

BOSCH ZÜNDER



ROUGH TIMES
FOCUS ON CHANGE: BOSCH STAYS ON COURSE

Hearing malfunctions

The SoundSee sensor system will make this a reality. And it is being tested on the ISS. ▶ [Page 28](#)

Rescuing people

The RescueWave smart solution provides a better overview in emergencies with multiple casualties. ▶ [Page 32](#)

Helping the homeless

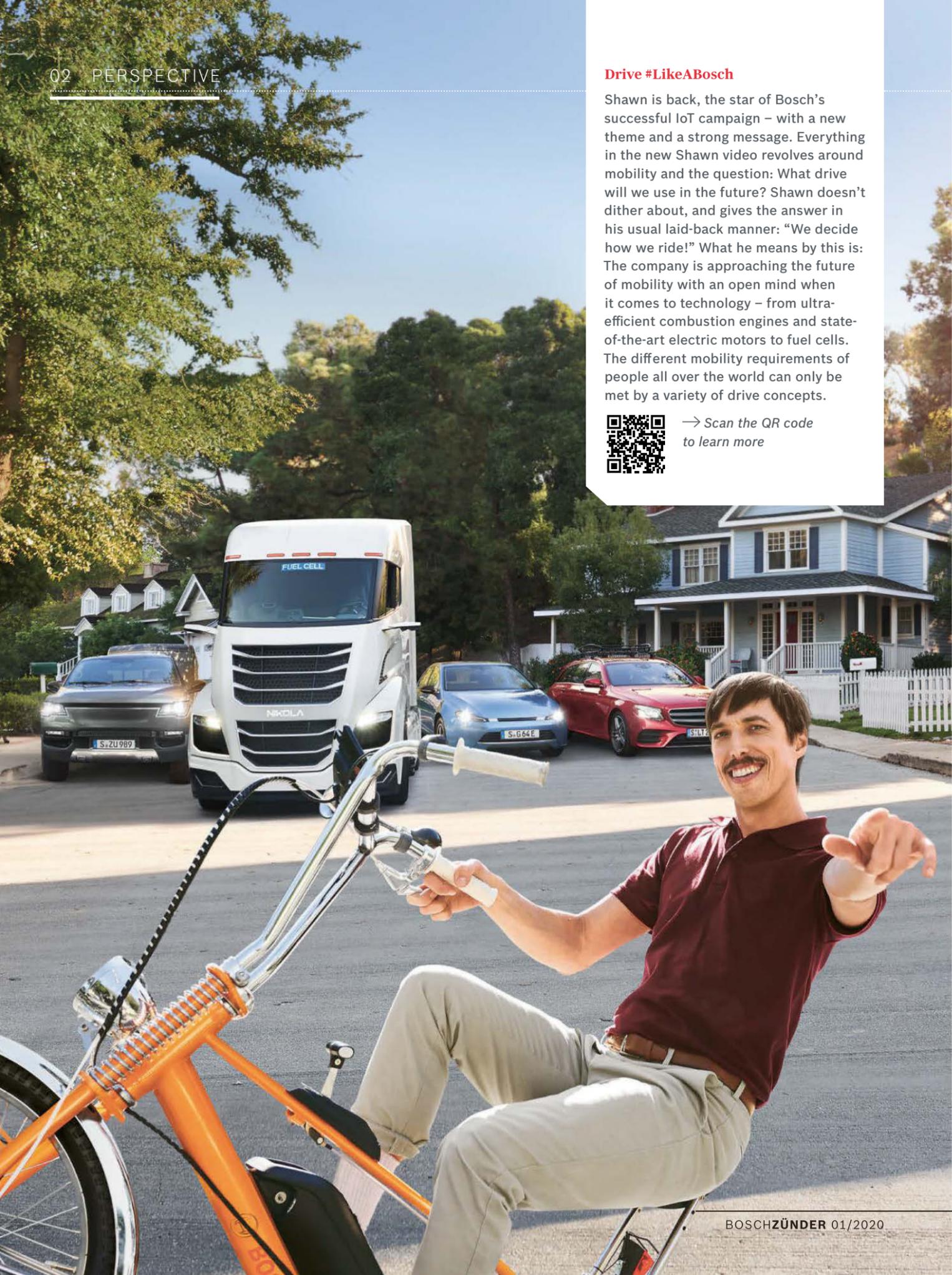
Our associate Maria Jung rides a bus through Munich, passing out tea and sandwiches. ▶ [Page 44](#)

Drive #LikeABosch

Shawn is back, the star of Bosch's successful IoT campaign – with a new theme and a strong message. Everything in the new Shawn video revolves around mobility and the question: What drive will we use in the future? Shawn doesn't dither about, and gives the answer in his usual laid-back manner: "We decide how we ride!" What he means by this is: The company is approaching the future of mobility with an open mind when it comes to technology – from ultra-efficient combustion engines and state-of-the-art electric motors to fuel cells. The different mobility requirements of people all over the world can only be met by a variety of drive concepts.



→ Scan the QR code to learn more



COVER PHOTO: MATT KNIGHTON/ABU DHABI OCEAN RACING/VOLVO OCEAN RACE/GETTY IMAGES; PAGE 2: BOSCH; PAGE 3: BOSCH, FLORIA MÜLLER, MICHAEL RYAN

Future mobility: How to manage change?



Many of us are occupying ourselves with this question.

For good reason. The automotive industry is currently experiencing unprecedented change. It's an unsettling situation – one that poses considerable challenges for our company in the near future. And also makes necessary some painful measures.

The revolutionary changes in mobility certainly do not mean the end of the car. Quite the contrary. These profound changes offer our company enormous opportunities. We are an innovation leader. And it is our desire to play a decisive role in shaping the new age of mobility. To do this, we rely on close cooperation. Both with our partners and customers and within the company.

Everyone agrees that the mobility of the future must protect the climate and improve air quality. At the same time, it must be both affordable for normal consumers and available and inspiring. That's why we rely on a mix of different powertrain systems. We are systematically further developing the internal combustion engine, and at the same time investing around €500 million in electromobility this year alone. We are already at the forefront of this development. We are also one of the leading suppliers of automated driving – and we will continue to expand activities in this area. Another promising business field is offered by mobility services – with new customers such as fleet operators and mobility providers.

Let's not kid around. It means we have to roll up our sleeves and get down to work if we are to successfully shape this transformation. Let's stride forward and tackle the tasks confidently and with self-assurance. Let's remain open for change and see challenges as opportunities. You will see that it is worth it. This is also made clear by the articles in this issue around the theme of "change."

We may be in rough waters, as the current *Bosch-Zünder* cover illustrates. But we are sticking to the course that we've charted. And we will gain speed once more.

Stefan Hartung

Member of the Bosch board of management and chairman of the Mobility Solutions business sector



Tell us what you think:

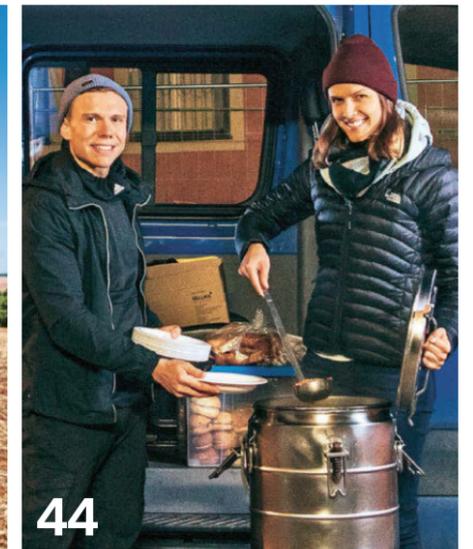
What's your opinion of the current issue? Send your feedback to bosch.zuender@de.bosch.com

Intelligent rescue operations Injuries can be treated more quickly, thanks to a solution from Bosch subsidiary ITK. Pages 32–33



Portraits of change

Chen Qingxue from Nanjing is one of six associates who speak about their experiences in the current situation. Pages 10–15



ILLUSTRATIONS: MALTE KNAACK; PHOTOS: MARTIN STOLLBERG, GIANCARLO GIANNELLI, QUIRIN LEPPERT

FOCUS CHANGE

10 Looking ahead
Bosch is facing challenges. Six associates from five countries tell us how they are dealing with this. They talk about concerns, ambitions, and personal motivation. And all six of them have one thing in common: They are looking ahead.

16 7 questions, 7 answers
Many companies worldwide, including Bosch, find themselves confronted with a variety of risks at the same time. These range from weak economic growth to a slowdown in the automotive sector. But what exactly are the reasons behind these events? Read the facts here.

22 "Take advantage of opportunities"
Bosch continues to invest heavily in important growth areas despite the difficult financial situation. CEO Volkmar Denner stresses this in an interview in which he calls on associates to "boldly take advantage of the new decade's opportunities."

Rough seas
require a powerful approach, as the crew of the Abu Dhabi Ocean Racing showed in the Volvo Ocean Race 2014/15.



TECHNOLOGY

- 28 Hearing malfunctions**
Is the ISS intact? The SoundSee sensor system is being used to find out.
- 32 Lifesaver 4.0**
The RescueWave smart solution provides an overview of incidents with multiple casualties.
- 34 Automation**
Bosch Rexroth brings the world of the smart-phone to the factory.

TEAMS

- 36 Semiconductor chips**
An analysis team from Reutlingen looks for errors in tiny structures.
- 40 Smart sowing**
A development for connectivity in farming from Brazil ensures a bountiful harvest.
- 42 Winners**
A team from South Korea has received a quality award for its spotless workplace.

LIFE

- 44 Volunteers**
Maria Jung and Thomas Jörg from Grasbrunn help homeless people.
- 46 One day in Mexico City**
Communicator Karla Retana Santamaria offers us some tips.
- 48 Robert Bosch Stiftung**
Associates are called upon to participate in a survey run by the United Nations.

REGULARS

- 02 Perspective**
- 06 Silent star**
Energy in motorhomes
- 43 Stand up!**
Arda Arslan, from Istanbul, talks about making mistakes.
- 50 Quiz**
Are you a climate protection expert?
- 50 Masthead**
- 51 After work**

Silent star



Full of energy

Motor home owners dream a lot about camping at sites off the beaten path. However, the availability of electricity is often limited. This is true even in some campgrounds.

But now an intelligent 48-volt system developed by Bosch Engineering can provide relief. The system generates and stores electrical energy while the vehicle is moving. This is an important development in electromobility for motor homes. Bosch is cooperating closely with Knaus Tabbert, a manufacturer of motor homes and caravans.



Man/machine



The man
Jiří Kužel



The machine
AP 10 laser patterning machine

MY HEAVYWEIGHT AND I

At the České Budějovice plant, we have introduced laser patterning technology in series production of the Denoxtronic system. This was really challenging. We developed the machine as a team. My work focused in particular on the patterned push rod, an essential component of the Denoxtronic system. We built a complex supply and assembly chain for the machine, working with many partners across four countries. Now this unique machine is in operation. I am very proud of it.

Compared to other machines at České Budějovice, the six-metric-ton AP 10 laser patterning machine is one of the absolute heaviest. This machine makes it possible to texture the surface of the push rod using pulsed laser. The push rod is an important component of the AdBlue pump in the Denoxtronic system for passenger cars. This modification of the push rod ensures a longer service life and effectiveness of the pump, contributing to further reductions in emissions. The machine can produce 9,000 push rods a day, or up to 2.4 million a year, when in full operation.

PHOTOS: BOSCH

ALL SOURCES: BOSCH

Just the facts, please!

ENERGIZED

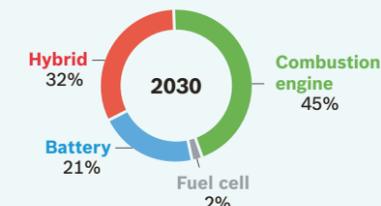
Electromobility is a major part of Bosch's future-oriented drive technologies



More than
€5 billion

IN SALES REVENUE What Bosch aims to generate in 2025 by electromobility for cars and light commercial vehicles

SALES BY DRIVE TYPE: CARS AND LIGHT COMMERCIAL VEHICLES (evolutionary scenario)



More than
40,000

CHARGING STATIONS in Bosch's charging network in eight different countries across Europe



The number of drive projects for **ELECTROMOBILITY** that Bosch has already implemented.

One question - four opinions

DO WE TALK OPENLY ABOUT MISTAKES?

Yes Talking about mistakes means showing humility. And it is a prerequisite for our continuing development as individuals or as a company. If mistakes are made due to insufficient knowledge, then we can learn from these mistakes. If they are due to lack of attention, they can be leveraged to sharpen our awareness and keep us from getting stuck in a rut in our daily work routine.



ANA MATEUS
Lisbon, Portugal



PRATIK CHHEDA
Plymouth, MI, United States

No I have to answer this question with a clear "no," although there are some initiatives working to change our feedback culture. The awareness that is necessary to promote an open feedback culture, one that accepts mistakes, is only gradually taking root at Bosch. We have set out on a journey, but still have a long way to go.



STEFFEN MARKOWIC
Feuerbach, Germany



VIDHI ANAM
Naganathapura, India

81% | NO

19% | YES

Based on a survey of **340 Bosch associates for Bosch-Zünder Online.**

Revisiting stories



From Bosch-Zünder 02/2019

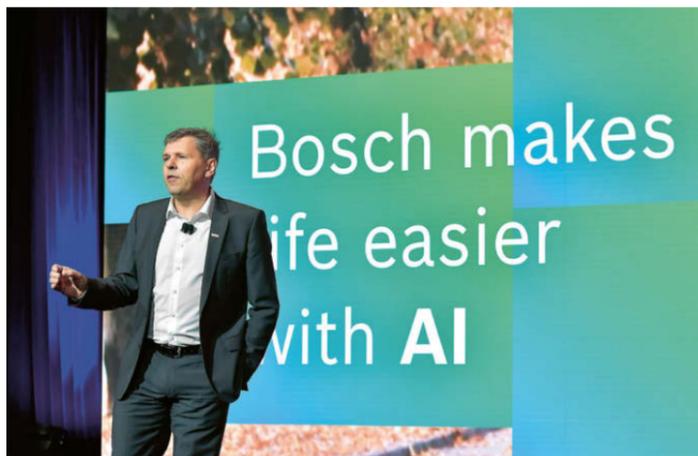
“Solar power”

Nine months ago, Bosch-Zünder reported on the Nashik plant in India, which has a photovoltaic system that provides it with solar power. Things are about to get even greener there: 2,358 new trees have been planted since June 2019, bringing the total number to some 5,963. This greatly benefits the area because the trees bind CO₂ from the atmosphere, and in the process improve air quality, reduce ambient temperatures, and provide a natural habitat for animals.



