DÜRR

LEADING IN PRODUCTION EFFICIENCY

eco

THE DÜRR MAGAZINE

DRIVING DIGITIZATION

OUR FIVE DIVISIONS

Paint and Final Assembly	Application Technology	Clean Technology	Measuring and Process	Woodworking Machinery and
Paint and Final Assembly Systems • Paint shops • Final assembly systems	**Application Technology** • Paint application technology • Glueing technology • Sealing technology	**Clean Technology Systems** • Exhaust-air purification systems • Energy-efficiency technology	**Measuring and Process Systems** • Balancing technology • Filling technology • Assembly technology • Testing technology	**Woodworking Machinery and Systems** • Machinery and systems for woodworking
Sales: € 1,174.9 million EBIT: € 70.3 million Employees: 3,457	Sales: € 620.3 million EBIT: € 64.1 million Employees: 2,063	Sales: € 185.4 million EBIT: € 3.4 million Employees: 603	Sales: € 511.2 million EBIT: € 64.9 million Employees: 2,279	Sales: € 1,223.5 million EBIT: € 85.7 million Employees: 6,371
DÜRR	DÜRR	DÜRR	DÜRR SCHENCK	HOMAG
Division heads				
 Dr. Jochen Weyrauch	 Dr. Hans Schumacher	 Dr. Daniel Schmitt	 Dr. Jochen Weyrauch	 Pekka Paasivaara

The Dürr Group is one of the world's leading mechanical and plant engineering firms. Business with automotive manufacturers and their suppliers accounts for 55 % of our sales of € 3.72 billion. Other market segments include the woodworking industry and the mechanical engineering sector as well as the chemical and pharmaceutical industries.

Driving Digitization

Nowadays many fly the digitization flag. We do not follow any trend, we shape it. Our digital services help our customers in their work, day after day. Together with our strong partners, we promote digital solutions for the mechanical engineering industry. Our mission remains our drive: Dürr – Leading in Production Efficiency.

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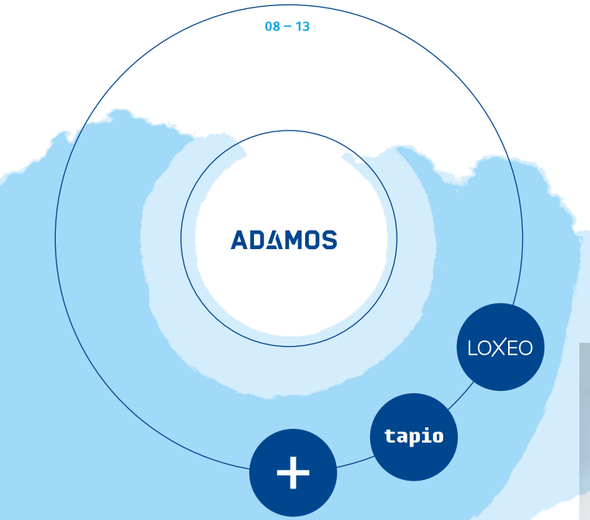

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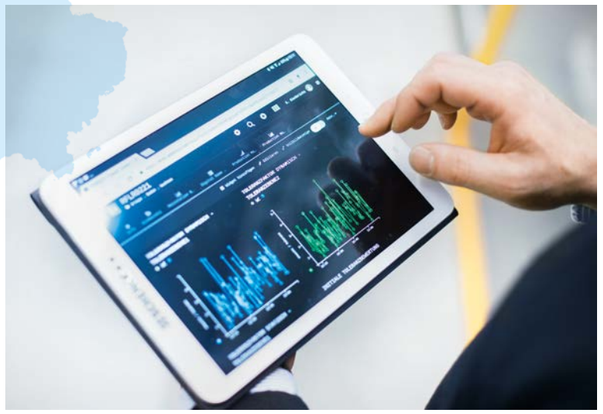

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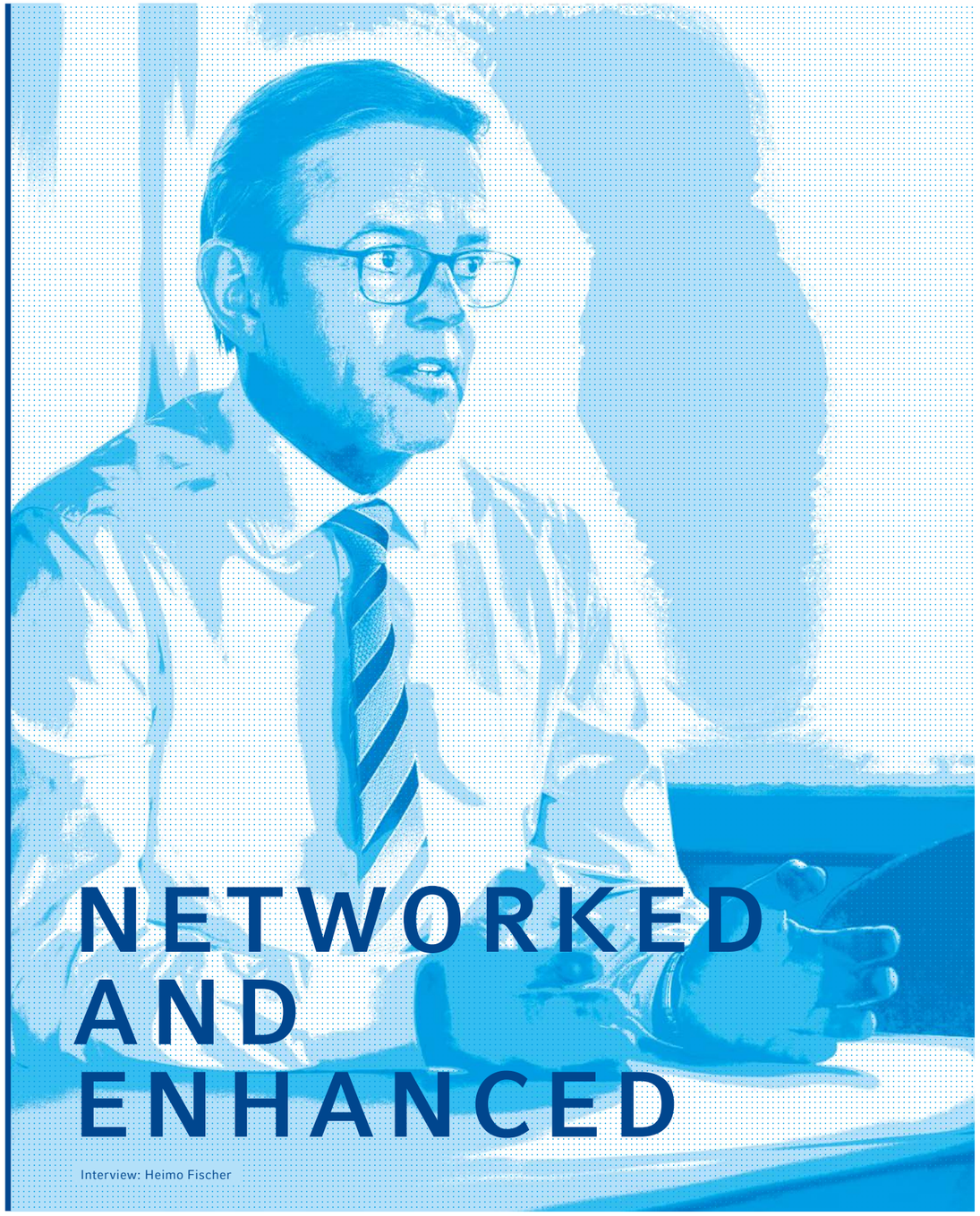


NETWORKED AND ENHANCED

Interview: Heimo Fischer

In the future, machines and systems will exchange data worldwide via the Internet. The technical foundation for this is provided by ADAMOS, a platform which Dürr has developed together with its partners. In the following interview, CEO Ralf W. Dieter explains why this project constitutes a key milestone for the entire industry.

THE ADAMOS PLATFORM IS AN IMPORTANT FUTURE PROJECT FOR DÜRR. WHY?

Machines can be networked through digital platforms. This enables them to exchange information via the Internet, and the machines can thus be operated more efficiently. In mechanical engineering, this is an important trend, which will play a crucial role in shaping the future of this industry. We do not want to leave this development to others, but play an active part in it.

YOUR MACHINES AND SYSTEMS CAN ALREADY SEND AND RECEIVE DATA. WHAT DOES ADAMOS ADD?

