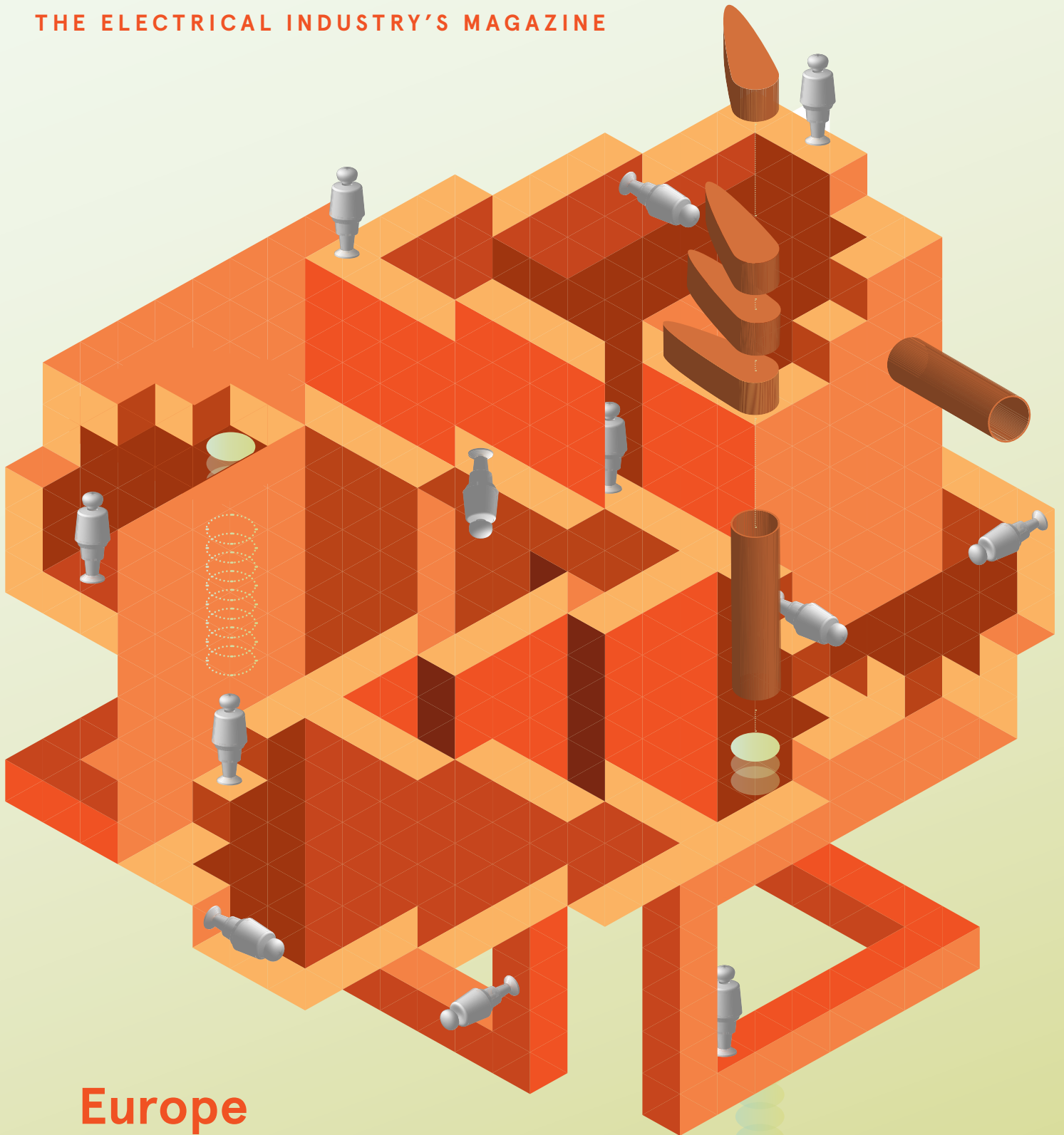


# AMPERE

3.2015

THE ELECTRICAL INDUSTRY'S MAGAZINE



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- Smart Energy
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## Europe has to manage the challenge of a digitalised economy.



Dear Readers,

As a child, I grew up during the 1950s. For me and many of my generation, the process of European integration was, above all, bound up with a promise: the nations in the heart of the continent would never again wage war on one another. Konrad Adenauer and Charles de Gaulle were both clever enough to know that lofty intentions would not be enough – instead, each state’s economy would have to be interconnected with those of its neighbours. For many decades, the process initiated by the Treaty of Rome in 1957 seemed to be successful. However, since the 2009 economic crisis, Europe threatens to run out of precisely the factor it urgently needs for further integration: growth prospects. Against such a backdrop, it is appreciated that the new European Commission has named employment, growth and innovation as the most important of the ten issues on its list of priorities.

It is nevertheless important to remember that Europe is more than just a free trade area that confers economic benefits on us all. With this in mind, the continent’s current turmoil represents not only an economic crisis but also a political one: Europe must develop a political vision that inspires people, one that shows that environmental goals, climate protection, high social standards and democracy are fully compatible with economic prosperity. Europe will thereby be able to serve as a laboratory for the entire world. In this edition of AMPERE, we would like to take you on a tour of the different “rooms” in this European laboratory where the future is already being tested.

I hope you enjoy reading our articles. Yours,

A handwritten signature in black ink that reads "Michael Zieseimer". The signature is fluid and cursive, written in a professional style.

