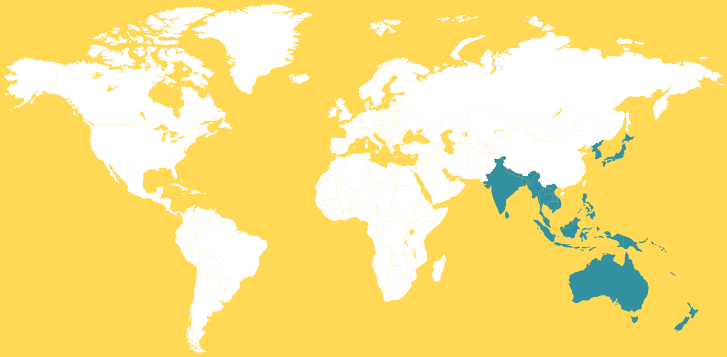
The future of mobility

At the **Digital CTI Symposium USA** in early September, industry experts from around the world shared the latest insights in strategies and technologies that will help drive the future of mobility. The focus of the digital event was centered on achieving **net zero emissions** by 2050. Schaeffler mobility experts discussed the opportunities and challenges of electric mobility: Schaeffler's Jeffrey Hemphill, Regional CTO Americas, spoke about challenges and progress related to electrification, batteries, and hydrogen. (kc)

MOVE: Puebla plants receive Basic Level award

Mexico's MOVE Team recently participated in the **Lean Performance Review** to better understand and evaluate their processes and systems. The results were extremely positive: MOVE Mexico, specifically the **Puebla** plants, received the Basic Level award from MOVE Corporate and are the first in the Americas Region to earn this honor. (pl)

ASIA/ PACIFIC



Schaeffler to be title sponsor of “Toyo Schaeffler Racing Car Thailand 2021”

Wuttiphat Kongrittipong, Schaeffler racer in the “Racing Car Thailand” series

Schaeffler Manufacturing (Thailand) Co., Ltd. has joined the **“Racing Car Thailand” series** as the title sponsor together with Toyo Tires. Organized by **FAEAST United Motor Sport Co., Ltd.**, the racing event will now be called “Toyo Schaeffler Racing Car Thailand 2021”. As a title sponsor, Schaeffler will compete with a team car in the “Isuzu One Make Race in 2.5L and 3.0L” class, one of 21 racing categories. Team Schaeffler will be represented by professional racer, Wuttiphat Khongrittipong, who brings over 10 years of racing experience to the circuit. The racing series is the oldest and largest motorsport series in Thailand, which has been running for the past 15 years with over 400 cars participating. Comprising six racing formats, the series features two racetracks, including Bira International Circuit in Chonburi – the first racetrack in Thailand –, and the Chang International Circuit in Burirum, the first FIA Grade 1 and FIM Grade A circuit in Thailand. (ac)

Schaeffler Automotive Aftermarket supports COVID-19 aid projects in India

The Association for India's Development (AID) has been helping to address the impact of the COVID-19 pandemic since early 2020. AID is a US-based volunteer-driven organization that works to ensure sustainable, equitable and just development for some of the most disadvantaged communities in India.

The **Automotive Aftermarket Global Management Board** has decided to donate **60,000 US dollars** to the **Association for India's Development**, a COVID-19 aid project in India. Schaeffler employees around the world can participate in the giving and collectively make a contribution to support the region, which has been deeply affected by the pandemic. At https://aidindia.org/donate/, you can join the donation effort by typing "Schaeffler" in the appropriate text field. "It has become a meaningful tradition for our division to donate to a good cause every year during the Christmas season instead of sending customer gifts or Christmas cards. Given the suffering caused by this pandemic and the urgent need for global solidarity, we have decided to act now," says Michael Söding, CEO Automotive Aftermarket. (sn)