Looking back

The highlights: What has happened in the past few months since the 04/2019 issue came out?



Member of the board of management **Michael Bolle:** “AI is a professional sport, not a popular sport.”

January CES in Las Vegas

MANY INNOVATIONS WERE PRESENTED

Artificial intelligence (AI) has become a permanent fixture in our everyday lives, regardless of whether in automated driving, in the smart home or in production. Bosch uses AI and the Internet of Things to make life easier and as safe as possible for people. Under the motto “Beneficial AI,” Bosch took advantage of CES in Las Vegas to reveal not only the Virtual Visor – an AI-powered digital sun visor for vehicles – but also a 3D display for cars, an application for predictive maintenance at the International Space Station, a system for monitoring vehicle interiors, and a smart platform for medical diagnostics.

November Award for Bosch

ADMITTED INTO THE FISITA ACADEMY

Bosch CEO Volkmar Denner has been admitted into the FISITA Academy of Technical Leadership. FISITA, the international umbrella association for the automotive and mobility systems engineering profession, is acknowledging Denner’s achievements in engineering and technical progress in the automotive industry. The chairman of the board of management emphasized that the award was a recognition of the achievements of all associates in Mobility Solutions.



Volkmar Denner: “It’s a tremendous honor to have been admitted into the academy.”

Bosch global

Researchers donating their prize money to Primavera, a high-caliber award for Ovar, and a test track with Mercedes-Benz – Bosch associates are active all over the world.

.br

1 New test track in São Paulo

Bosch and Mercedes-Benz will join forces to build a new test track at a Mercedes-Benz site in São Paulo. The two companies are investing around €15 million in the project. Scheduled to go into operation in 2021, the track will be capable of testing motorcycles, passenger cars, light commercial vehicles, and agricultural vehicles.

.de

2 €20,000 for Primavera

Andrea Urban and Franz Lärmer, researchers at Bosch, have each donated €10,000 to Primavera, the charitable organization run by Bosch associates. This is the prize money the two researchers received for winning the Eduard Rhein Foundation’s 2019 Technology Award. Urban and Lärmer received their award in Munich, Germany, back in mid-November.



Primavera wants to give better opportunities to children living in slums.



.cn

3 Rapid action taken

As the Covid-19 virus spread in China, Bosch immediately issued regulations to protect its associates. Among other things, business trips to and from China have been canceled, and production at Chinese plants has been temporarily scaled back. In addition, Bosch was able to support institutions in China with material and financial resources through donations from units such as BSH, PT, DC, and RBLC, and the commitment of the Bosch China Charity Center.

.ro

4 Standard final assembly line

In 2020, the first standard final assembly line for electronic control devices will be built at the Cluj plant. Automotive Electronics is relying on the “design-to-line” principle. In the future, modular and highly standardized cluster lines will be used for cross-product and cross-divisional production, leading to noticeably higher line utilization.



Cluj: The first standard final assembly line for electronic control devices

.pt

5 Ovar wins EFQM award

Every year, the European Foundation for Quality Management awards the EFQM Global Excellence Award to companies showing excellent and sustainable results. One of the winners is the plant in Ovar, which received seven stars – the highest score possible. Ovar was also presented with an award for Outstanding Achievement in Culture.

Bosch is facing challenges. **Six associates** talk about how they are dealing with them – about concerns, ambitions, and personal motivation.

LOOKING AHEAD

“Change is nothing new for us. I have been with Bosch since the early 1990s, and in this time I have seen how computers were introduced in all the plants. Back then, we informed associates about the change, trained them intensively, and closely monitored the situation. Today, it is no different. We see the current major transition as something new because the magnitude of the change and its speed have been stepped up. We are confronted with this every day, in our private lives – but also at Bosch to a great degree, for example, due to new drive technologies or the use of IT robotics in our workplaces. Naturally our associates now have a great need for information. There are so many questions. Therefore, as plant manager, I have to intensify the conversations I have with people, provide information quickly, and take questions. I see the change as an opportunity for us. We must reflect on what we have already done well so far and where we can improve in the future.”

Johannes Lauterbach

Commercial Director

*Chassis Systems Control/
Powertrain Solutions*

Blaichach, Germany

Tamara Pinterich

Software developer

Powertrain Solutions

Vienna, Austria

“As a software developer for features in fuel-cell, hybrid, and electric vehicles, my area of work is with a mind to the future. Of course, the difficult business situation is noticeable overall, with business trips being reduced to a minimum and vacations and hours for flexitime being cut back. However, I do not feel restricted in my work. The expectations placed on our business area are high. There is a lot going on; the topics of sustainability and green drive technology offer us very many opportunities. Our many years of experience afford us an important competitive advantage. Now we can prove that we are the right ones who can find the best solutions. This is a huge challenge. As a former climate researcher, I have presented sufficient evidence of climate change. As a developer at Bosch, I can now make an active contribution.”

PHOTOS: MARTIN STOLLBERG, STEFAN FUERTBAUER



Chen Qingxue

Shift manager

Automotive Aftermarket

Nanjing, China

“Of course I’m worried about losing my job. The changes can be felt everywhere and people are talking about it on the social media networks. But I know that there is no point in being afraid. That’s why I’ve been attending courses at the Bosch Training Center over the past few months and acquiring some new skills. I use my days off to do private courses for using computers where I learn the basics, such as how to use Microsoft Excel. I pay the course fees out of my own pocket. It may sound trivial for some, but I believe that having computer skills is a huge step forward for me. Eight years ago, I started working as a machine operator and now I am a shift supervisor. My goal for this year is to get promoted within the shift management. I am grateful to Bosch for giving me the opportunity to continually develop myself.”



PHOTOS: MICK RYAN, MARTIN STOLLBERG

“I have a special wish for the current year: a greater spirit of optimism.”



“In all my 30 years at Bosch, the past year has been the most difficult. We are in the middle of a transformation, and our most important markets are in reverse gear. We in Powertrain Solutions want to design mobility to be sustainable and offer the full range of drive systems. At the same time, we have experienced a significant slump in sales and need to make major changes and adjust our structures at some sites. It hurts. One of the biggest challenges is to find the right balance – between the measures that are necessary to maintain competitiveness on the one hand, and investment in growth areas on the other. We are already in a better starting position than our competitors this year, thanks to our agreements at sites such as Feuerbach, Schwieberdingen, and Bamberg. We can also attribute this position to the incredible commitment of the entire PS team. We will continue to intensify the exchange with our associates. Our informational events and live streams are open to all associates. And I have one very special wish for the current year: an even greater spirit of optimism.”

Uwe Gackstatter

President

Powertrain Solutions

Feuerbach, Germany

“It is extremely important to keep the team motivated.”

“The automotive industry today is extremely challenging. But especially in times such as these, I am in demand as an executive. I have 1,500 people working for me on my team. Of these, 80 percent are responsible for software development for combustion engines, while others deal with topics such as electrification or artificial intelligence. Right now, there are many tasks to be completed simultaneously; to achieve this, associates need to be trained for future topics and attend further education offerings. It is extremely important to keep the team motivated, despite the difficult market situation and the enormous pressure on existing projects. We have launched several automation initiatives to increase our productivity while reducing costs. This can only succeed if I am closely networked with the associates and throw myself into the fray instead of acting from behind the scenes.”

Latha Chembrakalam
Vice President Powertrain Software
 Powertrain Solutions
 Bengaluru, India

PHOTOS: MALLIKARJUN KATAKOL, EDUARDO MACARIOS



Alexssander Nascimento
Machine operator
 Powertrain Solutions
 Curitiba, Brazil

“The transformation in Curitiba began several years ago. Even then, the economic situation was challenging for the automotive industry. It was clear that we had to do something to remain viable in the future. Which is why we all pitched in. We launched initiatives, looked for innovative ideas; it was a real movement of associates. This entrepreneurial spirit has moved us forward. Six months ago, I had the pleasure of becoming part of the On Demand project, which deals with individual customer requirements in the aftermarket, in addition to my job as a machine operator. It’s a promising business model. We want to use it to strengthen our competitiveness. Regardless of whether one is speaking politically or economically, Brazilians are used to instabilities in life. That is why I’m not afraid of the future, but am looking forward to the new challenges it brings.”

THE BIG ISSUES COMPANIES ARE FACING:

7 QUESTIONS, 7 ANSWERS

Many companies around the world, including Bosch, find themselves confronted with a variety of risks, all at the same time: weak economic growth, geopolitical risks, slowdown in the automotive and machinery sectors. But what exactly is behind all this? Here are the facts.

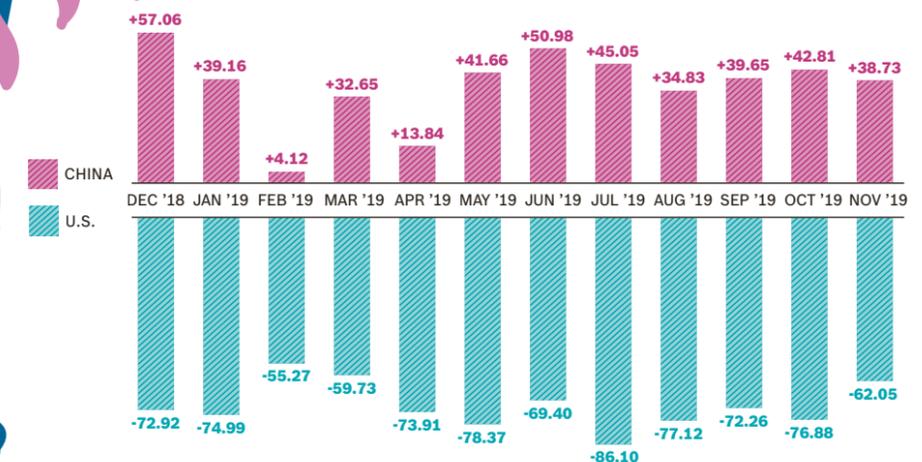
TEXT: GUNTER EPPLE
ILLUSTRATIONS: MALTE KNAACK

What is the trade conflict between the U.S. and China all about?

1 Over the past two decades, China has experienced a rapid upswing, both economically and in technological terms. It is also already the leader in several markets. Nowhere in the world are more cars and machines sold than in China. This development poses a challenge for the United States, as does the fact that significantly more Chinese products are bought in the U.S. than vice versa. That's why in 2011, then-President Barack Obama announced that U.S. policies would place a great deal more focus on the Asia Pacific region. After Donald Trump entered office, the U.S. government began to impose tariffs on products coming in from China. The government in Beijing responded by implementing similar measures. As a consequence, trade between the two nations has dropped off by 28 percent since March 2018. But there has now been an initial rapprochement. In January this year, the U.S. and China concluded a first partial agreement designed to overcome the trade dispute. This agreement prevents the U.S. from imposing new tariffs and partially decreases the existing ones. Among other things, China has promised to import significantly more goods from the U.S. and to respect intellectual properties.

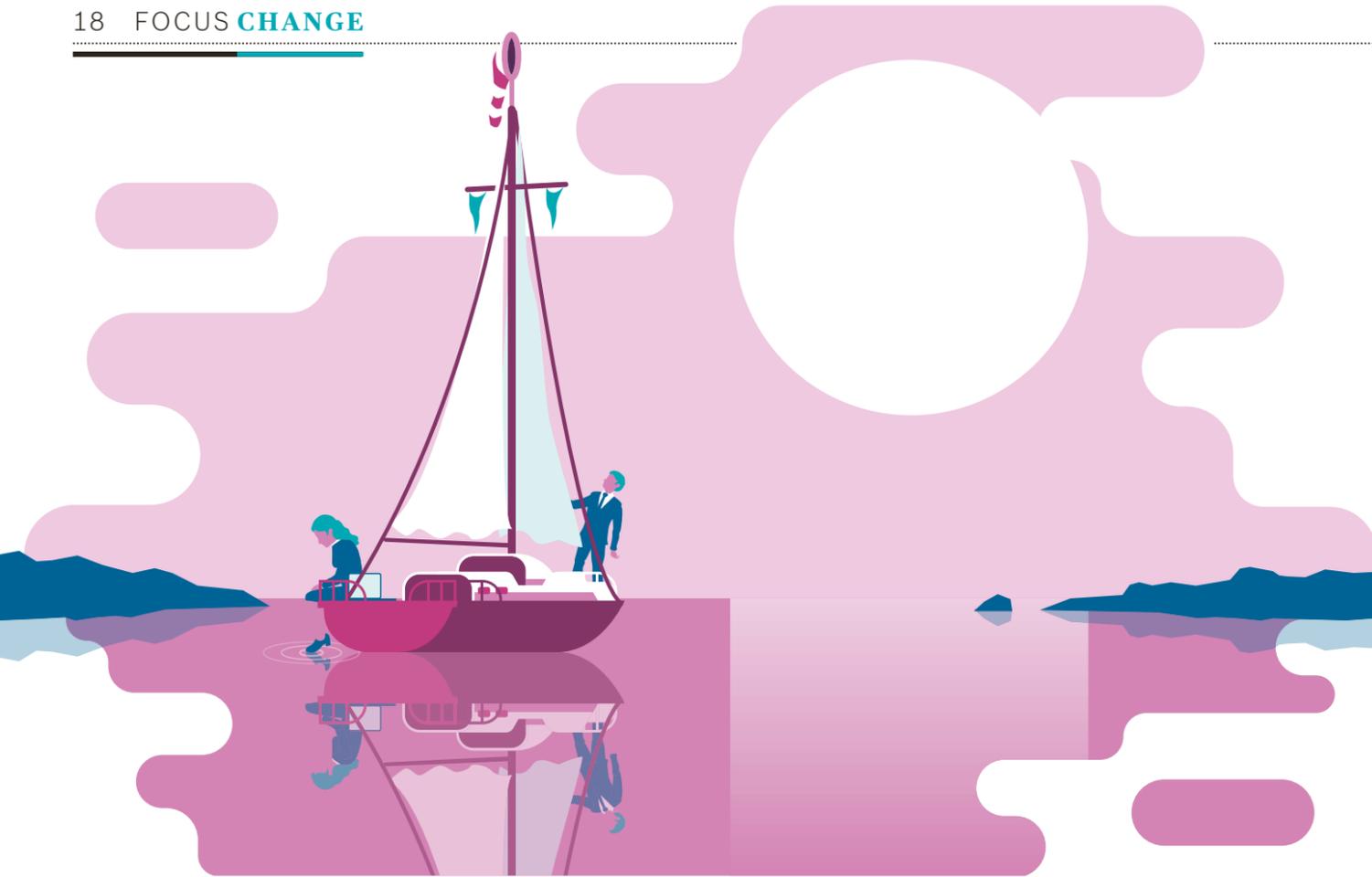


Trade balance sheets of the U.S. and China
in billions of USD



A country's trade balance sheet reports the difference between its exports and imports. The U.S. imports significantly more goods than it exports. With China, this is the other way around.

