#03

TOMORROW NOW

10.2022

EDAG

FOREWORD

Dear Reader,

Constant congestion, chronic lack of parking space, crowds everywhere – in constantly expanding cities all around the world, there is very little question any more of traffic flow. Is this what the city of the future will really look like? Or is a "smart" version also possible?

It is time for a re-think and for new mobility concepts, for instance the EDAG CityBot – a highly automated robot vehicle capable of dealing with any mobility application in urban areas: from passenger transport and delivery trips through to services such as road cleaning. Designed for a complete smart city ecosystem, this makes it the first and only mobility system to effectively counteract traffic gridlock: 24/7 - because thanks to their modular structure, the EDAG City Bots are always in motion.

In the third edition of our "Tomorrow Now" magazine, you can find out which playing field our ecosystem "EDAG CityBot" will be moving to in the coming year. In addition, we will be giving you exciting insights into other remarkable lighthouse projects of the EDAG Group. We will be presenting existing and soon-to-be specialists from our EDAG world. People who are committed to making our world quieter, cleaner, more life enhancing and smarter in the future - not just for us, but also for future generations.

I hope you will thoroughly enjoy reading the third edition of "Tomorrow Now"!

Cosimo De Carlo
CEO of the EDAG Group

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SHORT NEWS

EDAG AT THE GREENTECH FESTIVAL

From June 22 - 24, 2022, the GreenTech Festival was held in Berlin. The event stands out as a global platform for the promotion of innovative green technologies for a sustainable future. EDAG was also represented at the event, where we presented our concepts for various sustainability issues.

The first of these are our Smart City Dashboards and the EDAG CityBot, by means of which we want to make our cities safer, more sustainable and more life enhancing in the future. With innovations and products such as the ultra-lightweight vehicle body "genesis" or the Light Cocoon, a vehicle based on a bionic structure, we aim to drive sustainability at EDAG.

A further important subject is the use of resources. This is important for us in the design and prototyping phases, but also in the production phase. In line with environmentally friendly smart city concepts, we intend to reduce emissions as far as possible in all phases of use.

Our goal is to reduce the use of resources in production and construction and to reuse materials. For this reason, we are working on circular concepts to transfer raw materials to a circular economy and make optimum use of resources.

PODCAST: URBAN MOBILITY WITH ROBOTS - UTOPIA OR FUTURE?

In the german podcast, Bent Nowack (House of Logistics & Mobility, HOLM) and Johannes Barkmann (EDAG Group) talk about the Campus FreeCity project: https://www.edag-citybot.de/news/

NEW BUILDING IN INGOLSTADT

We finally have some news for you! Construction work on the upper floors of the south office building has almost been completed, and the carpets have been laid. The entire top floor has already been cleaned, and employees are even taking off their shoes to avoid making anything dirty. A flower bed has been created in the inner courtyard, and the first plants are already coming up through the soil. Apart from a few wooden pallets, the roof terrace has also been cleaned up.

After a long wait, the first think tanks have now arrived in the central office building. A number of small and large think tanks have been set up, each with room for two or four people.

In the midst of all the new building going on, it goes without saying that the old building has not been neglected. Many walls here have already been demolished, to enable the modern working environments concept to be implemented in this building, too.

EDAG AWARDED TÜV "CYBER-SECURITY" CERTIFICATE

Even while the new cybersecurity standard, "Road Vehicles – Cybersecurity Engineering", was still being drafted, the EDAG team with members from E/E was paying in-depth attention to the new requirements for vehicles, their components and the relevant development and production processes. "We spent more than 20 months examining the subject intensively and constructively. In the process, we put all relevant IT connections and processes to the test, changed existing processes and defined new ones," says Oliver Jäger, Corporate Manager for Cybersecurity and Functional Safety at EDAG. This also involved working very closely with the TÜV auditors.

Within weeks of the first stage of the Regulation of the European Parliament and Council on the type approval of motor vehicles, which from July 6, 2022 requires a CSMS, coming into force, the EDAG Group was one of the first companies in the industry to obtain the certification. The independent audit for this certification evaluates a wide variety of damage scenarios relating to possible cyber attacks on vehicles and their digital security architecture. The standard includes measures for product development throughout the entire product life cycle: from the concept phase through development and production to maintenance and decommissioning.

FORMULA STUDENT AUSTRIA 2022

1500 students, 57 teams and 20 nations took part in the international "Formula Student Austria" racing car design contest at the Red Bull Ring in Spielberg from July 25 to 29. Contestants can score points for the racing cars they have developed and constructed themselves in various disciplines, both on and off the race track: for their engineering design, for instance, or their business plan.

We were also involved, both as a partner and a sponsor - and met some of the teams we already cooperate with, but also got to know a number of new ones: Some of our employees were members of the judging team, and therefore actively involved in the evaluation of the individual categories. An exciting task involving intensive interaction with the Formula Student teams.

In addition, students were also able to discuss job opportunities with representatives from our technical departments and our recruiting managers at our stand, or just relax in a deck chair with a slush ice.

On the other hand, we were also present as sponsors of a special award, because in addition to the official main prize, there was also the chance to win the "EDAG Efficiency Excellence Award". Teams wishing to enter submitted a presentation of the most efficient and innovative technical solutions they had implemented during the development of their racing cars before the event. The three best teams were then selected and invited to give a short live presentation of their technical solutions at our stand on one of the event days - and win our jury over.

10 YEARS OF EDAG PS

In 2012, the independence has begun! Already as a profit center within the EDAG Group, we were able to gradually build up and continuously expand our business model in production engineering as EDAG PS. Accordingly, we are today in a position to plan complete factories across all specialist trades including cross processes and to accompany the realization. Here, the methods and tools of Industry 4.0 serve as the basis for networked engineering between the processes of product development and plant engineering.

With some ups, but also downs, we have now been active for 10 years since 2012 as an independent subsidiary, EDAG Production Solutions GmbH & Co. KG, within the EDAG Group. The first years of independence were characterized by very high growth and success. In addition to the acquisitions of the companies iSILOG and CKGP/PW, the international units in India and Hungary were increasingly expanded. In addition, numerous new international subsidiaries and profit centers were established, for example in Korea, China, Mexico and Brazil. From a technical point of view, we have also never stood still and have continuously expanded and developed our portfolio. From general planning to mechatronic engineering, the media-less gripper to the space frame, we have continuously followed the megatrends in the market with numerous new ideas.

In addition to these growth phases, the last three years in particular have been characterized by numerous cost-saving measures and transformations within EDAG PS based on the changing economic situation. These cost-cutting measures were unfortunately also associated with site closures and two organizational restructurings. During this time, we have moved closely together as EDAG PS, initiated several transformations for the future, expanded our portfolio in a targeted manner and positioned ourselves very well for the future with the target image 2029.

Today, all topics related to the Smart Factory determine our day-to-day business. For better focus, EDAG PS 2021 has been divided organizationally into the two divisions Automotive Solutions and Industrial Solutions. In the Automotive Solutions division, the focus is primarily on the automotive "New Tec" topics of batteries, sustainability and alternative drive systems. In the Industrial Solutions area, the aim is to completely secure a smart factory for customers from general industry, from consulting to planning to implementation. In addition, the Smart City division is making a decisive contribution to the digitalisation and networking of cities and municipalities.

MOBILITY ENGINEERING TRENDS

EDAG AND EINTRACHTTECH LAUNCH PARTNERSHIP

Both parties are among the best in their fields, both are geared to the future: the EDAG Group, the world's largest independent engineering service provider in the mobility industry, and EintrachtTech, the independent digital subsidiary of Eintracht Frankfurt, this year's European League winners, announce their partnership. The two partners are joining forces to focus on an all-round approach to digitalization. This can also be seen from the "Campus FreeCity real lab for the research of a networked fleet of modular robot vehicles" project, which has recently been jointly implemented and is funded by the Federal Ministry of Transport and Digital Infrastructure (BMDV).

"With the EDAG CityBot at the Campus FreeCity in the Deutsche Bank Park, the focus is not just on a revolutionary vehicle, but also on a complete ecosystem that the EDAG Group has developed for the mobility, transport and service tasks of a smart city," explains Holger Merz, CFO of the EDAG Group. EDAG CityBots are multi-functional, fully autonomous robot vehicles that move without emissions. Designed for a complete smart city ecosystem, this makes it the first and only mobility system to effectively counteract traffic gridlock. Thanks to their innovative and modular design, the EDAG CityBots can be used for a wide variety of different transport tasks - around

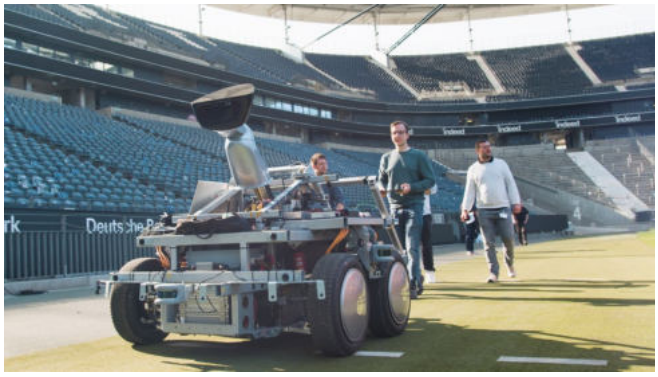
the clock. EintrachtTech offers a unique digital center in the form of the "Arena of IoT" where this can be researched, and in which many different innovation partners and start-ups from Eintracht Frankfurt's network are brought together to create a "perfect playing field" on which the innovative strength of the partners involved can be made visible and tangible. "We are pleased that, through our work with EintrachtTech, the progress that has already been made with the research project will be advanced, and that we are now an official partner of the "Arena of IoT"," adds Holger Merz. Hesse will therefore become a real lab for the future of mobility - be this in Germany or internationally.