Yes, indeed, our machines and systems have been communicating with supervisory control systems, also known as manufacturing execution systems, for many years. So far, this has only been possible within a factory – going forward, it will happen worldwide via the Internet of Things. This means production processes can be compared, machines and systems can be harmonized and their use enhanced. This is the main goal of ADAMOS.

WHAT DOES A DIGITAL PLATFORM LIKE ADAMOS CONSIST OF?

It is similar to the operating system of a computer plus database, with data stored either locally or in a cloud, depending on the customer's requirements. Due to the large number of machines connected within a factory, big data needs to be processed and stored quickly and securely. And this is exactly what the high-performance database does.

» It is similar to the operating system of a computer plus database, with data stored either locally or in a cloud, depending on the customer's requirements. «

THERE ARE ALREADY NUMEROUS PLATFORMS – SOME BY LARGE PROVIDERS. WHY DID YOU NOT JOIN AN EXISTING PLATFORM?

We did not want to become a mere hardware supplier, selling machines but not involved with the future business in digital services. It is therefore important for us to develop the right apps for our customers. ADAMOS helps us, as an independent platform for digitally networked production. The other platforms focus on certain software or technology, sometimes in-house and sometimes from other providers. This makes them inflexible. ADAMOS, on the other hand, is flexible enough to always integrate the best available solution – this is an essential added value!

DO USERS BENEFIT FROM THE FACT THAT YOU ARE A MECHANICAL ENGINEERING FIRM?
Absolutely! Nobody understands our customers' production processes better than us. After all, these customers order innovative systems from us to make their production more efficient. They know and trust us, and we are on the same page. We incorporate this domain know-how in our apps. It's a benefit that only a mechanical engineering firm can offer.

» In a project like ADAMOS, it is good to have other partners on board. Our technology partner, Software AG, is in an excellent position for this, being Germany's second largest software group. «

WHY DID DÜRR NOT DEVELOP ADAMOS ON ITS OWN, BUT TOGETHER WITH OTHER COMPANIES?
This was partly a financial issue. The investments alone are around € 60 million. Although this level of spending would have been possible for Dürr, it would not have been sensible. In a project like ADAMOS, it is good to have other partners on board. Our technology partner, Software AG, is in an excellent position for this, being Germany's second largest software group.

WHAT ROLE DO THE OTHER MECHANICAL ENGINEERING FIRMS PLAY IN THIS JOINT VENTURE?
We are a club of like-minded partners, we feel the same customer expectations and discuss business ideas. We also share existing software components: those who are really good at something allow the other partners to adopt the same solution. This makes us faster and saves development costs. We pursue the same goal with the App Factory: the partner companies provide developers and, together, we launch the apps that don't exist yet.

WHO IS ADAMOS AIMED AT?
ADAMOS is a platform. It is used by mechanical engineering firms as a basis to create their individual digital marketplaces, through which their customers can use the apps. A marketplace can be compared to the homepage of a mechanical engineering firm, where you look for software or information, for instance. An example of this could be an app for the predictive maintenance of machines.

Launching ADAMOS: the representatives of the founding companies, from left to right: Christian Thönes, CEO of DMG MORI AG; Günter Lauber, CEO of ASM Assembly Systems; Ralf W. Dieter, CEO of Dürr AG; Jochen Peter, Managing Director of Carl Zeiss Industrielle Messtechnik GmbH, and Karl-Heinz Streibich, CEO of Software AG.

DOES DÜRR HAVE ITS OWN MARKETPLACE?
Not just one, but two: LOXEO and tapio. The apps offered on LOXEO are designed for customers of the Dürr and Schenck brands, while tapio is aimed at the woodworking industry. All ADAMOS founding partners have their own marketplaces. Aside from these partners, there will be others who will only use the platform for their products. Thanks to ADAMOS, they, too, will be digital enablers for their customers by enabling their networked, digital production. This additional network will be much larger, which is important for us.

WHY?
The more companies connect their machines to ADAMOS, the more customers can use the apps via the marketplaces. In other words: by cooperating in this way, it is much easier to achieve the critical mass a platform needs to be viable.

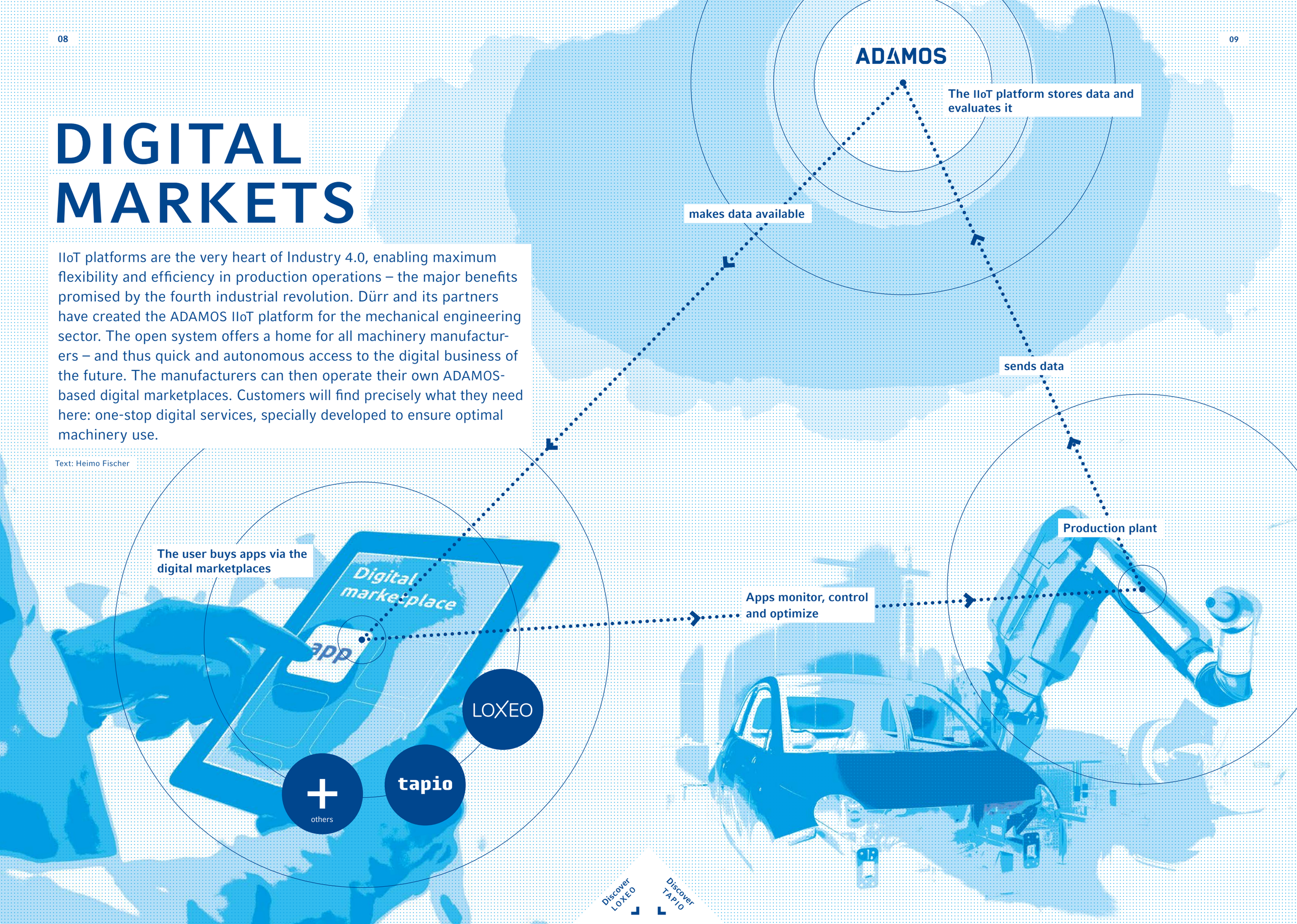
» ADAMOS has the potential to become the industry standard in mechanical engineering, and we want to take advantage of this. «

WHICH PLATFORMS WILL SURVIVE?
I think that only a few will succeed. There will be one or two platforms for individual industries or segments. ADAMOS has the potential to become the industry standard in mechanical engineering, and we want to take advantage of this.