Sources: U.S. Census Bureau, Statista 2020



Why does the global economy continue to be in a lull?

2 The engine driving economic activity sputtered in 2019. While the global economy in 2018 grew by 3.2 percent, it only increased by 2.5 percent in 2019. Every important region – Europe, North America, China, and India – suffered setbacks. Bosch Chief Economist Thomas Hueck attributes this development to a number of causes. The trade disputes between the United States and both China and the EU played an important role. Plus, the uncertainty surrounding Brexit coupled with the intensive climate discussions with stricter CO₂ limits dimmed the mood of many companies. A financial crisis in India also aggravated the situation. This will result in

drastically less credit in the form of loans and mortgages being approved and lent. Hueck is anticipating another slowdown for 2020. Both the first partial agreement signed by the U.S. and China in mid-January and the United Kingdom's initially orderly exit from the EU at the end of January temporarily took the pressure off. However, the partial agreement has not deescalated the trade war in the long term since the underlying causes still persist, and the danger of a hard Brexit has not been averted since a trade agreement with the EU must still be negotiated by the end of 2020. Plus, conflicts in the Middle East and political unrest in South America are adding additional strain. The spread of the Covid-19 virus will put a significant strain on global growth.

Global economy losing steam

Percentage change in gross domestic product compared to the previous year



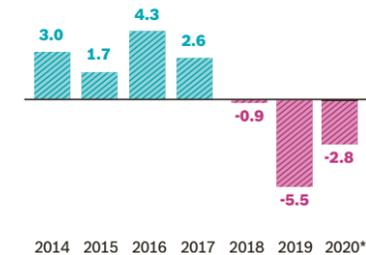
* Forecast/source: Bosch

Why is automobile production losing momentum?

3 The automotive industry is massively feeling the economic downturn and the geopolitical risks. That's why Bosch is assuming that just under 90 million vehicles will be manufactured in 2020. That's nearly 10 million units fewer than in the record year of 2017. The slump in sales in the leading automotive market, China, hit the industry particularly hard. The country's weakening economy combined with the trade war with the U.S. is unsettling car buyers. In addition, the government's purchasing incentives, which quickly drove sales figures upwards, have expired. As a result, 9 percent fewer cars rolled out of China's manufacturing factories in 2019 than in 2018. Slowdowns in Germany are also apparent. At 4.5 million passenger cars, production in 2019 has fallen to its lowest point since 1997.

Automobile production in reverse gear

Change against previous year, in percent



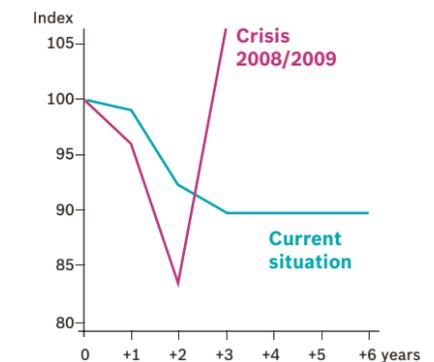
* Forecast/source: Bosch

Why will car sales probably not improve until 2025?

4 In terms of percentage values, the current decline in the automotive industry doesn't differ much from automotive crises of years gone by. What is new, however, are the structural changes: the discussion around CO₂, automated driving, and new user concepts in terms of mobility. Bosch estimates that these factors will not only create a difficult economic environment, but will also cause demand from consumers to remain rather low, complete with the corresponding negative impacts on production.

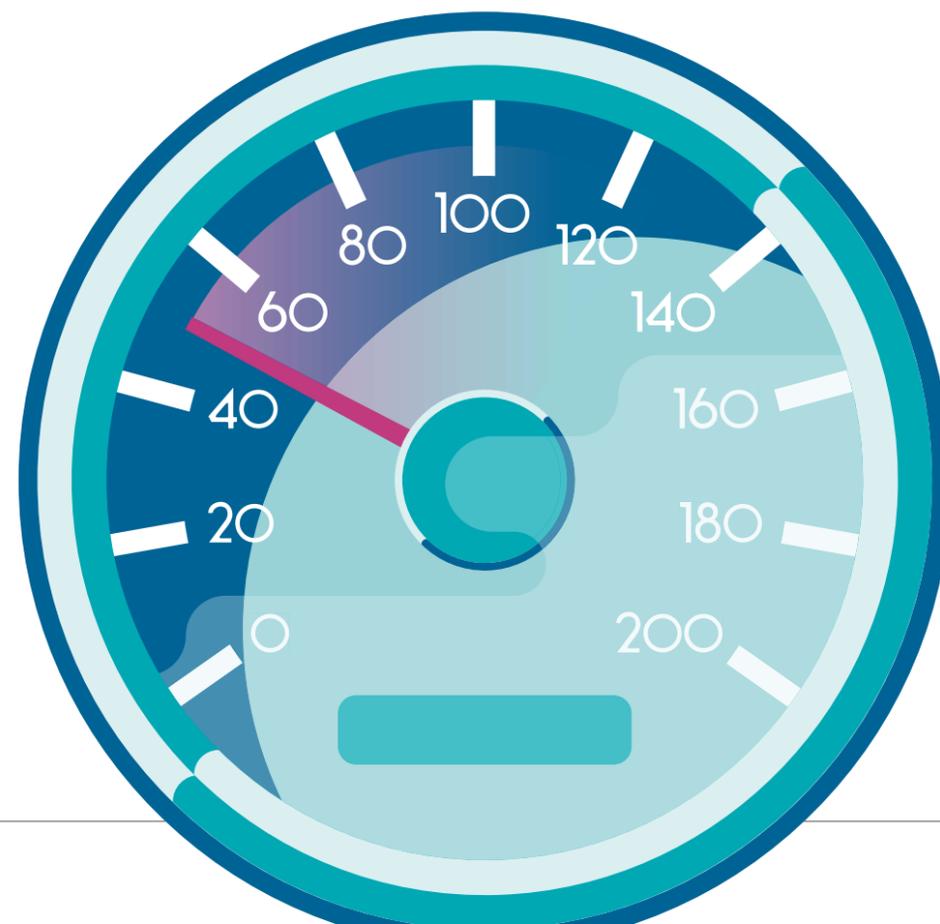
Automobile production remains at a low level

Index 100 corresponds to the year before the respective decline: i.e. 2007 and 2017



Automobile production increased strongly following the end of the financial crisis in 2009. The same type of upswing is still expected to occur this year.

Source: AMP, AMR

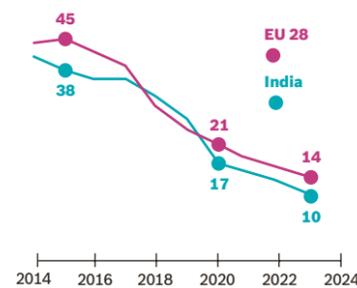


Why is diesel being increasingly ignored?

5 The decline of diesel has been a dramatic one. While every second new passenger car bought in the EU in 2015 was a diesel engine, Bosch forecasts for 2020 put this number at only around one in five. This is mainly down to the massive hit diesel's image suffered as a result of the scandal in which emission value measurements were manipulated. On top of that, the public now sees diesel engines as one cause of health-endangering nitrogen oxide pollution. Many major cities, including Paris, Rome, Madrid, and Berlin, have responded by putting driving bans in place. Politicians are also putting greater emphasis on

electromobility as a drive for the future. In the meantime, Bosch technology has now solved the nitrogen oxide problem. But this continues to be largely ignored by public opinion, as is the fact that diesel engines perform 15 percent better than the gasoline ones in terms of carbon emissions. The diesel engine was an important pillar for Bosch's revenue, and this is reflected in the dents that the sales slump has left behind on the balance sheet. This is all the more serious since it is doubtful, considering the economic and societal headwinds, whether the sales of diesel-powered passenger vehicles will ever pick up again at all.

Decline in diesel
Share of new passenger cars registered

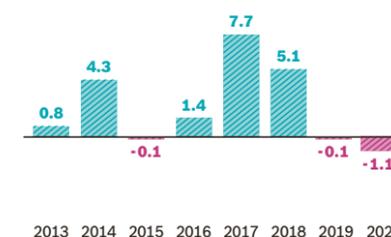


Source: Bosch 2018



Why is the number of machinery orders declining?

6 In times of economic uncertainty, the first thing companies generally reduce is their investments. This is having a direct impact on machinery, as demonstrated by the 4 percent reduction in orders received in 2019. And according to Bosch forecasts, the industry should expect a further decline of 1.6 percent in 2020. Manufacturers of tool machines in particular are facing doom and gloom. They rely on the vehicle industry for around half of their sales, meaning they are directly affected by the weak automobile industry. There is some light at the end of the tunnel in the form of the key market of China, where the government has put a range of infrastructure programs in motion. Prospects in North America and Europe, on the other hand, are somewhat more gloomy.

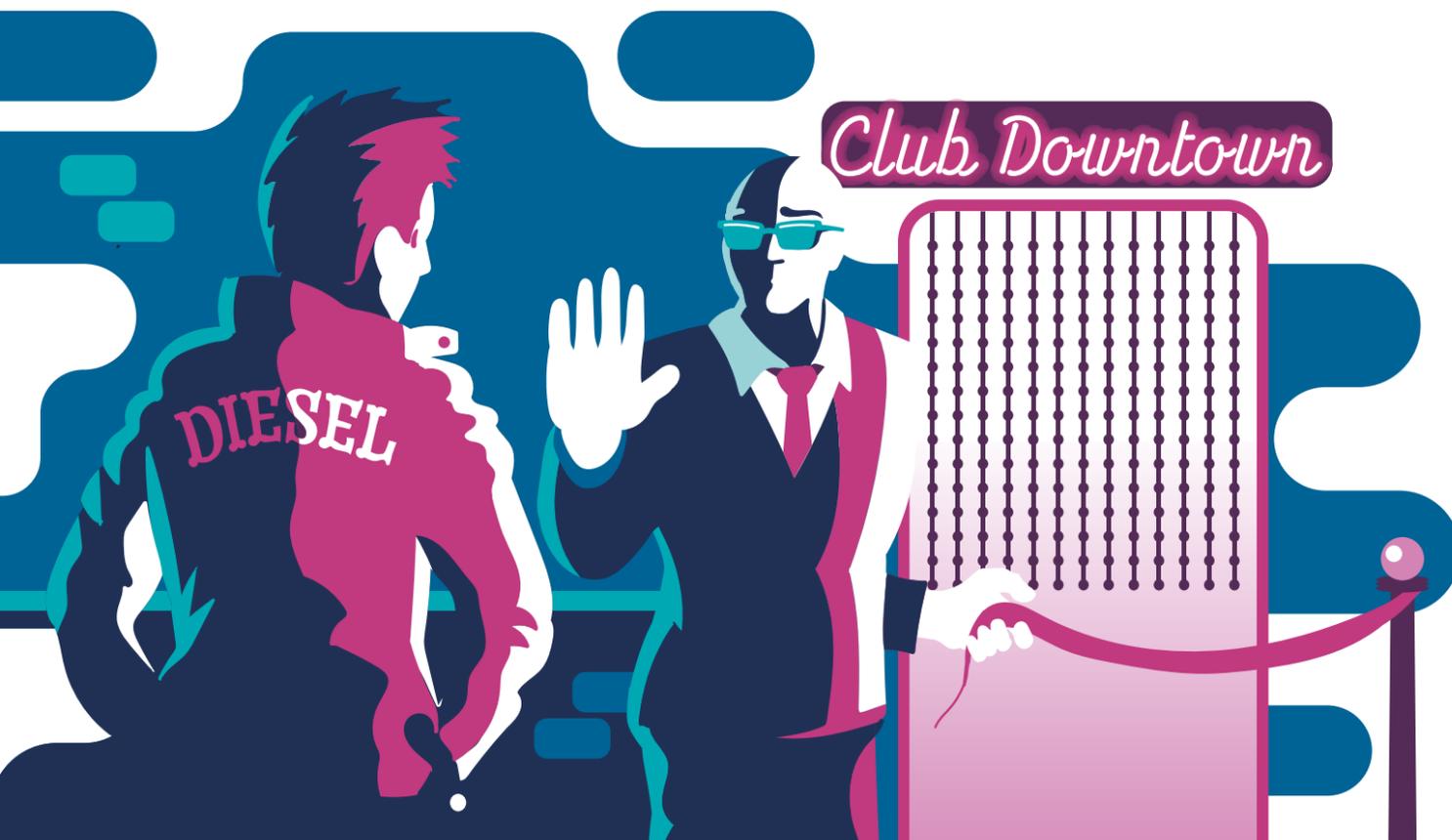


Production declines once more
Change in percent in comparison to the prior year

* Forecast/source: Bosch

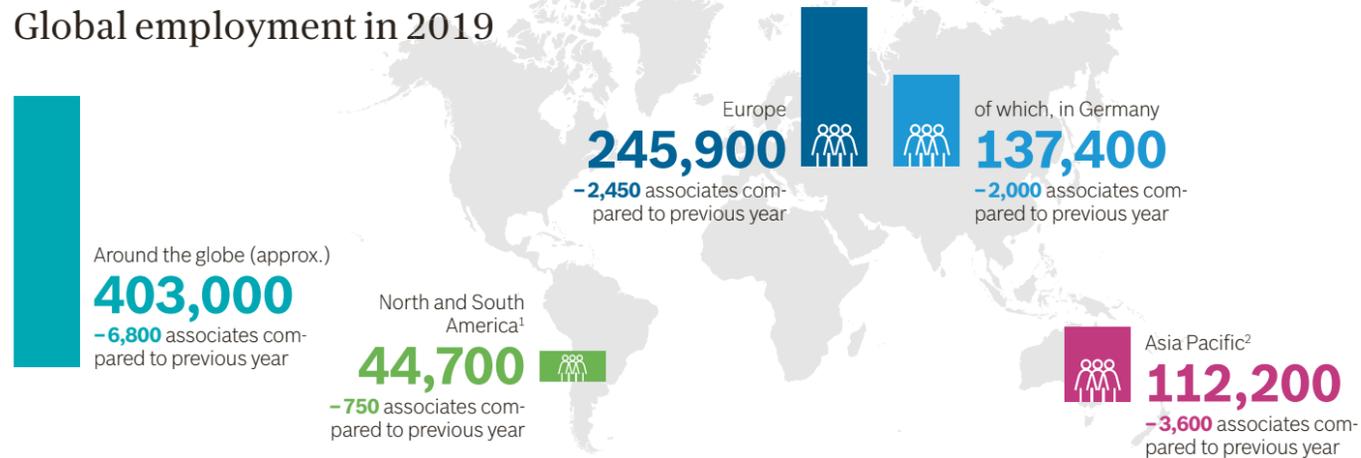
What risks are associated with Brexit?