"The digitalisation of all areas of life and work continues unabated. With this partnership, the EDAG Group and EintrachtTech want to make a sociopolitical contribution towards making our cities quieter, cleaner, more life enhancing and smarter in the future," explains EDAG Group CEO Cosimo De Carlo.

"Eintracht Frankfurt sees itself not just as a professional soccer club. Through EintrachtTech, it also takes an active role as a driver of the region in the field of digitalization," stresses Timm Jäger, CEO of EintrachtTech GmbH. The stadium is an ideal place to test "IoT" solutions in cooperation with technology partners like the EDAG Group, and to offer innovative projects a realistic test environment. With its digital center, Eintracht Frankfurt is actively strengthening the Frankfurt Rhine-Main digital location.

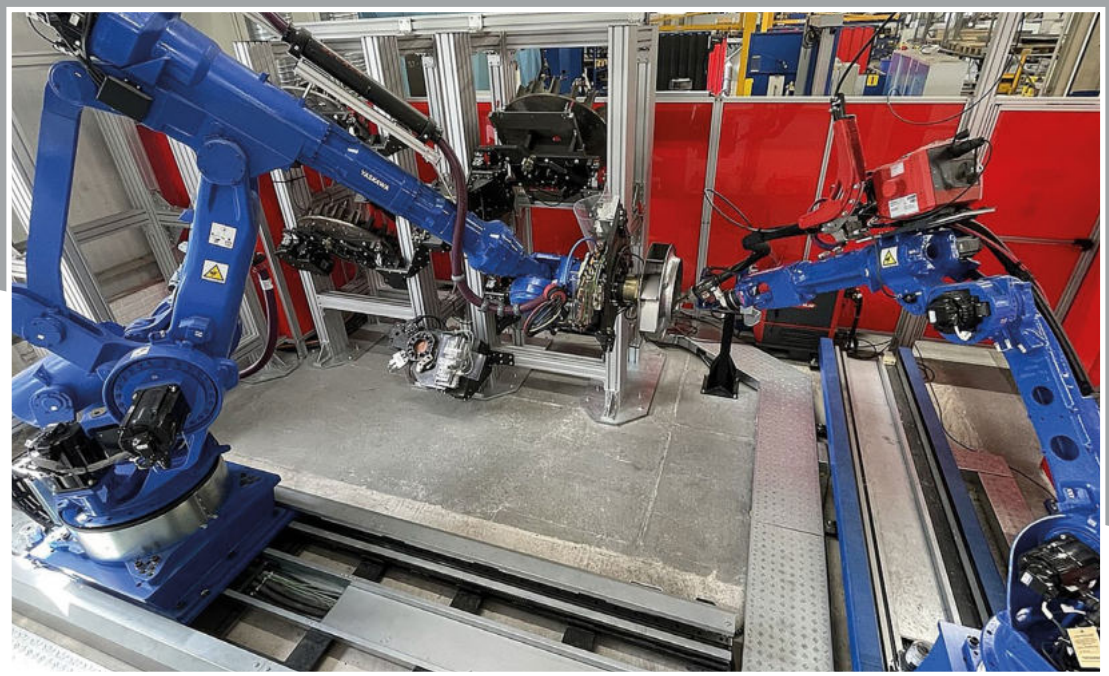
As Holger Merz sees it, there is "great potential" in this cooperation: "We experience EintrachtTech as an innovative and motivated technology pioneer, and are very much looking forward to this intensive and in many respects trendsetting partnership. This is the best of Hesse.

HESSE WILL THEREFORE BECOME A REAL LAB FOR THE FUTURE OF MOBILITY.
BE THIS IN GERMANY OR INTERNATIONALLY.



INNOVATIONS

PRECISION WELDING WITH NEW ROBOT TECHNOLOGY



EDAG PRODUCTION SOLUTIONS AUTOMATES WELDING TECHNOLOGY FOR TROX X-FANS

EDAG Production Solutions GmbH & Co. KG, subsidiary of the EDAG Group, one of the world's largest technology developers of both mobility concepts and industrial solutions, has joined forces with fan manufacturer TROX X-FANS and automated the welding technology at the production site in Bad Hersfeld, adapting the company to the increasing demands of dynamic markets.

The EDAG Group and TROX X-FANS have developed a comprehensive automation solution for the precision welding of a wide variety of fan components. The idea behind this is to relieve employees of heavy and complex jobs, while preparing production for new tasks.

WELDERING AND SOLDERING IN THE ROBOT CELL

The EDAG Group has developed a robot cell custom-made to meet the specific requirements of TROX X-FANS. This enables robots for handling and welding to work together and perform the welding and soldering of fan impellers, housings, covers and shafts with high precision and repeatability. Handling is on a just-in-time basis, and it is put to freely scalable use in a wide range of batch sizes down to single-unit production.

EFFICIENCY BOOST: 45% REDUCTION IN PRODUCTION TIME

With the new robot cell, a large number of individual parts that used to have to be manually welded can now be produced far more economically: On average, production time is reduced by 45 percent. Cycle and machine setup times have been significantly reduced, and the equipment is also able to handle demanding soldering and inert gas welding processes. The entire system is user-friendly and low-maintenance. This relieves the workload of TROX X-FANS operators. What is more, productivity and process reliability increase in series production while at the same time ensuring a high degree of variability. Ideal material flow means that component pick-up is ergonomically optimized.

SIMPLE INTEGRATION OF NEW PRODUCTS

Working in close interaction, a special clamping concept has been developed for the force-fit clamping of 60 impeller and housing variants with only two grippers. This permits the easy integration of new products and creates more production space. Significantly reduced processing times and lower personnel requirements go hand in hand with sustainable quality improvement, since errors are excluded in automated production. As a result, production is able to respond to expansions of the portfolio more rapidly - while at the same time the reject rate drops. The EDAG Group provided support and backing throughout the entire development process of the equipment, from the requirements analysis to the turnkey plant, through its many years of experience and wide-ranging expertise in the automotive and industrial sectors.

"Smart industrial solutions like this make a significant contribution to increasing flexibility and a company's ability to respond more quickly to fluctuating production figures," explains Christian Neidhart, the EDAG Group's project manager for the development of the robot cell. "We carried out a detailed appraisal of TROX X-Fans' extremely heterogeneous product portfolio and analyzed the previously manual process for manufacturing the fan components. From this, we were able to create a virtual image of the future system that reflects an ideal material flow. This creates prospects for the site that reach far into the future."

"Bearing in mind future challenges regarding product requirements and the progressive changes occurring in the labor market, we need new technologies and processes to maintain and increase our capacity to compete," said Uwe Vaupel, resource and production planning manager at TROX X-Fans. "In cooperation with the EDAG Group, we were able to validate and realize the plant concept step by step, from the initial ideas through experiments, tests and test setups. An important investment in our future."

"A LARGE NUMBER OF INDIVIDUAL PARTS THAT USED TO HAVE TO BE MANUALLY WELDED **CAN NOW BE PRODUCED FAR MORE ECONOMICALLY."**

IPU NEXT GENERATION

DISPLAYING AND OPERATING ADDITIONAL CONTENT ON THE VEHICLE DISPLAY – EDAG'S NEW SOLUTION ENABLES FLASHING BLUE LIGHTS, SIREN, ETC. TO BE CONTROLLED VIA THE STANDARD DISPLAY

Since 2012, the EDAG Group, the world's largest independent engineering service provider in the mobility industry, has been developing its own image processing systems – also known as image processing units (IPUs) – in the electrics/electronics division. With these products, the company offers a platform for integrating individual HMI (human-machine interface) designs from external sources into existing vehicles and visualizing real time image and video signals in the vehicle displays. The EDAG Group is today presenting the IPU-NG, the latest generation of its image processing systems. Connected between the main unit and the display, the IPU-NG projects either the usual vehicle functions or the data for the additional equipment installed in special and emergency vehicles, for instance the flashing blue lights and stop signal unit, onto the integrated display. With the greatly increased computing power of the IPU-NG, customers can from now on also create their own user interface, which can easily be controlled via the touchscreen display installed as standard.

VARIETY OF POSSIBLE APPLICATIONS OF THE IPU NEXT GENERATION

EDAG's next generation IPU is a technical platform that can be used for a wide variety of application scenarios and customer groups. For complex prototype vehicles, the IPU-NG is a quick and easy solution by means of which the measuring equipment installed can be switched and operated on the existing display surfaces. Another application from the exhibition sector is the integration of individual designs and contents with existing controls and indicators for show cars. In addition, the IPU-NG can be used in special-purpose and emergency vehicles.

IPU NEXT GENERATION IN SPECIAL-PURPOSE AND EMERGENCY VEHICLES

For almost 30 years, the EDAG Group's competence center for special-purpose and emergency vehicles has been accompanying customers through the complete development process from the production to the conversion of vehicles. In close coordination, the Electrics/Electronics division developed the new generation IPU for use in special-purpose and emergency vehicles.

Currently, it is usual for several external devices to be used to operate both radio and signal systems, and navigation and control center communications. This will now no be longer necessary because in terms of size, brightness and sharpness, the existing screen is on a par with the displays that have so far been installed. Often, emergency vehicles are leased for just a few years and regularly replaced by newer models. Vehicles that have been withdrawn are converted back to their original state, so they can continue to be used as "normal" automobiles. Any additional display or other controls in the cockpit must be removed, drill holes sealed, and the dashboard completely replaced. Not only does this push up costs, it also extends conversion time – both when the vehicle is purchased, but also when it is returned.