DIGITAL MARKETS

IIoT platforms are the very heart of Industry 4.0, enabling maximum flexibility and efficiency in production operations – the major benefits promised by the fourth industrial revolution. Dürr and its partners have created the ADAMOS IIoT platform for the mechanical engineering sector. The open system offers a home for all machinery manufacturers – and thus quick and autonomous access to the digital business of the future. The manufacturers can then operate their own ADAMOS-based digital marketplaces. Customers will find precisely what they need here: one-stop digital services, specially developed to ensure optimal machinery use.

Text: Heimo Fischer



Machine operators enter the digital marketplaces with a laptop, tablet and smartphone and select the apps that will improve their production operations: LOXEO and tapio are the gateway to a new world. They use a wealth of production data supplied to them by the ADAMOS IIoT platform.

Condition Monitoring
Constant monitoring and quality control of live production operations

Predictive Maintenance
Information on how long is left until the next service, using live data analysis

E-Learning
Digital training for every situation – the system automatically suggests the appropriate module

LOXEO

LOXEO

It is hard to predict when maintenance is required, because some factories run their machines 24/7, while others operate for just a few days a week. Digital assistants are the remedy. They can predict when a technician next needs to visit. This is known as predictive maintenance. Those who have the right app for their machine will receive a suggested date – depending on how intensively the machine is used.

The LOXEO digital marketplace was designed for this and many other services. It is aimed at customers of the Dürr and Schenck brands, many of them from the automotive industry and its supply sector. Some apps are about to be launched, while others are still under development.

For example, LOXEO offers a digital solution that monitors all shopfloor operations. Customers can also automatically investigate individual components of their systems if they are not working properly. New employees are shown how to operate a system in accordance with the specified instructions.

Thanks to LOXEO, customers also receive prompt assistance in cases of emergency: An app investigates the problem in the system and immediately identifies which of the machine manufacturer's departments is responsible. Within seconds, the relevant Dürr or Schenck expert is on the phone.

Help for self-help is available in the e-learning library on LOXEO, which contains a range of training modules. In addition, a program analyzes where there are issues with the system. It then suggests which training module the user should complete to ensure that operations run smoothly in the future.

In order to deliver the digital services, ADAMOS constantly scans the customer's processes and production data. This information is held only by Dürr and the customer. From the very outset, therefore, the customer has sole authority to decide what happens to their data.

SCHENCK

ADAMOS

TAPIO

Like LOXEO, tapio also provides a digital marketplace. The apps available there simplify manufacturing processes and machine maintenance for HOMAG Group customers. However, tapio does not just contain in-house apps and services. It is also available to other companies from the woodworking industry and their suppliers, such as glue manufacturers. Partners also market their own apps via tapio.

It therefore brings machine manufacturers and suppliers from the woodworking industry closer together. Working hand in hand, they can now deliver well-thought-out digital solutions for their joint customers. The result is a diverse marketplace offering digital services and solutions – the "digital ecosystem for the woodworking sector", as it were.

The range of apps on tapio is steadily growing. The MachineBoard, for instance, provides system status information. If machines are down or require a setup change, the operator is notified via a smartphone message. The app offers even more: The operator can, for example, preheat a machine's glueing unit while still at home – and then start work immediately on arrival on the shop floor.

Remote diagnosis of machines that are not working properly is also straightforward. This is handled by the ServiceBoard app, which allows the HOMAG service technician to assist via video link. And if a replacement part is needed? Online access to the aftermarket shop makes the operator's life easier.

Another app helps store important information securely. DataSave enables customers to save their machine data to tapio.

The advantage of this is that manufacturing data is not lost in the event of a fault and is quickly available again.

IntelliDivide is the latest member of the app family on tapio. This optimizes the sawing of wood panels. Customers can, for example, choose among various options: Is the priority for minimal wastage, particularly simple operation or short operating times for the machines? The production program appropriate to the selected option can be launched.

DataSave
Production data is securely stored in the cloud – nothing is lost, even in the event of a fault

IntelliDivide
Optimized panel dividing using smart production programs

tapio

EFFICIENT

»We make wheel/tire assemblies for the automotive industry and deliver them just-in-sequence. It all has to fit together. Thanks to Schenck's digital analytics tools, we can manage and control our wheel production perfectly. This increases the availability and efficiency of our systems.«

Philip Seibt,
Operations Manager, Dirks Group, Emden

Be they mid-sized furniture producers, automotive giants or parts suppliers: all of them rely on our digital services. This makes their production operations more efficient.

Every 8.5 seconds a wheel/tire assembly leaves the assembly line of the automotive supplier Dirks Group in Emden. The plant, which was delivered by our mechanical engineering subsidiary Schenck, fills the tire with air using an inflation ring - it only takes a split second. Digital monitoring ensures the right filling pressure.

»The ›ServiceBoard‹ and the ›MESBoard‹ offered by the HOMAG Group not only provide quick assistance in case of faults. We can also identify the optimization potential in our production in real time. We can access our machinery digitally no matter where we are. This makes us faster and more flexible.«

Adrian Wochner,
Managing Director, Josef Wochner GmbH & Co. KG, Rosenfeld

Josef Wochner GmbH & Co. KG, an efficient producer of furniture and high-tech wood elements, sets standards in the premium segment. The company offers small- and large-batch production as well as customized items. Optimum capacity utilization of machines is ensured via digital monitoring.

The 5-axis processing center automatically processes the 3D models from the engineering department. Any critical conditions are immediately reported via the cloud to prevent any production faults.

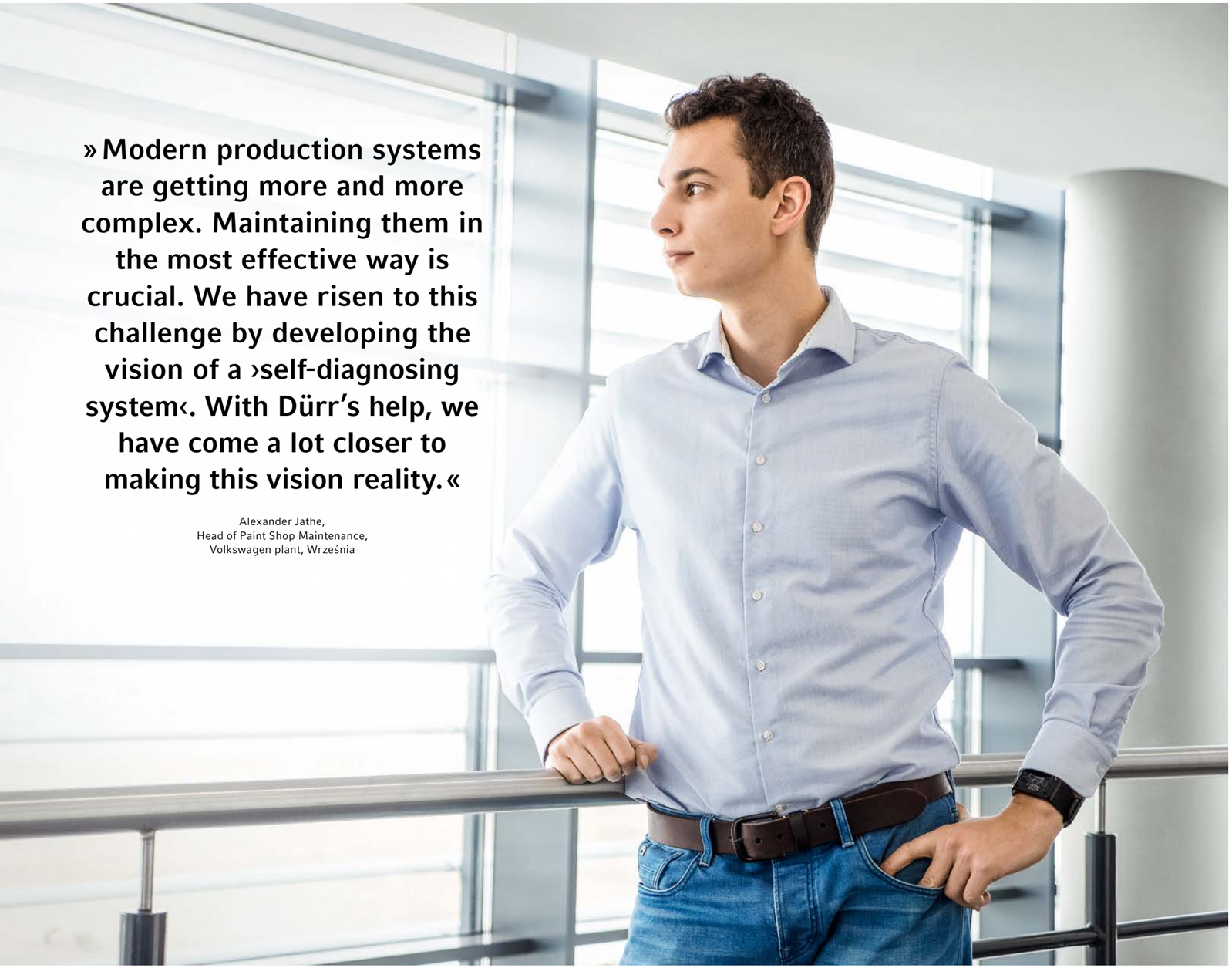
Unscheduled disruptions in the production process are now a thing of the past, thanks to predictive maintenance.