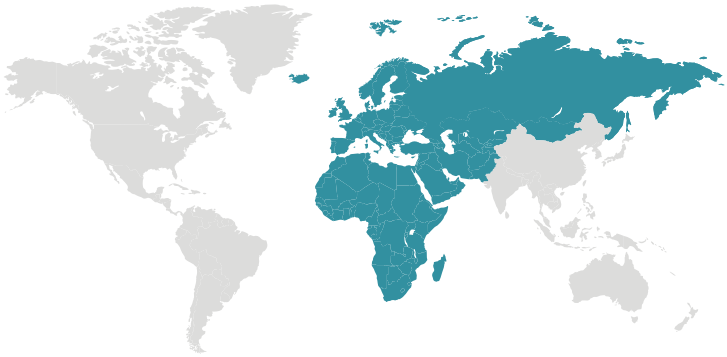
EVERGREEN actions in Korea

In **Korea**, more than 200 volunteers have been involved in social projects as part of the **"Evergreen"** program since 2013 – even during times of Corona. Last August, Schaeffler employees assembled COVID safety kits at home and donated them to Koreans in need. Evergreen participants also designed a special umbrella with reflective stickers that enable drivers to easily spot children in bad weather. These umbrellas were presented to a local daycare center. Additionally, the children at Hanbit School for the Blind in Seoul were delighted to receive "Versa Slates". These Braille boards do not require the use of paper and can be erased, making them ideal for visually impaired children learning to read and write. Evergreen sent boards with the Schaeffler logo on them to the school. And to boost immune defenses, Evergreen participants pickled vegetables and gave them to the disabled community. (ak)

Schaeffler Singapore: An excellent working environment

Schaeffler's **Singapore** location offers ideal working conditions: The location recently received the **"Great Place to Work®"** award. Great Place to Work® is an international research and consulting institute that helps companies in approximately 60 countries to develop their corporate and workplace culture. It evaluates companies' workplace culture on the basis of anonymous employee surveys and the analysis of HR measures. Every year, particularly excellent employers in various sectors are recognized for their performance internationally, nationally, and regionally – Schaeffler Singapore is now one of them. (ak)

EUROPE



“New standards in production”

Schaeffler **today** spoke with Tibor Szigeti, Managing Director Schaeffler Savaria, about the new e-mobility plant at the Szombathely location in Hungary.

Tibor Szigeti, Managing Director Schaeffler Savaria

Mr. Szigeti, what is the significance of the new plant for Schaeffler Savaria and the Schaeffler location in Hungary?

The opening of this plant is a key milestone, not only for Schaeffler, but also for Hungary and the entire automotive industry in this country. Our new, second plant in Szombathely sets new standards in terms of manufacturing, sustainability, and innovative products.

What distinguishes the portfolio of the new plant?

We are undertaking the production of electric motor components such as stators and rotors, which will be installed in two different types of electric drives and motors of different power ratings. From a production perspective, this development means that we are indeed initiating a system change toward new electromobility components and systems.

What state-of-the-art technologies are being used?

To manufacture the synchronous and asynchronous electric motor components – rotor and stator –, at the new Szombathely II plant we are relying on innovative and advanced processes. For example, the laminated cores of the rotors and stators are manufactured using high-precision stamping technology and interlocking processes. For the asynchronous variant, the rotor lamination stacks are prepared for the subsequent assembly processes by means of special aluminum high-pressure die casting technology. With the synchronous rotor, the magnets are fixed in the stacks using molding technology. Finally, the rotors are assembled in highly automated shaft machining and assembly lines.

Sustainability is also a major issue.

We take climate protection targets into account throughout the plant and along the entire value chain. The plant is designed to be climate-neutral. This means, for example, that we use green electricity from photovoltaic systems, recycle rainwater and rely on modern heating and cooling technologies. Heat recovery and energy-saving LED lighting is aimed at further increasing energy efficiency.

What role will Szombathely II play for Schaeffler as an employer in the region?