On top of this, people driving special-purpose and emergency vehicles are often exposed to extremely stressful situations. The system must be up and running in a matter of seconds. Two displays in the center console area complicate procedures and make operation more difficult for drivers. The reduction to the existing display helps to ensure that the field of vision is no longer restricted, and that further controls can be found more quickly. In addition, EDAG has developed a graphical user interface specially tailored to the needs of the emergency services. The user interface is fully customizable. In addition to customization of the individual CI, the underlying operating concept can also be adjusted to meet customer requirements. In this field, the development team works with psychologists and HMI specialists to continuously optimize the user experience.

CUSTOMER-SPECIFIC REQUIREMENTS FOR INTUITIVE HANDLING

Currently, the IPU-NG presents a high-performance platform from the field of vehicle development, which, with its modular structure, can be adapted to different displays. Even with the same standards - FDP-Link, GMSL and APIX for instance - sometimes different protocols or even physical interfaces need to be operated.

Every IPU-NG variant that can be approved for a vehicle is an OEM-specific derivative of the technology platform. As a result, the functions available and the modules required for these are individually tailored to meet the requirements defined in the project concerned. This makes the overall solution less complex, leaving it less open to attack, by hackers for example. The high functional safety and cybersecurity requirements, which carry a great deal of weight in the approval process, are met in full by each of the IPU-NG derivatives.

In many cases, there is no longer any need to add expensive, complex displays – production vehicles are often already fitted with equipment that meets the requirements for controlling the additional functions of special-purpose and emergency vehicles. The innovative, modular platform provides the flexibility necessary to adapt it to the technical conditions. In the future, this will enable police and rescue vehicles, company fire service or municipal utility emergency vehicles to be equipped at lower cost and in less time, and then reconverted back again at the end of their lifecycles.

"We are proud that our IPU has reached the next stage of its development," says Stefan Fuchs, Product Manager at EDAG Engineering GmbH. "The new generation of our innovative product brings simplicity to the complex world of special-purpose and emergency vehicles. Throughout, we work in close cooperation with users, vehicle manufacturers and equipment suppliers, to be sure of always delivering optimum performance and user-friendliness. We have already successfully implemented one derivative of the special-purpose vehicle IPU for a well-known customer."

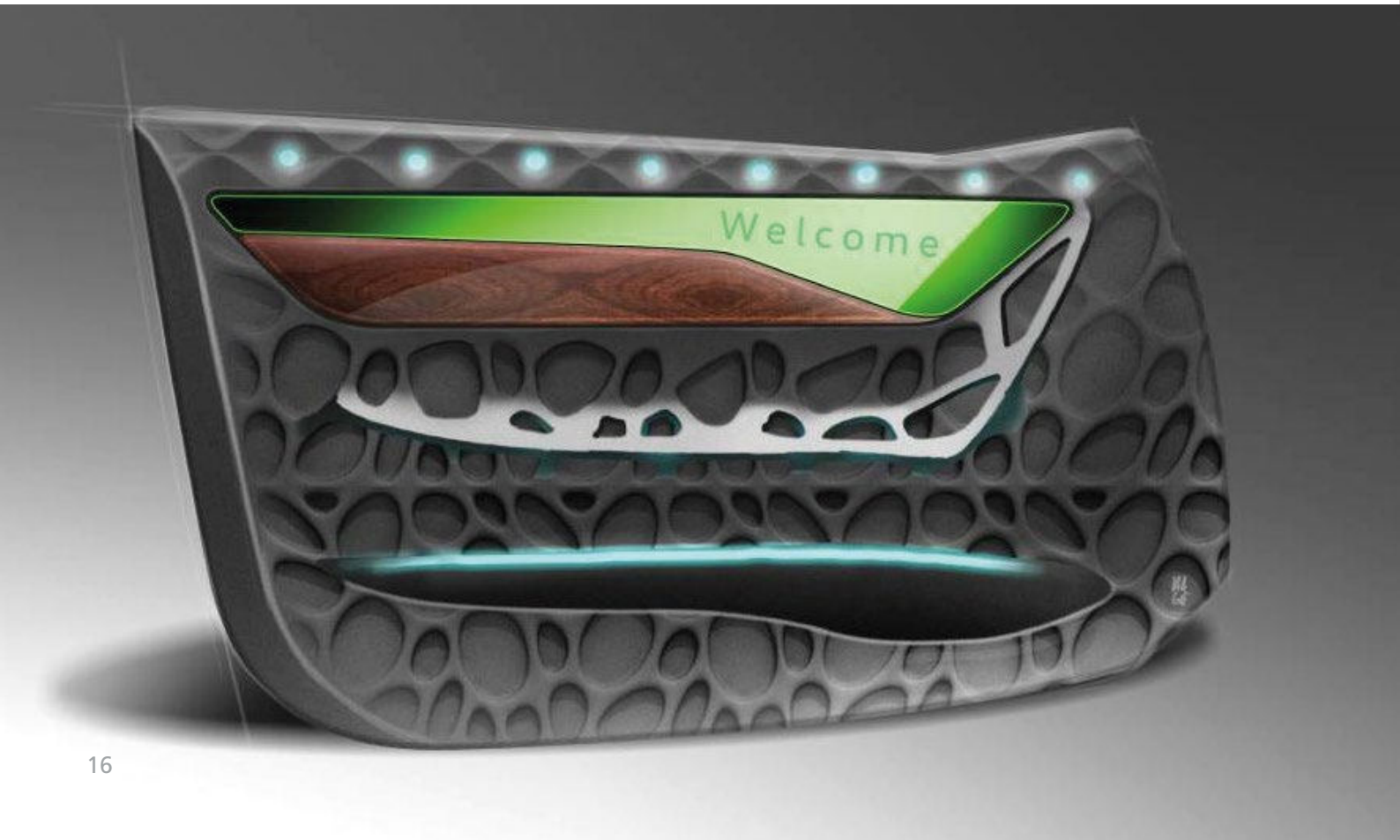
BIONICS AND AI FOR THE DEVELOPMENT OF SUSTAINABLE LIGHTWEIGHT COMPONENTS

Lightweight design is a key success factor when it comes to CO2 savings in mobility. It is therefore vital that sustainability aspects of lightweight vehicle components can already be measured and optimized during the development process.

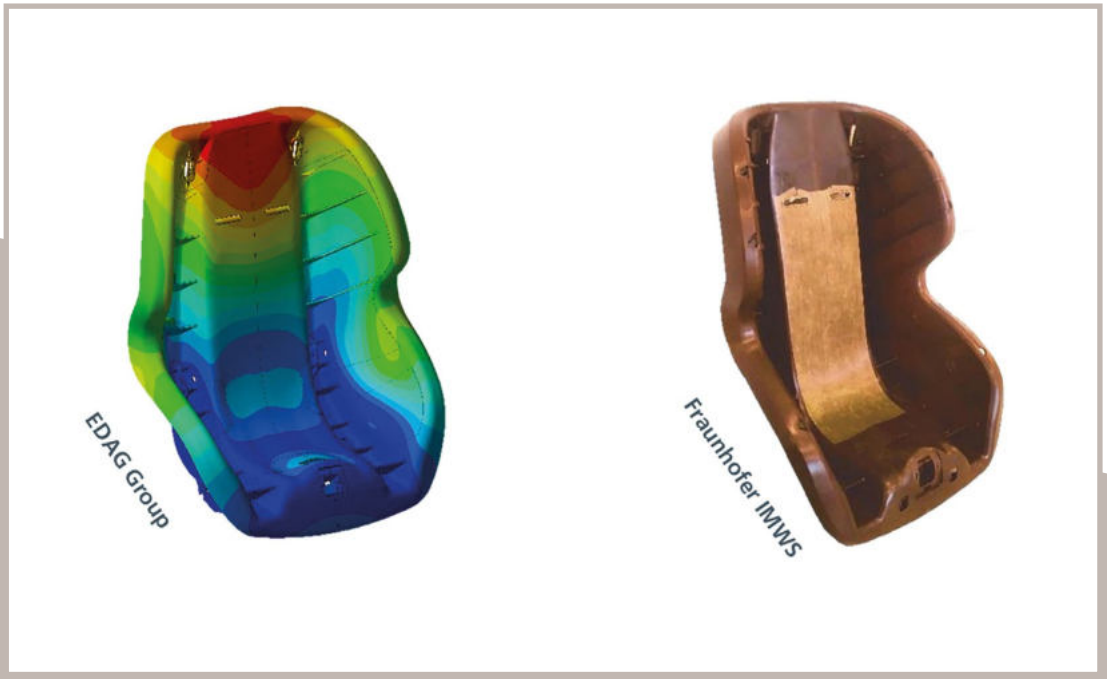
To this end, LCA methods are integrated into the software tools used for development, for instance CAD programs (Catia, NX, etc.), and FE simulation programs. In addition, AI and bionic algorithms are being developed to enable more sustainable components to be developed more rapidly.

The designs created with the help of AI and bionics are evaluated for sustainability using the LCA methods implemented, and subsequently optimized for sustainability by means of automated development loops within the ELISE software.