Whether wide or small areas: the **Eco**Bell3 Cx paint atomizer with its variable spray jet is extremely versatile. Thanks to its small electrode ring, it can easily reach less accessible areas.

»BMW has been using our painting robots for many years. Our analytics applications now enable them to tap their full optimization potential. Quality control is only the beginning. Together we are developing and implementing the exact applications and analytics that BMW needs.«

Tilo Eisenhardt,
Key Account Manager, Dürr Systems AG,
Bietigheim-Bissingen

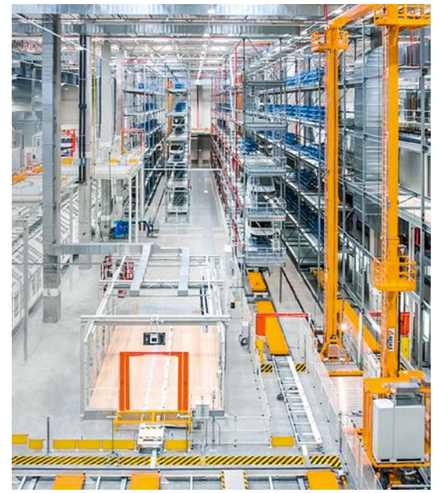
He has been the interface between Dürr and BMW for more than 10 years: Tilo Eisenhardt knows the requirements and processes of the German high-end manufacturer. He coordinates all issues related to the worldwide use of our painting robots.



»Modern production systems are getting more and more complex. Maintaining them in the most effective way is crucial. We have risen to this challenge by developing the vision of a ›self-diagnosing system‹. With Dürr's help, we have come a lot closer to making this vision reality.«

Alexander Jathe,
Head of Paint Shop Maintenance,
Volkswagen plant, Września

Open to digital support while keeping a close eye on the availability of his systems: Alexander Jathe is in charge of paint shop maintenance at the VW plant in Września (Poland).



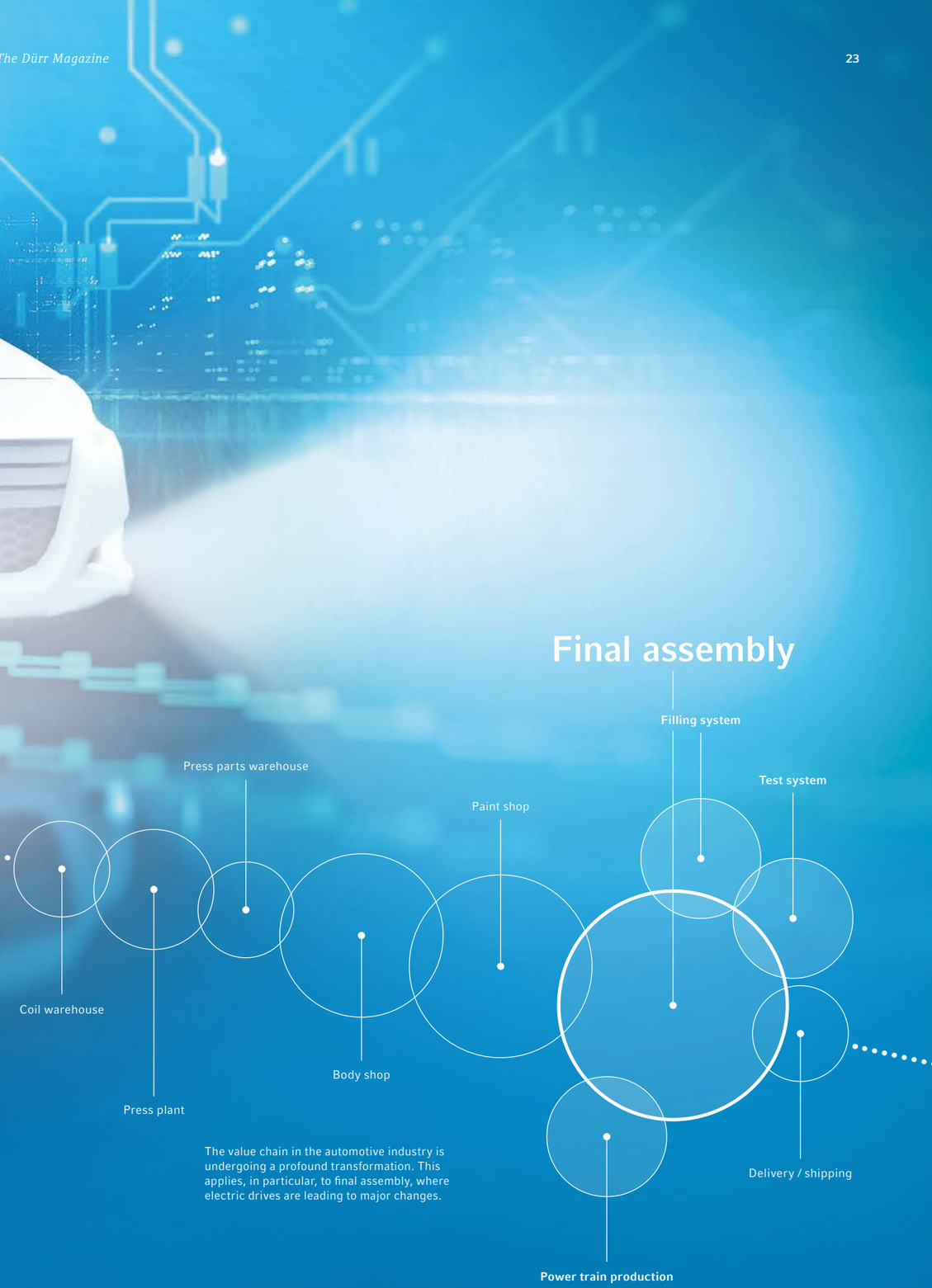
Large dimensions: the paint shop in the VW plant in Września, Poland, is one of the largest projects Dürr has ever implemented.

Rust doesn't stand a chance: once the anti-corrosive coating has been applied to protect its cavities, the body makes its way to the oven at 75 to 100 degrees Celsius.

NEW DRIVE, NEW OPPORTUNITIES

Automakers are investing billions in electromobility – not just in vehicle development, but also in the production plants. That represents a major opportunity for Dürr, because flexible, modular production facilities are required to enable cost-efficient entry into the new mobility era.

Text: Johannes Winterhagen



The value chain in the automotive industry is undergoing a profound transformation. This applies, in particular, to final assembly, where electric drives are leading to major changes.

