

MOBILITY WORLD ^{2/24}

The FERCHAU Automotive magazine



Left can do what the right can

Ambidexterity stands for the ability to react flexibly and effectively to challenges. Why ambidexterity is crucial for sustainable success for athletes and companies alike:

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Specialists in on-board
wiring systems

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Legal notice

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Pressure from the Far East

Dear readers,

A brief look back: In the last issue of MOBILITY WORLD, I spoke here about the Year of the Dragon, which will be celebrated in China in 2024. In many parts of Asia, the dragon symbolises strength, energy and vitality. A fitting analogy, especially for the automotive industry, where Chinese manufacturers are preparing to conquer Western markets with technically mature electric cars.

Much has happened since then: Taylor Swift was in Germany. Nothing to do with China's offensive, of course, it was simply a huge talking point among friends, family and colleagues. The European Football Championship also took place in Germany. And that has more to do with China. BYD, one of the fiercest competitors from the Far East, was one of the main sponsors. And most of the non-automotive companies that had booked perimeter advertising in German stadiums also came from China. **A clear signal to domestic manufacturers: Batten down the hatches!** Chinese manufacturers continue to exert pressure, particularly in the automotive sector. Now, even with the customs debate and volatile sales figures for electric cars, Chery is another serious volume manufacturer bursting into the German market.

I am particularly pleased that MOBILITY WORLD's editors have pulled off a real coup. **We managed to attract one of the most important representatives of the Chinese automotive industry for an interview: William Li, founder and CEO of the manufacturer NIO.** Anyone who has strolled through a major European city during the summer holidays may have seen one of the new, stylishly designed NIO Houses that Li is opening in prime locations all over Europe. Germany alone already has four: in Berlin, Hamburg, Düsseldorf and Frankfurt. In this interview, William Li explains his strategy and what is important when rolling out electromobility. Extremely interesting and informative!

And why are the Chinese so successful, apart from what seem to be substantial state subsidies? Because they react flexibly to challenges. Because they usually offer everything – car, software, batteries and microchips – from a single source and



» **And why are the Chinese so successful, apart from what seem to be substantial state subsidies? Because they react flexibly to challenges.**

obviously don't go overboard like some European manufacturers. **The secret is: ambidexterity.** You can find out what this is all about and what China's car offensive has to do with an ambidextrous tennis player in a fascinating essay at the beginning of this issue.

Enjoy reading!

Yours sincerely,

Bernd Gilgen
Managing Director FERCHAU Automotive

«LEFT CAN DO THE THE



Cover story: Ambidexterity

Ambidexterity, symbolized here in the picture by a tennis player, originally meaning using both hands equally well. However, ambidexterity today has a much broader meaning: the flexibility of companies to be successful in several technology disciplines at the same time – in other words, in principle, to be able to serve »left and right«.

WHAT RIGHT CAN»»

Ambidexterity is a somewhat unwieldy word – and it is the key to success in sport as well as in business. Ambidexterity stands for the ability to react flexibly and effectively to challenges.

It's 1980 and Luke Jensen tosses the yellow felt ball up into the sky over Michigan. Nothing unusual about that movement, as it happens. US teenager Jensen is one of the best young tennis players in the world. In 1984, he was ranked number one in the junior world rankings and later even won the French Open in the men's doubles with his younger brother Murphy. But that day at a youth tournament, Luke Jensen tossed the ball up with his right hand and smashed it over the net with the racket in his left hand. A left-handed ace – even though Jensen is naturally right-handed. His nickname was born: **Dual Hand Luke. Jensen was the first tennis pro in the world to play with both hands equally well.**

But one thing that Dual Hand Luke, now aged 58 and a motivational speaker, did not yet know at the time: his impressive ambidexterity also made him a role model for managers and management consultants. The pressing challenges posed by all-encompassing digitalisation, the increasing influence of AI on many business models and growing competition from Chinese rivals are combining to force German companies to increasingly need to multitask. They need to become much more flexible and efficient. New business segments must be driven forward intelligently, quickly and effectively – without jeopardising the core business. The technical term for this is **organisational ambidexterity.**

That means: companies also need to train ambidexterity. »Organisational ambidexterity is becoming a survival factor«, says Claudia Schmidt, Managing Director of the consulting firm Mutaree, which specialises in change processes in companies. »Ambidexterity and simultaneity will determine how we organise our life in the future. Companies must successfully find an added value framework for combining adaptation and innovation.«

In short, companies must be able to play »left and right« equally well. This is already extremely difficult for the individual. **Through a mixture of physical exercises and mental training – known as »deep learning« – it is possible to form and activate new cross-connections from the right to the left hemisphere of the brain.** Neuroscientists have discovered that this allows unfamiliar movement patterns to be automated.

The automotive industry shows just how challenging this can be for companies. **Manufacturers and suppliers need expertise outside their comfort zone.** If they are to be able serve ace after ace, like tennis player Jensen, they must become specialists in battery cells, for example. Or a microchip manufacturer. Or an independent software house that programs algorithms for the mobility of tomorrow.

This leads to disruptive upheavals. Volkswagen has founded its own software company, CARIAD, but it is also struggling with problems in the traditional automotive business. The start of production of some prestigious new models, such as the Audi brand, had to be postponed time and again, partly due to software delays. In fact, everyone's in the same boat. Mercedes recently cancelled its plan for a fully electric vehicle generation from 2028. The challenge is practising a successful mix of familiar patterns of action (right-handed serving, or developing premium cars) and a willingness to take risks to innovate (left-handed serving, or developing software, battery cells and chips).

The realisation that newly trained skills create advantages is almost as old as life itself. In fact, the actual pioneer of this deep learning practised his ambidexterity training in the depths of the oceans. 450 million years ago, when all life resided in the water, **the Placoderm** armoured fish evolved novel fin movements over many thousands of years in coordination with its sense of balance. It's clear where this path led: ashore. Figuratively speaking: to conquer a new market.

Not everyone has as much time as the Placoderm though. Or the time off. **Ambidexterity is hard work.** Tennis player Luke Jensen also proved this. The son of a gymnastics teacher, he spent every spare minute of his youth in the sports hall at East Grand Rapids High School in Michigan. There he smashed ball after ball against the wall. 7,000 serves a week without shying away from setbacks of temporary failure or sore muscles. Until he was able to serve aces with the yellow felt ball using his left hand as well as his right. Becoming an ambidextrous ace himself in the process. //

Luke Jensen, 58, is a former professional tennis player. The American is best known as »Dual Hand Luke« because he played with both hands equally well, even changing his playing hand during a match.



Everything is on the move

People have to coordinate up to 650 muscles when they move – no wonder footballers often struggle with their left foot. Movement researcher Prof Thomas Schack from Bielefeld University explains how the principle of ambidexterity is related to a 450-million-year-old Placoderm armoured fish.



Thomas Schack is one of the foremost internationally renowned researchers on the human musculoskeletal system. As a professor at the Faculty of Psychology and Sports Science at Bielefeld University, he heads the »Neurocognition and Movement« department, where he investigates the »neurocognitive architecture of complex movement sequences«. Prof Schack is also a trained car mechanic and the proud owner of a 2008 Ford Mustang Bullitt, a replica of the legendary film car from the Hollywood classic »Bullitt« starring Steve McQueen.

Prof Schack, there is a nice quote from the former football coach Giovanni Trapattoni from his time in Stuttgart in 2006: He talks to his grandchildren in Italy on the phone every day and always asks them two things: Firstly, »Have you done your homework yet?«, and secondly, »Have you shot with your left foot today?« Was Trapattoni ahead of his time? According to a study, around 80 per cent of professional footballers are right-footed, even today.

(laughs) Of course! The realisation that you can, as a right-hander or right-footer, also train the other side, is older. As far back as the early 20th century, the first attempts were made to consciously transfer from one side to the other through practice. In professional football, however, the trend of training on both sides seems to be something of a novelty.

Together with Matthias Nowak, the former technical and creative coach of FC Bayern Munich, you have developed a new training scheme for two-footedness. So it seems that Trapattoni's advice to his grandchildren to »shoot with the left« is not enough?

It's all about effective resource management. It's not enough to just shoot a thousand times with your left foot to train your two-footedness. I have to be able to use the newly acquired »left-footed shot« resource in the relevant situations in the game. Deep learning is a key to this. Using varied exercises. For example, moving the ball alternately and purposefully with both feet in a certain rhythm, creating additional challenges. These can be simultaneous hand movements or cognitive tasks. Such perception and coordination tasks strengthen neuronal cross-connections from the right to the left hemisphere of the brain.