Together with the first plant, which has been active in Szombathely since back in 1996 and employs approximately 3,300 people, our new production facility will strengthen Schaeffler’s reputation as an attractive employer and innovative company in the region. Up to 150 new jobs are expected to be created in the e-mobility sector. (as/os)

A location with innovative strength

Milestone anniversary in Slovakia: 30 years of Schaeffler Skalica

In October of this year, Schaeffler celebrated the 30th anniversary of its legal entity Schaeffler Skalica in Slovakia, a company that has established a successful history since 1991. Today, it is one of the Schaeffler Group's largest plants worldwide with approximately 4,000 employees and a production area of more than 80,000 square meters.

The Schaeffler plant in Skalica manufactures products for the Automotive Technologies and Industrial divisions.

"We are proud of the fact that Schaeffler is one of the largest employers in the entire Trnava region. Together with our second Slovakian location in Kysuce, we will continue to create jobs in the future and thus make an important contribution to driving the local economy," says Eva Jurkovičová. The CFO of Schaeffler in Slovakia and the Czech Republic describes herself as a proud employee of the location and has accompanied its development almost from day one. She joined the company in 1993 and has witnessed all of its milestones since then. "We were a young and highly motivated team and wanted to build something successful here," she recalls of the early years.

Support for pilot projects

The location grew rapidly during this period: Starting with approximately 180 employees and around 12,000 square meters of production space in 1996, the plant was expanded as frequently as nearly every two to three years. The employees repeatedly demonstrated their willingness to innovate. As one of the first plants within the group, Skalica successfully completed the roll-out of SAP software. "We implemented many pilot projects and then used our know-how to support other plants worldwide," adds Eva Jurkovičová. Most recently, she and Miroslav Janota, Managing Director at Skalica, were pleased to see Schaeffler join the Diversity Charter of Slovakia.

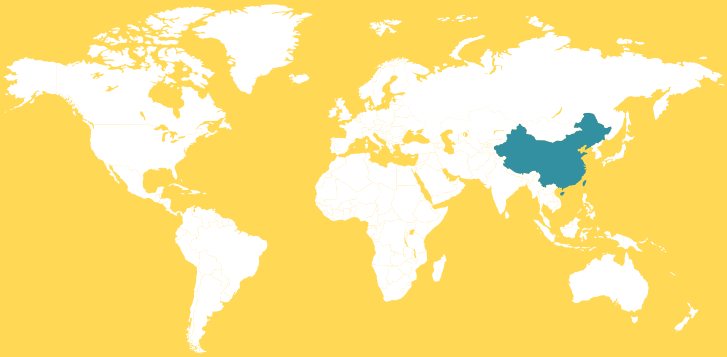
Today, the Skalica plant offers a comprehensive product portfolio for the Automotive Technologies and Industrial divisions. Its customer base includes well-known automotive manufacturers and companies from numerous industrial sectors. Managing Director Miroslav Janota points to the plant's strong position in these markets: "During the course of the location's long and successful history, we have built up an excellent team and a stable network together with Dušan Bernhauser and Dr. Jaroslav Patka, my two predecessors as plant manager. Schaeffler Skalica is the preferred partner and technology leader for both suppliers and customers. Together with our employees, we strive for the highest possible quality with a focus on zero defects, maximum efficiency, and a high degree of delivery reliability."

Goals for the future are correspondingly ambitious: "Together with the second Slovakian location in Kysuce, Schaeffler Skalica embodies what defines us as a company. We play a leading role in shaping the mobility and motion of tomorrow through innovation and sustainable action," says Miroslav Janota. Projects in the area of environmental sustainability remain an important goal for the future of the location. Initial progress has already been made in areas such as electricity from renewable sources and energy efficiency. When it comes to employee qualification, Skalica is focusing on new technical competencies and is strengthening its dual-track vocational training system, for example.