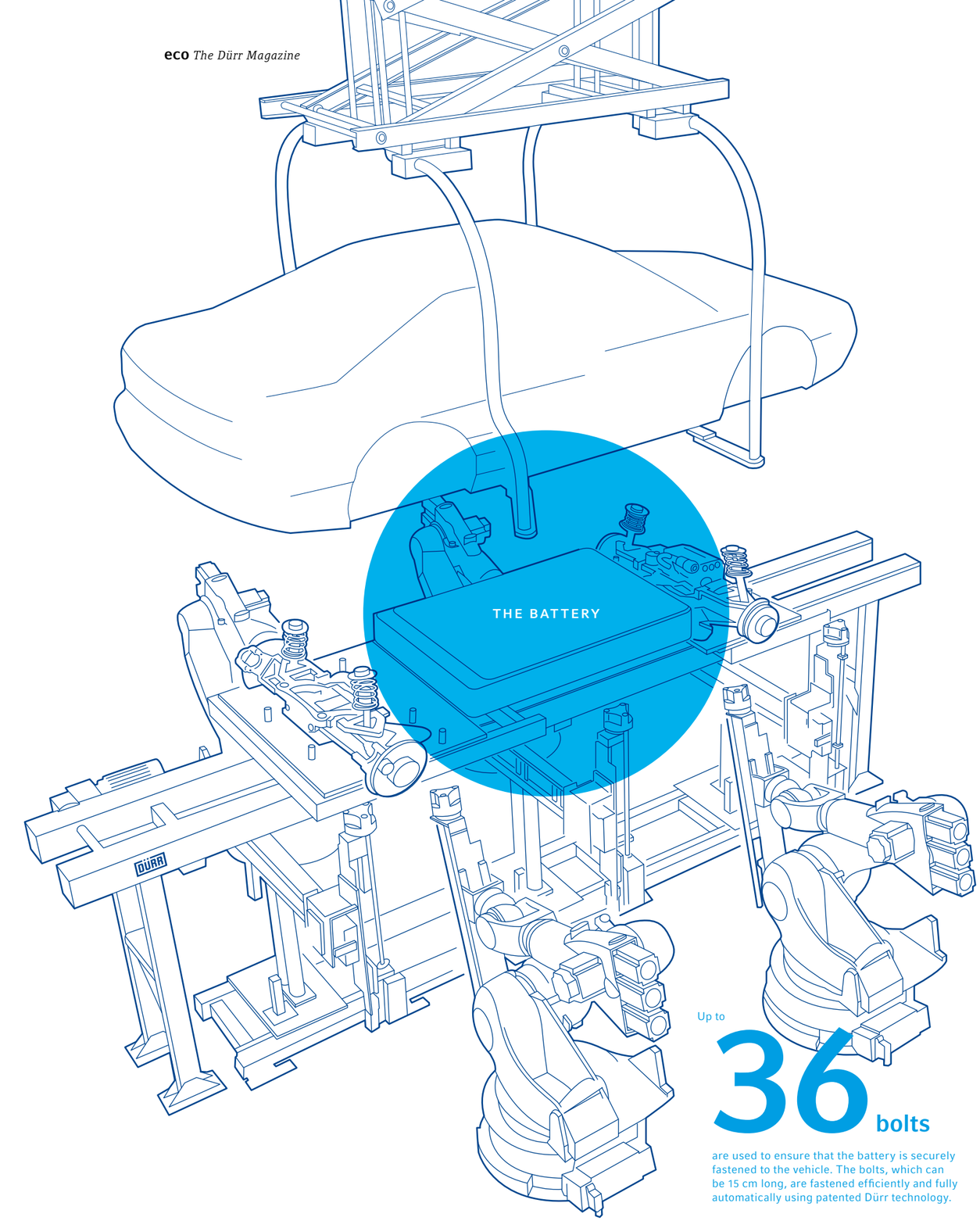
It will have four wheels and also, for the moment, a steering wheel. But the drive, and therefore the entire vehicle concept, will change dramatically. Professional services company PwC estimates that 55 percent of the new vehicles in Europe could be powered solely by electricity as early as the end of the next decade. In China, the largest car market in the world, things could move even faster. A fixed electric quota of, initially, 10 percent has been specified there from 2019 onwards, and the intention is to gradually increase this figure. All of the vehicle manufacturers have responded to this and are working on a new generation of e-vehicles. According to the German Association of the Automotive Industry, German manufacturers alone plan to expand their model range to more than 100 electric vehicles, including plug-in hybrids, by 2020. In addition, startups with no automotive engineering experience, mostly domiciled in California or China, are moving into the market.

HIGH DEMAND FOR NEW SYSTEM CONCEPTS

The changeover to electric cars is a huge challenge for the manufacturers' production planners, who work on a long-term basis. After all, every investment decision being made right now will impact the cars that are expected to roll off the production line in 2025. The gradual changeover to electric drives will not revolutionize the complete automotive production process overnight, but: "Many automakers are currently still working with a mixed production operation, in which up to six different drive variants are built on one line," explains Dr. Johannes Grobe, who is responsible at Dürr for sales of paint shops and final assembly systems. Over the next few years, however, more and more factories specializing exclusively in the production of electric cars will be commissioned. Both strategies harbor challenges. A mixed production system has to incorporate additional process stages, such as fitting the battery, without disrupting the specified production cycle time. For a plant solely manufacturing e-cars, on the other hand, the question arises of the plant's design production volume. In either case, according to Grobe: "Our customers have to be capable of responding flexibly to changing markets. We therefore foresee a high demand for new plant concepts, assisted by innovative technologies." Grobe cites as an example a new oven for paint shops that ensures ideal drying of electric cars, which are designed with lightness in mind, while at the same time having a very small footprint.

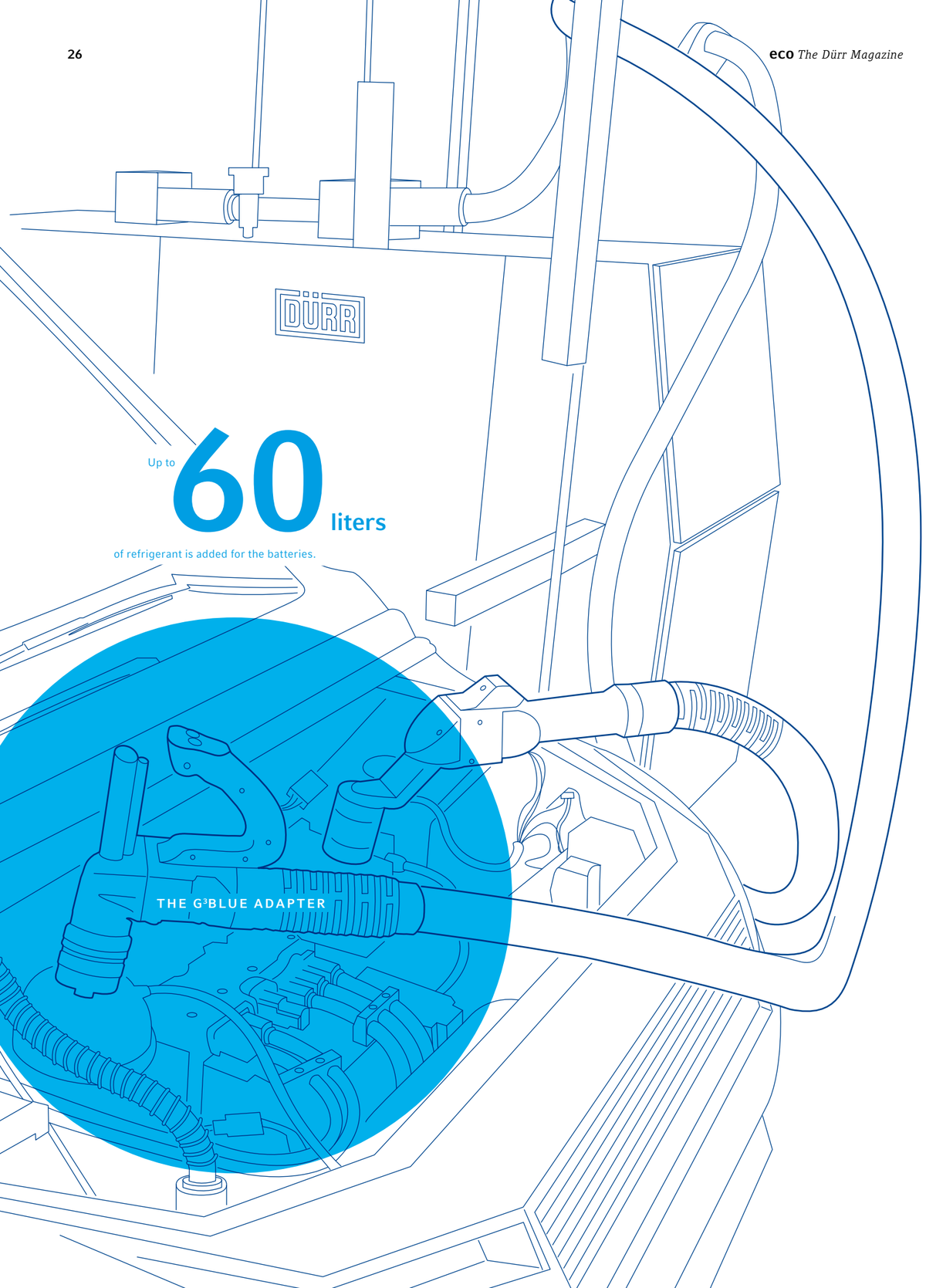
Armin Herrmann, product line manager for assembly lines at Dürr, illustrates what flexibility in final vehicle assembly means, using the example of a "marriage". This romantic term is used by specialists to denote that part of the manufacturing process in which the power train, chassis and body are permanently attached to each other. Extreme precision is called for from day 1 of production, and this same specification then continues for years in an unchanging 60-second cycle. Electrification adds a new

MODULAR MARRIAGE
In automotive terms, "marriage" relates to the stage in which power train, chassis and body are attached to each other. In the age of electromobility, the battery is to become a further element in this permanent connection. Dürr's computer-based technology enables this fully automated assembly process without requiring any additional time.