What this might look like in practice is what we are working on in the research project "Bionics and AI for sustainable integration in product development for resource-efficient lightweight construction" (BIKINI), along with the University of Paderborn, Additive Marking GmbH, Atos Deutschland, Krause DiMaTec GmbH, RHaug GmbH, and the Alfred Wegener Institute. The BIKINI project is being funded by the Federal Ministry for Economic Affairs & Energy (BMWi).



REGENERATIVE SEAT SHELL: "REGSCHA"



USE OF NATURAL FIBRE-REINFORCED BIO-BASED PLASTIC COMPOSITES AS SUSTAINABLE MATERIALS FOR A SAFETY-RELEVANT STRUCTURAL COMPONENT

In the future, high-stress structural components in automobile applications are also to be produced using sustainable resources. With this in mind, in the composite research project "RegScha", we researched the potential of biopolymer-based natural fibre-reinforced plastics (bio-NFRP) in terms of structural, crash and safety relevance, developed a seat shell for a child car seat in composite design which meets the high structure and safety requirements in force, and simulated its crash performance. It also exhibits a weight reduction compared to the reference structures.

In the next few months, its performance in physical crash tests is to be examined by associate partner Britax Römer, a series manufacturer of child car seats.

Our research partners also developed a process and performance additive for bio-NFRP injection moulded materials and an NFRP semi-finished product for the production of bio-tape using innovative coating systems. In addition, processing principles were worked out, the materials mechanically characterised, and a production process for bio-NFRP semi-finished products and bio-NFRP hybrid moulded parts developed.

Our project partners are Evonik Perations GmbH, SachsenLeinen GmbH, the Technical University of Chemnitz, and Fraunhofer IMWS. Associated project partners are Britax Römer, GK Concept GmbH and KNOTEN WEIMAR Internationale Transferstelle Umwelttechnologien GmbH.

This project was sponsored by the Federal Ministry of Food and Agriculture (BMEL) via the Agency for Renewable Resources(FNR) under a resolution passed by the German parliament.

Would you also like to switch your focus to automobile applications that are sustainable but safe? We will be happy to support you. Michael Begert looks forward to hearing from you.

COMPETENCES & PROJECTS

PREDICTIVE MAINTENANCE: DIGITAL RISK ASSESSMENT IN AEROSPACE ENGINEERING

The question of when a component or subsystem will reach the end of its life cycle and be in danger of failing is even more critical in aerospace engineering than in other industries. It is true that more and more sensors are monitoring the loads and functionality of numerous components. However, this flood of data calls for modern software capable of analyzing it and making it accessible in a user-friendly way. EDAG aeromotive's FMEA and FMECA experts provide assistance with the selection of suitable tools, the transfer of existing data, and the further development of the method itself.

In the industry, predictive maintenance is currently regarded as one of the most interesting artificial intelligence and machine learning applications. In simple terms, the aim is to calculate, on the basis of large amounts of historical data, when a component will have reached the end of its service life, so that a maintenance date on which the component will be replaced can be predicted. On the one hand, this prevents the machine from breaking down unexpectedly and causing problems in the production process. On the other hand, a part should not be replaced unnecessarily early, in order to keep costs down.

In the aerospace industry, the Failure Mode and Effects Analysis (FMEA) and Failure Mode, Effects and Criticality Analysis (FMECA), which is supplemented by criticality, are also used to determine the probability of failure of individual components through to complete systems on the basis of large volumes of data - albeit with a slightly different approach. The first goal is to maximize the reliability of the aircraft, and therefore the safety of its occupants. In addition, the methods enable improved maintenance and testability of components. To optimize both, there is a feedback loop, the aim of which is to radically optimize the life cycle. This goes as far as iterative design adjustments to improve the service life of components.

The specific FMECA thus provides the basis for logistic support analysis (LSA), which in turn is the starting point for integrated logistic support (ILS), which also, for example, considers logistic processes so as always to have essential flight system components available wherever they are needed. Maintenance and downtimes can be reduced in this way, substantially lowering costs.

THE AIM IS TO CALCULATE [...], WHEN A COMPONENT WILL HAVE REACHED THE END OF ITS SERVICE LIFE [...].

SOFTWARE REACHING ITS LIMITS

The FMEA or FMECA has long been used in aviation as an analytical method for reducing risks and determining reliability. Initially, card systems and forms were used to collect failure rates at all system levels, and the probability of failure was calculated on the basis of criticality. Using computers, the application became more efficient and user-friendly. Now, however, another technological change is essential.

Why? Because the database for the components and systems concerned is growing all the time. Increasing digitalization is leading to exponential growth in the volume of data in all areas, with a current estimate of a 27 percent increase each year – which is equivalent to doubling every three years. This poses problems for some of the solutions applied to date. Often, neither the data models used nor tried and tested software applications are geared to this development. They are unable to handle additional data points and variables and also the sheer volume of data.

With outdated systems, therefore, the extent to which links can be visualized is limited. Filtering out certain data takes a great deal of time and manual effort. The lack of user-friendliness increases the error rate. All in all, productivity suffers, and what is more, the information available cannot be used in its entirety – so not all opportunities for optimization can be exploited.

NUMEROUS FMEA-/ FMECA-APPLICATIONS

However, selecting the "right" software is not that easy. It is important to make the wide variety of data generated accessible on the one hand, while on the other guaranteeing that this wealth of data can be precisely analyzed. In addition, there are company-specific requirements that need to be met.

EDAG aeromotive, an EDAG Group subsidiary, assists aerospace companies in their search for suitable FMEA or FMECA technology. The EDAG experts help not only with the decision as to which software is suitable, but also with its implementation and the necessary data transfer. The service we offer includes the following steps:

Dominik Meyer
Function Owner
EDAG aeromotive GmbH

- Extensive market research to find out what potential tools there are on the market
- A comparison of the requirements on the basis of the product specifications
- An independent evaluation of the tools, taking into account the importance of individual tool requirements, working on the basis of a defined weighting factor
- Calculation of the score of the utility value, which makes it possible to compare the different software applications
- Submission of a concrete recommendation based on an objective, independent and transparent evaluation
- to reach a decision with the customer with regard to the most suitable tool
- Integration of the software selected, including testing and implementation of existing data
- Further development of the analytical method by means of troubleshooting, restructuring, digitizing old inventories and developing new functions

The specialists trained in the method stress the fact that the only way for wrong decisions - which would be reflected later on in application deficits, for example, or even necessitate another software change with repeated data transfer - to be avoided from the outset is by working on the basis of precise research and intensive validation based on the company's own requirements. They familiarize themselves with the various software applications and evaluate them, using a predefined catalog of criteria.

OPPORTUNITIES OFFERED BY MODERN APPLICATIONS

Once the new software has been implemented and the data file has been checked, purged and transferred, this opens up new possibilities for data evaluation and use. This allows historical data to be linked across different levels, so that changes are applied consistently. All connections can be visualized and even large data files can be filtered and extracted as required.

Modern FMEA or FMECA technology is also a suitable starting point for other reliability methods, such as fault tree analysis (FTA) or the reliability block diagram (RBD), and enables both "top-down" and "bottom-up" inspection. The FMECA in particular thus provides the basis for adapting and further optimizing the LSA and subsequently the entire ILS to the requirements of digitalization, and further optimizing them.

If you have further questions about FMEA or FMECA applications or want to know how EDAG aeromotive supports the aerospace industry, talk to our functional manager, Dominik Meyer.

FLASHING BLUE LIGHT, EMERGENCY SERVICES RADIO AND A FEW MORE EXTRAS

The local German Red Cross (DRK) association in Neuhof has a very special emergency vehicle: a Ford Ranger with a 30,000-euro drone in the rear body, an 80,000-lumen light mast on the roof and an adapted chassis for difficult terrain. Yet these are just the externally visible changes, in addition to the DRK livery and the customary flashing blue light. The EDAG Group's Center of Competence for Special-Purpose Vehicles has made extensive modifications to the former series production vehicle. These include further extras on the inside, which are needed by the rescue services - and an unusual in-house development.

A few weeks after the flood disaster on the Ahr, Erft and Swist rivers, the German Red Cross (DRK) in the district of Fulda received an ambulance that is built precisely for such missions. The drone squadron at the local Red Cross association in Neuhof uses aerial drones for emergency and disaster situations, to reconnoiter inaccessible terrain and find missing persons. A high-performance drone is housed in the box assembly at the rear of the vehicle, as is a powerful battery that provides sufficient power for the drone as well as the vehicle's on-board components. A retractable light mast is installed on the roof, providing up to 80,000 lumens of brightness - equivalent to the spotlight of a stadium lighting system. To enable the vehicle to be used in difficult off-road terrain, the chassis was raised and the track width increased. Inside, there are also additional components to control the extra equipment, such as the flashing blue light and siren, as well as the necessary means of communication for rescue teams, which includes both radio and mobile data transmission.

Christian Spelda
Sales Manager

The basis of the rescue vehicle was a standard Ford Ranger, which was extensively modified by the special-purpose vehicle design division of the EDAG Group. This is where emergency vehicles of all kinds are produced, including those for the police, rescue services, the Federal Technical Relief Agency (THW) and fire departments. However, customers also include other "first responders", such as plant fire brigades of chemical companies, emergency teams at Deutsche Bahn, electricity and water suppliers, municipal infrastructure operators and security services. Mobile operations centers are in demand, as are vehicles for transporting tools, equipment and materials, and crew vehicles. EDAG also has two other vehicle categories in the division: campers and KMPs, which are motor vehicles for transporting people with restricted mobility, i.e. vehicles for wheelchair users.