MICHAEL ZIESEMER  
President of ZVEI



## Woodworking for the war effort

# 1915

Before WWI, Waring & Gillow was a well-known furniture manufacturer. As planes became an important weapon during the course of the war, the London-based company responded by switching production, and its staff started making aircraft wings.





## *Producing for the international market*

# 2015

Every Airbus is a European product. Wings, in this instance for an A320, are made in England. According to its own figures, Airbus commands a roughly 50 per cent share of the international market for aircraft with over 100 seats.





# Building Europe

For more than half a century, the states of Europe have been working on creating a common home. The work is still not done – and yet we have achieved a great deal, above all freedom, peace and high levels of prosperity in global terms, yet with a low environmental impact. A journey with the editorial staff of AMPERE shows how it can continue.

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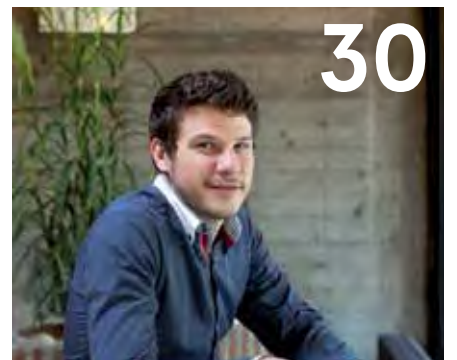
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**BRUSSELS:** MEP Matthias Groote is convinced that modern technology can help us to live well



**PARIS – GOTHENBURG:** Energy efficiency and safety are now more important than speed



**TURIN:** Giuseppe Barillaro studied in Turin. Now he's working in Germany. What are his plans?



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**THINKING AHEAD:** Student **Janneke Berndt** speaks to Chairman of Festo, **Eberhard Veit** about the city of the future



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**MADRID:** Professor **Dr. Marcel Jansen** from the Universidad Autónoma de Madrid reports on the progress made by the EU in terms of employment and prosperity



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**DETMOLD:** Weidmüller Chairman **Peter Köhler** has a clear vision for growth and employment through re-industrialisation



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**EDINBURGH:** The oldest technical academy in the world is in demand as a research centre for microsystems engineering

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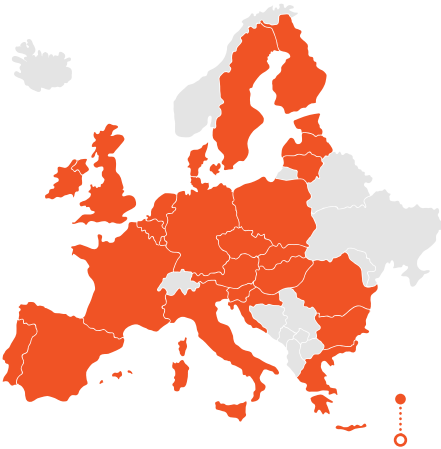
# How well prepared is Europe for the challenges of the future?

Key figures from six central fields of activity provide an insight.

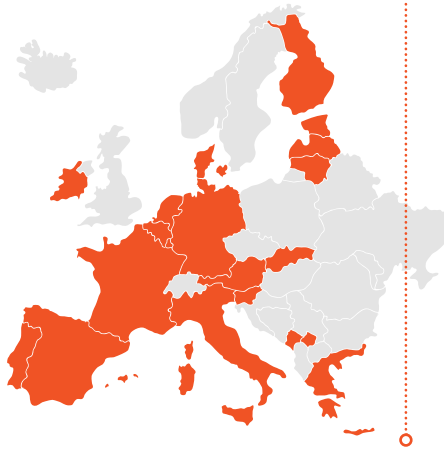
Compiled by: Johannes Winterhagen

## 1. How does the German economy benefit from Europe?

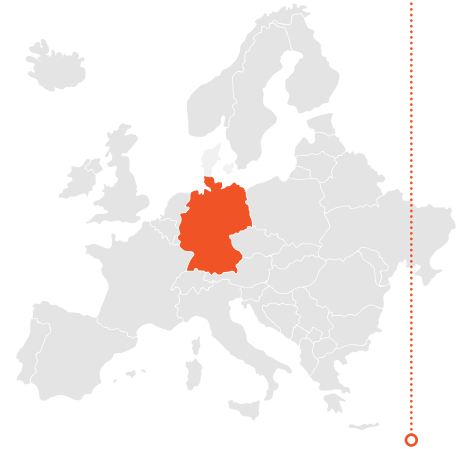
(source: Eurostat)



EU foreign trade balance in 2014:  
**€22 billion**



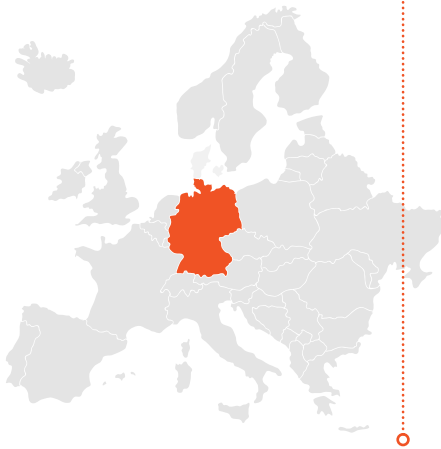
Eurozone foreign trade balance in 2014:  
**€193 billion**