Up to **36** **bolts**

are used to ensure that the battery is securely fastened to the vehicle. The bolts, which can be 15 cm long, are fastened efficiently and fully automatically using patented Dürr technology.



»The next innovation will be a fully automated filling system, in which the adapter is put in place and removed by a robot.«

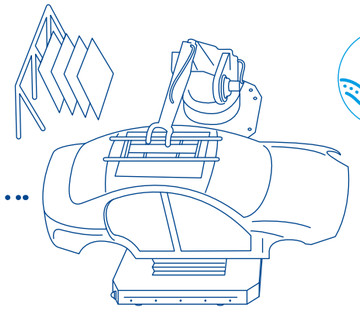
Bernd Preißler,
Managing Director of Dürr Somac GmbH, Stollberg

LOADED
The G³Blue adapter for fully automated filling processes in final vehicle assembly is substantially lighter than previous generations and requires less time. It is also used for filling electric vehicles with the refrigerant required for their batteries.

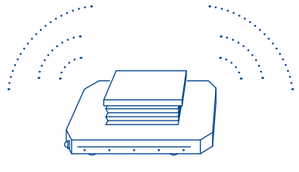
element to that, namely the battery. “The batteries are getting bigger and bigger to enable longer and longer ranges,” explains Herrmann. “They generally take up the entire underbody.” He picks up a roughly 15-cm-long bolt. The battery is secured at up to 36 attachment points. The bolts are not all identical – an additional challenge for the engineer. “Computer-controlled bolting stations mean that the battery can be fitted within the usual cycle time on the line,” says Herrmann. He is particularly proud of a technology patented by Dürr that enables up to four different bolts to be delivered simultaneously and fully automatically to the attachment point.

MODULAR, FLEXIBLE, EFFICIENT
For the final vehicle assembly specialists at Dürr, however, flexibility in automotive production also means being able to very quickly extend and commission production lines or, if necessary, relocate them from one plant into another. This is made possible by ensuring that the systems required for the marriage are constructed entirely in discrete modules. Since each module is self-contained, in terms of both connections and control technology, and has its own base, it can be shipped anywhere in the world as a complete unit. “A line that has already been erected and tested in advance attains full production capacity within two weeks of arrival on our customer’s premises,” explains Herrmann. “The concept has gained added impetus again as a result of the upcoming investments in the production of electric vehicles.”

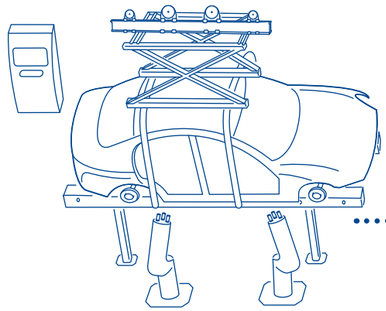
For Bernd Preißler, too, the priority is on producing electric cars as efficiently as possible. In Stollberg, a small town in the Ore Mountains region of eastern Germany, the managing director of Dürr Somac turns to a different matter. The large batteries of future electric cars will have to be kept within a constant, narrow temperature window of between 20 and 40 degrees Celsius in order to retain their full capacity. Up to 60 liters of refrigerant has to be added in the factory. “We’re relying on flexibly operating filling systems to keep to the specified cycle time,” says Preißler. Thanks to their ergonomic design features, patented lightweight adapters used to connect the system and the vehicle will help ensure that the process is conducted both quickly and reliably. An integrated measurement unit will monitor the process and transmit data continuously to the system computer – enabling trouble-free filling operations to be documented. The systems from Stollberg, which are also used to fill the vehicles with brake fluid,



GLUEING
More plastic, less weight. Here, welded seams are replaced by glue points. Another application is glueing windows in vehicles.



AUTOMATED GUIDED VEHICLES (AGV)
Moving to the next production stage without a driver: the small transport vehicles know exactly where to go and always take the car body safely to its destination.



MARRIAGE
Chassis, car body and electrified power train including battery: these elements are married to produce a car. Dürr's computer-based technology enables this fully automated assembly process without requiring any additional time.

transmission oil and refrigerant for air-conditioning systems, are already being successfully used not just with conventional vehicles but also with electric cars. The brake and cooling systems of the StreetScooter electric van developed by Deutsche Post, for example, are filled using systems from Dürr Somac. Preißler is already working on the next innovation in conjunction with a vehicle manufacturer: a fully automated filling system in which the adapter is located by a robot.

BEST CONNECTIONS

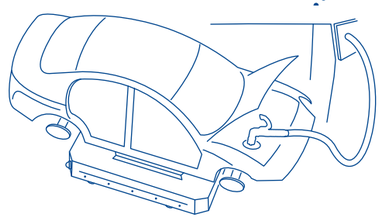
The main implication of extending the range for electric vehicles is that the battery becomes larger and therefore heavier. For that reason, the manufacturers try to save weight wherever possible in the car. Plastics and composites such as CFRP supplement aluminum and steel. The outcome of this on the shop floor is that many connections with these materials can no longer be welded. "In many cases, glueing represents a good alternative to welding or at least supplements mechanical jointing methods," explains Frank Schnur, who is in charge of the development of highly automated glueing systems. However, glueing also plays a critical role with the battery, the heart of every electric car, because the cells which are linked to form A5-sized modules must be securely attached in the battery housing – such that the heat generated during charging and discharging can be dissipated. The cells are therefore embedded in a gap filler. This filler material can weigh up to six kilos per battery – and a corresponding number of systems are needed on the shop floor of an electric car plant. Other battery module components, too – e.g. the cover – are attached using an adhesive and also sealed as a result. "Dürr supplies the battery module manufacturers with the complete one-stop system on request, including the handling and manufacturing execution system," says Schnur.

STRONG PARTNER

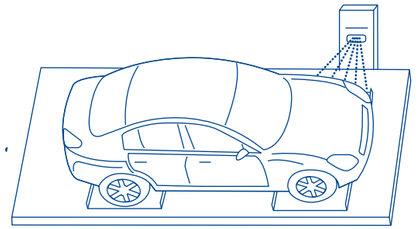
As a supplier of all the systems needed for final vehicle assembly, Dürr is also an attractive proposition for start-ups that are moving into the market with electric cars. The machine and plant engineering company oversees its customers' projects from planning of the initial layout to commissioning – and also subsequently provides downstream services. "We can supply 70 percent of the entire added value between the marriage and the end-of-line testing technology ourselves," says Johannes Grobe, who has extensive experience as a sales manager and constantly receives new inquiries from China. He is also responsible for paint shops, where a turnkey handover is almost the norm. Whether electric cars come to dominate sooner or later is irrelevant for this business field. Both tires and paintwork are absolutely indispensable, whatever other changes may occur.

VALUE CHAIN

Automotive manufacturing is complex. The vehicle must pass by numerous stations before it can finally roll, fully functional, off the conveyor belt. Dürr provides the production technology for numerous stages in automotive manufacturing. Electromobilty mainly affects the final assembly stage. We present our solutions.



FILLING
Brake fluid and other fluids must still be pumped into the vehicle. However, an electric drive has no need for engine oil. Instead, our systems fill the car with refrigerant for its battery.



TESTING
Do the brakes work? Are the headlamps set correctly? Do the distance sensors work properly? Following end-of-line testing, the results are documented.

» We can supply 70 percent of the entire added value between the marriage and the end-of-line testing technology ourselves. «

Dr. Johannes Grobe,
Head of Sales for Paint and Final Assembly Systems,
Dürr Systems AG, Bietigheim-Bissingen

WELCOME

LATERAL THINKERS

The mechanical and plant engineering industry is changing faster than ever. Networked technology is making production operations smart. Eighty people in Dürr's digital factory are the driving force behind this development. Markus Hummel is a member of the management team. The engineer values experience and fresh ideas from young employees, who are keen to shape this change.