7 While the United Kingdom left the European Union on January 31, the risk of an exit without a trade agreement being concluded between the UK and the EU by the end of the year has by no means been avoided. The two parties have just 11 months in which to negotiate and conclude an agreement, which is extremely challenging in the short timeframe. This means continued economic uncertainty, which in turn will result in a decrease in investments. A hard Brexit with customs and border controls would have a massively negative impact on trade between the EU and the UK and place considerable pressure on companies. From Bosch's point of view, the Thermotechnology division with its plant in Worcester would feel the effects particularly hard.

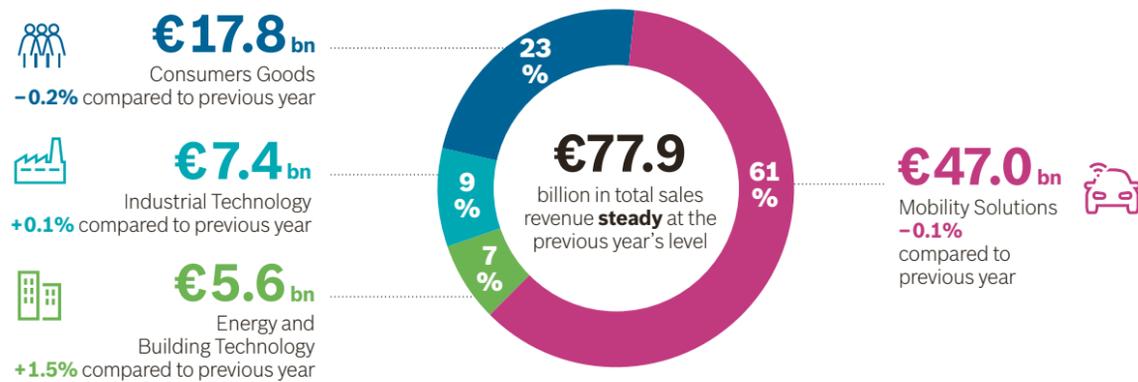


FIGURES – THE BOSCH YEAR IN REVIEW

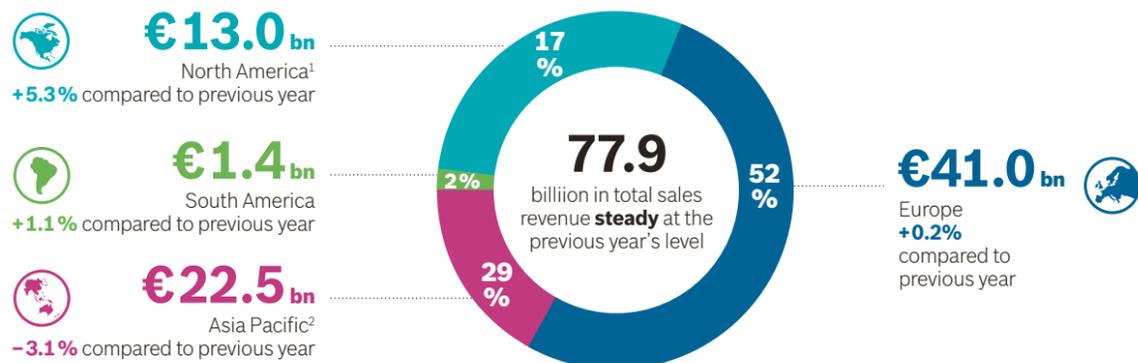
Global employment in 2019



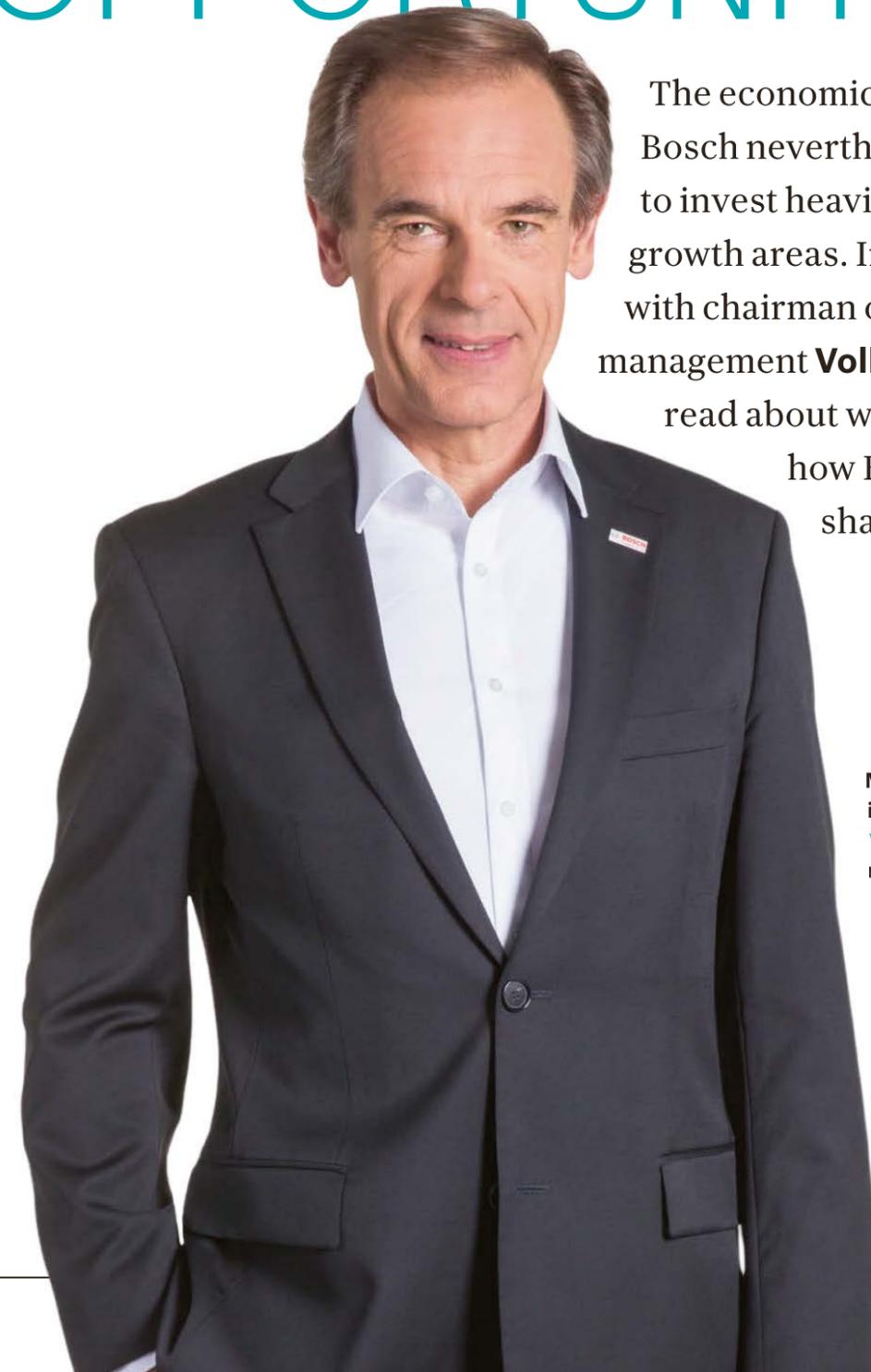
2019 sales revenue by business sector^{3,4}



2019 sales revenue by region³



“LEVERAGING THE OPPORTUNITIES”



The economic situation is difficult. Bosch nevertheless continues to invest heavily in important growth areas. In this interview with chairman of the board of management **Volkmar Denner**, read about what they are and how Bosch is actively shaping change.

Mr. Denner, how do you stay in shape?

VOLKMAR DENNER: I exercise regularly and I don't stop learning new things. Why do you ask?

I'm wondering about it because the company is not exactly in top shape right now.

Yes, that's a fitting image. If you look at it like that, we have to work hard on our fitness, especially in terms of income. Income shrunk in 2019 by €2.4 billion to →

PHOTO: BOSCH

1: including Mexico; 2: including the remaining regions; 3: temporary figures from fiscal 2019 based on internal accounting; 4: without miscellaneous

around €3 billion. Surely, we cannot be satisfied with that. We are feeling the full force of the slump in diesel business and the sharp downturn in the automotive industry, the scale of which we could not have expected. We are particularly hard hit by the setbacks in China and India.

What homegrown causes are partly responsible for the decline in income?

In some areas we haven't gotten a hold on costs. So we need to start there. At the end of last year, we clearly defined the necessary measures. Now we need to implement them more consistently and faster than in the past.

How then?

My colleagues and I on the board of management are working very closely on the measures with the business areas. We have set target costs with each operating unit. For direct material costs and for sales and administration costs or the costs of research and development. And we have to achieve them. This is crucial, and we cannot afford to make any trade-offs here.

What does this mean for the units specifically?

Economy and profitability. And we have to set the focus for our businesses. It means restructuring and adjusting the portfolio of products and even operating units. It also means reducing complexity by having fewer hierarchies and greater spans of control.

The package of measures also includes job cuts.

It hurts. But unfortunately they are unavoidable. We have to adapt our cost structures, which also means

subjecting our employment levels to drastic changes, especially in the automotive markets. In particular, it's because we cannot assume that the automotive industry will regain steam again in the coming years. It's our way of remaining true to Bosch's path.

What does that mean?

We are trying to implement the adjustments in the most socially responsible way possible. And we are taking a differentiated approach. Each site needs different solutions. We are in close discussion with employee representatives in each place. It doesn't make sense to implement a blanket reduction of jobs. If we did that, we would not be taking sufficient account of the individual future opportunities of each site. All these activities require great expenditures. At the same time, however, we will continue to invest in technologies and products of the future.

Which future technologies are we talking about?

As an innovation leader, we play a major role in shaping the future

of mobility and are thus leveraging the opportunities arising from the major changes in the automotive industry. This year alone, we are investing more than €1 billion in electromobility (including mobile fuel cells), automated driving, and mobility services.

What is planned for the other business areas?

Leaving mobility aside, we have injected around €600 million into the Internet of Things between 2015 and 2020. We are also investing about €100 million in the heat pump business. All this demonstrates that the change in technology is a considerable financial feat for us. Ultimately though, it will pay off.

Investments in the combustion engine are not included in this list. Have you already written off diesel faced with societal headwinds?

The public debate on the car is now more characterized by emotions than it is by facts. This is particularly true of the diesel engine. The fact is that diesel engines emit virtually

no nitrogen oxide thanks to our new exhaust-gas technology. In addition, they emit about 15 percent less CO₂ than gasoline engines. Technically, the diesel engine remains sustainable. There's no doubt about that.

In other words, Bosch is continuing to develop existing powertrain technology?

According to our market research, a minimum of two out of every three new cars in 2030 will still have a diesel or gasoline engine – in a hybrid system or not. This gives us sufficient reason to make these new cars as efficient as possible. It is clear that the combustion engine will continue to be a building block in the mix of future-oriented drive technologies at Bosch.

In addition to battery-powered electromobility, the fuel cell, and the hybrid?

The path that leads to emission-free mobility can only be one that is open to new technologies. It is the only way that will help mobility to remain affordable for consumers. This message is also transmitted in our video with Shawn, the star of our LikeABosch campaign, which was recently released. An electric car can make good sense if a customer needs a car for the city only. For people who regularly drive long distances, however, a modern diesel engine is the right choice, both economically and ecologically speaking. In terms of the existing vehicle fleet, synthetic and regenerative fuels could also contribute to substantially reducing CO₂ emissions. But for this to work, we need the support of politicians.

Which electromobility has long since been achieved. How is Bosch coming along in this area?

“ We have to adapt our cost structures, which also means subjecting our employment levels to drastic changes, especially in the automotive markets.”

We are the leaders in electromobility. This year alone, we are investing some €500 million in this area. In addition to batteries, we are focusing on fuel cells. We estimate that up to 20 percent of electric vehicles could run on fuel cells by 2030. Our goal is to introduce the fuel cell to the market in 2020, initially for commercial vehicles.

And when will Bosch be in the black in this area?

We want to break the billion-euro barrier in electromobility sales this year for the first time. And the break-even point is also not too far off – in about three years.

The development of automated driving is a tremendous challenge. What role does Bosch play in the face of financially strong competitors such as Google subsidiary Waymo?

We are also leading the pack in automated driving, as with electro-mobility. The reason is our successful driver assistance systems, whose sales in 2019 rose by 12 percent to €2 billion. By 2022, we will have invested nearly €4 billion in the continued development of automated driving. We are currently developing Level 2 (or “hands-off”) systems for the U.S. and Asian markets.

What's involved in that?