MANY SKILLS IN DEMAND

"All you're doing is screwing a blue light onto the roof" is one of the jokes that colleagues sometimes use to tease each other. Everyone knows, of course, that numerous different skills are needed to develop, integrate and convert special-purpose vehicles - even if "only a blue light is screwed onto the roof". Because that could cause rattling, vibrations and natural frequency resonances. In the case of interior fittings or roof and rear assemblies - such as the blue light - the company's extensive know-how, which includes the simulation of vibration behavior, proves its worth.

The so-called special signaling system on the roof also has to be connected and controlled. This can entail the development of a cable harness or even a complete on-board network for special-purpose vehicles. In some cases, this may include the development of a control unit for the vehicle infrastructure, which is used to switch on-board equipment on and off or to show sensor and camera data on a display. In addition, signals from the CAN bus need to be evaluated and written back, or vehicle data logged in an accident recorder, in order to document information such as speed, vehicle movements, seat belts used or not used, and much more. Moreover, communications are an essential part of the retrofit in many vehicles. On the one hand, the use of public mobile radio networks for calls and mobile data communications, and on the other hand, special networks such as TETRA digital radio for public authorities, or even support for local wireless networks when emergency teams communicate with each other by radio.

ENGINEERING SERVICES FOR EXTERNAL CUSTOMERS

Other requirements include fixtures, such as tool holders for technical emergency teams or cabinets for medical material in rescue vehicles, as well as superstructures, for example in the form of box attachments or rear fixtures. Another task for EDAG engineers is to redesign the vehicle cabin, for example to create space for wheelchairs and to add ramps and lifting systems.

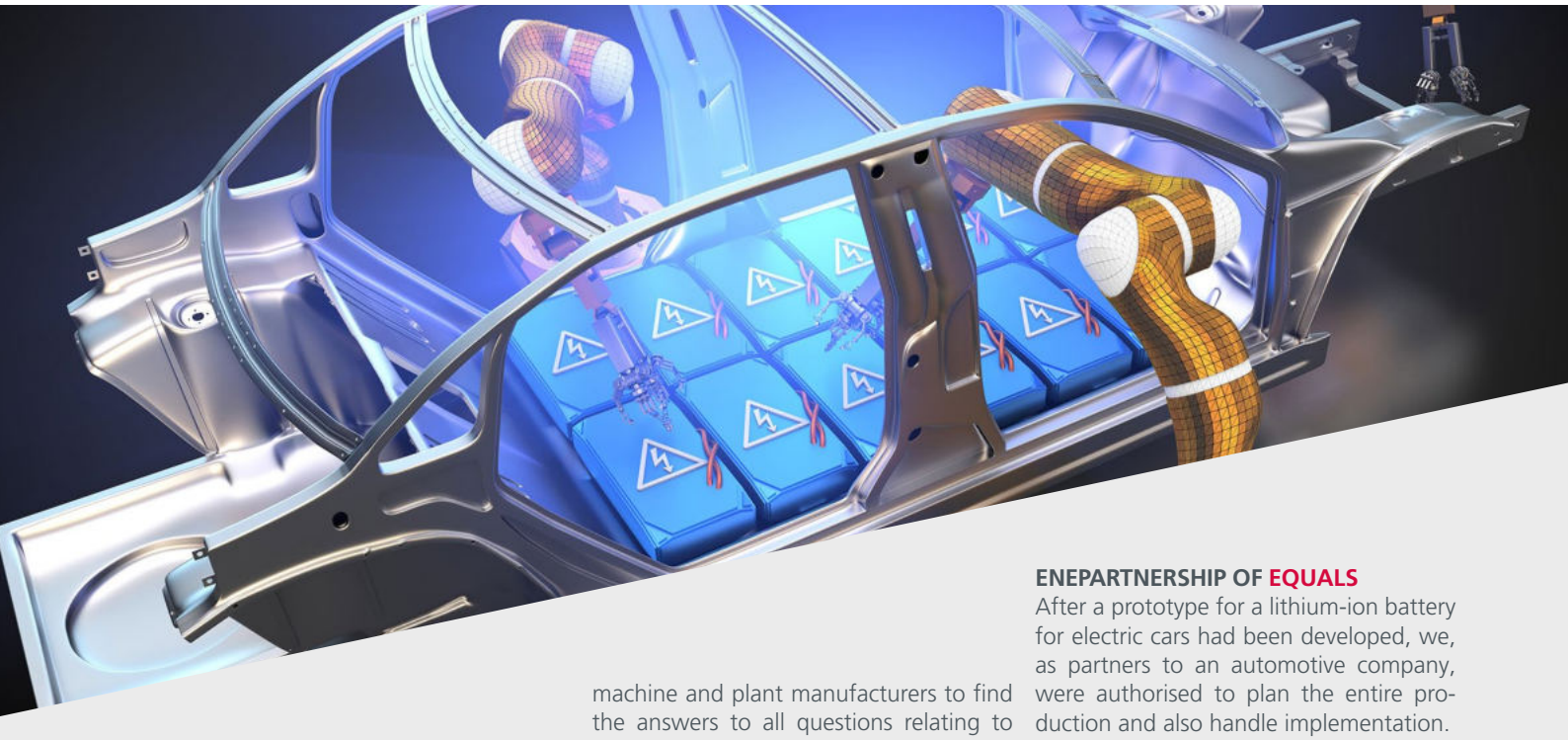
For this purpose, the vehicle construction and development specialist relies, for example, on installation space analysis and 3D layout design, i.e. the simulation of fixtures, as well as the development of proprietary fasteners and screens. The development process includes CAE calculations, for instance with regard to stability and crash behavior, as well as natural frequency analyses, simulations and crash tests, if required by the customer. Last but not least, it may also be necessary to adapt the body, to design the chassis for changed weights and centers of gravity, or to reinforce the brake system.

However, converting the vehicles is not always performed by EDAG. The company works with both vehicle manufacturers and body suppliers, who then carry out all or part of the work themselves. PDM sheet and parts list creation, production support and simulation of real tests as well as supplier sourcing and control are among the services offered.

To facilitate cooperation in the field of special-purpose vehicles for prospective customers, EDAG brings together the necessary skills in the Center of Competence for Special-Purpose Vehicles. In this way, all expert divisions involved are integrated and their services are available to customers. Sales Manager Christian Spelda can provide you with more details about cooperation with EDAG in the field of special-purpose vehicles.

ANOTHER TASK (...) IS TO REDESIGN THE VEHICLE CABIN, E.G. TO CREATE SPACE FOR WHEELCHAIRS AND TO ADD RAMPS AND LIFTING SYSTEMS.

BATTERY PRODUCTION:
A SPECIAL CHALLENGE WHICH WE ARE HAPPY TO TAKE ON!



As a result of increasing electromobility, vehicle manufacturers and suppliers are facing new challenges. New materials with as low a CO2 footprint as possible need to be processed using innovative production methods such as additive manufacturing and digital development tools.

THE HEART OF AN ELECTRIC CAR IS ITS BATTERY

The heart of an electric vehicle is its battery, which serves as the energy source for the powertrain. It is composed of interconnected battery modules, and these are made up of battery cells. These cells are based on lithium-ion technology, which has a high energy density and therefore a long service life, which in turn makes a large number of charging cycles possible.

There are a number of major challenges to be solved during production of the battery. To master these and find fully developed solutions, the automotive industry is working with battery producers and machine and plant manufacturers to find the answers to all questions relating to battery performance, service life and cost optimisation possibilities, and serve the rapidly growing market.

Anyone wanting to build electric cars needs not just motors, but also storage cells for the electrical energy. Since the demand for electric vehicles is currently constantly increasing, and therefore offers great potential for large sales volumes, it is without doubt a wise decision not to purchase these batteries from other suppliers, but to develop and manufacture them one's self. This creates the kind of know-how necessary to gain a technological competitive edge.

In addition, materials that are difficult to process and sometimes extremely dangerous are needed for the production of lithium-ion batteries for electric vehicles. This requires expert knowledge and innovation, both of which can be contributed by EDAG Production Solutions. For OEMs and, of course, also system suppliers.

ENEPARTNERSHIP OF EQUALS

After a prototype for a lithium-ion battery for electric cars had been developed, we, as partners to an automotive company, were authorised to plan the entire production and also handle implementation.

EDAG Production Solutions has a very good reputation as factory and production planners with international OEMs. However, there were a number of reasons why EDAG was chosen.

The main factors here were the following competencies and skills :

- Fully integrated factory planning: Development of production, the building and the entire infrastructure

- Cooperation of a wide variety of departments in the project:
  1. Product Development to ensure production-oriented product design
  2. Involvement of implementation engineering employees for design and simulation
  3. Involvement of body manufacturing and material flow simulation employees

Robert Wilschrey
Technical Expert HV Components, EDAG Production Solutions

- Utilisation of our years of planning expertise from industrialization and optimisation projects in the field of chassis and drive components
- Special knowledge of the joining technologies required for battery production
- Factory planning methods such as value stream design and potential analyses

UNUSUAL MATERIALS, SPECIAL MEASURES

The planning for this project was no ordinary challenge: lithium in its metallic form is a highly flammable material that begins to burn as soon as it comes into contact with normal air (at temperatures above 1,000 degrees Celsius). On top of that, some of the materials used are highly toxic and the batteries deliver high currents at high voltages: all of which makes special safety precautions in production essential.

For both the customer and EDAG, the production of lithium-ion batteries was at that time still uncharted territory – in terms of both manufacturing technologies and manufacturing standards. Despite this, we were still able to rise to the challenge, as our large pool of excellently networked experts and engineers from a wide range of technical fields and the enormous experience we have acquired in 40 years of industrialisation and engineering mean we have the know-how to master such projects.