Text: Heimo Fischer

DIGITIZATION IS EVOLVING AT AN EVER-INCREASING PACE. WHAT EFFECT DOES THIS HAVE ON THE REQUIREMENTS FOR YOUR STAFF?
The effects are far-reaching. Twenty years ago, automation engineers would pick up the necessary programming skills on the fly – they were generalists. Today, that's no longer enough. We need **#experts** who specialize in certain areas and master them perfectly. For example, they must plan entire software systems and know how the components work together.

ASIDE FROM TECHNICAL SKILLS, WHAT ELSE IS REQUIRED?
Apart from technical qualifications, today's employees must be more creative and open than before. They must identify new trends quickly and be able to assess the opportunities of technical developments. This is because our industry is changing at an ever-increasing pace. And we want to help shape this change – through fresh and unconventional ideas. We therefore welcome **#lateral thinkers** as part of our team.

HOW HAVE PERSONALITY REQUIREMENTS CHANGED?
Communication skills have become particularly important. In a complex digital project, nobody knows every single detail. Specialists are mainly familiar with their own fields. They must therefore be able to describe accurately and clearly what they are working on and what their issues are. Only then can managers keep track of what's going on and lead the team successfully.

Markus Hummel
Department Head Software Engineering & Solution Development

The mechanical engineer has been with Dürr for 17 years. He is heavily involved in manufacturing execution systems but also more complex programs used for controlling and managing the production processes of entire factories. At Dürr's digital factory, Hummel is also responsible for developing digital products – one of the Group's most important areas of the future.

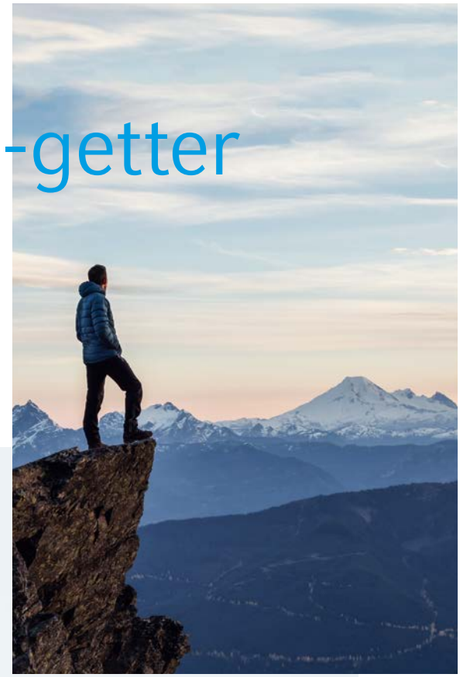
WHY DO YOUNG IT EXPERTS OPT FOR DÜRR?
Because we work on the big ideas of the future. We are quite similar to the well-known software and Internet companies. But I believe that the work here is more exciting. Apart from the new and further development of our products, we also work closely with our customers and adapt our software to their requirements. To this end, we need to travel to their production sites. When you work with us, you also see the world.

#experts

#JulianSpöcker

#IoTconqueror

#go-getter



#lateralthinkers

#digitalnative

NEW PROTOTYPE
Digital transformation will only happen with the help of qualified people. This is why the Group is preparing employees specifically for the digital workplace. Julian Spöcker is one of them.

Julian Spöcker is only 30, but he already has a keen knowledge of the HOMAG Group. The Dürr subsidiary builds woodworking machinery, which can be found in factories and workshops all over the world. Today, these systems can do much more than just saw, drill and glue. They are networked and produce furniture automatically – almost as if by magic.

Spöcker is passionate about his work. During the interview, he keeps reaching for his marker and going up to the wall to draw squares, circles and arrows on the whiteboard. The machine here, the customer there. Here is the digital platform that connects furniture producer, mechanical engineering firm and supplier. And there is a digital marketplace, which can be accessed using a cell phone or tablet.

#1987: Born in Freudenstadt (Germany)
#2008: Joined the HOMAG Group
#2011: Completed his cooperative state university bachelor's degree
#2011: Started in Life Cycle Service at the HOMAG Group
#2015 Completed his cooperative state university master's degree
#2017: Began working on tapio

tapio offers such a digital marketplace and brings different companies from the woodworking industry together via the Internet of Things. "tapio helps the woodworking industry to take the next step on their digitization journey", says Spöcker – and talks about a whole evolving ecosystem.

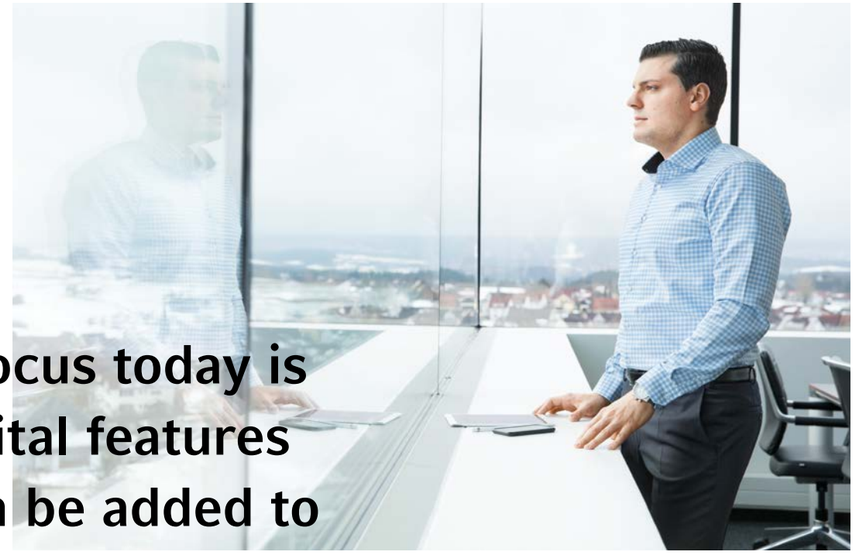
tapio helps customers analyze their production, plan more flexibly and video call service engineers. Going forward, the plan is to add more features. It will be possible to predict exactly when maintenance is due and to optimize production. Spöcker heads up the tapio sales operations, but his responsibilities are not limited to selling: one of the key tasks for his team is, together with partners, to develop digital products for the woodworking industry.

FRESH IDEAS FOR THE TRANSFORMATION

In the traditional mechanical engineering sector, this is not a classic approach. Here, high-quality technology has always been developed in-house over many years and then sold. "Nowadays, applications are often tested at the customer's site early on, and improved together", says Spöcker. It's a way of working that he is used to.

Experienced engineers regard Spöcker more as a lateral thinker. But people like him are needed more than ever. Everyone knows this industry is undergoing far-reaching change and that fresh and unconventional ideas are important. "I'm keen to help develop them", says Spöcker and laughs.

Dürr is specifically promoting employees like him. The industrial engineer, specializing in mechanical engineering, began a cooperative state university program with the HOMAG Group after finishing high school with an IT qualification. During his cooperative studies, university lectures alternated with practical sections – which even took him to Singapore for several months. While studying, Spöcker was already exploring whether Facebook or Twitter could be used to boost sales in mechanical engineering. He smiles. "The time was not yet ripe for it."



»The focus today is on digital features that can be added to machines at a later stage.«

Julian Spöcker, Head of Sales at tapio

SUCCESS AT THE DEEP END

Spöcker's first permanent job with the HOMAG Group threw him in at the deep end. He was tasked with introducing a digital system for worldwide customer service. Remote maintenance, service tickets, the engineers' work – all of which was to be handled uniformly. He visited 14 foreign subsidiaries, traveling as far as Australia, to train his colleagues. "There I was dealing with experienced engineers." They were used to doing their own thing and were thus skeptical toward him. Did he have to prove himself? Spöcker nods.

He completed the job successfully and was motivated by his colleagues' praise. He had also gained valuable knowledge. "I learned what needs our customers have." Today, he is often approached for internal advice – even by more experienced colleagues. Sometimes he joins members of the Board of Management around the conference table. A good opportunity to show what he can do.

GO-GETTERS WELCOME

Over the next few years, Spöcker would like to build and manage a market segment. In a mid-sized but global company such as Dürr, this is not a pipe dream, but a realistic goal. Go-getters are welcome. Alongside his job, he also completed his master's degree in international management three years ago. The Group supported him in gaining his second degree – also financially. Spöcker believes that "here, everyone is given the opportunity to achieve something."

HIGH-LIGHTS 2017

JANUARY

New member on Board of Management

Dr. Jochen Weyrauch joins the Board of Management on January 1, 2017. The Board of Management is thus increased to three members in view of the Group's strong growth.