They are assistants for driving on the highway that allow you to take your hands off the steering wheel while on the road. Another example of our innovative strength is the long-range lidar sensor, which we have added to our sensor portfolio. This laser-based distance measurement technology also reliably detects non-metallic obstacles, such as stones, at great distances. It makes automated driving possible in the first place.

Then we will soon have the first car driving down city streets fully automatically?

Not quite yet. Automated driving will initially be introduced in a limited number of applications, such as specific routes with minimal traffic. It will still take time before the systems are ready to handle urban traffic situations and all their complexities entirely on their own.

How about the Internet of Things? What is Bosch's strategy in this regard?

Our aim is to achieve a leading position – driven by AI and based on our ability to innovate.

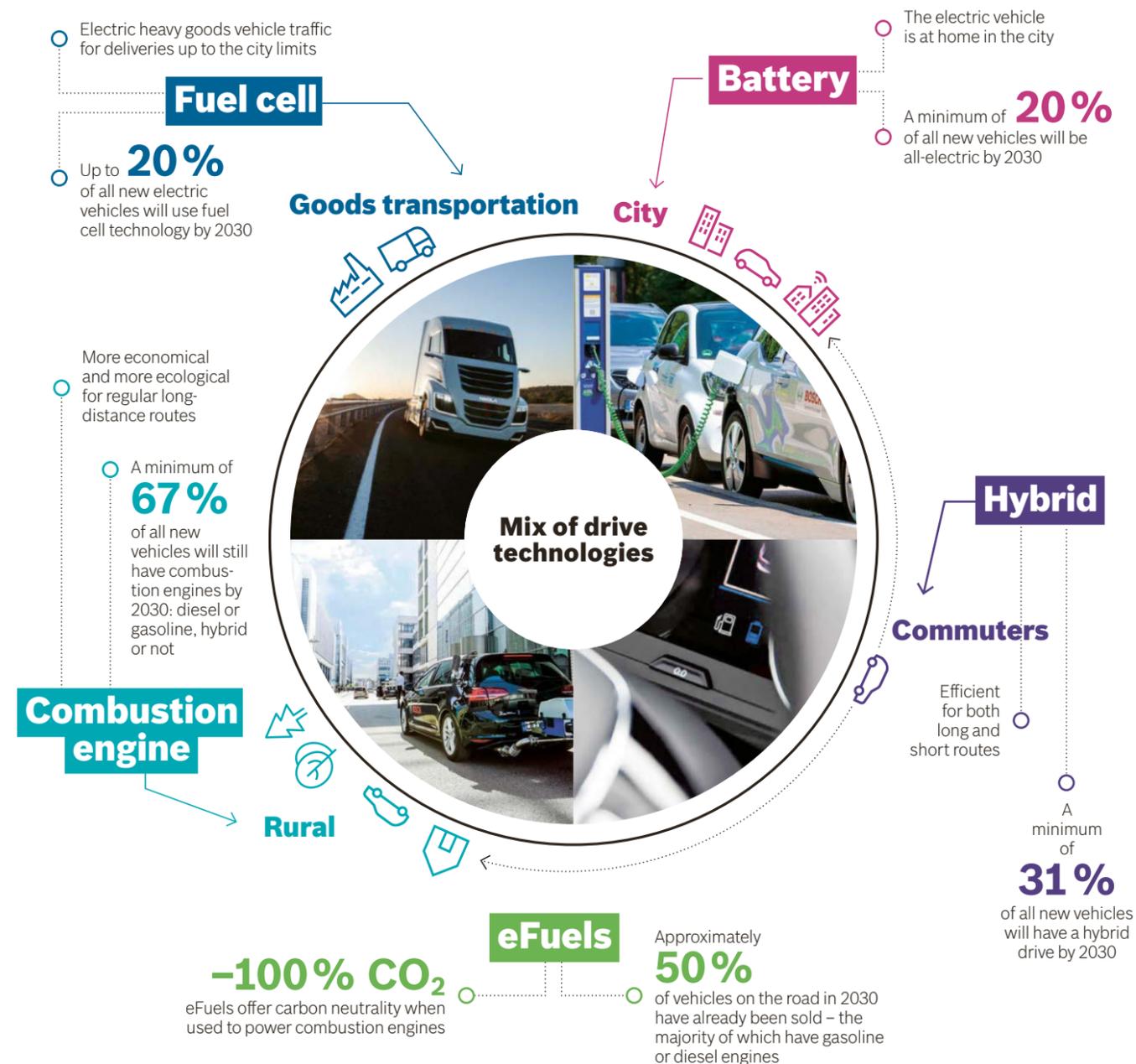
What are the prerequisites necessary to make that happen?

We need to succeed in making all Bosch's electronic product

“ According to our market research, a minimum of two out of every three new cars in 2030 will still have a diesel or gasoline engine – in a hybrid system or not.”

INTO THE FUTURE WITH COMBUSTION ENGINES AND ELECTROMOBILITY

Bosch focuses on a powertrain mix for sustainable and affordable mobility



classes capable of connectivity. We are well on the way to achieving this. It will have been achieved to nearly 92 percent this year already. In addition, we have to ensure that we handle data responsibly. And we must use artificial intelligence.

Which is viewed as a key competence for Bosch's future. Artificial intelligence is an absolute necessity. Only then will we be able to remain competitive in the future. We rely on AI to make our products intelligent, offer new functionalities, and improve how we manufacture them. This turns our products into intelligent assistants for our customers.

And which Bosch products are already using AI? For example, the emergency brake assistant in cars will become even more reliable and safe with our intelligent MPC 3 front camera, which understands what it sees. In production, machine learning helps to classify faulty parts. When implementing AI, we can combine intelligent algorithms with our domain knowledge, ranging from mobility to buildings to industry. Our primary goal is to use artificial intelligence to optimize technology.

Where does Bosch stand in a global comparison in this regard? Germany and Europe could become world leaders in the field of industrial AI, in particular. Bosch is already positioned among the leaders. We took an important step in 2017 when we established our Bosch Center for Artificial Intelligence (BCAI). We plan to invest €300 million in the BCAI, which now operates at seven sites worldwide, by 2021. We are investing an additional €100 million

“ We know how to shape change. We have proven this often enough in our history. And we will succeed in doing so now.”

in the new AI Campus in Tübingen, Germany. When it comes to AI, it is very important to gain and maintain the trust of associates and customers. This is why we have developed an AI code of conduct, which lays down ethical guidelines for the development and application of AI.

Let's change the topic. Bosch has set itself the target of becoming climate neutral by 2020. It's an ambitious intention. We will achieve this goal. All German sites have been climate-neutral since 2019. And we are also making great progress worldwide. What I am particularly pleased about is how enthusiastic our associates are about this goal. Last year, they proposed more than 800 energy efficiency projects worldwide. In addition, 22 photovoltaic projects were added at our sites in 2019. And – we cannot forget – climate protection also presents Bosch with major business opportunities, in particular in our Thermotechnology business area.

To wrap up, Bosch is undergoing a major change. What do you expect from associates, and what will make the difference now?

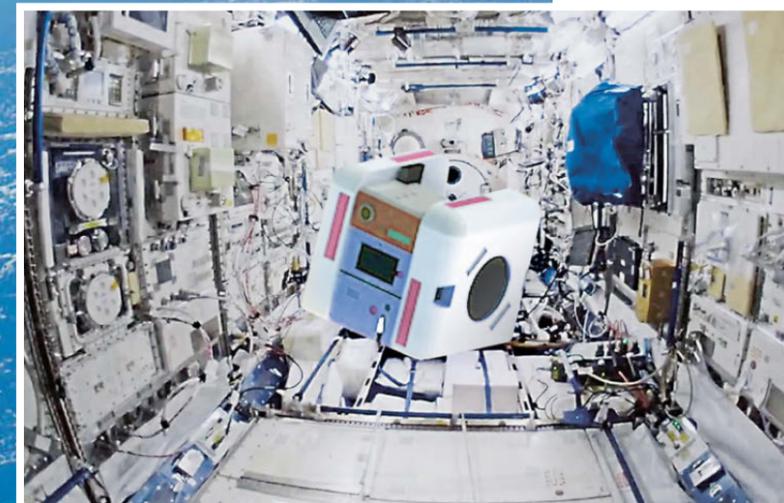
What we all need now is utmost cost awareness. At the same time, we are all being called on to contribute all our knowledge and skills, to develop ourselves in creative ways, and to participate boldly in transforming our company. We have to use times like these to question all processes in the company and design them more efficiently. In doing so, it is very important that we consistently implement the measures we have set ourselves.

What makes you confident that Bosch will return to its familiar strength? We know how to shape change. We have proven this often enough in our history. And we will succeed in doing so now. We have a promising new decade ahead, one that offers us enormous opportunities. We should make the most of them. And in the process, we should focus more than ever on the core strengths of our company: innovative strength, outstanding quality, global presence, and our unique corporate culture – of which we can be very proud. We are a strong team, and we will succeed.
 Interview conducted by: Gunter Epple und Christian Fronck

PHOTOS: BOSCH

ODYSSEY IN SPACE

Is the ISS intact? Bosch technology will soon be able to answer this question. The key to the uncovering that answer is **artificial intelligence**.



The system floats around on an autonomous robot in the International Space Station.

W

hen he was a boy, Samarjit Das had a dream that many children have. He wanted to be an astronaut.

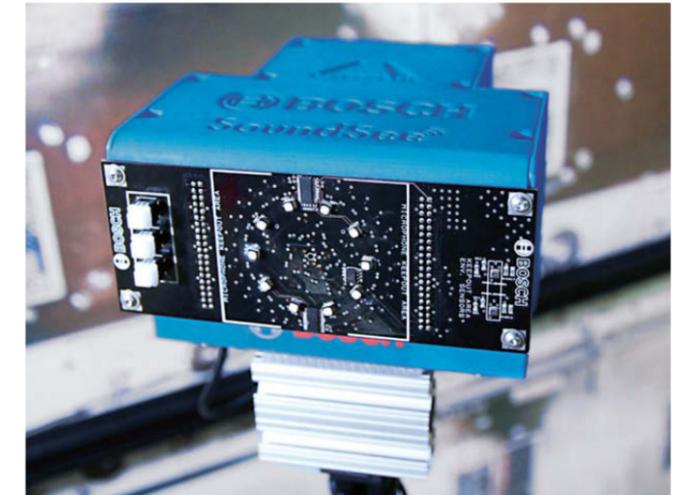
Now he is 36 years old, has a child himself, and is sitting in an office in the U.S. At least he has come close to his dream. “Astronauts spend most of their time in space performing maintenance work on equipment,” says Das, a senior researcher at the Bosch Research and Technology Center in Pittsburgh. “My team and I have developed a system that can make this work easier for them.” In the meantime, his invention is actually in orbit: on the International Space Station (ISS). It helps to detect whether machines are intact – using artificial intelligence.

The technology is called SoundSee, and literally does what its name indicates. Technically, it is referred to as depth audio analytics. The system captures sound with an array of microphones, and analyzes it using machine learning. SoundSee is designed to extract usable information from the space station’s audio data in order to monitor its condition and thus improve the future operation of the ISS. “I

PHOTOS: GETTY IMAGES; BOSCH



The team has an overview of everything going on in the lab. The audio data will be sent there for analysis.



SoundSee was tested on Earth in a soundproof room that is modeled on the habitation and work modules of the ISS.

want to understand the language of machines,” says Das, who majored in electronics and communication engineering in India. “Their sounds can tell us a lot about whether or not they work properly.”

EARTH-BOUND ANALYTICS LAB

About as big as a lunch box, SoundSee is equipped with 20 microphones, is capable of detecting sounds in high and low frequencies, and focuses on sound patterns in space and time. “It’s like seeing. You focus on something to get a picture of it,” says Das, who holds a PhD in electrical and computer engineering. In the next step, the audio data that SoundSee captures on the ISS will be sent to Das and his team for mapping and analysis.

They work in a laboratory in Pittsburgh that is modeled on the interior of the ISS. “It helps us gain a better understanding of the sounds in their actual environment,” says project scientist Jon Macoskey. He is standing in a soundproof room as big as one of the habitation and work modules of the ISS. In this room, the researchers have tested SoundSee

on the ground, Macoskey explains. However, unlike in the Earth-based laboratory, SoundSee can float around on the space station – which means it can avoid many annoying noises. The system that carries it around is called Astrobee, an autonomous free-flying mini-robot designed and built by NASA.

Das and his childhood dream are the reason for the cooperation. “We had a robotics meeting in Pittsburgh in 2017. At it, I met the head of Astrobotic Technology, a space robotics company,” he says. “I told them, ‘I love space exploration. How about we work together?’”

This was the beginning of a research partnership that led to SoundSee’s mission to space. Even back then, Das had thought about flying robots, he says. Through the space experts, he learned about Astrobee, the autonomous mini-robot, which NASA wanted to equip with sensors. Das put his idea about SoundSee to NASA at the end of 2017. In early November 2019, the sensor system was actually sent into space. “This is a dream come true for me,” Das says. “Now Bosch has

“It’s a dream come true for me.”

Samarjit Das has developed a sensor system to analyze sounds on the International Space Station.



PHOTOS: MICHAEL RAY

a foot in the door in space research.” As a postdoctoral researcher at the Robotics Institute of Carnegie Mellon University in Pittsburgh, Das himself was able to establish contacts in the industry.

FOCUS ON TWO MACHINES

SoundSee will initially listen to two machines on the ISS, and one of them is vital for human life. It is the system that controls and regulates everything – from the air pressure and oxygen generation system to water treatment and waste disposal. The sounds come from pumps and fans, for example.

Another source of sound is the fitness training equipment that astronauts use to maintain muscle mass and conditioning. SoundSee takes a close look at this equipment, too. In both cases, the system will record sounds in two-hour blocks,

Das says. The test phase is scheduled to last about three months. “But we have no plans at this time to bring SoundSee back to Earth.” According to Das, it makes sense to test the system for a longer period in order to get better and better analyses.

In the best case scenario, the SoundSee team can use the audio data from the ISS to train reliable artificial intelligence models to monitor the status of the equipment. The algorithms learn the sound patterns of a normal machine and those of a defective one. Or what it sounds like just before it fails and what could be the cause. The technology could also be used on Earth – in factories and in the mobility sector.