And then as if by magic you shoot left-footed?

This is a very complex process. The human body uses around 650 muscles to move. We have learned a differentiated organisational or movement planning system to do this. This then has to be partially rebuilt for the left-footed shot.

Companies are also proving themselves in new disciplines. Car manufacturers suddenly have to be software developers, battery manufacturers and sharing service providers.

However, companies often do not really come to terms with the new roles they are suddenly expected to take on. Ambidexterity offers the same advantages in business as it does on the football pitch: I give myself more room for manoeuvre.

I make new connections and become more confident in my domain. The key is to automate new patterns of behaviour. And if the first left-footed shot doesn't work, don't immediately plunge yourself into crisis mode.

You are a trained car mechanic. When we first contacted you, you were out and about in your Ford Mustang. How important is your research for the automotive world?

A vehicle's cockpit is also about motion sequences, about motorised impulses within a moving car. For example, the perception and accessibility of on-board instruments is crucial – and how harmonious the corresponding movements feel. In my experience, there is still potential here.

Tell us more.

With many movements, we do not control these consciously, but automatically. When I write by hand, for example, I no longer think about tensing my shoulders or coordinating my arm, wrist and fingers. This is also the case in football; certain dribbling and shooting movements are automatic. On the other hand, all functions in cars are now often managed via touchscreens or even gesture control. I sometimes find this stressful. It often feels alien from a sensory point of view and there is hardly any tactile feedback. I often prefer to press a button, move or turn a control.

The Placoderm was also mentioned in your study. It lived 450 million years ago and could also use both feet equally – or rather, flippers?

(laughs) You could say that. The Placoderm armoured fish was the very first creature that was able to perform cyclical and bilaterally coordinated movements. The nervous system developed in this way was an essential step for its later movement on land, if you like. If it hadn't developed targeted movement sequences, life would never have moved on from water to land. And we wouldn't be talking about two-footed footballers today either. //

Never odd or even

What do the climbing onion, Johann Sebastian Bach and this seemingly meaningless headline have in common? **Your ambidextrous qualities**, i.e. being able to approach things from both the left and the right.



Word acrobatics

»Never odd or even« – our headline is a palindrome. This is the name given to a word or phrase that reads the same, both forwards and backwards. In other words, when a word backflips and still looks the same. Palindromes show in language what footballers have to painstakingly learn on the pitch: to express oneself equally fluently using left or right. Have a look at what must be a candidate for one of the longest English language palindrome sentences, by Scottish poet Alastair Reid – 22 (!) words long: **»T. Eliot, top bard, notes putrid tang emanating, is sad; I'd assign it a name: gnat dirt upset on drab pot toilet.«**



What a whirlwind

The wind blows where it wants. This is what it says in the Gospel of John in the Bible. But how it blows, whether from the left or right, or behind or in front, is often not haphazard. Hurricanes, for example, can be left or right. However, their direction of rotation depends on the Earth's rotation – and then stays that way: they always rotate anti-clockwise in the northern hemisphere and clockwise in the southern hemisphere. The same applies to eddies in the ocean. **Physicists call this phenomenon the Coriolis force.** The keyword is earth's rotation: viewed from the North Star, the Earth rotates anti-clockwise around its own axis. Fortunately, it is not ambidextrous and does not change direction. Almost all the planets in the solar system do the same as Earth. Only Venus steps out of line; it is the only planet that orbits clockwise.



Penalty!

»Others bring up their children bilingually, I bring them up bi-footedly.«

This quote comes from former Bundesliga football coach Christoph Daum. In fact, training two-footedness is no longer something special, but an integral part of youth team training programmes. The role model for this is the recently deceased Andreas Brehme. He scored the DFB team's winning penalty in the 1990 World Cup final against Argentina. Brehme coolly shot with his right foot. Four years earlier, in the World Cup quarterfinal against Mexico, Brehme had scored a penalty with his left foot. A record that still stands to this day: no other player has ever scored penalties at a World Cup using both left and right foot.



Left hand number

Here in Germany, the traffic rule is: right before left. But also worldwide: right as well as left. **Around two thirds of the world's population drive on the right-hand side of the road, while one third drive on the left.** In some countries, drivers have even experienced both. In 2009, for example, the island state of Samoa switched from driving on the right to driving on the left overnight. The government hoped that this would lead to cheaper car imports from neighbouring Australia, who drive right-hand drive models. Eleven years later, the Swedish car manufacturer Volvo applied for a patent for a kind of »ambidextrous cockpit« that the people of the Samoa Islands could have used: a movable steering wheel that can be placed anywhere on the dashboard.



Up the pole

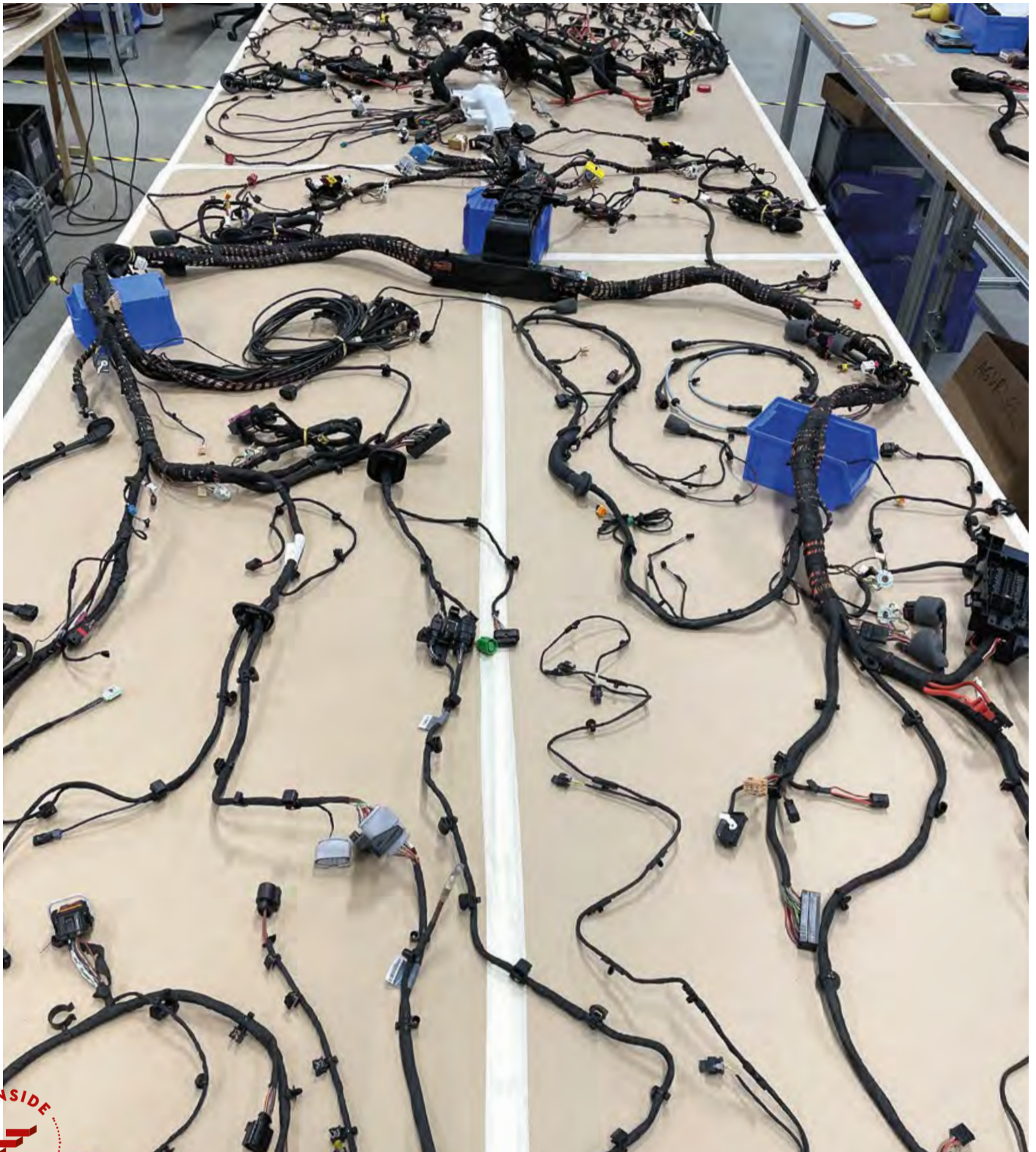
Some plants also have a preference for right or left. For example, there are right-hand and left-hand winders as well as climbing plants that wrap around a branch in both directions. These include the field knotweed and the climbing onion. The two are therefore true **»ambidextrous plants«**. The decisive factor for categorisation is whether a plant as seen from above – the »botanical perspective« – winds around a pole in an anti-clockwise or clockwise direction. The majority of bindweed plants belong to the left-handed bindweed family, for example the runner bean or field bindweed. Right-hand winders are clearly outnumbered botanically. The most prominent example is hops. And: those who savour too much of the fermented hop juice often no longer know which is left or right...