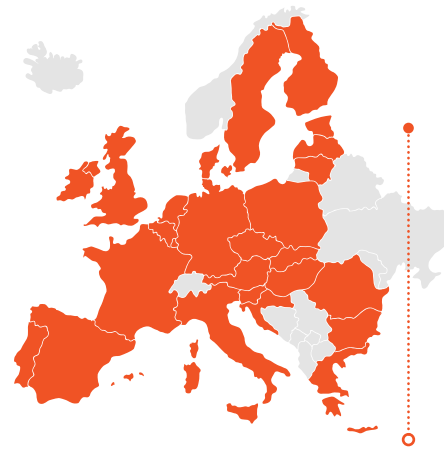
Germany's foreign trade balance in 2014:  
**€220 billion**

## 2. Is Europe at risk of de-industrialisation?

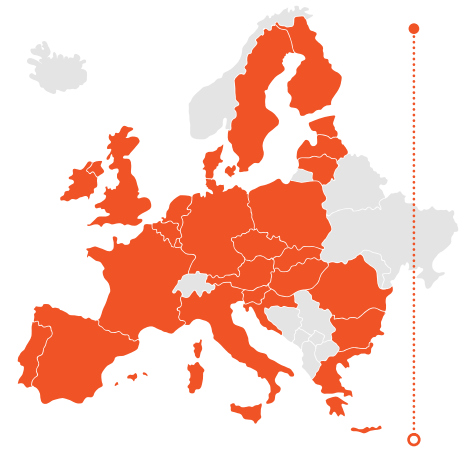
(source: German Federal Statistical Office)



Manufacturing industry share of German GDP  
in 2014: **22.3 per cent**



Manufacturing industry share of EU GDP  
in 2014: **15.3 per cent**



Manufacturing industry share of EU GDP  
in 2020 (EU Commission target): **20 per cent**

## 3. Is safeguarding peace still an essential political objective?

(source: Heidelberg Institute for International Conflict Research)



Number of wars between EU member states  
since 1945: **None**

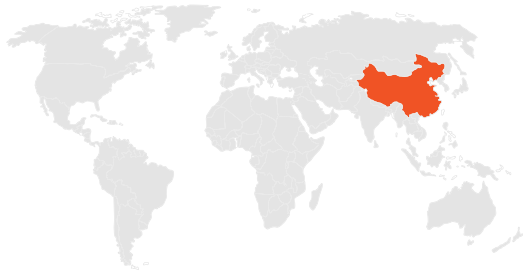


Number of wars (including "limited wars")  
worldwide in 2014: **46**

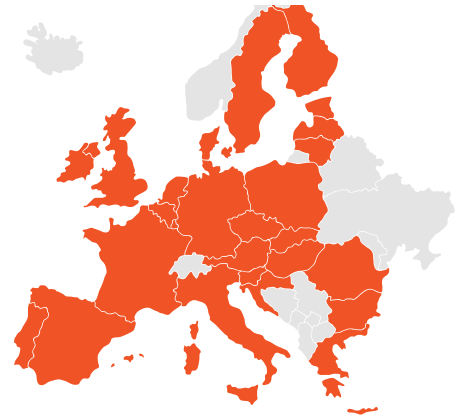


#### 4. Is Europe really a ground-breaker in environmental protection?

(source: Global Carbon Atlas)



Increase in CO<sub>2</sub> emissions in China between 2000 and 2013:  
**+6.6 billion tonnes**

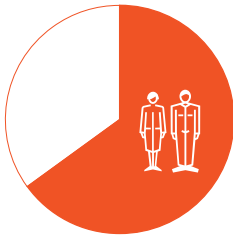


Reduction in CO<sub>2</sub> emissions in Europe between 2000 and 2013:  
**-0.4 billion tonnes**

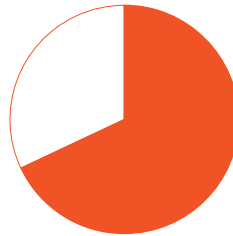


#### 5. Is free movement of labour a problem for Europe?

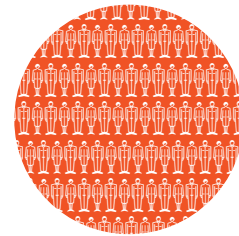
(source: EU representative office in Germany)



Employment rate of EU citizens **staying**  
in their home countries: **65 per cent**



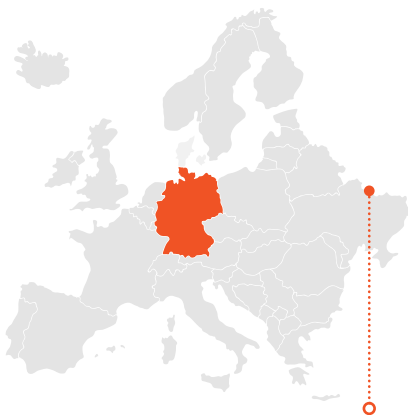
Employment rate of EU citizens **living in**  
another EU member state: **68 per cent**



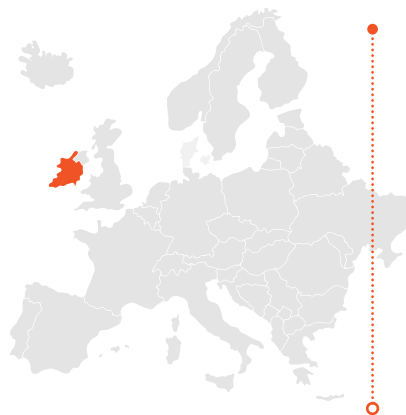
Number of EU citizens living in another EU  
member state: **14 million**