Das also has an idea for future missions in space. “There are plans to put a space station in orbit around the moon, which, unlike the ISS, will not be permanently occupied by astronauts. SoundSee could help to detect machine malfunctions.” This he has learned: “It’s worth reaching for the stars. Now I’m thinking about putting a Bosch sensor on the moon.”

Antonia Lange

250
miles above Earth:
the International Space Station.

20
microphones are used
in SoundSee to best
detect sounds.

2
machines will be monitored
by the system.

LIFESAVER 4.0

Whether it's a train wreck, a terror attack, or a pile-up, every second counts in emergency situations that involve multiple casualties. **RescueWave** is a life-saving solution developed by Bosch subsidiary ITK Engineering, together with security and rescue experts from VOMATEC Innovations and antwortING. The digital system supports emergency services in crisis situations, from giving an overview during the immediate aftermath, through providing casualties with first aid, to organizing transport.

Emergency personnel on the scene get an overview of the situation immediately via the Rescue.App. Rescue.Node devices transfer data to the app in real time.

Rescue.Carbox

Operation coordinator

The network
Rescue.RAN (RescueAreaNetwork) establishes itself automatically when the vehicles arrive on the scene. It is autonomous and allows encrypted communication of operation data.

Transport
can be arranged quickly thanks to data collected. Casualties can be assigned to destination vehicles and clinics according to priority.

Casualties
each receive a Rescue.Node, which is automatically registered. The electronic FARS device notifies the Rescue.RAN of the FARS category, the exact position, and the transportation priority for each casualty.

The important FARS categories

-  Fatal injury
-  Incapacitating injury
-  Non-incapacitating injury

The crisis management group receives data in real time and can pass on information such as the number of casualties to authorities and the public.



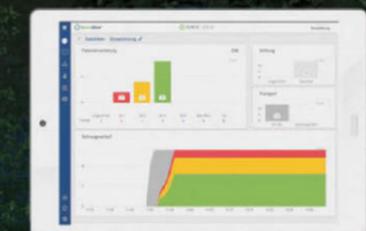
The electronic Rescue.Node sighting device

- 1 Internal radio network and GPS
- 2 Sets FARS categories
- 3 Determines transport priorities
- 4 QR code enables data access via the Rescue.App
- 5 Color coding lights up in the respective FARS category



The Rescue.Carbox

Is installed in emergency vehicles and acts as the core of the digital system. The servers connect the nodes with the app autonomously and automatically via the network.



The Rescue.App

Live statistics provide information about the latest numbers, locations, and FARS categories of all casualties at all times. In addition, patient information can be recorded and viewed.

THE SMARTPHONE OF AUTOMATION

The new **ctrlX AUTOMATION** platform has erased the traditional boundaries between machine control, IT, and the Internet of Things.

Often it takes weeks of work for a mechanical engineer to do something that a smartphone user can manage in seconds. Updating the operations of a production plant can still involve a tremendous effort, while smartphones simply need a new app to add the latest features.

Now Bosch Rexroth is bringing the world of the smartphone into factories with its new ctrlX AUTOMATION solution. “Nowadays mechanical engineering is just software development,” explains Steffen Winkler, the responsible sales manager. To this end, the experts at Bosch Rexroth developed a solution that dramatically simplifies the job. The focus is placed on user-friendliness, flexibility, and open standards. “We have created an automation platform that removes

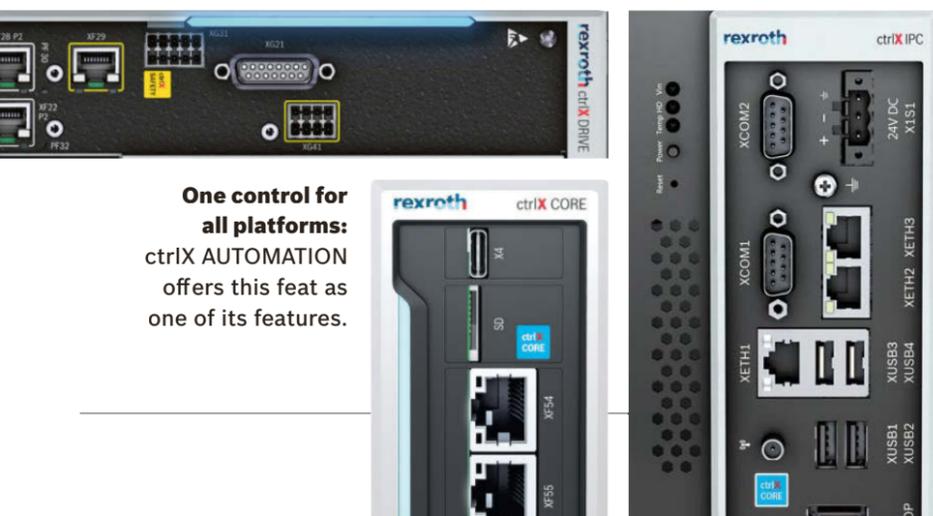
the limitations of previous solutions,” says Winkler. The technology includes controls, drives, motors, monitors, user interfaces, industrial PCs, and software. The core is the ctrlX CORE control unit with its powerful processor, which for the first time can be integrated into all relevant hardware components: in drives, in industrial PCs, and as an embedded controller.

The new end-to-end solution makes it as easy as possible for software developers. “We have chosen an uncompromisingly open platform,” says Winkler. This involves a departure from manufacturer-specific standards, which is tantamount to a paradigm shift in the industry. The solution is based on the Linux operating system, which is known for its flexibility and security features. Other advantages include the use of app technology for

-  programming, web-based engineering, preprogrammed features, and intuitive programming tools. Machine manufacturers can easily create individual functions themselves as apps, or purchase them externally and combine them with each other. Running independent of the hardware, the software can be updated much more easily, and with wireless options too. This makes machines ready to incorporate new standards anytime in the future.
-  A human cyborg points out that a microchip can also be used to pay or to capture and exchange data. It shows that this is only the beginning. You can install magnets in your home – or devices that allow you to determine which direction is north, to detect an earthquake, or feel colors. All this is already happening and exists today, and will probably increase in scope in the future.
-  The solution supports a wide range of programming languages and is no longer tied to specific machine languages that only specialists are able to master. At the same time, some of the components are only half the size, which reduces the required installation space in the control cabinet. These improvements can cut component and engineering costs by 30–50 percent.
-  “There were also detractors who initially said it was impossible to transfer the world of the smartphone to automation,” says Winkler. “We now know that we have made the seemingly impossible possible.”
-  *Alexander Fritsch*

ing their ears or other body parts had been the most serious intervention to date. The freedom of every individual includes acting against general reason and one’s own well-being. This can become a problem with children, because they cannot judge the consequences of their actions.

It also becomes a problem if politics and business put pressure on us, force us to have a microchip implanted or incorporate other artifacts in our bodies. Reasons might include ease of identification or – an important aspect in human enhancement and transhumanism – performance improvement. It is also questionable whether the improvement someone wants to achieve with animal enhancements serves only human beings. A data chip is useful for domestic pets and wild animals, a collar that creates a virtual fence for farm animals, as long as it gives them more freedom of movement. But if insects are equipped with microphones and cameras and remotely controlled, it will at best help spies and stalkers.



One control for all platforms: ctrlX AUTOMATION offers this feat as one of its features.

WILL WE SOON ALL HAVE IMPLANTS?

A Swedish company implants microchips under the skin of its employees – for example, to use in opening doors. Expert **Oliver Bendel** explains this method of bodyhacking and what the future holds.

Bodyhacking – like biohacking in general – is about changing and rebuilding organisms. As the name suggests, the focus is placed on the human body or on animals. A microchip is inserted into a person – which in the case of a Swedish company, can be used to open doors. It can also be useful for animals, such as cats, the same as it is for humans. If it is an improvement, it is called human or animal enhancement. If technical resources or information technology is used, the result is called a cyborg.

A human cyborg points out that a microchip can also be used to pay or to capture and exchange data. It shows that this is only the beginning. You can install magnets in your home – or devices that allow you to determine which direction is north, to detect an earthquake, or feel colors. All this is already happening and exists today, and will probably increase in scope in the future.

The change is the freedom of the human cyborg. Its body is its own. However, one could reproach him for becoming a role model – even for those who do not sympathize with transhumanism, the transformation of the human condition. Likewise, for those who thought that pierc-

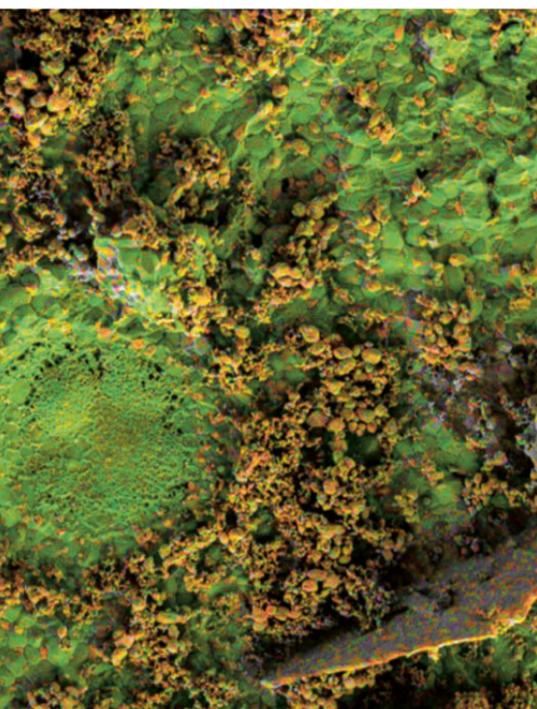
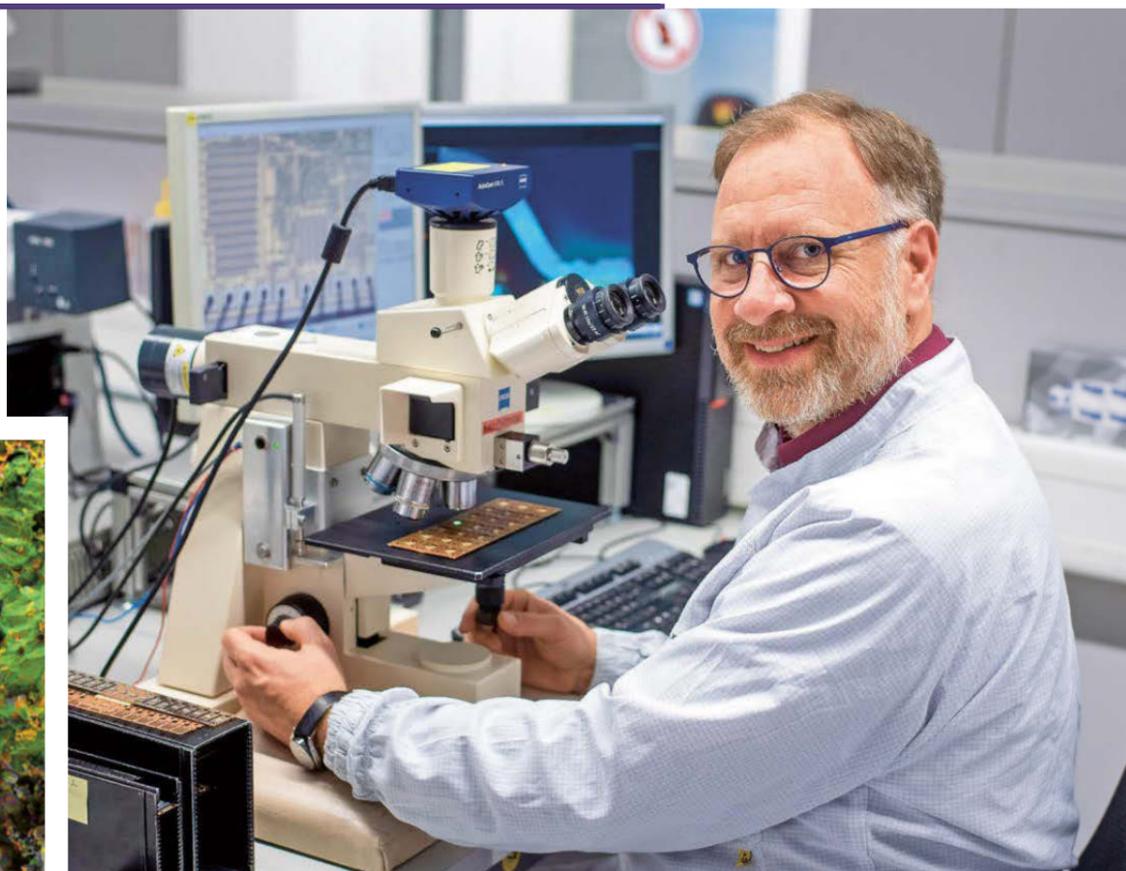


Dr. Oliver Bendel is an expert in information ethics, machine ethics, and information systems at FHNW university in Switzerland.

PHOTO: BOSCH REXROTH

PHOTOS: LINDA POLLARI; WIKIPEDIA/NETSPY; GETTY IMAGES

Materials scientist Jörg Krinke sits at a microscope searching for defects in the tiny structures of semiconductor chips.



When searching for impurities, chemical elements can be displayed in different colors (*top*). **Tiny pieces:** The semiconductor chip is situated in the center (*below*).



Silke Selg knows her way around X-ray machines. For example, smartphones whose sensors have caused problems end up on her desk.



THE CHIP DETECTIVES

They are invisible to the naked eye, but an analysis team in Reutlingen still tries to track them down. With the fervor of detectives, they search for **defects in semiconductor chips**.

The work of Joachim Glück and his colleagues is reminiscent of a detective story. The team from Reutlingen solves cases where others have failed. The important thing in their quest is to not wipe away any traces and to collect as much evidence as possible. Generally, the culprit cannot hide for long. But Glück and his team have nothing to do with crime. In a laboratory at Automotive Electronics (AE), they actually examine semiconductor chips and micro-mechanical sensors in search of defects. And they are successful, with a detection rate of over 90 percent.