Good notes!

Eddie Van Halen is considered one of the greatest guitarists of all time. The musician, who died in 2020, and his band Van Halen, created global hits such as the rock anthem »Jump«. He also made **»two-handed tapping«** world-famous. This involves pressing the strings onto the guitar's fingerboard with the fingers of both hands to produce particularly fast melodic sequences. A stroke of musical genius. But by no means the first. Three years before his death in 1750, the German composer Johann Sebastian Bach created **the ambidextrous composition »The Musical Offering«**, which features what is known as a crab canon: a melody that sounds harmonious when played forwards by one musician and backwards by another.





They've got a lot of nerve!

The wiring system is the modern car's nervous system.

If it weren't for wiring harnesses and control units, no engine, no ABS and no battery would work. FERCHAU Automotive specialises in developing such highly intricate systems. ***Now the company is even building test benches in its own factory.***

Andreas Gradziski stands in front of a large table. On it is spread out the soul of a vehicle. Grand words, but those of Gradziski himself. Gradziski, Division Manager Vehicle Integration and Protection at FERCHAU Automotive, looks almost lovingly at the table. There are cables, plugs, small electric motors, sensors, terminals and lots of compact boxes containing control units and high-performance computers. Everything is arranged in a strangely intentional way, following an overarching pattern. »Yes, it's a car«, says Gradziski, who has laid out all the cables and components with his team on the huge workbench in the Cologne branch – in the same configuration in which they would be installed in a car. A look behind the scenes. »There are the windscreen wipers and cruise control switches at the front, the door locks on the left and right, the navigation system in the centre, and the battery and tail lights at the rear«, explains Andreas Gradziski. »Well, and all the rest, of course.«

In other words, the vehicle's very soul. Or the nervous system, which is also a popular image for a vehicle's electrical system. Both comparisons have one thing in common: the driver cannot see what is going on hidden in the depths of the vehicle architecture. These are highly complex processes: sensors, switches, control units and cables operate in a perfectly coordinated electronic choreography. **Today, FERCHAU Automotive is one of the most sought-after companies in the field of vehicle electrical system support.** Many car manufacturers and all major Tier 1 suppliers for wire harnesses rely on the development service provider's expertise. The company offers all wiring systems-related services, from circuit diagram development, 3D cable design and virtual fuse processes to in-house wire harness manufacturing for small series and demanding special projects.

FERCHAU Automotive provides the infrastructure needed for this with its own technical offices, the appropriate special software and, of course, the relevant experts – although it can also deliver wiring system support on site at the customer's premises. **»The wiring system is a key discipline in modern mobility«**, explains Christoph Liebe, Head of FERCHAU Automotive's Wolfsburg site. »Electromobility, automated driving, the ever-increasing networking of cars with each other and with the infrastructure – none of this would be possible without a high-performance wiring system. We offer our customers all core skills relating to this important topic, from a deep understanding of vehicle IT to expertise in cable circuit diagrams and highly complex E/E architecture.«

The projects are as varied as the demands placed on the wiring system. The Cologne branch specialises in small series and prototype development. Wiring systems are manufactured in the in-house factory by hand on an area of around 650 square metres – exactly where Andreas Gradziski has laid out his wiring system puzzle for demonstration purposes. Wolfsburg, on the other hand, primarily supports customers with major development and series issues – both branches provide cross-location and interdisciplinary support. The Lower Saxony branch employees are currently working on a special project. A premium

manufacturer is planning an electrically powered limited edition super sports car with a particularly strong power-to-weight ratio of 1:1. FERCHAU Automotive is developing its wiring system. »An incredibly exciting brief«, says project manager Gian-Marco Braccu. »Unlike most projects, there are no previous vehicle generations or similar models to draw from. We are starting completely from scratch.« Of course, he is not allowed to reveal any details – just this much: »It takes a huge amount of expertise and, above all, creativity. Which cables do we use? Aluminium or copper ones? How much installation space do we have to play with and where? Where are the sensors, actuators and control units located? We face new challenges every day – and that's what makes the subject matter so interesting.«

What customers really value about FERCHAU Automotive is something that all those in charge hear time and again from their contacts: the enormous flexibility and willingness to innovate. In Wolfsburg, for example, a small team is currently writing its own software to simulate vehicle electrical system functions. The idea came from an employee who was writing his

bachelor's thesis on the topic of virtual modelling of technical components and was now »simply up for an exciting challenge«, as project employee Ahmad Elnazer explains refreshingly openly. His bosses found the idea »purposeful«, as branch manager Christoph Liebe puts it somewhat more soberly. Now the former student Elnazer, a »self-confessed gamer« with a soft spot for the »Need for Speed« video game, is programming a software application to simulate highly complex vehicle electrical system functions on the computer in future.

These examples also demonstrate how FERCHAU Automotive has grown steadily and dynamically with its wiring systems-related tasks. A few years ago, there were just a handful of employees in Wolfsburg and Cologne tinkering with the wiring system, but today their number has grown to **almost 200 experts** in total. Today, for example, there is also a high demand for expertise in the area of safeguarding. Hardware components and software applications are prepared virtually and physically on »hardware-in-the-loop« test benches for use on the road. FERCHAU Automotive also develops its own test benches for this purpose – so successfully, in fact, that it was able to win a test bench supplier as a customer.

It is not yet clear whether the wiring system for the super sports car, which is currently under development, will also be safeguarded on the innovative, »made in Germany« test benches. There are still a lot of technical challenges to overcome in the early stages of this fledgeling project. »I'm looking forward to it«, says project manager Gian-Marco Braccu. The project has only just started. And yet Braccu already has one thing in mind: his first drive in the hypercar. »I probably won't be allowed to drive it myself«, he says. But he certainly has his eye on a place in the passenger seat. »Negotiations are ongoing«, he says with a laugh. And that would be a very fitting place for the on-board electrical system expert and developer of the vehicle component without which even a super sports car would not move a millimetre from the spot. //

A vehicle's electrical system...

...is responsible for supplying power and the flow of information between a large number of components and control units. The wiring harness, accumulators (e.g. batteries), actuators, CAN bus systems, sensors and connectors all form part of the vehicle electrical system. Along with the large increase in electronic vehicle functions, wiring system design and construction has developed into one of the most important disciplines in vehicle construction. What began decades ago with a basic ignition and lighting system has now become a high-tech network with dozens of control units, a few high-performance computers, 600 different plugs and up to 2,000 individual cables weighing in total up to 60 kilograms. With increasing electrification in vehicles, a 48-volt on-board electrical system is being used on top of the conventional 12-volt network, for example in light hybrid vehicles. Large plug-in hybrids and purely electric cars require a high-voltage on-board 400 to 800 volt electrical system to be able to transfer energy and data between the battery, power electronics and electric motor, for example.



Heike Wegner is a transmission expert and sought-after project coordinator. Here, she is checking the interface for the entry and exit of the transmission oil on an automatic transmission housing during the installation test.

Wedding planner

Even in digital times, it still takes gearbox-driven cars to get to the beach and back.

FERCHAU Automotive developed a key component for a volume model for a customer. A successful project, due in no small part to an expert's input.

In a way, it was also their wedding. Heike Wegner and her team had been working towards the big day for months. The wedding planner holds all the strings to make the things that belong together come together in the end. Last spring was the wedding day: transmission and engine said »I do« to each other. This is actually known in the industry as the »small marriage«, and the »big marriage« is when the unit is actually installed in the body. The »small« marriage of the two components took place in one of FERCHAU Automotive's customer's workshops. And as is usual at drive weddings, without a hitch. The transmission and engine were joined together and integrated as one into the vehicle. Finally, the congregation of engineers and project managers shook hands: congratulations, it all worked.