#### 6. Is Europe prepared for the digital age?

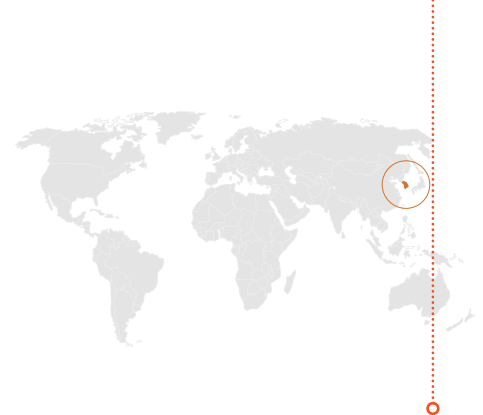
(source: Statista)



Average data transfer rate in **Germany**  
in first-quarter 2015:  
**10.2 megabits per second**



Average data transfer rate in **Ireland**  
in first-quarter 2015:  
**17.4 megabits per second**



Average data transfer rate in **South Korea**  
in first-quarter 2015:  
**23.6 megabits per second**





MEP Matthias Groote (SPD, Germany's social democratic party) firmly believes that with the help of modern technology, we can combine sustainable business with living well. **However, he doesn't want to leave the issue up to the market alone.**

Interview: Johannes Winterhagen | Photography: Marvin Zilm

# What does living well mean?

Born in 1973, Matthias Groote first spent an evening with an MEP at a youth centre when he was 16 years old. The MEP was from the FDP, Germany's liberal party. Groote has been fascinated by Europe ever since. He did not get involved in politics until 1996, when he joined the SPD, and he has been a professional politician since 2005, when he was elected to the European Parliament.

For ten years, Matthias Groote has represented north-west Germany's Weser-Ems region in the European Parliament. Next to his desk hangs a photo of former German chancellor Helmut Schmidt from 1966. "Still a cool character," says Groote. Though he possesses the down-to-earth demeanour typical of his East Frisian background, Groote is not to be underestimated: the industrial engineer is known as one of Europe's highest-profile environmentalist politicians.

## **Given Europe's current difficulties in the fields of foreign and economic policy, how important is environmental protection?**

It is natural that media reports are periodically dominated by issues such as Greece and Ukraine. Nevertheless, the environment still remains a high priority, because we Europeans bear great responsibility in this regard: we must demonstrate that it is possible to harness greater resource productivity to achieve a balance between having a good lifestyle and a high level of climate and environmental protection. I am confident that Europe will succeed in generating sustainable growth. In a globalised world, high-quality products that also deliver sustainability are the only way we can retain our current level of prosperity.

## **It is claimed that environmental degradation in Europe comes with a price tag of €50 billion annually because existing laws and regulations are not applied.**

The problem is that there are often very lengthy transitional periods and, as a result, it takes a very long time before anything gets moving in different member states: 15 years for the Water Framework Directive, for

example. This is also proof that we Germans can in no way always be considered European champions when it comes to putting this directive into action; we are in the lower half of the league table.

## **The EU's environment action programme is called "Living well, within the limits of our planet" ...**

I like that title. It implies that we can't use up everything for ourselves – we have to leave something for the generations that come after us. The planet's population is growing, so we will need to improve how we organise our activities. With regard to the environment action programme, the European Commission really has to pick up the pace and implement it, otherwise it might as well not have developed the plan at all.

## **The programme comprises a host of individual measures that are to be put into action between now and 2020. In your opinion, which ones are the most urgent?**

Reforming the emissions trading system takes top priority, and enhancing resource efficiency is another important issue. Biodiversity and farming are other issues that we should also consider.

## **Let's start with emissions trading. Will this system fulfil its objectives as a control instrument?**

Emissions trading is, in principle, the right tool for the job. The alternative would be taxing CO<sub>2</sub>, something that can't be enforced in the EU. The emissions trading system had structural flaws because it was based on the assumption that growth would be constant. We have partially solved this problem by establishing

50°51'N 4°21'E  
BRUSSELS



### Centre of power

The seat of the European Parliament is officially Strasbourg in Alsace. This is where most of the plenary sessions are held. The actual parliamentary work in the committees and groups takes place in Brussels, however, which is also the meeting place of the EU Commission and the European Council.

a market stability reserve: now, the trading system has upper and lower limits so it can respond better to actual economic conditions.

**However, the most serious, but unforeseeable, oversight when the system was launched was that the electricity sector would not need a large number of certificates due to the strong growth of renewable energy sources.**

The details of energy policies are the business of the member states. The EU has no say over them.

**That might be the de facto case, but is it right?**

I think it would be very difficult to collectively arrange the promotion of renewable energy sources here in Brussels, and renewable energy will continue to need promotion for some time to come. Expansion is, however, something that requires careful management.

**How will emissions trading look after 2020?**

Emissions will have to fall by 2.2 per cent per annum instead of the previous figure of 1.74 per cent. We will then have to discuss how to distribute the burdens among Europe's national economies more equitably. It would also be worth considering introducing threshold figures for power plants, i.e. the maximum volume of CO<sub>2</sub> they are allowed to emit per kilowatt-hour. Whatever legislative course of action we take, we should definitely take the time to discuss key questions, i.e. which industrial sectors really need exemptions and which ones don't.