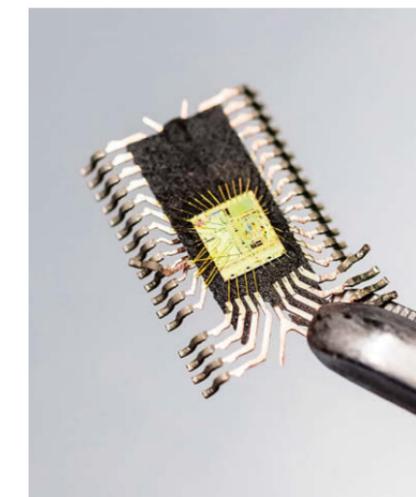
“These are generally isolated cases,” explains Joachim Glück, head of the department for physical analyses. “Although semiconductors are manufactured in a clean room, if there is even a single particle there, it can lead to defects.” It means that other areas have already failed if a part ends up in the hands of the team in AE/QMS-A.

“We carry out detailed detective work on semiconductor chips, looking at the tiniest of structures, right down to the atomic level,” says materials scientist Jörg Krinke. “Our motto is, find a ping-pong ball in a soccer stadium from on board a helicopter.” The team has access to about 100 different methods. A total of 75 colleagues work in two shifts.

TROUBLESHOOTING WITH A PHONE

Silke Selg is a materials scientist specializing in X-ray computed tomography (CAT scans). She uses this tech to generate 3D images in order to locate defects. For example, a smartphone whose display no longer rotates when the device is moved ends up on her desk. This is an indication of a defective sensor. But where exactly is the error?

Selg notes that Stefan Oberhoff is often consulted to resolve this issue. Among other things, this materials scientist is an expert in the analysis of acceleration and rotation rate →



Tiny: The team runs analyses on these chips, right down to the atomic level.



Ultrasound for chips: Stefan Oberhoff takes a very careful look (top). **Where is the defect?** Some 75 colleagues work in two shifts to uncover the answer to this question (below).

sensors. His method is ultrasonic microscopy. “I examine components using a bath-type sonicator and create images of their inner structure,” he explains. “This allows us to get even closer to the culprit with the ultrasound head – up to 100 micrometers.” This is similar to the diameter of a human hair.

The chip is opened – as gently as possible – once the defect is located. It is important not to wipe away any traces, as with a crime scene, stresses Philip Hartmann. A physicist and nanostructure engineer, Hartmann is responsible for error analysis. “We will delay destroying the chip for as long as possible.”

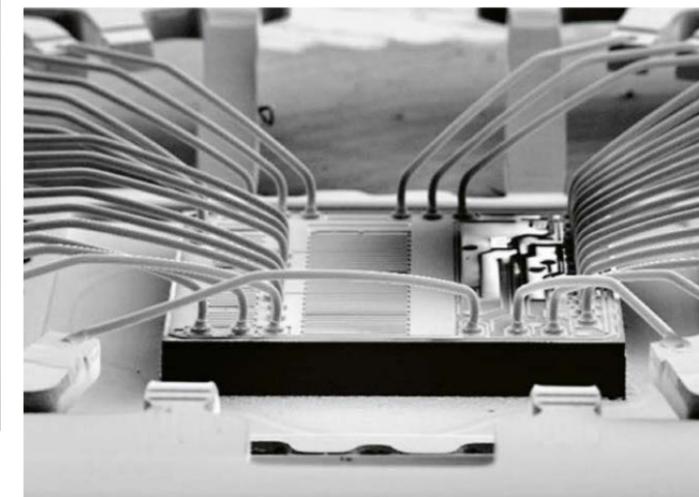
APPLICATION OF CHEMICALS

Specialists remove the housing with a laser to enable detailed analysis while keeping the sample intact. Then other colleagues apply chemicals to the component. Part of their daily routine includes a hotplate with fuming nitric acid. And this is just one of several methods that are used to expose the surface of the chip or sensor. It calls for experts with a steady hand, as they sometimes also have to show off their grinding and polishing skills.

Once this has been done, it’s time for Stefan Käßner. He’s a mineralogist who examines the microstructure of



The next step: Stefan Käßner examines the microstructure of components after it becomes clear where the defect is located.



The **microscope image** shows a chip with its electrical connections, which enables the experts to analyze it.

the components after the defect has been localized. “What the screwdriver is for some, the electron microscope is for my colleagues and me,” he quips. “We work with it every day.” How long will it take to solve the case? “It can be very simple,” he says. “If you immediately see a cavity that should not be there, for example.” But Käßner often has to go deeper into the analysis, right down to the atomic level.

The laboratory receives more than 7,000 job orders each year, as Joachim Glück points out. In addition

to troubleshooting, these include reliability checks of components for their release. Even a complex fault analysis takes only 15 work days on average.

SMALL CHIPS ARE EVERYWHERE

The cases that end up under these scientists’ microscopes are all as different as those solved by real detectives. These small chips are now in use everywhere, and can be found in smartphones, electric bikes, and even cars, for example. “In our work it’s important to establish as



“Even a small particle can lead to a defect.”

JOACHIM GLÜCK
Expert for physical analyses

quickly as possible whether we have a serial problem or a one-off defect,” says electrical engineering expert Clemens Helfmeier. Bosch has been manufacturing semiconductor chips for more than 45 years, primarily as application-specific integrated circuits (ASICs). Helfmeier specializes in analyzing them. “The components are becoming increasingly complex and the structures smaller and smaller,” he says, adding that this makes the work ever more demanding.

But in the end, more than 90 percent of the job orders result in a case solved. What was the reason for the defect? Particles, cavities, or contacts that had shifted are the most common culprits. Sensors occasionally have unwanted guests, despite being so tiny: “For example, the hole in the lid of a pressure sensor was once a little too large,” recalls Philip Hartmann. “Ants crawled in after it had been installed in a vehicle.”  Antonia Lange



90%

Detection rate

Even though the analysis team in Reutlingen only deals with the tricky ones, it finds the defect in most cases.



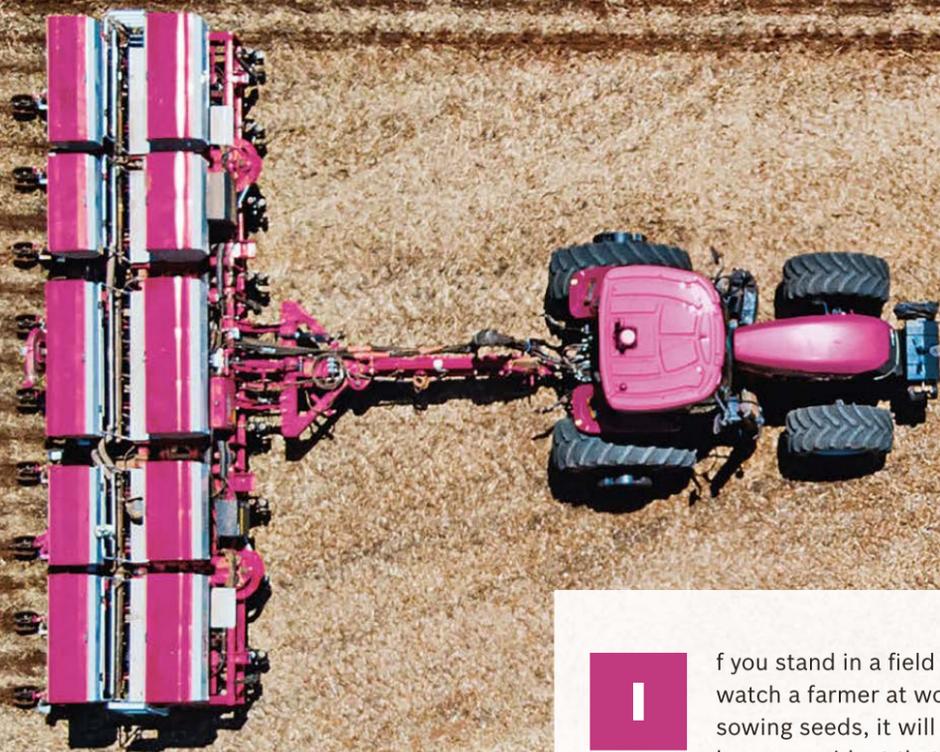
7,000

Job orders

Smartphones, cars, electric bikes – semiconductor chips and micromechanical sensors are on the advance. This means the colleagues have a lot of work to do. A fault analysis takes 15 days on average.

REAP WHAT YOU SOW

A field study was, in the truest sense of the term, the beginning of a new Bosch solution for connectivity in agriculture from Brazil.



If you stand in a field and watch a farmer at work sowing seeds, it will become evident that there is a much better way to do it,” says software developer Guilherme Sionek from the Curitiba site. For example, a farmer with a conventional seed sowing machine often needs an hour of preparation before he or she can start working. Observations such as these breathed life into a project developed in Brazil. And gave rise to a team led by Rubens Avanzini, a business owner, helped by experts in hardware, software, and sales. Together they worked not only on improving agriculture – in particular the sowing process – but also on making it digital. The result was the Intelligent Planting solution, launched in South America last year. “The system automates and improves the sowing process and seed use,” says Vinicius Povineli from Sales.

SOWING WITH DATA

Speaking of his team, Avanzini says, “We’re open to new things, and on top of that, we’re creative.” But it did not start in the countryside. The Intelligent Planting solution uses

proven dustproof and waterproof components from automotive production. What’s new is that the solution also implements sensors and data. The components of the Intelligent Planting solution basically fit in a shoebox. It is attached directly to each row of the sowing machine. The system uses coordinate data to identify which sections of the field have already been planted. Seeds are sown only where the tractor has not yet passed, while maintaining the correct distance from each other. The system uses soil fertility data to regulate the quantity of seed. “This all happens automatically and individually for each row of plants,” says Avanzini. The farmer monitors everything from the cab via the display, which is part of the solution. A warning is emitted if seeds run out, for example. As well as convenient, the system is easy on the wallet. It’s faster to sow and saves up to 10 percent of seed, which is expensive, making harvests more profitable.

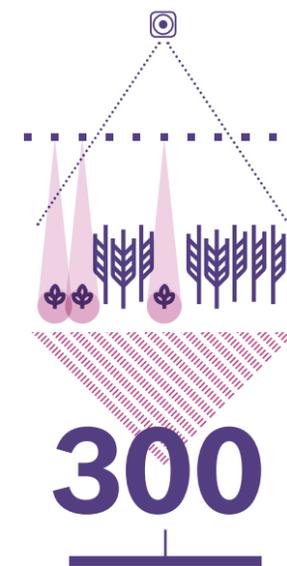
HUGE MARKET OPPORTUNITIES

Povineli is certain that “farmers are willing to pay a little more for the smart system.” The Intelligent Planting solution will be marketed to

PHOTOS: EDUARDO MACARIOS; GIANCARLO GIANNELLI; ILLUSTRATION: MARIA CHRISTINA KLEIN

Even greater intelligence in the field: Smart Spraying

Bosch promotes profitable and sustainable agriculture not only with smart sowing, but also with intelligent crop protection. Smart Spraying technology uses cameras and artificial intelligence to distinguish crops from weeds. Herbicides are only applied where they are needed.



Milliseconds, or the blink of an eye, is the time that passes between detecting and spraying any weeds.

manufacturers of agricultural machinery. Thirty systems were sold immediately after market launch. “The agricultural market offers huge potential,” says Avanzini. “Both in Brazil and worldwide.” The team plans to use the solution in the future to cultivate fields in other countries.

✉ Julia Neitzel



A shared passion: Connectivity in agriculture. The team from Curitiba working on the Intelligent Planting solution (from left to right):

Priscila Fonseca, Marcel Martinez, Vinicius Povineli, Anthony Ziobro, Sidney Oliveira Junior (seated), Wellinthon Kiiller, Leonardo Vecchi, Guilherme Sionek, Rubens Avanzini (seated), Marlon Mata, Aline Joia, and Rodrigo Mendes.

A CLEAN WORKPLACE

High-pressure fuel injectors are manufactured in Daejeon, where cleanliness has top priority. Even the modest lint brush has a role to play.



Jongchan Oh, Yohan Ma, Kwangbom Song, Wangsu Han, and Ingi Kim (left to right) received the Bosch Quality Award for maintaining a spotless workplace.

The idea



“A single speck of dust can destroy an engine.” When you hear the slogan, it sticks with you. So much so that it played a major role in the **Daejeon plant** receiving a major award. For many years, the South Korean site has been producing **high-pressure fuel injectors** for gasoline engines, including the **HDEV5** model. “Maintaining absolute cleanliness is of critical importance,” says production engineer **Ingi Kim**. “Even the smallest particle entering the production process can cause fuel injectors to fail.” That’s why there are a number of steps in place to help the

team maintain a tidy workplace. They include having clean shoes, regularly replacing gloves, and using lint brushes. Another key measure at the plant was a broad-based campaign where the slogan at the beginning was first used. **Daejeon** was the only plant in the international manufacturing network to report zero complaints in 2018 due to untidy conditions at the workplace. In recognition of this fact, the South Korean team received the **Bosch Quality Award**. “We want to maintain this level of quality in future products, too,” says Kim.

Facts and figures



34

million **HDEV5** high-pressure fuel injectors have been produced in Daejeon as of the end of 2019. Buyers include **Nissan** and **Suzuki**.



There are **internal costs** associated with quality defects during production. These were cut by 74 percent for the **HDEV5** through targeted measures.

Zero

customer complaints were reported for the **HDEV5** in Daejeon in 2018.

PHOTO: JUN MICHAEL PARK

TO ERR IS HUMAN

We like to talk about times when we are successful, not so much about our failures. **Arda Arslan from Istanbul** turned the tables around and publicly spoke about it.



One mistake almost cost Arda Arslan his health. But in the end he learned from it.

ZÜNDER: You took part in a “**Screw-Up Night**,” an event where people come to talk about the times they made mistakes. Why?

ARDA ARSLAN: I wanted to show others that it’s only human to make mistakes. You don’t need to feel ashamed or be afraid of them.

How did you learn that?

I had to move to another country for Bosch around 13 years ago. The associates there were experienced and very knowledgeable. However, they didn’t share their knowledge or support one another – it wasn’t their style. The interpersonal aspect was missing. But for me it’s important. It is here where I made a mistake.

How so?

I tried to act like my colleagues and stick to the facts and the figures, as if there was no one else around – instead of just being myself. There was no empathy, no trust, no communication.

How did it turn out?