Since the customer had no battery production facilities at the time, planning itself began with a "sheet of white paper". As a general contractor and production planning company, however, we have ample experience in setting up new production plants, and so were able to draw up the concept plan very quickly, and then validate the various concepts. The advantage for the customer: investment security was quickly achieved, and it was possible for the planning of the new factory and production to be started and implemented on schedule.

The same applied to implementation: the plant constructor was able to set up and commission battery production for the customer on time – without having to adapt our planning documents in any way whatsoever. We are particularly pleased to note that the customer is now already producing the next generation of lithium-ion batteries. This shows that a customer who was very impressed by our achievements has succeeded in securing an excellent position in the growth market of electric mobility with the production of rechargeable batteries.

WITH EXPERTISE AND KNOW-HOW, EVEN NEW TERRITORY CAN BE CONQUERED

Even when it comes to technologies that are still uncharted territory for EDAG Production Solutions, our expertise and know-how in production planning and industrialisation enable us to achieve excellent results that immediately prove their worth in practice. Since our project engineers work in a highly networked environment, this results in innovative solutions for production – not only for the automotive industry.

Do you have a similar application or would you like to talk to our expert, Robert Wilschrey, Deputy Head of our Assembly Planning Client Team, about the future – namely eMobility? Then please contact him.

OUR SCALEBAT – A MODULAR AND SCALABLE BATTERY HOUSING

Are you curious about what new territory we will be setting out to conquer next? We already have something new: the SCALEbat. The scalable battery housing helps car manufacturers and startup companies to develop flexible and economical electric vehicle floor assemblies, and provides an excellent starting point for new cooperation projects, research and development. Its scalability is not the only outstanding characteristic of SCALEbat. It is also an ideal means for the structural integration of various battery systems. The intensive use of steel roll-formed profiles for the frame structure of the battery housing results in enormous savings potential, especially where large quantities are involved. Here, too, Robert Wilschrey will also be happy to answer any questions you might have.

CLARITY ON THE WAY TO DIGITALISATION

When it comes to modernizing production, many problems can be solved with the help of digitalization. But what exactly are the problems? And which ones are so crucial that the investments are really worthwhile? With "Smart Vision", EDAG has developed a concept that ensures that the path to the smart factory points in the right direction from the very beginning.

Even in industry, it repeatedly happens that digitalization projects fall through. One of the problems are mega projects that aim to do too much at once - this is especially true when the aim is to build a "smart" factory. Things often start with the sentence "with digitalization, we will solve all your problems". It is not unusual for projects to be curtailed because the cost of complex projects spirals out of control, or because implementation would take too long given the shortage of manpower. Even if all the plans are implemented, it might in the end turn out that little has been achieved for a great deal of money - due contradictory goals being pursued in some areas, or investments being made in solutions that fail to address the actual problem.

One of the reasons for such problems during the development of a smart factory is that there are no patent remedies. "Smart" does not mean creating 100 percent automation, nor does it mean the widespread use of artificial intelligence (AI). A truly smart factory makes targeted use of digitalization and AI technologies to solve existing problems, and in this way dramatically increase efficiency. It is a fact that every smart factory achieves its individual optimum, depending on the product, the processes, the philosophy and the people – and the solution must be pursued just as individually.

THE NEEDLE IN THE HAYSTACK

The greatest problem needing to be solved on the road to the smart factory is first of all to find out what bottleneck exists in production or what obstacle is obstructing an improvement in efficiency. This might sound trivial, but in large organizations with sales in the triple-digit million range and correspondingly complex processes, this is the one question that is so very difficult to answer.

This is exactly where EDAG Production Solutions comes in. The company has developed a concept that will find the answers people are looking for: "We first write down what your problems are": that is the goal of "Smart Vision". In a two- to three-day workshop, the participants involved, who might, for instance, be from the fields of production, logistics, purchasing and IT, work out the requirements that will have to be applied in project planning in order to achieve the goals. The concept is designed so that, with relatively little preparatory work, it can be used at the very beginning of a Smart Factory project, and results can be produced quickly and with little effort.

TRANSFORMATION DRIVERS AND ENABLERS

The Smart Vision concept is based on the realization that almost all manufacturing companies in all sectors of industry face virtually the same challenges. These can be traced back to a number of "transfor-

Nicolai Rimmler
Project Leader
Factory and Logistics Planning

mation drivers": Individualization, increased flexibility, cost pressure, new technologies, climate change and globalization.

In addition to these transformation drivers, on the other hand, there are also "transformation enablers". These are factors that help translate the factors mentioned above into production practice. The most important transformation enablers include modularity, mobility, compatibility, universality and scalability. Six to seven such enablers are relevant for the production area. On the basis of its project experience, EDAG has drawn up three to five questions for each of these enablers, and these can be used to determine the priority of each of the enablers in the project. 20 to 30 questions are enough to determine what requirements the smart factory needs to meet.

COMPLETE PICTURE OF THE SMART FACTORY

Obtaining a holistic picture of the task is essential to this concept. This is not just about the production environment; indeed the starting point is the "order processing procedure" – everything that helps to complete the order to the customer's satisfaction. This results in the group of participants for the workshop: a group that is as heterogeneous but all-inclusive as possible to develop a comprehensive vision of the smart factory. In this way, it is possible to prevent the manifestation of conflicting development goals - for example, an improvement is brought about in logistics, but turns out to hamper processes in production.

This group needs to outline the most "painful" areas in the existing processes, so for example:

- What is the most disruptive factor?
- What is the most obstructive factor?
- What needs to be rectified most urgently?

In the end, the individual answers result in a priority list for the enablers. Taking these, EDAG draws up a central part for the strategic paper, with the main requirements for the planned project. These must then form the basis of all further developments. The result is therefore not a value stream analysis at production level, and so cannot serve as a manual for implementing certain technologies or processes. Instead, the answer is given at management level, and provides information about what ability is needed to solve the problems identified.

If required, EDAG's experts can also complete the strategic paper and assist with further steps, such as subsequent planning and implementation.

TARGETED DIGITALISATION

The procedure outlined here creates transparency on the path to increased digitalization, because it clarifies where the most urgent need for action is and how the greatest possible effect can be achieved with the resources available – both investment capital and the employees available – to improve efficiency. This helps to prevent bad investments, and improves the probability of bringing a project to a successful conclusion.

Further details of the "Smart Vision" concept are available on request from Nicolai Rimmler, Project Leader - Factory and Logistics Planning, and Frank Breitenbach, Senior Technical Expert - Smart Factory Planning Methods.

"WE FIRST WRITE DOWN WHAT YOUR PROBLEMS ARE": **THAT IS THE GOAL OF "SMART VISION".**

EDAG WORLD


EDAG

HYDROGEN ENGINE AS A RELEVANT CONTRIBUTION TO CLIMATE PROTECTION

Developing competitive, sustainable mobility for the transport, heavy-duty and work machinery sectors is one of the major challenges in the energy transition. Cummins, one of the world's leading manufacturers of diesel and gas engines with its headquarters in Columbus (Arizona), will be presenting an 18-ton Mercedes-Benz Atego truck that has been converted to run on hydrogen at the IAA Transportation 2022 show in Hannover from September 20 - 25. Cummins accomplished the powertrain and fueling system integration in cooperation with the EDAG Group's truck, complete vehicle and hydrogen experts. The conversion exhibited at the IAA is already fairly close to a possible series development.

"Hydrogen engines can make a significant contribution to achieving the zero-emissions target, especially where commercial vehicles and mobile machinery are concerned," explains Jim Fier, Vice President and Chief Technical Officer (CTO) at Cummins. They are reliable and of economic interest, not just because of the lower cost of conversion compared to battery-powered vehicles, but also because they build on technologies with which vehicle manufacturers, fleet managers and drivers are all equally familiar. This means that the complexity of the vehicle concept is manageable. All the same, the efficient integration of the H2 engine and the H2 tank system still calls for a high degree of complete vehicle competence.

"In these transformative times, openness to technologies is essential if high-performance alternative drives are to be implemented in all fields of mobility. Especially where commercial vehicles with energy-intensive superstructures and mobile machinery are concerned, the hydrogen engine can be a simple, efficient and climate-friendly powertrain solution," states EDAG Group CEO Cosimo De Carlo. "To this end, and in collaboration with partners from industry and research, we have brought about sustainable H2 solutions for the powertrain and safe tank systems for Cummins."

No radical changes need to be made to the vehicle and drive concept in order to convert a truck such as the Atego, a tractor, a construction or rail vehicle for a climate-friendly hydrogen combustion engine. "We work with an internal combustion engine that has been adapted accordingly. If hydrogen is being used as a fuel, the drivetrain simply needs to be adapted. As there is no longer any need for a complex emission control system, the space it would have occupied is used for the tank system. The number of operating hours between refueling sessions can easily supplemented by adding more tanks. These are much easier to position than the heavy batteries used in BEV solutions. The conversion is primarily a matter of hydrogen-specific integration services and domino effects in the overall vehicle, with technological and geometric adjustments," explains Dr. Andreas Quanz, Key Account Manager, Commercial Vehicles at the EDAG Group. "In particular, this benefits manufacturers who carry out

EDAG GROUP INTEGRATES INNOVATIVE HYDROGEN ENGINE AND TANK SYSTEM FOR CUMMINS' IAA PROJECT

tasks that are weight-sensitive and where hydraulics plays a critical role. For them, heavy batteries and not having access to a powerful charging infrastructure detract from the desired performance and cost-effectiveness," continues Dr. Quanz. The Atego project presented by Cummins at the IAA Transportation 2022 show is an exemplary case of how different skills and experiences can be brought together. This was crucial for the success of the project.