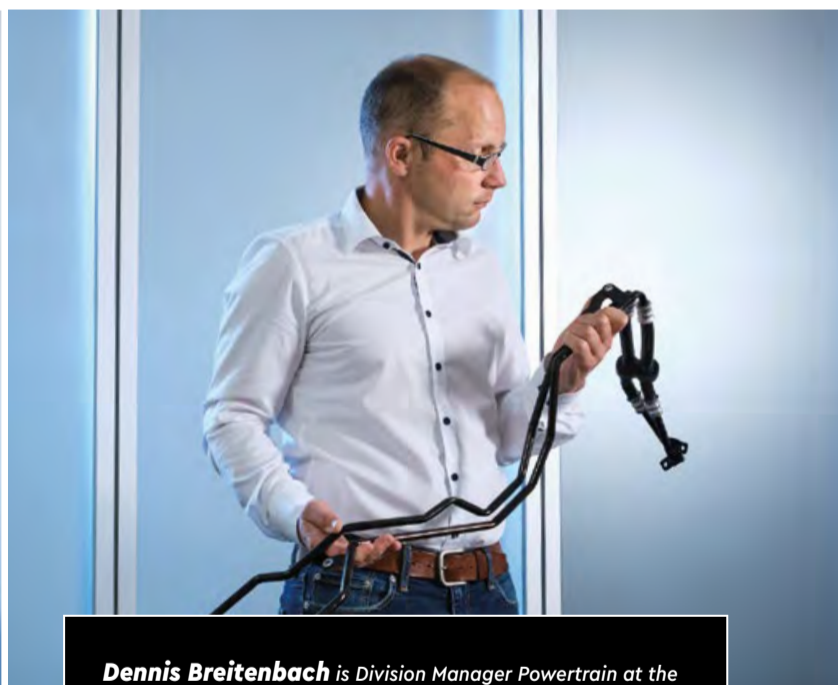
However, this bond for life did not come about entirely without some jitters. »I was a bit nervous«, admits Heike Wegner, Technical Project Coordinator in Transmission Development at FERCHAU Automotive. Since the start of the project in 2021, she has been responsible for key aspects of a challenging project. All of the development service provider's expertise in the field of transmissions was called upon: component design, virtual installation space analysis, tolerance simulation, change management, project coordination and also the development of components such as transmission oil lines. This specific project required a new gearbox to be integrated into the existing architecture of a volume model on behalf of a car manufacturer service provider. The OEM had changed the transmission manufacturer and the new transmission differed from its predecessor. Important interfaces and cables had to be rethought, developed and redesigned to be able to marry it to the motor.

The FERCHAU Automotive experts designed a new cast adapter plate to enable the gearbox and engine to be combined. The ATF transmission oil lines – ATF stands for »Automatic Transmission Fuel« – also had to be redesigned for this. Heike Wegner explains the project's particular challenge: »The transmission oil lines somehow had to be routed under the new automatic transmission because the inlet and outlet for the oil are on the exact opposite side to the old transmission.«

That may sound simple, but it is a complex development process that required »lots and lots of coordination«. Almost every day saw a tussle for millimetres with those responsible for the engine, transmission and exhaust system components. But that is also one of Heike Wegner's core strengths: »Goal-orientated project coordination«, as her supervisor Dennis Breitenbach, Division

Manager Powertrain at FERCHAU Automotive's Wolfsburg branch, puts it. He is also »extremely proud« of his employee, who has »enormous expertise in gearboxes«: »It was a hugely challenging project, but in the end, everyone said: »Great teamworking, it worked out really well«. And to Heike Wegner's team, of course, who were also responsible for the PDM sheets, the product detail assembly instructions. In the same way as Ikea assembly instructions, every screw and every movement is described in detail.

Even if the small marriage in spring was celebrated rather soberly – it is an example of a crucial discipline in automotive engineering. »Today, everyone is talking about AI software, digital twins and the user experience in the digital cockpit«, explains Dennis Breitenbach. »But the hardware is also crucial. You won't get far with software alone; it won't get you to the beach on holiday.« Heike Wegner nods in agreement. And then talks about the honeymoon after the wedding. The van was not roadworthy to begin with. Its first venture out came weeks later. Wegner was sitting in the passenger seat as the vehicle with the FERCHAU Automotive-designed component sped along the test track. »A special moment«, comments Wegner succinctly. And she smiles. //



Dennis Breitenbach is Division Manager Powertrain at the FERCHAU Automotive Wolfsburg branch. The oil cooler in his hands (left picture) will later be fitted to a commercial vehicle's radiator core. The automatic transmission line harness (top picture) serves as a supply and return line to the oil cooler.

Competences from the company

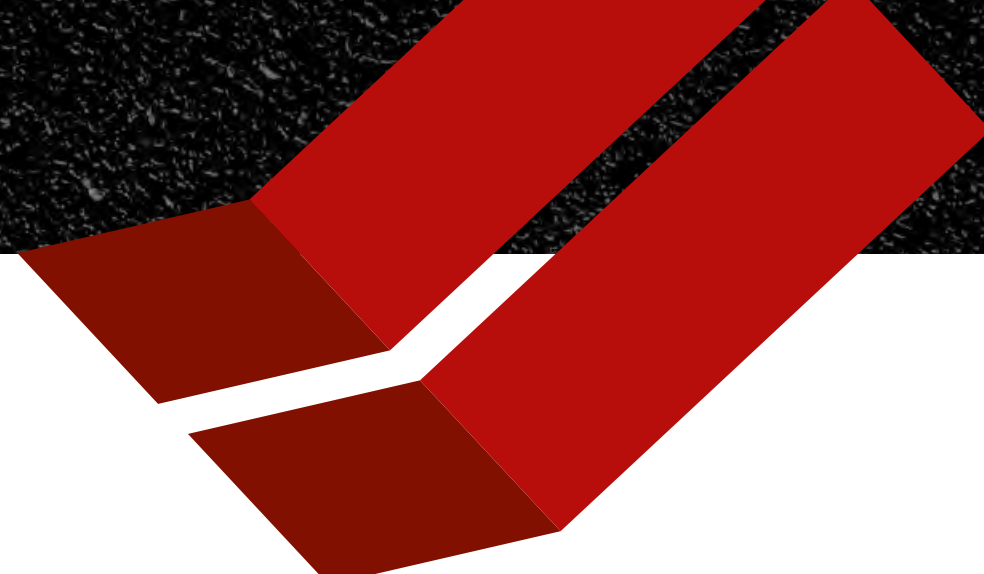


Attention, testing!

Competence from the company

Alex Tesler is an electrics/electronics expert at FERCHAU Automotive and head of the SUSTAIN research project which is funded by the Federal Ministry for Economic Affairs and Climate Action.





FERCHAU Automotive's Cologne branch has pulled off a coup: it has set up a research project that is now being funded by the Federal Ministry for Economic Affairs. **A diagnostic procedure is being developed for used batteries from electric cars – an important contribution to resource conservation and a sustainable circular economy.**

On some Mondays, Ole Bolin gets stern. He gathers his employees together in front of the coffee machine and grills them on how the project is going. Progress that has been made, whether the last sprint to the interim goal was successful. The customer demands results! However, Ole Bolin, Division Manager Electrics/Electronics at FERCHAU Automotive's Cologne site, can't suppress a little smile when he speaks. After all, it's quite a schizophrenic situation: Bolin is not only the project manager at the development service provider. He's also the customer, the client.

At least, he assumes this role for the internal distribution of tasks to »keep everyone's eye on the ball«. This is because the project does not have a client in the normal sense. It is the development service provider's first research project to be funded by the Federal Ministry for Economic Affairs and Climate Action – and is one hundred per cent the brainchild of Ole Bolin and his team. One more reason why Bolin hardly ever has to be stern: everyone is so »wrapped up in the task at hand«. The project's official title is »Damage and condition analysis of defective high-voltage batteries«; the somewhat snappier short name is SUSTAIN, in the sense of »preserve«. The aim is to preserve and recycle batteries from electric cars.

The project's aim: to develop an innovative diagnostic procedure to assess used batteries from electric vehicles – so as to make an important contribution to resource conservation and thus to the circular economy. **»After an accident or prolonged use, batteries are often like a black box«**, explains Alex Tesler, Project Manager at FERCHAU Automotive. »They are in an unknown state, or at least only partially known, with regard to their residual capacity and hazard potential.« The testing device, which will initially be about the size of a refrigerator, is intended to offer three crucial advantages: It aims to work with all battery and cell types, be easy to use even for non-experts, for example at recycling companies or used car dealers, and provide a comprehensive diagnosis in just 20 minutes.