**The recycling economy is meant to get off the ground across Europe now. Will everyone in Europe sort their rubbish in future as diligently as the Germans?**

If we put time and effort into establishing the recycling economy, then it will generate precisely what we urgently need: jobs. Increasing resource efficiency by 30 per cent would create up to two million new jobs in the EU. That is potential on a tremendous scale. Concentrating on how to avoid producing waste is something we definitely need to look at. After all, do we want so much plastic to remain floating in our seas, or do we want to keep throwing away half of our food because our best-before criteria are so strict?

**How much should the EU be able to intervene in its citizens' daily lives in the name of the environment?**

Let's use the example of vacuum cleaners. When the unanimous opinion of industry and consumer groups is that machines can generate the same suction strength while using far less energy, then why on earth should governments tolerate the sale of appliances that fail to even reach a minimum performance standard? If consumers get to save money over the lifespan of the appliance, then it's a win-win situation.

**Do you see a connection between digitalisation and the future of environmental protection?**

This is something that the political actors have not yet realised sufficiently. Digitalisation will facilitate a major improvement in resource efficiency. It starts with things such as carsharing, for example: the younger members of my staff use this and then don't have to buy cars of their own.

**Carsharing is developing without any contribution from politicians. This again begs the question: why not just supply information instead of actively intervening like only you know best?**

Wherever we uncover shortcomings, we need to act, i.e. introduce regulations. That's our job. One thing that is of course important when drafting such legislation is keeping it technology-neutral. We can't inadvertently create a situation that gives certain manufacturers advantages over their competitors.

**The annoyance many citizens feel towards the EU has coalesced around the ban on incandescent lightbulbs.**

Who was it that initiated the ban on incandescent lightbulbs? It was the German economy minister in 2006, when Germany held the presidency of the Council of the European Union. Brussels was only too





happy to put the proposal into practice. But leaving that aside, there really are more efficient ways to heat your home than with a lightbulb. The rapid adoption of LED technology is surely also something that is due to the ban. All the same, the Commission should be able to better explain why it acts as it does. From cucumbers to lightbulbs – everyone wants to have their say, after all.

- Trained as an industrial mechanic, Groote has a degree in industrial engineering and is therefore familiar with technological and scientific issues, unlike many other parliamentary deputies. His predilection is clearly for technologies that serve to promote environmental protection: he wrote his dissertation on a particularly energy-saving process for desalinating seawater. Groote states that he is only in Brussels for working and sleeping. He spends his free time with his wife and two daughters in his home in East Frisia.

#### **Be that as it may, wouldn't clearer labelling on the packages have been enough?**

The point of a lamp is to generate light. No society can tolerate it if 98 per cent of the energy consumed is simply wasted. I think it is right to set out the framework conditions in such a manner that gives new, better technological innovations a chance. In this instance, the market had enough time to regulate itself. That never happened, so laws had to be introduced in the end.

#### **By having so many regulations, isn't Europe putting itself at a major disadvantage against competing global economic blocs?**

Topics such as air quality, environmental protection and healthcare policies have become potentially explosive social issues even in places such as China. The result: Beijing is now investing billions in renewable energy. Changes are also underway in the USA, even in the US army, which classifies climate change as a threat. I don't think Europe is on its own here, but we think too often that we have something of a monopoly on wisdom. When it comes to climate protection, we have to make sure that others follow our lead. We have to solve these problems as part of the international community, where Europe still plays an important role.

#### **Living well – what does that mean for you personally?**

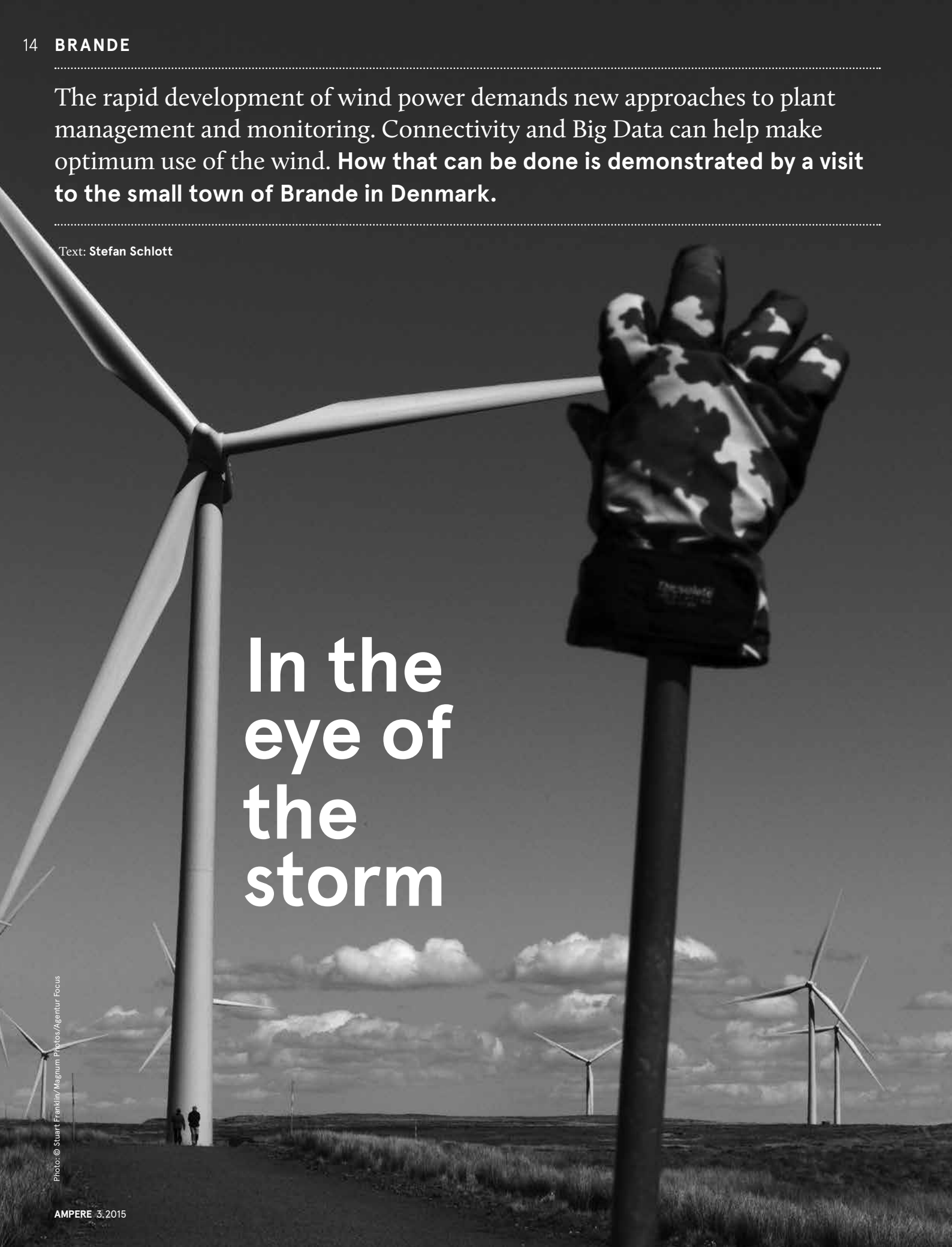
It means not just living well yourself, but also enabling future generations to live well. It means destroying as little as possible in the time you have on the planet. Having a good job and being able to live autonomously and as you see fit even when you're old. And for me, it also means a good life for everyone, without major differences.