"With green hydrogen, many more CO2-optimized drive concepts than many people currently perceive can easily be realized," is the firm conviction of Cummins' CTO Jim Fier. Dr. Andreas Quanz sees another another major opportunity in sustainable hydrogen engines also being used in other related industries.

What is more, in order to share its experience and expertise in the emerging H2 market and harness these to increase the pace of innovation, the EDAG Group has joined the ‚Allianz Wasserstoffmotor' [Hydrogen Engine Alliance]. This is a cross-sector technology initiative focusing on sustainable transformation. This reflects the EDAG Group's commitment to the advancement of this technology, and provides another element in the mobility of the future.

In addition to the H2 combustion engine demonstrator, other hydrogen systems developed and constructed by the EDAG Group will also be on display at the show. These include numerous developments carried out in cooperation with NPROXX, a Cummins joint venture and global leader in high-pressure hydrogen storage for stationary and mobile applications. Here, the EDAG Group acts primarily as a developer, integrator and production service provider for storage systems, and also for hydrogen-powered fuel cell vehicles.

EDAG EMPLOYEE STORY

ALWAYS AT THE CUTTING EDGE

The automotive industry is in a period of transition: Highly automated driving, eMobility and connectivity – all will be important in the future. Marc wants to help shape this transition. "What we are developing now will be on our roads in a few years' time. It makes me proud to see a vehicle driving past and know that I helped to develop its control units," he says.

How electronics works has always fascinated Marc. After finishing secondary school, he first of all did an apprenticeship as a mechatronics technician in Fulda, his hometown. As his company did not have its own apprentice workshop at the time, from day one he was allowed to work directly on the production line when maintenance jobs, modifications and new installations were being carried out. "At that time, I was most interested in automation engineering. During my apprenticeship, I developed a great deal of software for the programmable logic controls of production facilities. However, the really complex problems were often dealt with by external service providers," recalls Marc. He wanted to be able to do that, too, so went to Darmstadt to study electrical engineering and information technology.

WIDE RANGING PROJECTS

After finishing his master's degree, Marc worked for several years in an automotive supplier's development department before coming to Fulda and joining the EDAG Group, initially as a project manager for embedded systems. Today, he is a team leader with 30 employees working in embedded software development. "The good thing about working here is that our projects are very varied. As a general rule, the projects are completed within two years at the most, after which our developers then move on to another

project. It is never boring, and you are always at the cutting edge," says Marc.

Marc and his team develop safe and powerful software for control units that will go into future generations of vehicles, at all vehicle levels. "We are involved in every phase — from the concept to start of production. A number of prototypes and showcases have also been created by our team." One example Marc can mention is the truck that can take over transport tasks for logistics centers in areas not open to the public. Or the self-driving harvester developed in Fulda and already in use in Brazil for the sugar beet harvest.

"It's an amazing feeling when, at the end of a project, you see that the thing really works, and all the effort has paid off," says Marc. Viewed in this light, the changes in the industry he works in do not worry him. As he says, stagnation would be the worst thing that could happen. "People who want to get ahead and try out new things will always be in demand in our industry."

ADVANTAGE OF THE FULDA SITE

After his apprenticeship, Marc spend ten years in other parts of Germany, both as a student and working for other companies. Then at the beginning of 2017, he was drawn back to Fulda, where he still had friends with whom he had never lost contact. He is currently renovating his childhood home for his family and himself. Another advantage of being in Fulda for the passionate skier and snowboarder is its proximity to the Rhön Mountains: a 15-minute car ride, and he can be speeding down the slopes of the Wasserkuppe or another mountain. If there is any snow, that is.

He finds he can create a very good balance between his job and his family life. Having flex-time, for instance, enables him to take his small daughter to kindergarten on a regular basis. Just one of many points that, from his point of view, make working for the EDAG Group an attractive proposition. "We are family friendly, and also respond to the needs of each individual in other ways, too," says Marc. As a team leader, this is also a matter of great importance to him. It makes no difference whether someone is planning a world tour and wants to work remotely while away, wants to work fewer hours for private reasons and so have more time for their family, or just needs a month off. "Wherever possible, we try to make sure these things happen," says Marc. Because a positive and open working atmosphere in which employees and supervisors treat each other with respect and friendliness is important to him, as are flat hierarchies and plenty of scope for creativity.

MENTOR FOR YOUNG TALENT

Retaining good employees, securing new talent: as a mentor to students, Marc also does all he can to get the next generation interested in working for the EDAG Group. "We train our students on special innovation projects, and in this way make them fit for direct entry into the automotive industry," says Marc. To this end, he and his team have devised a development process that gives students the opportunity to learn about the development steps from the concept phase to the vehicle on the road. The students can, for example, work on the "Kidscar" innovation project, in which, step by step, a small electric car for children is transformed into an autonomous model vehicle.

Marc sees this as a major gain, as it enables him to learn about and try out innovations along with the students, and ideally also acquire motivated new employees for his team. And, as Marc points out, your resume doesn't necessarily need to be conventional. As a team leader, he also finds unusual biographies fascinating and the people behind them often particularly enriching. "People go their different ways, you should give each and every person a chance."

EDAG EMPLOYEE STORY

THE CALM WARRIOR

It is about eight and a half thousand kilometres from the Upper Palatinate in Germany to Korea. It takes a good twelve hours to fly such a distance by plane. Claudia makes this connection a little easier and faster - all it takes is a few kicks and punches.

Claudia is 28 and a software engineer at EDAG Engineering in Regensburg. And she is also a Tae Kwon Do fighter. She started at the age of nine in her home town of Nittenau, a 9,000-strong community in the Upper Palatinate some 30 kilometres north of Regensburg. Today, she is a 1st Dan black belt. There are ten such master grades. So even after 20 years in the sport, the fighter never gets bored, nor will she in the long run.

A TAE KWON DOIN

Asian martial arts bring to mind tough, muscle-bound figures like the legendary Bruce Lee or Jackie Chan, who took on whole armies of bad guys in Hollywood and knocked and kicked them out of the way, bypassing all the laws of gravity. And Claudia? A graceful young woman who exudes a gentle, friendly charm... For her, Tae Kwon Do is much more than just fighting. She also sees it as a metaphor for a successful software development process.

The 2,000 year old martial art, she explains, has its roots in Korea and is a unique way of combining jumping and kicking (TAE) and fist and arm techniques (KWON) with a physical and mental maturation process (DO). "A Tae Kwon Doin - that's what people who practise Tae Kwon Do are called - is familiar with physical laws and can apply the required force in a very specific way to achieve the desired potent effect."

STRENGTHENS YOUR SELF-ASSURANCE

For example, smashing wooden boards two- to three-centimetre thick with the side of your hand or foot. Claudia remembers breaking a board for the first time, when she was eleven. "At first, I was really quite nervous - and then the thing broke on my first try. I was so proud of myself!" Now that she coaches children herself, she is, of course, aware that the boards used in the first tests are not all that thick, so as not to frustrate the youngsters. "Technique, strength and willpower enable you to do things that you would never have thought possible," as she knows from experience. "It's a great sport for the whole body and the mind, it strengthens your self-assurance and confidence in your own abilities."

With this philosophical approach to energy, technology and performance development, she was really already well on the way to studying information and communication technology in Erlangen, "especially as maths was my favourite subject at school". Getting to the bottom of things, developing strategies for her own success and implementing them with great discipline and maximum efficiency led her to her Master's degree. The subject of her thesis focussed on new features for machine communication in the LTE-Advanced mobile communication standard.

FAN OF TECHNOLOGY ON THE ROAD

As a car fan, Claudia is not fascinated by horsepower or certain brands, but by the technology on the road. She was therefore delighted to start working for a development service provider in the automotive industry after university. Working as a software tester for embedded systems in the energy management department at BFFT, and then later EDAG, in Regensburg, she immediately felt at home. "Because, to me, software testing is meaningful work. In our team, we are working on the future of mobility and are helping to make driving safer and more environmentally friendly."

The EDAG team in Regensburg specialises in development for volume production. Software testing is therefore always about getting new developments up and running in the vehicle. "Our software will shortly be on the road, so it has to meet various safety requirements and comply with standards."

AGILE SOFTWARE ENGINEERING

As a software engineer, Claudia and her 25 or so colleagues in the team are involved in the entire process, as represented in the V-model: from the inquiry, through the customer's requirements and development of the software architecture, to its integration in the vehicle. "We combine our work in line with the V-model with agile software development, and usually complete our work packages in three-week sprints," says Claudia.

Agile software engineering evidently strikes a chord with the Tae-Kwon-Doin. "Just following some kind of rigid pattern would not be enough for me. I like to achieve success through strategy, as I do in my sport". For instance in functional training, where more that anything else you use your own body weight. Occasionally also outdoors, in the park – "The main thing is that it's fun!" she says. Rigid running programmes or gym workouts are definitely not for her, she adds with an apologetic shrug of her shoulders.

This will be one of the reasons why Claudia is not particularly fond of competitive sports. Tae Kwon Do fights, in which people are sometimes knocked out, are really not her thing. "Obviously, competition is part of it, but what I find much more interesting is the way that self-defence is aimed at de-escalation and the conscious use of the techniques and harmonious movement sequences that we practice in training." This, combined with the discipline you have learnt, makes you more self-confident and calm in your everyday life and job, even in critical situations.