A distinction is made between slightly defective batteries (which pose no danger and can be disposed of without major safety precautions), significantly defective batteries (which require special safety precautions) and fully functional batteries (which can continue to be used in a second-life application). It should be possible to analyse the condition of an unknown lithium-ion battery system by determining alternating current resistances, also known as impedance spectroscopy, and using machine learning methods. Cologne is the ideal location for the project: »We are able to map end-to-end development«, says Ole Bolin. »From formulating the system requirements to electrics and electronics planning and producing a customised wiring harness in our in-house wiring harness factory, designing and implementing our own software, assembling in our own laboratory space and final commissioning.«

FERCHAU Automotive has formed a consortium of three companies and three universities for the project – a prerequisite to win the funding. Accurec Recycling has expertise in processing raw materials. Voltavision, a former FERCHAU Automotive Munich site customer and now a project partner, will build the device, which the engineering service provider is in charge of developing. Rheinische Fachhochschule Köln, Hochschule Aalen and Technische Hochschule Ingolstadt are the three university research institutions providing expertise and diagnostic infrastructure for post-mortem analyses, damage tests and diagnostic methodology.

The Federal Ministry for Economic Affairs funding will run until the end of 2025. Ole Bolin will be calling a few more coffee machine meetings before then. As a good customer always does in discussions with their service provider, to express satisfaction with progress – and at the same time »keep up the pressure«. //

Sky stormer

NIO – that means something like »the sky is turning blue«. NIO is also a brand that is impressing the automotive industry. The Chinese electric car manufacturer aims to conquer the West. Company founder and CEO William Li explains his expansion strategy, what he thinks of possible EU tariffs – and why he shares his office in Shanghai with the brand's president: in an exclusive interview with MOBILITY WORLD.

Transformation: from the industry



William Li, 50, is the founder and CEO of the Chinese electric car manufacturer NIO. The businessman – often dubbed the »Elon Musk of China« by the media – is, like the American electric car pioneer, a self-made billionaire. Growing up the son of a dairy farming family, he studied computer science and sociology. He entered the business world as a car service provider operator, among other things. In 2014, he founded NIO together with his business partner Qin Lihong, who is still president of the company today. NIO now plans to conquer the European market, for example by opening NIO Houses in popular business locations. Li is now launching two sub-brands, ONVO and Firefly, for mid-range and entry-level models to complement the premium NIO brand. One of the company's unique selling points is that NIO operates power swap stations in all its markets: battery changing stations where a battery can be replaced in just a few minutes. The company's name means something like »The sky is turning blue« – a reference to the smog in Chinese cities. NIO sold around 160,000 electric vehicles worldwide last year.

Mr Li, we are meeting you today at the new NIO House in Amsterdam. However, you did not fly directly to the Netherlands, but instead landed in Frankfurt yesterday with NIO President Qin Lihong. Given the highly competitive situation in the e-mobility sector, we have to be a little neurotic and ask: were you on a secret mission in Germany?

(laughs). No. There was a pretty banal reason for this. We took a look at the new NIO Houses in Frankfurt and Düsseldorf and then travelled up to Amsterdam by car. There were two of our new power-swap stations on the way. I have not been in Europe for nearly two years. Back then, we also made a road trip out of it and travelled from Munich to Oslo! We stopped off in ten cities in all. In contrast, yesterday's short journey was not quite as demanding.

Exactly ten years ago, when you founded NIO, you announced your intention to help shape a »joyful lifestyle«. Now you are opening one showroom after another, large display areas that look like Scandinavian design shops. You are getting it done.

A lot has happened in the past one and a half years alone. We are more present on the market, offering more and more points of contact for our customers, both online and offline in the NIO Houses. We are not only adding more showrooms, but above all more power swap stations – an integral part of our strategy. A road trip like this gives me the opportunity to see the progress for myself. And I have to say: I'm very satisfied.

The »Living Room« in NIO House Frankfurt is intended to represent the cosy centre of every home.



Do you also meet political decision-makers during a trip like this? With a view to driving forward expansion on the European market?

Above all, contact with customers is very important to me. We organised round table discussions with our customer organisation, the User Advisory Board, with the local end users of our products both in Frankfurt and Düsseldorf. Customer feedback is crucial to our success, especially with regard to our fully automatic battery changing stations. Customer feedback flows directly into our further developments. Our motto is »co-creation«: we want to ensure that we also understand the special features and requirements in each new market.

You are also launching the ONVO sub-brand.

We have just presented our second brand, ONVO, at the International Family Day in Shanghai, and of course also the new brand's first vehicle, the L60 compact SUV. This puts us in direct competition with Tesla's Model Y in the mid-range segment. We are better than the Model Y in terms of the drive's energy efficiency and also the amount of space in the interior. The concept has been well received, we have received nothing but positive feedback after presenting the L60 – and a good number of pre-orders.

When will you launch it in Europe?

As soon as possible, we are planning for this year. We expect to reach additional customer groups with this first sub-brand. The L60 is a successful concept that will work worldwide.

And a third brand, Firefly, is also in the starting blocks. You are aiming to bring affordable electric cars onto the market for less than €30,000. This is concerning for the industry in Europe, which is not sufficiently active in this segment.

Correct. We are currently working intensively on the product portfolio. The first model is expected to be launched in Europe in the first half of next year. Firefly is our entry-level brand, in terms of price as well.

Market entry into Europe is currently fraught with uncertainty for Chinese manufacturers. The European Union is threatening to impose higher tariffs on vehicles from China.

We are of course monitoring this very closely. There are a lot of uncertainties. But I have a clear opinion on this: good products and good services should be available to everyone. There should be no barriers if intelligent products, which can also make an important contribution to mitigating the effects of climate change, can be made available to everyone worldwide. We hope this will be clarified soon.

The battle lines have hardened between China and the western markets, especially the USA and Europe.

We don't see ourselves as a traditional Chinese brand. We are a global brand with products for the global market. For me, many of the arguments put forward by those including the European Commission make no sense. An example: anyone who was at Auto China in Beijing in the spring will have noticed that Chinese start-ups in particular

are very proactive. They are very innovative, developing new technologies that could make life easier for everyone. In addition, local competition in China is enormous. A new car gets developed in 24 months. If you can't do that, you have no chance. So those who succeed in China really set the benchmark with their technology. Shouldn't European customers be allowed to benefit from this to the same extent?

If higher tariffs are imposed on automotive products from China now, though, how will that affect your business?

I can only repeat that none of this makes any sense in my eyes. We are talking about products that are in line with the Paris Climate Agreement and help to reduce the burden on the environment. But well, we'll just have to wait and see. We will align our strategy accordingly and make sensible, economically viable decisions.

Innovation business is fraught with risk. It absorbs constant financial input without immediately generating a profit. Do you have the necessary resources to ride out any turbulence?

We invested around 1.8 billion euros in research and development in 2023. Last year, we opened more than 1,000 battery replacement stations worldwide. We invest a lot in our brand presence, such as in this NIO House here in Amsterdam. Yes, our levels of investment are high – but on target. At the time, we have outlined what we need to be able to seriously develop and sell vehicles and innovative technologies, and we ▶▶

Transformation: from the industry

NIO's first electric MODEL on the German market is the ET7, a 5.10-metre-long saloon.





NIO ET5: the mid-range model from the Chinese manufacturer.

are operating within the limits we set ourselves. We don't throw money down the drain either. We've already had some bad experiences; we almost collapsed in 2022 due to the global economic situation. We've learnt from this.

The brand presence with huge showrooms styled like premium airport lounges is not exactly a modest one.

You may be impressed by the sheer size of our showrooms. But I can assure you: back at our headquarters in Shanghai, I work in a fairly small office, which I also share with my co-founder and president of the brand, Qin Lihong. We use our resources purposefully and sensibly.

Will you build your own car plants to avoid the tariffs? Your competitor BYD, now known to many customers thanks to its sponsorship of the European Football Championship, is planning a second plant in Europe. The manufacturer Chery wants to start its own production in Barcelona this year.

This is less a political question than an economic one. If customers accept our products and we gain a good foothold in Europe, then we will also produce here. It depends on the sales figures. If our market share does not initially grow as we would like, then it will be simply too expensive to have our own production plant. Of course, I hope that we will also produce in Europe, possibly in partnership with a local manufacturer. That remains to be seen. The prerequisite for this is that our products, our brands and our technologies must be accepted by the market.