I was unhappy, lonely, and wasn’t successful at my job. My health suffered and became worse and worse. My doctor told me that the stress would destroy my body at some point. That was when I hit the brakes.

How?

At first I thought about leaving. But then I told myself: Just be yourself, just be rational about things. For example, I offered to help my

colleagues. And I could literally see the question marks popping up in their eyes – because they had never experienced this before in a team situation. I built up relationships with them, and trust.

What did you achieve?

Doing good to others paid off. I got something in return. The associates there started to help me, too. Of course, not everyone changed completely, but they started to help one another a little more.

What was your takeaway from this experience?

It is very important to do your job well, but this also includes some interpersonal skills. It is still important to me that I continue to develop myself into a better person, and help others do the same. Together we can accomplish much more. Then success will follow of its own accord.

Antonia Lange

Arda Arslan is responsible for the independent spare parts business for the Turkey, Iran, and Middle East region. He is based in Istanbul, Turkey, where his career at Bosch began some 17 years ago. During that time, Arslan has worked abroad and in various divisions.

FINALLY DOING SOMETHING ABOUT IT

Maria Jung and **Thomas Jörg**, from Grasbrunn, help homeless people. Their volunteering means more to them than just distributing food.

A cup of tea, sandwiches, or warm gloves. “These are things that are a great help to people who have no roof over their heads. Especially in the cold winter months,” says Maria Jung, director of marketing for Switzerland and Austria at Bosch Building Technologies. That is why she has been active in helping homeless people in Munich for about a year now. Every month, she and her colleague Thomas Jörg spend two evenings driving a van called *Möwe Jonathan* (“Jonathan Seagull”) through the city streets, taking care of people who sleep outside at night. Jörg and she are among the volunteers who help the non-profit organization Sisters and Brothers of St. Benedict Labre, which is dedicated to helping the homeless of Munich.

TAKING THE SEAGULL FOR A SPIN

Jung and Jörg need to stock the bus with food supplies – donated by bakeries, butchers, and two monasteries – before they start their route. “We occasionally bring something special, like cinnamon rolls, in addition to sandwiches and tea.” Then they head off to the hotspots

in Munich’s downtown area where people typically sleep rough: in private driveways, on park benches, and under the bridges on the Isar. For almost 30 years, the “Friends on the Streets,” as the homeless are affectionately called, have awaited the arrival of the *Möwe* every evening.

FLOWERS FROM FRIENDS

True friendships have even developed with some of these people. Like with Christian, a “lovely young man.” Maria Jung is noticeably moved when she mentions him: He sometimes brings her roses, which he receives from a supermarket when it closes for the



“I liked the idea of helping people who others tend to ignore.”

Maria Jung

evening. Generally, the evening drives are jovial times, with nice and humorous conversations. “Now and then there are loud fights between drunken men.” Then there is nothing else to do other than help settle the matter. Jung and Jörg particularly enjoy that they don’t just pass out hot tea and sandwiches. They also listen, comfort, and encourage – which is just as important. “We volunteers are often the only social contacts the homeless have, and the only ones who meet them at eye level.”

There are up to nine places where the two Bosch associates stop by on some evenings. So it is often close to midnight by the time Maria Jung arrives at home. That sounds exhausting. Why does she do this job voluntarily? “I liked the idea of helping people who others tend to ignore. Even though you think that the situation of the homeless people is sad, you usually continue walking and do nothing.” Especially in Munich, she adds, there is a deep gulf between the very rich and the very poor. “And this is where I want to make a difference. I saw this volunteer work as a way to finally start doing something about it.”

Ortrun von Hochmeister

PHOTO: QUIRIN LEPPERT



Maria Jung (right) and Thomas Jörg: Especially in the cold winter months, supplying homeless people with hot beverages or a warm soup is crucial.



One Day in Mexico City



Karla Retana Santamaria
from Corporate Communications
gives us some tips
for visiting her city.

1 Handicrafts market

You can find traditional Mexican handicrafts at this market. There are also workshops to give free range to your creativity.
→ <https://mercado-artesanal-mexicano.business.site/>

2 Cineteca Nacional

This movie theater screens a range of historical and international arthouse films. The building complex also provides space for exhibitions, small shops, bars, and food stalls. A must-see for anyone who likes art and architecture.
→ <https://www.cinetecanacional.net/>

3 Frida Kahlo Museum

The museum, with works by the painter Frida Kahlo, is one of the most famous in Mexico City. If you are there on the weekend, buy a Frida Bus ticket. It is valid for admission to the Frida Kahlo Museum and the Diego Rivera Anahuacalli Museum.
→ <http://www.museofridakahlo.org.mx/en/>

4 El Jarocho Café

Traditional coffee blends have been available here for more than 50 years. The beans come from Veracruz, one of the most important growing regions in the country. And churros, a delicious fried-dough pastry, pair nicely with the coffee.
→ <http://www.cafeeljarocho.com.mx/>

5 Parroquia de San Juan Bautista

The architecture of the church is New Spanish Baroque. It is worth taking a look at its striking interior. And on June 24 there are masses, music, Mexican food, and fireworks to celebrate the festival of its patron saint.
→ <http://www.oldmissionsjb.org/>



My hobby in numbers

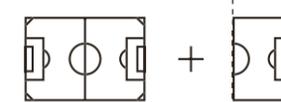
MUSEUM TOUR

Hua Guangchao is an engineer in the Automotive Electronics business division in Suzhou, China. She has been giving visitors guided tours of the museum in her hometown for more than ten years.



35

is how many **guided tours a year** are conducted by Hua Guangchao. She plans every detail so she can answer even the trickiest questions.



10,700 m²

The museum unites ancient and modern styles of architecture and gardens with many cultural sights on an area equivalent to **1.5 soccer fields**.



1,000

One of the oldest and most famous cultural relics in the museum is an olive green porcelain dish that is more than **1,000 years old**. It looks like a blooming lotus flower.



30,000

exhibits are on display in the museum. Many of the art objects are made of porcelain. Yet there are also old paintings and calligraphy from the Ming and Qing dynasty.

ILLUSTRATION: ANNIE DAVIDSON; PHOTOS: BOSCH, PRIVATE



Reader Photo



Rainer Feuerfeil
works in Renningen.

“This extraordinary wooden signpost caught my eye one day when I was on a walk. It is located on a path through a forest that stretches from Gerlingen to Schillerhöhe. The post was carved and erected by Gerlingen-based forest ranger Jirka Lorenz for a Bosch associate whose daily commute to work passes by the location.”

NEW HEALTHCARE CENTERS IN GERMANY

Hohenstein in the Swabian Jura is home to one of the first PORT centers in Germany. PORT stands for “patient-oriented centers for primary and long-term care.” It is a program financed by the Robert Bosch Stiftung.

Since 2007, PORT has been supporting initiatives and local health care centers that provide basic medical care from a single source, thus enabling better care in a specific region, especially for the chronically ill.

A central component of the PORT concept is the establishment of guides for patients. Elisabeth Reyhing has taken on this job in Hohenstein. She sits in the

reception area of the center and is the central point of contact for patients and guests. “I answer their questions about health issues, translate letters by their doctors into layman’s terms, put people in touch with the right contact, and listen a lot,” says the trained nurse. “I have a sense for what people actually want to say, even if they don’t express

it verbally.” In doing all this, Reyhing can provide patients with appropriate information and let them know about specific offerings.

Guides are a part of a network of family doctors, pediatricians, physiotherapists, nursing staff, and social workers at Hohenstein’s PORT center. They coordinate the treatments for patients they support, combining modern medicine with offerings for prevention, health promotion, and consultation.

Four PORT centers are currently being established around Germany. The initiators of the concept drew inspiration for it from international fact-finding missions to exemplary institutions in Canada, Sweden, and Spain.  Alexandra Wolters



Elisabeth Reyhing



TAKING PART?

The UN turns 75 and initiates a global conversation about the world’s future.

The world was in shambles at the end of World War II. Violence and oppression had destroyed countless lives and families, and had defined relations between countries for decades. Cities lay in ruins. Many people packed up their remaining belongings and set out to look for a new beginning – accompanied by traumatic experiences and the hope for “No more war!”

Hope took on concrete form just a few months after the end of the war in 1945, when 50 states signed the Charter of the United Nations. Now comprising 193 countries, the international organization promotes peace and security in the world. It protects human rights, provides humanitarian aid, and has given the international community a common agenda through the sustainable development goals (SDGs).

The UN turns 75 years old this year. “We want to listen to people’s aspirations and fears for the future, to listen to their ideas about how we can improve as the UN,” says Fabrizio Hochschild Drummond, UN Assistant-Secretary-General. There are plans to conduct thousands of surveys of people worldwide, which are to be made accessible to as many people as possible – including young people, critics, and members of marginalized groups. Challenges such as climate change, migration, increasing inequality, and digital technologies that affect everyone’s lives will be placed center stage during the anniversary celebrations. The proposals and ideas submitted will be evaluated and discussed with heads of state and government at the UN this September.

The Robert Bosch Stiftung is a partner of the celebrations for the UN’s 75th anniversary. The Stiftung promotes dialogue in Germany

and in its international work. Last year, the foundation supported a group of experts from the UN that drew up recommendations on how digital technologies can be used for the benefit of all, and how misuse and unintentional negative consequences can be avoided. Nanjira Sambuli, most recently working at the World Wide Web Foundation, is one of these experts. “Despite its known weaknesses, the UN has a unique role and the power to bring together the various players to create standards and frameworks and to help build the capacity we need to ensure a safe and equitable digital future for everyone.”

Hochschild Drummond is also counting on these strengths of the UN: “We want to use the anniversary to revive the spirit of global cooperation, a spirit that is fundamental to the implementation of sustainable development goals (SDGs) in the remaining ten years before 2030.”  Klaus Voßmeyer



“No country or community can solve the complex problems of our world alone.”

—António Guterres, UN Secretary-General

PHOTOS: BOSCH, UN PHOTO/MARK GARTEN, GETTY IMAGES

The invitation is open to everyone: The UN wants people from around the world to join in the conversation.

Join in!

Bosch associates are invited to take part in a short survey from the UN.

“We need to come together, not only to talk, but to listen.

It is absolutely essential that you all join the conversation,” says UN Secretary-General António Guterres.

<https://un75.online/>



ARE YOU A CLIMATE PROTECTION EXPERT?



New in Bosch-Zünder:
the Quiz. This time it's all about climate protection. Bosch is developing into a pioneer. Test your knowledge here!

1 Clear target

Bosch has set itself the target of becoming completely **climate neutral**. By what year will it achieve this?

A 2020
B 2025
C 2030

2 An old problem

Which economic sector is the **largest emitter** of CO₂ in the world, giving off 42 percent of it?

A Industry
B Transport and traffic
C Electricity and heat production

3 Green Greta

How did **Greta Thunberg** travel to the climate summit in Madrid in fall 2019?

A By glider and e-scooter
B By catamaran and train
C By Volocopter and electric car

4 Fresh air

Bosch is aiming to generate a significant portion of the energy it consumes **from wind and solar power** by 2030. How much in percent?

A 20 percent
B 40 percent
C 60 percent

5 Keen saver

Bosch consumed around 7,844 GWh of energy in 2018. **How many fewer gigawatt hours** is Bosch aiming to consume annually by 2030?

A 1,000
B 1,300
C 1,700

Correct answers: 1A, 2C, 3B, 4B, 5C (corresponds to the annual power consumption of private households in Cologne)

Contact Masthead

E-mail:
bosch.zuender@de.bosch.com
Telephone:
(+49-711) 811-7112
Address:
Redaktion Bosch-Zünder
(Abt. C/CGC-IC),
Postfach 10 60 50,
70049 Stuttgart, Germany



Bosch-Zünder is the international newsletter for associates of the Bosch Group. It was founded by Robert Bosch in 1919 and named after the magneto ignition device ('Magnetzündler'). *Bosch-Zünder* is published worldwide in ten languages.
Published by:
Corporate Communications and Governmental Affairs
Corporate Communications Manager:
Christof Ehrhart
Internal Communications Manager:
Christian Fronck

Editor-in-Chief:
Gunter Epple
Editors:
Alexander Fritsch, Lien Herzog, Ortrun von Hochmeister, Antonia Lange, Michaela Lukesova, Diana Manov, Julia Neitzel, Klaus Voßmeyer
Production and Design:
Axel Springer Corporate Solutions GmbH & Co. KG
Art Direction:
Christian Hruschka, Stefan Semrau, Maria Christina Klein, Uwe Holländer

Translations:
Milengo GmbH, STAR GmbH, INPUZZLE, 4Translations
Printed by:
Westdeutsche Verlags- und Druckerei GmbH, Mörfelden-Walldorf
Print Run:
170,000
Articles in *Bosch-Zünder* are only classified as official statements by the board of management if they are marked as such. Reproduction with permission only.

SOURCES 1, 4, 5: BOSCH; ILLUSTRATION: GETTY IMAGES; P. 51: MICHAEL RAY; P. 52: BOSCH



Another string to her bow

Sara Werner

For Sara Werner, the cello has human traits. "Some people say it sounds like the human voice," says the management assistant from Pittsburgh. "The tones range from very high to very low." She has played for nearly 22 years with the Edgewood Symphony Orchestra, which has about 70 members. The musicians give concerts four times a year, plus the one they perform at Christmas, and practice on Tuesdays. "I played the piano as a child," says the 44-year-old. "But the school orchestra was missing a cello, so I started playing it." A plus: "You can hug it while you play."

Here are Robert's thoughts
on acting decisively:



"Our company will overcome the low point we are going through now, which is only slowly improving, and even has the stamina from within to maintain its old standing and stabilize it once again."

— Robert Bosch, 1926

Robert Bosch saw his company experience a crisis situation four times. The last crisis was also the most serious one: In the course of fiscal 1926, a slump in sales in the automotive industry resulted in a reduction of the workforce to some 6,400 – down from nearly 11,000. The situation gradually eased up, however. Management nevertheless made a “decision,” which is the literal translation of the Greek word *krisis*. Bosch established new business fields – without any experience in these fields, but with the necessary courage and brilliant acumen for market opportunities. This not only helped in subsequent economic crises, but also established the company’s ability to transform itself.

Dietrich Kuhlitz
Bosch historian