**Mr Groote, thank you for talking to us.**

The rapid development of wind power demands new approaches to plant management and monitoring. Connectivity and Big Data can help make optimum use of the wind. **How that can be done is demonstrated by a visit to the small town of Brande in Denmark.**

---

Text: **Stefan Schlott**



# In the eye of the storm



**M**ore wind turbines than people. Even Denmark is well away from that level. But Brande, a town with a population of just over 7,000 people, is getting close – at least in the online sense. It is here that data from more than 7,500 wind turbines all over the world converge. They produce more than 200 gigabytes of data every day. But why go to all that effort and expense?

As the wind does not blow continuously, and wind turbines are subject to a degree of wear and tear, the management and monitoring of wind power plants is a key function. Rotor imbalance, especially, can often prevent wind turbines from operating optimally. There is usually a simple reason for the imbalance. Often an incorrect angling of the rotor blades is the cause. If fine adjustments are made in time, such problems can be eliminated before damage occurs. Consequently, preventive maintenance, such as is becoming more and more the norm for industrial manufacturing plants, is one of the keys to success for wind farm operators.

The wind turbines are equipped with an extensive array of sensors for the purpose. The data from them enables remote monitoring. Many problems can even be remedied from a control centre, without the need to dispatch engineers to carry out on-site maintenance. One of the most state-of-the-art facilities of this kind is a remote diagnostics centre opened by the Siemens Wind Power Service division in the Danish town of Brande in 2014. The specially designed centre manages 7,500 wind turbines on all continents using a data cable. A staff of 130 specialists are on hand round the clock to ensure that the plants operate to their optimum performance and without interruption.

### Remotely remedying faults

According to its own data, Siemens makes more than 300 million diagnostic calculations a week. The centre's work is based on a database of all signals indicating irregularities in operation. The expert team of the company based in Brande has been continually feeding and upgrading the database since 1998. They created the "Automatic Root Cause Identifier" – a program that automatically detects variations in the system performance of wind power plants and analyses the relevant parameters. Those analyses in turn form the basis for corrective action. The underlying faults

were remedied remotely for 85 % of the error messages generated. The remote diagnostics team in Brande often springs into action even before problems arise. For example, diagnosis of vibration patterns from the sensors in the plants enables them to detect early signs of irregularities. This means countermeasures can be planned and implemented before a problem impacts on plant operations. That is worthwhile for the operators too: less downtime means the plants attain higher energy yields.

So-called "condition monitoring" for the purposes of preventive maintenance is just one of the activities carried out in Brande. Another important aspect is assistance to wind farm operators in optimising their technical operations management. Analysis of data from ongoing operations also enables forecasting for individual wind power plants as well as for the entire fleet. The centre also employs a software program named "Automated Surveillance" that continually cross-checks the system performance of wind power plants against actual and forecast data as a means of optimising them. This provides the experts in Brande with information on location-specific characteristics, operating conditions and running times. On that basis, they derive recommendations for the operators to optimise the performance of their plants and so cut their energy generating costs. As Tim Holt, CEO of Siemens Service Renewables, asserted at the opening of the remote diagnostics centre: "In combination with historical data, what we discover and observe today can deliver valuable information." What he means is: results obtained using Big Data methodology will play a key role in the development of future plants.

55°57'N 9°07'E

BRANDE



### A true pioneer

Denmark now generates 40 per cent of its total electricity requirements from wind energy. However, the country is not just a "power user", but rather a world leader in the global wind energy industry, whose history goes back 100 years:

In 1918, the country could already generate 3 megawatts of electrical power from 120 facilities.