A technology that you are the only manufacturer to rely on: automatic power swap stations. Couldn't this be a technology with a short half-life? That in ten years, people will say: »Hey, remember those huge battery changing machines?«

I don't think that's the case. There are so many advantages to this technology solution, I could easily talk for two hours about it (laughs). We see our technology as something that is constantly in flux. Something that evolves, that constantly offers upgrades. Battery replacement is always a customised solution. You can be back on the road with a fully charged battery in less than five minutes – no other technology offers that. On top of this, charged battery packs can also serve as stationary energy storage at many of our stations and reduce the load on the local power grid. We have already connected a network of 500 such energy storage systems to the electricity grid in China. In light of the energy transition, I also see great potential in Europe.

That seems to be the future: car manufacturers becoming versatile companies that are even entering the energy supply business.

Our strategy pursues a holistic approach. At the same time, we are focussing on a charging infrastructure that is as seamless as possible, especially with fast charging stations. We are very strongly positioned here. We dominate the market in several key regions in China, with charging stations along major highways. And not only for our own customers, but for e-vehicle users in general.

What advantage do you see in the battery exchange technology compared to a quick-charging station?

No fast-charging station can compete with our battery changing stations in terms of the time the user needs to take. And not just in terms of convenience either: they don't even have to get out of the car at a swap station. There is also the fact that very few people can afford their own charging station in cities, simply because they live in a block of flats on the third or fourth floor.

A basic global problem...

Exactly. This is where battery replacement offers the perfect solution. What's more, each customer can assess day-to-day whether the battery performance is sufficient and, if necessary, opt for a more powerful update for a longer weekend trip. Our vision is similar to how smartphone technology evolved. If you can charge your phone anywhere, then you don't need a huge battery. This also contributes to the issue of sustainability. In future, car batteries can be small and compact and do not have to offer a range of 1,000 kilometres if I can charge or replace them anywhere within a few minutes. We believe in the electric car principle. The future belongs to battery-powered vehicles. We also believe in our strategy. As we all know, Rome was not built in a day. But it was built. We are on the right track. //



NIO is expanding throughout Europe – recognisable not only by the cars on the streets, but also by their showrooms in central city centre locations, such as here in Berlin.

TALK of TOWN

Mobile phone cars are coming!



»Smartphone on wheels« – this is the image often used to describe the automotive industry's focus on digitalisation and connectivity. But reality has long since caught up with the metaphor. Smartphone manufacturers are now actually building cars. The Chinese tech company Xiaomi, for example, no longer just develops mobile phones, but also has an electric car in its portfolio: the SU7 saloon – with an output of up to 495 kW (673 hp) and a range of 800 kilometres. Xiaomi boss Lei Jun has ambitious goals. His company intends to be one of the five largest car manufacturers in the world in 20 years' time. Huawei from China, long one of the largest smartphone manufacturers in the world, is also already

building electric cars. Huawei's electric car brand, Aito, has already sold 60,000 vehicles in China in 2023. Other tech companies want to muscle in on the car market in the future. Playstation manufacturer Sony, for example, plans to make its start with the electric car brand AFEELA, which it has launched together with Honda. Then there is the Taiwanese company Foxconn. Up to now, the company has primarily been known as a contract manufacturer for Apple's iPhone, but electric cars are soon to be added under the Foxtron name. These include the Model B crossover, which was designed by the renowned Italian design studio Pininfarina. The only thing missing now is the first car manufacturer to build mobile phones.

Two cars from mobile phone manufacturers: SU7 saloon from Xiaomi (above) and Model B from iPhone manufacturer Foxconn from Taiwan

New Neue Klasse



BMW intends to launch a new vehicle architecture for electric vehicles next year. The Munich-based car manufacturer has named the platform Neue Klasse, and it is deliberately drawing on historical parallels. This was, in fact, the name of BMW's mid-range 1500 saloon back in the 1960s. The car, built from 1962 onwards, marked a turning point in the Bavarian brand's history. The forerunner of the 5 Series saloon became the key model with which BMW was able to end the financial skids of previous years. A good sixty years later, the Neue Klasse has been revived. The first model on the new platform will be a mid-range SUV. The Vision Neue Klasse X study from the spring provided an initial glimpse. On board the concept vehicle: an 800-volt system for particularly fast charging at rapid chargers, new battery cells with a 20 per cent higher energy density and a new drive system that should enable a 30 per cent greater range. This means that BMW will join others in having an all-electric platform from next year: Volkswagen (MEB), Hyundai (E-GMP), Stellantis (STLA-E) and Renault-Nissan (CMF-EV) are already producing their electric vehicles on special e-platforms.

E in the 911



Newly developed turbocharger for the 911

A true first: Porsche has electrified the 911 sports car, the brand's classic. »For the first time in what is now our icon's 61-year history, we are installing a hybrid drive in a road-going 911«, says Frank Moser, responsible for the 911 model series at Porsche. The revamped eighth 911 model generation is now also available with a performance hybrid drive derived from motorsport. Two electric motors provide extra thrust in the 911 Carrera GTS model. An electric motor works in the newly developed exhaust gas turbocharger and ensures that the turbocharger is brought up to speed in an instant.

The second electric motor is located in the eight-speed dual-clutch transmission and delivers up to 40 kW (54 hp). A battery with 1.9 kWh storage capacity is also new on board. However, the 911's centrepiece remains a six-cylinder boxer engine. It delivers 357 kW (485 hp). The system output of the combined engine and electric motor is specified as 398 kW (541 hp). The new hybrid Porsche accelerates from 0 to 100 km/h in 3.0 seconds. It has a top speed of 312 km/h, with a price starting at €170,600.

THERE NEEDS TO BE ZERO

The change process in the automotive industry is a marathon. Decarbonisation joins electrification and digitalisation as one of the industry's megatopics. Most companies are still in the infancy of their efforts to completely avoid CO₂ emissions in the future.

Transformation: from the industry

The entire windscreen as a head-up display... Gradually fading out reality through dimmable glazing... 240 body segments that can take on 32 different colours independently of each other... The announcement from car manufacturer BMW reads like a science fiction plot. Far from it: the BMW i Vision Dee vehicle study in question is to be launched on the market from 2025 as the »Neue Klasse«. »We can exploit everything digitalisation has to offer and make the vehicle an intelligent companion. This is the car manufacturer's future – and this is the future of BMW: the fusion of virtual experience and true driving pleasure«, said BMW CEO Oliver Zipse.

674 million tonnes of CO₂. According to the Federal Environment Agency, this is the enormous amount of the carbon dioxide greenhouse gas that was released in Germany last year. At the same time, decarbonisation, i.e. reducing CO₂ emissions to zero, is seen as a megatrend for the coming decades. Do they fit together? They even belong together. This is because CO₂ emissions – and therefore one of the key factors for climate change – can only be reduced comprehensively through a consistent transformation in all areas.

This also applies in the automobile industry. »Sustainability is our basic attitude and a central pillar of our strategy,« says Volkswagen Group CEO Oliver Blume, for example. The Group's Sustainability Report 2023 states that the transport and mobility sector is »one of the biggest contributors to climate change (...) Volkswagen is aware of the responsibility this entails as one of the world's largest car manufacturers.«

Around 15 to 20 per cent of all total emissions from a combustion engine car – depending on the mileage and vehicle – are generated during the vehicle's production,

as calculated by the ecologically-minded Verkehrsclub Deutschland (VCD). This proportion is 40 per cent or more with an electric car. To improve the automobile's carbon footprint, it is not only its use phase that must be decarbonised, but so too must the extraction of raw materials, the manufacture and procurement of components and the development and production of vehicles. Manufacturers know this – and are working on it.

Take Audi, for example. In January 2024, the company announced that production at the Ingolstadt plant had been »carbon-neutral« since the beginning of the year. Following in the footsteps of the plants in Brussels, Belgium, and Győr, Hungary, this is the third Audi factory to be carbon-neutral. By 2025, this will also apply to the remaining Audi sites in Neckarsulm and San José Chiapa, Mexico. The manufacturer has set up a four-stage programme for this purpose. The first step is to increase the energy efficiency of the plants, which will save energy. The second step is to generate renewable energy, for example through photovoltaic systems. Then come steps three and four, purchasing green electricity and offsetting unavoidable CO₂ emissions.

Other car manufacturers are also following similar strategies. **Porsche**, for example, plans to be CO₂-neutral across the entire value chain by 2030. According to **Mercedes**, they already achieved this goal by 2022. This is partly because around 45 per cent of the energy required for production comes from electricity from renewable sources. A photovoltaic system has been installed on the roof of »Factory 56« in Sindelfingen, for example, which supplies the Mercedes plant with green electricity. But it is also the case that the majority of the electricity required is still purchased. And where this does not come from renewable sources, the carbon footprint is offset by compensation projects.