Strong commitment

Sascha Zaps, Regional CEO Europe, congratulated all employees on the location's 30th anniversary and thanked them for their commitment to the company: "The Skalica plant is one of Schaeffler's most important production facilities worldwide. The comprehensive expertise, tremendous innovation potential, and dedicated commitment of the employees are an excellent basis on which the location will continue to contribute to the Schaeffler Group's overall success, in line with our motto 'We pioneer motion'." (eg)

GREATER CHINA



Layout of solar panels in the Anting R&D Center

Inauguration of the photovoltaic panels in Anting: Armin Kress, Vice President SPS, Strategy & Processes Schaeffler Greater China (center), and Li Youmei, Director Communications & Corporate Marketing & Branding, Schaeffler Greater China (4th from right), celebrated the occasion with project team members and supplier representatives.

With the power of the sun

Schaeffler Greater China is taking significant measures towards climate protection, thus supporting the Schaeffler Group's sustainability target of using 100 percent power from renewable sources from 2024. Early July saw the first photovoltaic panels being put into use on the roof of Schaeffler Greater China's Regional Headquarter and R&D Center in Anting.

This marks the first step in the generation of solar power in Greater China, with further photovoltaic systems to be installed in Taicang and Nanjing. With a planned total capacity of 11.25 MW, the photovoltaic panel system at Schaeffler Greater China will generate 11 gigawatt hours a year – the equivalent of 3,470 tons of burned coal. CO_2 emissions amounting to 9,478 tons can thus be avoided annually.

Used in R&D, production, and office areas, the electricity generated will help to reduce the peak power load and CO_2 emissions. Furthermore, costs of more than 3 million CNY – about 400,000 euros – can be saved per year. (js/ak)

5 millionth

wet double clutch manufactured in Taicang: Production started in 2014. Since then, Schaeffler has continuously optimized the component's design, improved production efficiency, enhanced deep-processing capabilities, and is now capable of providing a complete portfolio of wet double clutches with torque capacity ranging from 250-600Nm.

Team

Teamwork is a core element of our global collaboration – in this section, Schaeffler **today** addresses topics that are especially significant to employees as well as ourselves as editors.

Team spirit at Schaeffler

A fantastic team that helps out when needed (from left): Damien Grimsley, E'yanna McElveen, Robert Pettus, Michelle McElveen, Evans Ross, Betty McLaughlin, Franklin Garner, Olivia Rivers, Joanne Ruffin, and Chris Burr

What do you do when an area of business is experiencing more work than they can keep up with and another area is experiencing a decline in work? You get a group of ten fantastic employees who volunteer to temporarily relocate to help out!

While Valley City was struggling to navigate warehouse capacity constraints and labor shortages, Cheraw had been cutting back hours in some departments. Through inquiries with HR, a solution was reached – rather than have valued employees sitting idle, a Cheraw team was temporarily moved to Valley City for a win-win story. Thanks to the additional staff from Cheraw, customers could be supplied quickly. In the meantime, the team members have returned to their normal duties in Cheraw. That's team spirit at Schaeffler! (pl)

DTM finale in Nuremberg

Season finale in Nuremberg: Cheered on by around 500 Schaeffler employees forming the "green wall", Marco Wittmann and Sophia Flörsch started their last two DTM races of the season at the Norisring circuit. Both Schaeffler brand ambassadors managed to finish in the top 10 once again: Marco Wittmann came in 7th place. Sophia Flörsch secured another two points finishing in 9th position – this was also thanks to the support of Schaeffler employees. In the overall standings, Marco Wittmann secured 4th place in the championship, Sophia Flörsch finished 18th.

The green wall was there at Hockenheim too in early October: Around 100 Schaeffler employees supported the two drivers on the track. (ak)

Marco Wittmann and Sophias Flörsch within the green wall at the Norisring: 500 Schaeffler employees cheered the two drivers on at the track during the last two races of the season.

A colleague provides explanations

WHAT EXACTLY IS ...

Schaeffler received two prestigious PACE Awards this year: Automotive News honors the company's P2 hybrid module and innovation partnership with its customer Ford.