### WIND POWER IN THE EUROPEAN UNION

Wind power has been booming in Europe over the last 15 years. According to figures from the German Federal Ministry for Economic Affairs and Energy, wind power accounted for just 1.6 % of total renewable energy production in Germany in the year 2000, but by 2014 that figure had risen close to the ten per cent mark, at 9.6 %. The same trend can be observed internationally: according to the latest annual report from the European Wind Energy Association (EWEA), almost 12 gigawatts of wind power was installed in the European Union in 2014. There is now a total of 129 gigawatts of installed power from wind turbines in the EU. That is 14.1 % of the total installed power at all Europe's power plants. Among the member states with the highest rates of wind power generation as a percentage of their national power consumption are Denmark, Spain, Portugal, Ireland and Germany.

High-speed trains and high-tech cars built to handle German Autobahns are top European exports. However, the focus of development work is shifting in terms of both road and rail: **energy efficiency and safety are more important than speed.**

Report: Laurin Paschek and Johannes Winterhagen

## Speed is out

“From 0 to 100 in 8.0 seconds.”

“Trumps.”

A typical interchange between schoolboys playing cards back in the 1970s, as Germany’s car industry was dominating all of Western Europe. By 1975, just 38 per cent of German households did not have a car. Today, car-makers try to trump the opposition with values other than acceleration and top speed. Only 200 of the so-called “one-litre” car from Volkswagen, consuming just one litre of fuel per 100 km, were actually built, but the model demonstrates what is technically possible under extreme conditions. The research labs at BMW are

currently even working on a car that will consume just 0.4 litres per 100 km. The fuel efficiency of mass-market cars is likewise improving dramatically as EU emissions standards become ever more stringent. By 2021 the average carbon dioxide emissions of all new vehicles registered in the EU will be limited to just 95 grams, corresponding to 4.1 litres of petrol or 3.6 litres of diesel per 100 kilometres. Other modes of transport can also boast significant cuts in CO<sub>2</sub> emissions. According to the German Aviation Association (BDL), the average fuel consumption per airline passenger has fallen from 6.3 to 3.8 litres per 100 kilometres since 1990.

And yet around a quarter of total CO<sub>2</sub> emissions in Europe are produced by the mobility sector. The gains in efficiency are at risk of being cancelled out by increasing traffic volumes. Experts forecast that passenger car traffic will rise 10 per cent by 2030, with truck traffic even predicted to increase by 30 per cent. Moreover, the EU is currently missing its ambitious road safety targets. A total of 25,700 people died on the roads of the 28 member states in 2014. The target is actually to reduce that figure to around 16,000 by 2020. The noble “Vision Zero”, instigated in Sweden and adopted by the EU Commission, is far away.

So there are plenty of reasons to search for new safe, sustainable traffic concepts. How can passenger transport between European cities be made as energy-efficient as possible? And how can city car traffic – which will always exist, despite highly developed local public transport systems – be made safer and more eco-friendly? Work is under way in Europe to resolve those issues too – perhaps more intensively than anywhere else around the world. Two snapshots from Paris and Gothenburg.

### On the move

*Frankfurt central railway station, platform 1.* Every morning, a silver-and-blue TGV lines up alongside an armada of white-and-red ICE trains. At 8:57 a.m. it sets off on its journey from Frankfurt to Paris. The pioneer among European high-speed trains negotiates the just under four-hour trip in very differing ways however. For the first 200 kilometres as far as the German-French border near Saarbrücken, it takes around two hours. Then it really steps on the gas: at speeds of up to 330 km/h, it completes the remaining 400 kilometres to Paris in just 1 hour and 50 minutes. France is still the benchmark when it comes to high-speed



Future generations of the TGV should consume up to 35 per cent less energy





48°51'N 2°21'E

PARIS



### High-speed

France was a forerunner for high-speed rail transport. Since the 1980s, the country has invested in the expansion of the TGV's infrastructure with great success: the route from Paris – Marseilles (780 kilometres) is now covered in 3 hours and 19 minutes.

trains. The TGV has brought France's major cities closer together. It covers the 500 kilometres from Strasbourg or Lyons to Paris in less than two hours as well.

Just a few kilometres away from the destination, Gare de l'Est station in Paris, are the works of Alstom, the inventor and manufacturer of the high-speed trains. "Over the last 30 years we have been very focused on developing ever faster trains," says Dr Bruno Marguet, Alstom Transport's Vice-President Strategy, and also head of its research and development activities. Those developments peaked with a legendary record-breaking run: on 3rd April 2007, a modified TGV unit set what is still today the speed record for rail vehicles, accelerating to 574.6 km/h in 13 minutes. But the wind has since changed. "In future there will be a greater diversity of trains," Marguet reports. "Because people have started to rethink their

attitudes. For many, the energy consumption of the trains has become more important than speed alone."

There are a wide variety of reasons why, but the most important is to do with physics. Because however aerodynamic the trains may be, at higher speeds the power consumption of the electric motors also rises. As Marguet points out: "Judging the time gained against the cost, we find that above 350 km/h the energy cost – as well as the cost of designing the systems, such as the wheels and brakes – is much too high. So in future our trains will no longer be designed to shorten a journey by 10 or 15 minutes more. Rather, the focus will be on ensuring that passengers feel at home in a pleasant, quiet environ-

ment, offering them the connectivity they need."