Solar roof at Mercedes:
The plant in Sindelfingen produces its own green electricity.

In general, the automotive industry still has to rely on compensation in many cases. This often involves re-forestation projects in different regions of the world. These projects are celebrated as pioneering deeds in the companies' environmental reports, but environmental protection organisations often criticise so-called green-washing in this context. Greenpeace transport expert Benjamin Stephan says: »Climate damage cannot be compensated for, especially not through supposed forest protection.« Intact forests are of course important for the climate, but this does not absolve the car industry of its responsibility to quickly reduce its own CO₂ emissions.

This is important because any hesitation in implementing decarbonisation measures »jeopardises the market share of battery electric cars«, as the management consultancy Deloitte writes in a recent study. »Rapid decarbonisation, on the other hand, is the best way to achieve a strong market position and keep pace with the new electric car competition from China.«

recycling and reutilisation of materials, is a key component in reducing emissions in raw material extraction and in production (see below).

Switching to climate-neutral production is an important topic for the future, not only for globally operating OEMs, but also for small and medium-sized suppliers. Management consultants Bain & Company emphasise in a study that supplier companies can significantly reduce their direct emissions with sustainable production and thus improve their carbon footprint. »Strategic decarbonisation brings clear cost benefits«, states the analysis. Not least because CO₂ savings lead to competitive advantage, which increases the opportunity to expand market share.

The Stuttgart-based supplier MAHLE has acquired a stake in the Dresden-based start-up Sunmaxx PVT, which has developed solar panels that generate both electricity and heat. MAHLE supplies the heat exchangers for the innovation – and itself equips its own plants with the new modules to thus reduce their CO₂ emissions. German manufacturing company ZF, for its part, has opened the first zero-emission factory in Klášterec in the Czech Republic, where the supplier produces power electronics. The power supply is secured by 3,400 solar modules, while the heating power comes from heat pumps that do not require fossil fuels and at the same time reduce heating costs by 50 per cent. And as part of a joint circular economy strategy, Valeo has worked with Stellantis to, for the first time, remanufacture a front camera which can be refitted to the windscreen.

If you look closely, you will discover numerous innovations at all levels, all of which contribute to reducing CO₂ emissions. From a wider perspective, a clear picture emerges: the automotive industry is working on decarbonisation. And there is still much to do. //

Fair steel at BMW:
From 2026, all European plants are to use low-CO₂ steel.



The supplier Salzgitter AG will supply all of the **BMW Group's** European plants with low-CO₂ steel from 2026. This makes the Bavarian OEM the first car manufacturer in the world to enter into such an agreement. The BMW press shops

process more than 500,000 tonnes of steel in Europe every year. And in future, this steel will be produced using hydrogen and green electricity, which will reduce the CO₂ emissions of the process by more than 95 per cent. Practically all major manufacturers aspire to increase their use of green steel. Sue Slaughter, Purchasing Manager for Supply Chain Sustainability at Ford, says: »By using climate-neutral steel, we will take a significant step towards reducing our vehicles' carbon footprint.«

The Stellantis Group, which includes the **Opel, Peugeot, Fiat, Citroën** and **Jeep** brands, has set itself the goal of reducing net CO₂ emissions to zero by 2038. And it has explicitly stated that compensation should contribute no more than the single-digit percentage range. The production plant in Mulhouse, for example, where DS and Peugeot brand car models are manufactured, is being converted to a largely geothermal energy supply. The French car manufacturer **Renault**, together with partners, is developing an energy supply system based on deep geothermal energy for the plant in Douai in northern France, a biomass heat supply system for the Maubeuge plant and a photovoltaic system with a capacity of around 500 gigawatt hours per year for the Cléon plant.

Cars are still being built at the Renault site in Flins, north-west of Paris, where the classic Dauphine, R4 and R5 once rolled off the production lines, but far fewer than 20 or 30 years ago. Instead, the traditional production halls are being filled with the »Refractory« – the first centre for the automotive industry's circular economy in Europe. The focus is on renewable energies, reprocessing, recycling on more than 230 hectares and in a total of 65 buildings – in short: the careful use of raw materials of all kinds. The »circular economy«, the continuous

The goal: circular economy

Things must move forward, always further – that is the maxim according to which the global economy has functioned to date. Namely, linear. Raw materials are extracted from the earth, from which products are manufactured, which in turn end up as waste on landfill sites after they have been used. In a circular economy, the sequence is organised in a fundamentally different way: **The raw materials used are not thrown away at the end of the product's life, but recycled.** They are recovered using various processes and reused in production. Ideally, waste would completely be a thing of the past. The circular economy therefore has revolutionary potential. In the EU alone, more than 2.2 billion tonnes of waste are produced every year. The renowned **Wuppertal Institute for Climate, Environment and Energy** has formulated the goal of »increasing the depth of value creation in Germany and at the same time minimising both the loss and the outflow of urgently needed raw materials. It will not be possible to achieve the climate targets without the transition to a circular economy.«

50 years of the Porsche 911 Turbo

...and now: a fanfare!



50 years ago, in October 1974, Porsche unveiled a car of superlatives – the 911 Turbo. The car was an attraction even when standing still: huge rear wing, widened wheel arches, »turbo« lettering on the bonnet. Turn the ignition key, and then comes the epiphany. Yesterday just as much as today. MOBILITY WORLD pays tribute with a look back at the history of the sports car icon.

The crowd around the car on the stand at the Paris Motor Show is so big that it is almost closed due to overcrowding. Everyone wants to see the car that will set new superlatives. Such was the birth of a myth in October 1974. The Porsche 911 Turbo was the world's first production sports car with a turbo engine, the first with internally ventilated disc brakes and aluminium brake callipers – and it was the fastest German road sports car as well as one of the most expensive. The manufacturer stated the top speed as »over 250 km/h« and the price was 65,800 Deutschmarks. To put it in context: a normal Porsche 911 could be yours from 32,350 Deutschmarks.

The high-end sports car soon had many fans. One of them being Walter Röhrl, twice world rally champion. »The forefather of all turbos was a technical revolution in series automobile construction«, says Röhrl, one of the most knowledgeable experts on the 911 Turbo, who first bought one of the models in 1979. »The first version with 260 hp and a four-speed gearbox was still very sharp in its power delivery, but for this very reason it was a wonderful challenge for experts.« You could say that: the three-litre, six-cylinder boxer engine designated M 930/50 weighed 207 kilograms and catapulted the coupé from a standstill to 100 km/h in around six seconds.

Sales of the extreme sports car began in spring 1975. Porsche had initially planned to build 1,000 units of the 911 Turbo. The first oil crisis in autumn '73 with Sunday

driving bans and soaring fuel prices were still too fresh in the mind. And then a car like this?

Customers gave an unequivocal answer to the question: the first thousand cars sold out after just one year, and by the end of the production period of the first Turbo in 1977, 2,876 units had been built. In view of the unexpected success, the Zuffenhausen team went one better: The Turbo 3.3 followed the Turbo debut – with more displacement, now 300 hp and with intercooling – a world first in a production vehicle. The car took on legendary status. Partly because of the brute strength of its performance, but also because many Porsche fans at the time thought it would be the last 911 ever.

The reason: Porsche had been working since 1972 on a completely new model as the successor to the 911. And this model, the Porsche 928, came onto the market at almost the same time as the Turbo 3.3 – a farewell and hello with the accelerator pedal to the floor, so to speak. But as we know today, things turned out differently. The 928 was merely a passing phase, while the 911, already old at the time, remained firmly in the running. Right up until the present day. And this also applies to the top model in the series, the Turbo.

The eighth generation of the 911, and the seventh generation of the top 911 Turbo model, are currently on the market. The Porsche 911 Turbo S, which develops 650 hp

from 3.8 litres of displacement and enables a top speed of 330 km/h, currently marks the top of the Turbo range. Digital instruments, rear-axle steering and carbon-ceramic brakes come as standard on this car. The thing that has remained unchanged over the past 50 years is the fascinating combination of unbridled power delivery and surprisingly comfortable ride. The first Turbo already featured electric windows, heated windscreen and rear window, thermal insulation glazing, velour carpeting and a stereo cassette radio with four loudspeakers.