EVERYTHING IN DO IS PROGRESSING

As a developer, Claudia is always open to new ideas. A year ago, she discovered salsa dancing. "This is enjoyment at its best." For the software engineer and martial arts expert, this means: everything in DO - the physical and mental maturing process - is progressing. Maybe one day she'll make the eight and a half thousand kilometre trip to Korea after all, to the roots of Tae Kwon Do and her own sense of calm.

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We look forward to hearing from you!

READY, SET, GO!
START OF THE NEW TRAINING YEAR AT THE EDAG GROUP

88 JUNIOR EMPLOYEES GET THEIR CAREERS OFF TO A SUCCESSFUL START

"You can only ever learn from someone who loves his subject": not just a quotation from the author Max Brod, but also what it says in the training section of the EDAG Group's website. 88 young people, 55 in Fulda alone, are starting their careers with the EDAG Group, global engineering service providers, this year.

No matter whether they are doing an apprenticeship, dual study program, training-integrated study program or technical college internship with the EDAG Group: all new recruits always come to Fulda for a welcome week in mid-August. Getting to know each other and networking between different sites (Fulda, Munich, Wolfsburg and Ingolstadt) and company divisions is given top priority, because team spirit is one the EDAG Group's most important success factors, and therefore also part of the corporate culture.

Throughout Germany, the engineering service provider offers more than 25 different apprenticeships and degree courses. Founded in 1969, the EDAG Group meanwhile has 60 branch offices in 19 countries, and a workforce of almost 8000. Susanne Brune, the EDAG Group's Head of Talent and Performance Management, welcomed the newcomers to Fulda and stressed the value of the Welcome Week as an excellent opportunity to establish initial contacts with colleagues, find out more about the EDAG Group, and acquire new knowledge.

Cosimo De Carlo, CEO of the EDAG Group, and EDAG Group CFO Holger Merz made sure to take this opportunity to welcome this year's new apprentices and dual system students to the EDAG Group. "With our almost 50 years of experience as a training company, we will support you from now on to give you a qualified start to your careers. So far, we have trained more than 2,000 future shapers in both technical and commercial careers," said Holger Merz. Cosimo De Carlo added: "An exciting time awaits you - we have many innovative projects and a variety of interesting activities with high social relevance. Only by working together can we handle our customers' complex projects."

In addition to the welcome by the Executive Management and some initial training, team building events were also on the agenda. One particular highlight for all newcomers to EDAG was a visit to an escape room. Only by working together were the young people able to solve all the puzzles and achieve their aim - namely to get out of the escape room. The apprentices and dual system students found all the information they needed in next to no time, and were afterwards singled out for praise by the organizer, who called them a "top team". After they had worked together so successfully, a welcome party was held at the Kurfürst in Fulda. The people from Fulda who had completed their apprenticeships or studies this year were also awarded their certificates at this event.

30 YEARS OF EDAG DO BRASIL

In the early 1990s – around 100 years after the first car was imported to Brazil – the Brazilian automotive market experienced a veritable run. The established automotive manufacturers including Fiat, Ford, General Motors and Volkswagen and the truck manufacturers Mercedes-Benz, Scania, Volkswagen Bus & Truck und Volvo were joined by numerous other OEMs. Nissan, Renault, Peugeot, Citroën, Honda, Hyundai, Mitsubishi, Mercedes-Benz and Audi all set up local production facilities. Why? Because at that time, the import of vehicles was not permitted.

This meant that the Brazilian market was also interesting for engineering service providers. In 1992, the EDAG Group opened its first office in São Bernardo do Campo/SP. Business activities began with initial developments for Volkswagen do Brasil. Before long, the customer base also included other well-known automobile manufacturers. In 1995, just three years after its foundation, EDAG do Brasil received the "Certificate of Merit for its High Quality Engineering Services" von General Motors do Brasil for the first time.

Both the team and the range of tasks performed on site grew rapidly. Today, EDAG do Brasil offers extensive services in the development of passenger and commercial vehicles, in particular in the fields of body engineering and chassis, including model and prototype construction and testing. The portfolio also includes engineering services in the field of electrics / electronics. The Production Solutions segment covers the planning, design and simulation of production plants through to virtual commissioning. With this extensive portfolio and its numerous local customers, EDAG do Brasil is now one of the best established engineering service providers in the local market.

"EDAG do Brasil's services are aimed not only at the local market, but also at international customers. The Brazilian team is also well networked within the EDAG Group, and bundles know-how from the entire group of companies for its local customers," explains Harald Keller, COO of EDAG Engineering GmbH.

For Martin Vollmer, Managing Director of EDAG do Brasil, the company's success lies not only in its international connections, but also in the flexibility and adaptability of the location: "The fact that we are celebrating this anniversary this year is clear proof of our ability to adapt flexibly to different market situations. This is something we will continue to uphold and develop in cooperation with our customers, working out new technologies and in this way shaping the mobility of the future. Completely in keeping with the EDAG Group's vision – **efficient, safe and sustainable**.

OUTLOOK

UPCOMING EXHIBITIONS AND EVENTS

SMART COUNTRY CONVENTION
FROM 19. OCTOBER

HYDROGEN TECHNOLOGY EXPO
FROM 19. OCTOBER

DUTCH DESIGN WEEK (NL)
FROM 22. OCTOBER

BOSCH CONNECTED WORLD
FROM 09. NOVEMBER

ELIV
FROM 15. NOVEMBER

SMART CITY EXPO BARCELONA
FROM 15. NOVEMBER

IMPRINT

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EDAG Engineering GmbH
Kreuzberger Ring 40 · 65205 Wiesbaden

Pictures: EDAG Group, Adobe Stock, Synektar © 2022

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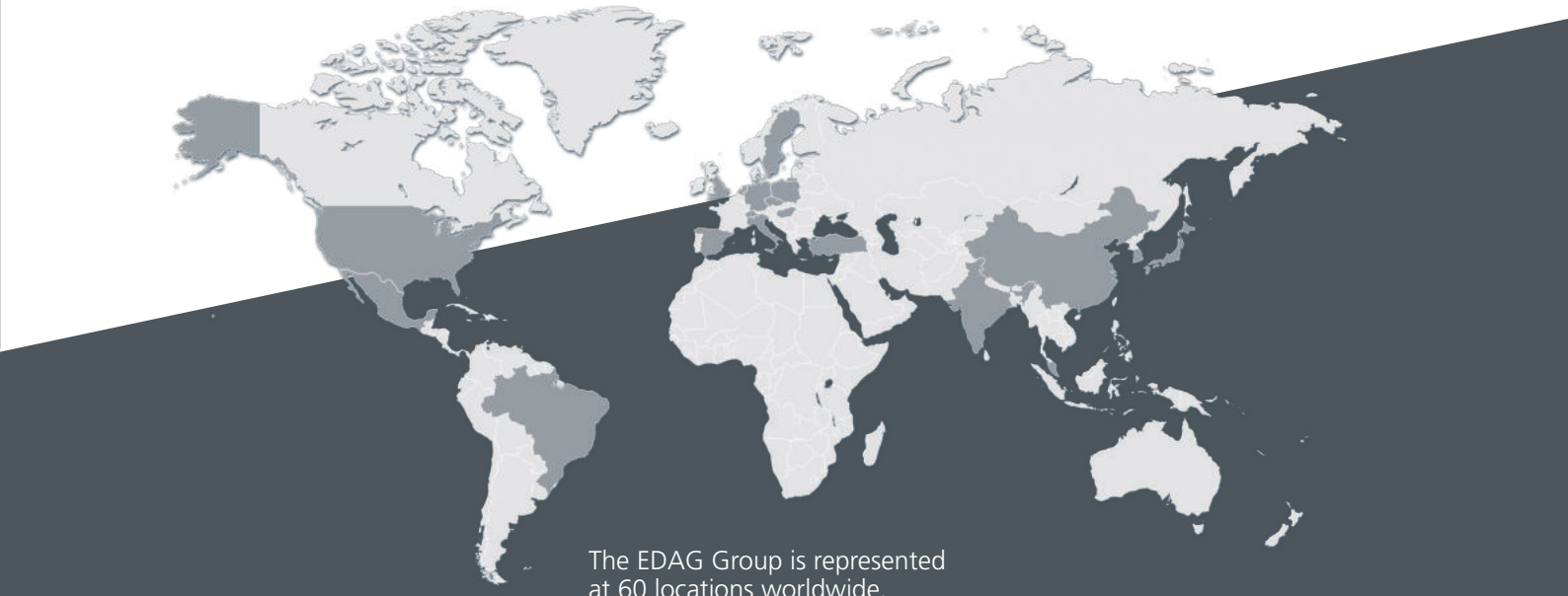

The EDAG Group is represented at 60 locations worldwide. These include Japan, Mexico, South America, India and Asia.

YOUR GLOBAL MOBILITY ENGINEERING EXPERTS

EDAG is an independent engineering service provider working for the global mobility industry. The company has a global network of some 60 branches at the world's major automobile centres to serve leading national and international vehicle manufacturers and technologically discerning automotive suppliers.

In addition, EDAG also offers engineering services in the vehicle engineering, electrics/electronics and production solutions segments. This extensive competence enables EDAG to provide its customers with allround support, from the original idea to design, through to product development, prototype construction and even turn-key production systems. As an innovative technological leader, the company also has competence centres for ground-breaking future technologies for the automotive industry: sustainable vehicle development, safe mobility, digitalisation and drive and storage technologies.

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