... the PACE Award

The PACE Award has been presented annually for the past 27 years by the Automotive News magazine and the Automotive Parts Manufacturers' Association (APMA). It recognizes automotive suppliers for pioneering innovations, technological progress, and overall business performance. Suppliers such as Schaeffler are eligible if their products, processes, materials or services are used directly in the production of cars and trucks. The award is considered the industry benchmark for innovation worldwide.

We are therefore particularly pleased to have been honored with two of the prestigious Automotive News PACE Awards this year. We received one award in recognition of our P2 hybrid module, which is used in transmission architectures for rear-wheel drives. Schaeffler's hybrid module is an achievement in design and optimized packaging. The module consists of an electric motor and an automated disconnect clutch that are mounted between the engine and transmission. Thanks to its compact design, the hybrid module can be used in a variety of vehicle platforms.

Together with Ford Motor Co., Schaeffler also received an Innovation Partnership Award in honor of their successful collaboration in the development of the system. Automotive News presents this award to automakers that do an exceptional job of collaborating with a supplier to drive innovation.

Schaeffler earned the award following an extensive review by an independent panel of judges. Incidentally, this is Schaeffler's third PACE Award win in the past five years, of which two were for e-mobility solutions.

I would like to warmly congratulate the entire P2 Hybrid Module team for developing a next-generation technology that can be adapted to today's infrastructure. These awards underscore our on-going commitment to innovation and demonstrate that Schaeffler is the preferred technology partner of our customers. (pli/mm)

Patrick Lindemann

President, Transmission Systems, E-Mobility and Chassis at Schaeffler

Location close-up

Schaeffler is a global automotive and industrial supplier and one of the largest family-owned companies worldwide. But where exactly is Schaeffler represented throughout the world? Schaeffler **today** takes a look behind the scenes and introduces the company's Bühl location.

When did production start?