FEBRUARY

We open a modern campus site for around 1,100 employees in Shanghai-Qingpu. There we combine our Chinese activities in the painting and environmental technology field. Customers benefit from extensive opportunities for product testing and training. The investment volume amounts to around € 25 million.

Successful financial year 2016

We announce two record figures for fiscal 2016: incoming orders increased to € 3,701.7 million, while EBIT rose to € 271.4 million.

MARCH

New CFO

On March 1, 2017, new CFO Carlo Crosetto takes over from Ralph Heuwing, who has been on the Dürr AG Board of Management for ten years.

New owner

We sell our cleaning technology business, Dürr Ecoclean, to the Chinese mechanical engineering firm, SBS Group. The new owner offers better growth opportunities for this business. Dürr retains a 15 % stake in Ecoclean.

Somersault

Dürr gets things rolling: car bodies with lengths of up to eight meters will soon be rotating in the dip tank of Daimler's paint shop in North Charleston (USA). The **Ecopaint RoDip** rotational dip process ordered by the carmaker is commonly used for passenger cars; for the first time, we now offer it for commercial vehicles of this size.

ONE HOMAG

From now on, every machine from the HOMAG Group will bear the HOMAG logo. Previously, some subsidiaries operated under their own brands. Customers now increasingly perceive the HOMAG Group as a strong unit. This single-brand strategy is supported by a new website.

1

MAY

Dürr AG pays a record dividend for fiscal 2016: our shareholders benefit from our corporate success through a dividend of € 2.10 per share.

Ready to spray 1

The "ready2spray" painting robot for general industry is the result of our cooperation with our partner Kuka. The advantage: the technology is ready for use straightaway. Previously, companies wishing to automate their paint shops had to buy the robots and application technology separately before integrating them. The ready2spray robot is suitable for wood, plastics, glass and metal, among other materials.

Large order from China

Chinese furniture manufacturer Oppein orders 307 individual machines worth a total of over € 30 million from the HOMAG Group. Together with the systems already installed, the customer's production facility now consists of more than 1,000 HOMAG machines

Fit for the future

Investments at the HOMAG Group in Holzbronn: we are spending around € 8 million to make this site fit for the future. Among the new features are an optimized production facility and a showroom.

2

Revolution at Ligna 2

Digitization with "tapio": the world's first IIoT marketplace for the woodworking industry attracts much attention at the leading trade show in Hanover. Being the largest exhibitor, the HOMAG Group registers strong demand for this innovative solution. tapio enables woodworking businesses, machine suppliers and partner companies to create a digital network via cloud connectivity.

JUNE

Second World Excellence Award

We are presented with the World Excellence Award by Ford for the second time in a row. We receive the award for expanding Ford's paint shop in Valencia (Spain) and for developing environmentally-friendly and flexible production concepts together with the US carmaker.

JULY

Global Champion

Volkswagen presents us with its Group Award 2017 for outstanding achievements. Special mention is made of our work as a general contractor in the construction of turnkey paint shops.

AUGUST

Inner heat

We present **Eco**InCure, an innovative curing process for automotive painting. It heats and cools car bodies from the inside for the first time. It also features a new transverse mode of operation, which makes systems more compact and lowers energy consumption by 25 %.

SEPTEMBER

We present ADAMOS, a platform for the Industrial Internet of Things, specially tailored to the mechanical and plant engineering sector and its customers. The founding members of the ADAMOS alliance are Dürr, DMG Mori, Software AG, Carl Zeiss and ASM PT. ADAMOS is launched on October 1, 2017, with 200 experts.

Pure Passioneering

Dürr stands for fascinating technology, innovation, passion and international reach. We position ourselves as an attractive employer by realigning our employer brand with these values.

OCTOBER

Change on the Supervisory Board

Klaus Eberhardt announces his plan to step down as Chairman of the Dürr AG Supervisory Board at the end of 2017. The Supervisory Board elects Karl-Heinz Streibich, CEO of Software AG, as his successor.

3

Go West

International success story made in Germany. The 11,000th Dürr painting robot made in Germany is now in Mexico, painting vehicles for Japanese carmaker Nissan.

Tester on board

Schenck strengthens its international presence in testing and balancing technology through the acquisition of US company Test Devices Inc. (TDI). TDI is a leading service provider for high-speed rotation testing in the aviation, automotive, energy and medical technologies.

More orders, more sales

We increase our forecast for 2017: we readjust our target range for incoming orders, which has previously been between € 3.3 and 3.7 billion, to between € 3.6 and 3.8 billion; we also raise our sales target, previously between € 3.4 and 3.6 billion, to between € 3.5 and 3.6 billion.

NOVEMBER

Shareholders rate Dürr higher than ever – the share price rises to € 120.55.

Dürr Challenge celebrates anniversary 3

To celebrate the five-year anniversary of this film competition, we send student teams, along with their camera equipment, to Tokyo, London and Silicon Valley. And the winner is... Silicon Valley!

Key supplier

The PSA Group names us one of its key suppliers. With its Peugeot, Citroën and DS Automobiles brands as well as recently acquired subsidiaries Opel and Vauxhall, PSA has been one of our most important customers for decades.

DÜRR AT A GLANCE

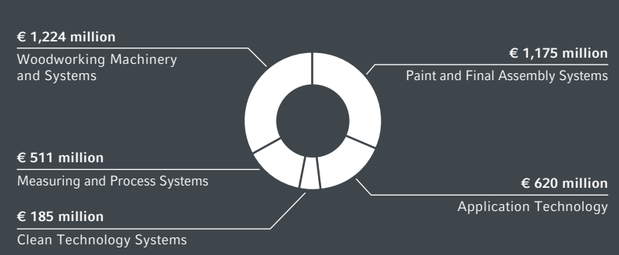
KEY FIGURES (IFRS)

		2017	2016	2015	2017/2016 Change in %
Incoming orders	€ million	3,876.0	3,701.7	3,467.5	4.7
Orders on hand (Dec. 31)	€ million	2,516.3	2,568.4	2,465.7	– 2.0
Sales revenues	€ million	3,715.4	3,573.5	3,767.1	4.0
of which abroad	%	86.9	84.8	86.0	2.1 pp
EBIT	€ million	289.6	271.4	267.8	6.7
EBIT before extraordinary effects[1]	€ million	281.8	286.4	294.3	– 1.6
EBT	€ million	269.9	258.1	244.5	4.5
Net profit	€ million	201.5	187.8	166.6	7.3
Cash flow from operating activities	€ million	119.8	227.4	173.0	– 47.3
Cash flow from investing activities	€ million	– 17.2	– 116.9	– 94.4	
Cash flow from financing activities	€ million	– 152.2	192.5	– 162.4	
Free cash flow	€ million	14.3	129.9	62.8	– 89.0
Equity (with non-controlling interests) (Dec. 31)	€ million	903.7	831.0	714.4	8.8
Net financial status (Dec. 31)	€ million	191.5	176.5	129.4	8.5
Net working capital (Dec. 31)	€ million	362.1	194.4	236.8	86.3
Employees (Dec. 31)		14,974	15,235	14,850	– 1.7
of which abroad	%	47.7	46.1	46.0	1.6 pp
Gearing (Dec. 31)	%	– 26.9	– 27.0	– 22.1	0.1 pp
Equity ratio (Dec. 31)	%	26.5	24.8	23.9	1.7 pp
EBIT margin	%	7.8	7.6	7.1	0.2 pp
EBIT margin before extraordinary effects[1]	%	7.6	8.0	7.8	– 0.4 pp
ROCE	%	39.5[2]	41.1[2]	45.3	– 1.6 pp
EVA	€ million	145.5	142.5	146.2	2.1
Dürr stock (ISIN: DE0005565204)					
High[3]	€	120.55	79.95	109.80	
Low[3]	€	74.00	49.52	58.22	
Close[3]	€	106.55	76.35	73.60	
Number of shares		34,601,040	34,601,040	34,601,040	
Earnings per share	€	5.62	5.26	4.67	6.8
Dividend per share	€	2.20[4]	2.10	1.85	4.8

[1] Extraordinary effects: € +7.8 million (2017), € –15.0 million (2016), € –26.6 million (2015)
[2] Adjusted for the effects of the sale of Dürr Ecoclean
[3] XETRA
[4] Dividend proposal for the annual general meeting

€ 3,876 million
Incoming orders reached an all-time high in 2017

2017 SALES BY DIVISION



14,974
Employees worldwide

2017 SALES BY REGION

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