It was only logical, then, that the car attracted an illustrious clientele. Antoinette Princess zu Fürstenberg, footballer Uli Hoeneß and the conductor of the century, Herbert von Karajan, all bought the Porsche showpiece. He, by the way, had the car custom-built to his specifications: with racing suspension, bucket seats, roll bars and without any comfort features. Karajan insisted that his Turbo should weigh less than 1,000 kilograms – the car weighed 1,140 kilograms in standard production trim. The maestro and his Porsche Turbo have even gone down in music history in a duet: the cover of the »Famous Overtures« record with the Berliner Philharmoniker shows Herbert von Karajan at the wheel of his special turbo. Incidentally, the car now belongs to a collector in Switzerland and has an estimated value of more than €3 million.

Stories like this help fuel the myth of the Turbo at Porsche. Aristocratic customers as well as the prominent footballer clientele. The star conductor's automobile toot. And then there is the fact that, long after the model has become an icon, Porsche engineers succeed time and again in making it even faster, even more powerful and at the same time even more controllable with each new edition. Or in the words of the incomparable rally driver Walter Röhrl, who says of the current, seventh turbo generation: »I take my hat off to the development department, because the talents that the new car combines were simply unimaginable just a few years ago. Not even by me.« //



Walter Röhrl,
rally driver and Porsche
expert, on an original Turbo.



The forefather of all turbos – a technical revolution.
Here is a comparison of the Porsche 911 Targa and Turbo 3.0.



...and always chasing the evening sun

Frank Ferchau, 59, Managing Partner of the ABLE GROUP, the parent company of FERCHAU Automotive, is a huge Porsche 911 fan. Although he doesn't drive a Turbo, he has been driving a 993 model series 911 Cabriolet, the last with an air-cooled boxer engine, for around 15 years. Here he explains his fascination with the car and the 911 myth.

Mr Ferchau, how did you come by this car?

I came across the car on an internet used car platform. Two previous owners, 40,000 kilometres on the clock, really smart. It was love at first sight. I had been looking for a car like this, and as is the case when the opportunity suddenly arises, it was a very spontaneous purchase. I didn't tell my wife about it. I then parked the car in a street parallel to our house.

That sounds like a complicated situation...

At first I thought so too, but then my wife and I went for a walk past the car and she said, »That's a nice car«. »I like it too«, I replied. And then she said, »Look at the number plate, that's my birthday«. So, ever since then it has not only been my favourite car, but her favourite as well.

What exactly do you like about the car?

I find it extremely attractive. I like the sound of the engine, I find the view into the engine compartment fascinating, as well as the cockpit with the five round instruments. Then there's the feel of the black leather on the seats and on the dashboard, the six-speed manual gearbox...

And how does it drive?

Quite marvellously. Six weeks before the seasonal licence plate becomes valid again in April, I'm already looking forward to it. The car is simply a pleasure to drive.

What is the secret of the 911 for you?

The iconic design. A 911 is a 911 – irrespective of the model series. Then there is the social acceptance. You get approached at almost every refuelling stop. One motorcyclist even asked for a photo together. And my wife and children like the car just as much. My son keeps borrowing it.

Your favourite journey in the car so far?

I do this one every year when our family reunion takes place in Holland in the summer. My family usually sets off on Thursday, and I drive up in the Porsche a bit later on Friday evening. Around four hours completely relaxed ahead of a wonderful weekend – and always chasing the evening sun. A dream. //

Where is the miracle battery?

Many experts share the opinion: **The future of e-mobility belongs to the solid-state battery.** But there are also interesting alternative approaches. An update on current battery research.

Proclaimed advantages of solid-state batteries
* compared to a lithium-ion battery



1,000
charging cycles



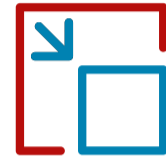
<5%
capacity loss



1,000 km
range



40%
weight saving*



1/3
less installation space*

Higher energy density, greater range, shorter charging times, greater safety – solid-state batteries are considered by many to be an essential building block for the e-mobility of the future. Its features read like a wish list from the car industry. But is the solid-state battery really the holy grail of mobility?

»That sounds a bit suspicious: advantages everywhere – and yet no product«, says Markus Hölzle, Head of the Electrochemical Energy Technologies division and member of the Board of Directors at the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) in Ulm, in an interview with MOBILITY WORLD. Although many major manufacturers and suppliers are working on batteries with a solid rather than liquid electrolyte, **solid-state battery technology is not yet ready for series production.** The industry is making great progress in this area. Volkswagen subsidiary PowerCo, for example, reported in January 2024 that a solid-state cell prototype from its US partner QuantumScape withstood a thousand charging cycles and then still had more than 95 per cent of its original storage capacity. The industry standard targets of 700 charging cycles and a maximum capacity loss of 20 per cent have been clearly exceeded.

But things have gone quiet since the supposed breakthrough. What's the problem? The answer lies in the nature of the solid-state battery. It is precisely this special feature, i.e. the solid and not liquid electrolyte currently used in electric car batteries, that poses major challenges for the industry. A solid electrolyte is non-flammable – a big plus point, especially for the safety of electric cars. The electrolyte transports the ions between the anode and cathode, which ultimately enables the electric motor to be driven. The problem: »It's not easy to create such close contact between solids that lithium ions can flow easily«, explains battery expert Markus Hölzle. Battery components such as separators for solid-state batteries »have to be produced as extremely thin ceramic foils, which is more than complex in terms of production technology«.

The automotive industry therefore often leaves research into the new type of battery to start-ups and battery specialists. Mercedes-Benz, for example, announced in the summer that it had taken delivery of the first solid prototype cells from its US development partner Factorial Energy. Factorial Energy promises a range of almost 1,000 kilometres, 40 per cent less weight compared to a lithium-ion battery and a third less installation space required. The Stellantis Group has also already invested in Factorial Energy. The industry is on the move. The Japanese car manufacturer Nissan, for example, is building its own plant in Yokohama for production of solid-state batteries. This will initially be for prototypes, and for series production from 2028.

Nissan has recognised that production equipment for lithium-ion batteries, as currently installed by most car manufacturers in electric cars, cannot be used for future solid-state batteries. This puts many companies off. A great deal of financial effort is already being invested. The Japanese electronics company Panasonic, for example, invested around US\$700 million just to further develop a lithium-ion battery for the US electric car manufacturer Tesla.

The current mantra in the industry is therefore: **optimise existing technologies instead of developing completely new ones.**

The cobalt mined by questionable means, for example, can already be saved in lithium iron phosphate batteries (LFP). BYD, a leading e-car and battery manufacturer from China, recently presented a new generation of its LFP blade battery – the name refers to the particularly long and sword-shaped cells. The energy density has been increased by 26 per cent compared to the previous batteries. With the second generation, BYD held out the prospect of ranges of 1,000 kilometres for electric cars, causing a stir. Just like the Yiwei E10X small car. The sub-brand of the Chinese car manufacturer JAC launched the first series-produced electric car with a sodium-ion battery onto the market with this model. The manufacturing costs are said to be 40 per cent lower than those of a lithium-ion battery. And it can be manufactured on existing lithium-ion battery production lines. //

BYD is causing a stir with blade batteries with ranges of 1,000 kilometres for electric cars.

Which component in your car will have disappeared in ten years?

We asked four people to send us snapshots of their cars.



»In ten years' time, cars will no longer have a standard key. Opening, locking and starting will be done via an app on your smartphone. And if you don't have a smartphone, you probably won't be buying a new car in 2034.«

Burkhard Riering (53)
 Publisher and Editor-in-Chief of Automobilwoche



»The exterior mirrors of some lorries and buses are already being replaced by digital mirrors. They could also become increasingly important in the passenger car sector in the coming years. I see potential in them for increasing road safety and also driver convenience.«

Alisa Lindner (35)
 Professor of user experience design for autonomous driving at Coburg University of Applied Sciences



Philipp Ostbomk (45)
 Vice President B2B Sales at Michelin Europe North



»The air in the tyres. In future, tyres on an aluminium rim will be inseparably connected to the profiled tread via flexible, highly resistant plastic spokes. The solution will be puncture-proof, virtually maintenance-free with exemplary environmental properties.«



Robin Schmid (40)
 YouTube influencer and presenter on »Robin TV«

»I've just been to the USA and tried out the latest version of Tesla's »Full Self Driving Software«. I am convinced that fully autonomous driving will work in some cities and regions in the next 12-24 months. In ten years' time, all new cars will be completely self-driving and there will be no need for a steering wheel.«



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