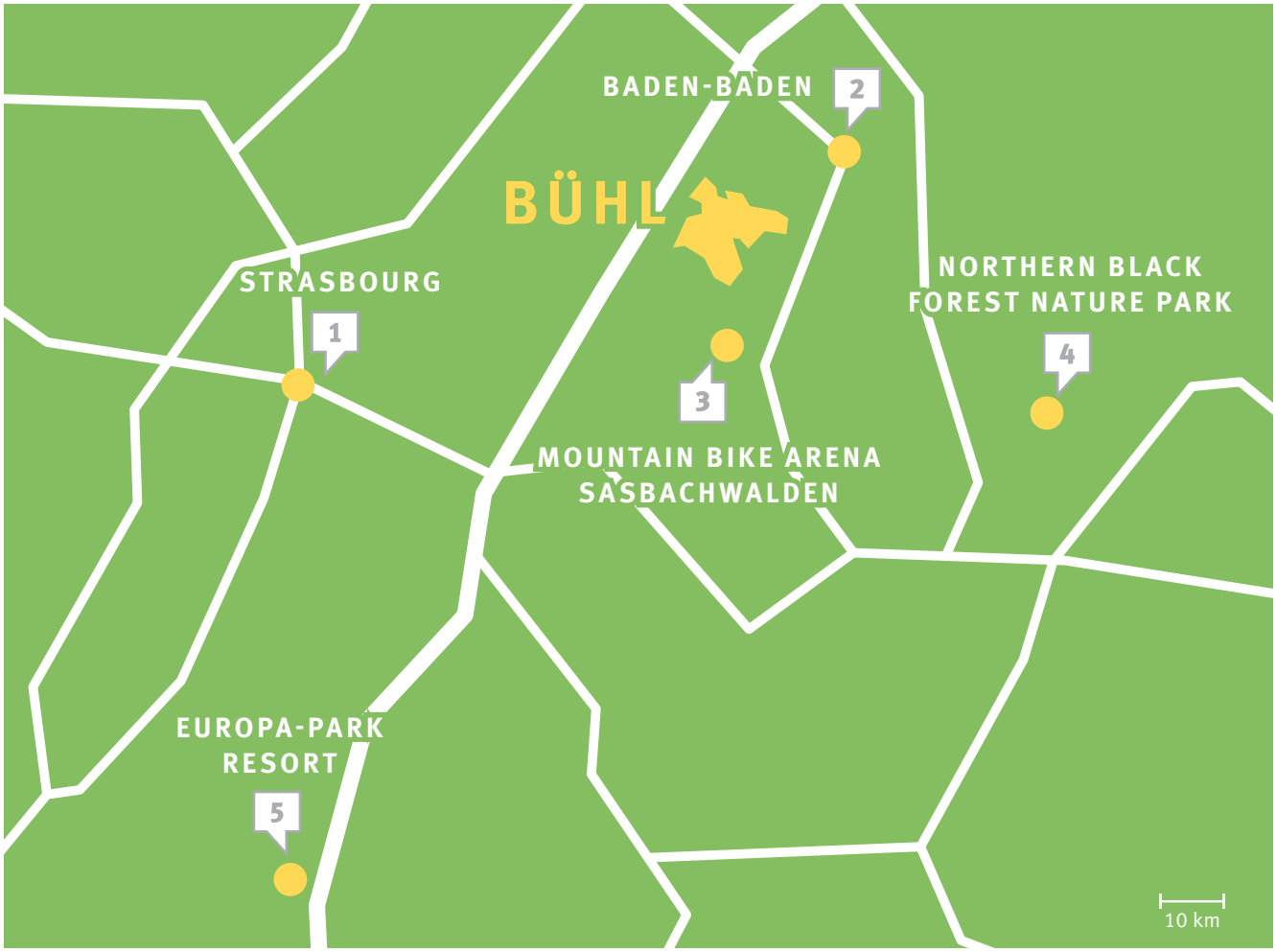
Bühl is a Schaeffler location with a long-standing tradition. In 1965, the Schaeffler brothers co-founded LuK Lamellen- und Kupplungsbau GmbH. With the diaphragm spring clutch, the company secured its position at the technological forefront of the market. LuK has been fully owned by Schaeffler since 1999. The location includes the headquarters in Bühl and the Bußmatten, Sasbach, and Kappelrodeck plants. Since January 2018, Bühl has been the Automotive Technologies division's headquarters.

What is produced?

What began in 1965 with the diaphragm spring clutch was continued with the development of pioneering innovations such as the dual-mass flywheel for vibration damping in 1985 and the first self-adjusting twin-plate clutch for standard applications in 2006. Since 2017, products such as the hybrid module and the e-axle as well as the MultiMode transmission have also been produced in Bühl. In 2019, Bühl became Schaeffler's lead plant for electric mobility.

Anything else?

Situated between the Rhine Plain, numerous vineyards, and the Black Forest, Bühl was first mentioned in a document as early as 1283. The city of around 30,000 inhabitants, famous for its "Bühler Zwetschge" plum, boasts great diversity. Bühl is not only the home of the sweet, blue-colored fruit, but also to the companies Bosch and UHU alongside Schaeffler. Thanks to the cooperation with SHARE at KIT in Karlsruhe, there is no shortage of well-trained technical specialists.



The surroundings

1 Strasbourg

Strasbourg is the capital of the Alsace-Champagne-Ardenne-Lorraine region in northeastern France and the official seat of the European Parliament. The city is known for the ancient charm of its medieval old town. From its historic old town to the many museums and the science and technology center, Strasbourg delights with many things to see. The highlight of any visit to Strasbourg is a tour of the Strasbourg Cathedral and the tasting of traditional specialties such as the original Alsatian tarte flambée or Baeckeoffe, a hearty stew of three marinated meats and potatoes.

2 Baden-Baden

The city with its approximately 56,000 inhabitants is part of the "Great Spa Towns of Europe" UNESCO World Heritage Site. Baden-Baden welcomes tourists to enjoy its flair for high culture and the delights of the Black Forest. It is for good reason that Baden-Baden has been dubbed the "European Capital of Culture". The Baden-Baden Festspielhaus, the world-famous Belle Epoque ambience casino, the Kurhaus, the thermal baths for deep relaxation, the Trinkhalle, and the Baden-Baden theater provide an unforgettable city ambience.

3 Mountain Bike Arena Sasbachwalden

Stunning trails, a mild climate, breathtaking views, and epic sunsets – the Schaeffler Mountain Bike Arena offers everything to make the heart of trail bikers and enduro fans beat faster. Opened in 2014 in cooperation between the local bike club and the municipality of Sasbachwalden, the Schaeffler Mountain Bike Arena has become a must-ride location for mountain bikers from all over southern Germany, Switzerland, and nearby Alsace.

4 Northern Black Forest Nature Park

The Black Forest Nature Park Central/North is the largest nature park in Germany. Together with the adjoining Southern Black Forest Nature Park in the south, it encompasses the low mountain range of the Black Forest and adjacent natural areas. The nature park was founded in 2000 and covers an area of 4,200 km².

5 Europa-Park Resort

Germany's largest amusement park, nestled between the Black Forest and the Vosges Mountains, captivates every visitor to it. Every year, over five million people are enthralled by the theme park and its more than 100 attractions and shows. Europa-Park Resort not only makes the heart of amusement park fans beat faster, but also inspires young and old alike.

Save the date

Participation in trade fairs and other events – in presence and digitally – and internal events at Schaeffler: You can find below all the dates important for Schaeffler.

Oct. 26-27

Electric Vehicle Production Days

Aachen. Schaeffler's Special Machinery division is presenting its portfolio digitally at this year's Electric Vehicle Production Days (EPT) in Aachen. The EPT will highlight the entire value chain of electric mobility components. Topics range from battery and electric motor production to battery systems, hairpin stator and fuel cell production, and other product and process innovations in electric vehicle production.

Nov. 2

Urban Zero Night

Glasgow. As part of this year's United Nations Climate Change Conference (COP26) in Glasgow, Schaeffler is hosting the Urban Zero Night together with Deutsche Bank AG. Klaus Rosenfeld, CEO of Schaeffler AG, and Christian Sewing, Chairman of the Board of Managing Directors of Deutsche Bank AG, will present the companies' sustainability strategies and key initiatives at the event.

Nov. 2-4

AAPEX

Las Vegas. At the Automotive Aftermarket Products Expo (AAPEX), Schaeffler will be presenting its latest products and solutions for the automotive aftermarket and demonstrate its qualities as an original equipment manufacturer.

Nov. 10-11

Global Production Forum

Herzogenaurach. Under the motto "Adjusting value chains to changing customer requirements", Schaeffler experts will come together for a professional exchange at the 55th Global Production Forum (GPF).

Nov. 23-25

Smart Production Solutions

Nuremberg. Smart Production Solutions (SPS) is one of the largest trade shows for electric automation technology. This year, the trade show is taking place in a hybrid format for the first time – Schaeffler is among the participants.

Masthead

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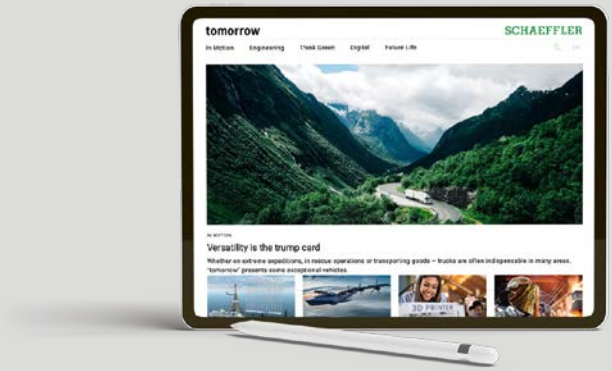

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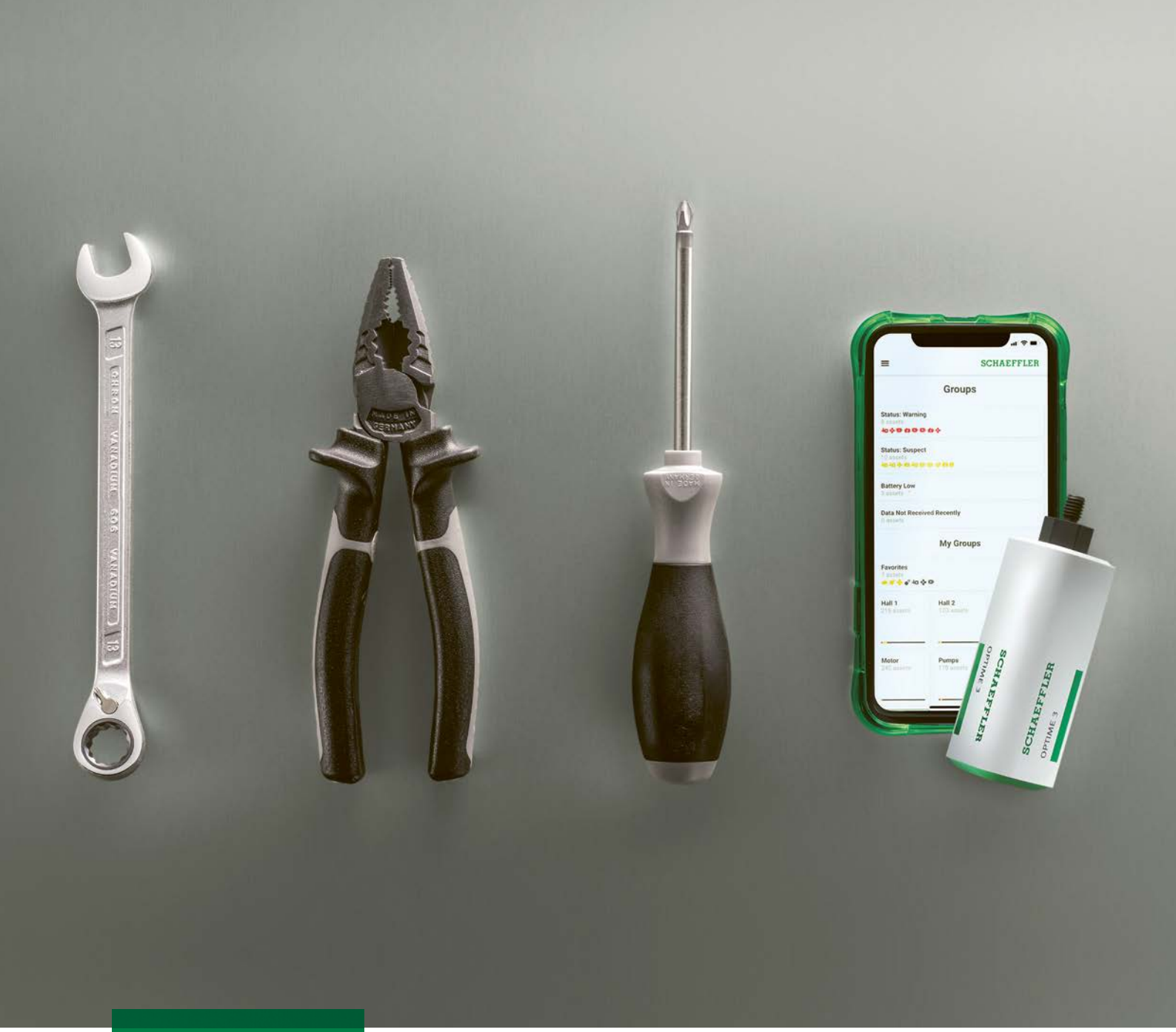

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