According to Alstom's research, the cut-off journey time for business travellers on trains is around three hours before they decide to fly instead; tourists tolerate up to five hours – though it also needs to be considered that trains travel between city centres. Even at speeds of 300 to 350 km/h, large radii are possible. The limiting factor today is the rail infrastructure, and not the potential speed of the trains. "That is why the operators' costs are now the focus of our development work," Marguet states. "We look at two key factors: energy consumption

and maintenance costs."

The goals of the developers at the TGV works in Paris are certainly ambitious. By 2020, they intend to cut the power consumption of even the existing trains by 20 per cent – based on more efficient electric motors, optimised aerodynamics, and lighter weight. "In about five years' time a new generation of TGVs will be coming onto the market which will consume 35 per cent less energy," Marguet announces. "That will be made possible not only by the use of state-of-the-art permanent-magnet electric motors, but also based on optimised design of all systems, such as the air conditioning, according to their actual demand." For the ancillary units, Alstom is developing inverters with silicon carbide chips, which will significantly reduce transmission losses. The eco-train of tomorrow will also feature LED lighting, optimised systems for the recuperation of braking energy, and assistance systems that provide the driver with recommendations tailored to the route profile.

### Accident-free around town

*On we go to Gothenburg, this time by plane.* In the late afternoon on the motorway ring road, it is easy to understand why this city – which with a little over half a million inhabitants is by no means a global metropolis – has such a traffic problem. Commuters wend their weary way home, snaking bumper to bumper. Rear-end shunts are a regular occurrence, though in the stop-and-go traffic, most cause no injury. Erik Coelingh does not worry about such mishaps. The Volvo engineer has his own driver. His test vehicle has an autopilot which he can activate at the press of a button.

Coelingh heads the "Drive me" project, instigated by his employers in conjunction with the Swedish

road traffic agency “Vägverket” and the city of Gothenburg. All leading car-makers are working on self-driving vehicles, but the Swedish approach to its research is unusual: starting in 2017, 100 normal customers will be testing piloted driving in special versions of the Volvo XC-90 as part of a fleet trial. The test customers will pay for the vehicle as normal, but must agree to all data from it being evaluated – including from a video camera monitoring the interior. “We want to know the effects of highly automated driving, both on the individual motorist and on the entire transport system,” Coelingh explains.

### Drive me

To date, the Volvo engineers have been mainly working on upgrading the XC-90’s electronics platform for self-driving. In parallel, however, together with university institutes, the car-maker is also investigating what methods can be employed to measure the benefits of self-driving generally. Less fuel consumption, improved traffic flows, social benefits: scientific methods will be applied to simulate, measure and quantify all the parameters as far as possible. Volvo will be focusing especially on recording the reactions of other road users. One core question is: does any special indication need to be given that a vehicle is being driven autonomously?

The XC-90 will be designed so that drivers do not have to monitor the vehicle when driving on motorways. “That means we will have to create a redundancy level for all on-board safety systems,” says Coelingh. He is critical of competitors, pointing out that it is easy to fit out a demonstrator vehicle and have a single engineer drive it. By contrast, a car in everyday use by normal customers must essentially be just as safe as a high-volume production vehicle. That is why Volvo is also equipping its small-lot production run with three different sensor designs:



How will car drivers use their extra time when the car drives itself?



Photo: © Martin Wahlborg

radar sensors and a video camera will be aided by additional laser sensors.

The self-driving mode will initially only work on the 50 kilometre motorway ring road around Volvo’s home city of Gothenburg. This is because of the lack of high-resolution navigation maps needed by the self-driving vehicle. The Swedes are currently producing the maps, showing every road marking, themselves. “But producers of digital maps are already working to provide the relevant data on a commercial basis,” Coelingh reports.

There are still plenty of uncertainties – including the question of the criteria by which test drivers will be selected. The cautious engineer will certainly not make any predictions as to the expected safety gains. All he dares to say is: “People are always going to be inattentive, and make mistakes. I am sure that self-driving vehicles will reduce accidents due to such causes.” He is most likely right about that: according to German road safety experts, 95 per cent of all accidents are caused by human error and not by technical faults.

57°42'N 11°58'E  
GOTHENBURG



**Vehicle and road**  
Under the motto “Vision Zero”, the Swedish road traffic agency “Vägverket” is working on ensuring that no more people are killed in road traffic. Alongside better vehicle technology, modern road-building is also part of the concept: road users should drive as far apart from each other as possible.



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55° 57' N 3° 13' W  
EDINBURGH



**Not isolated**

In a referendum watched closely across Europe, 55 per cent of Scots voted in September 2014 to stay in the United Kingdom – and therefore also to remain in the EU. In the capital city of Edinburgh, a large majority of 61 per cent of the population voted in favour of a continued union.

The Scottish capital Edinburgh is one of Europe's major research centres in the field of microsystems engineering. **A visit to the world's oldest technical academy, which exports its expertise worldwide.**

Text: Peter Gaide

## Part of the system

The midday sun is high in the sky; a light breeze flutters through the leaves on the trees. The campus of Heriot-Watt University is literally a greenfield site, surrounded by fields and woodland. The two-storey, brown brick college buildings exude an air of democratic modesty. If it wasn't for the stone bust of a pondering James Watt, the famous steam engine developer, at the entrance to the institution, you might almost think you were standing in front of the clubhouse of the local golf club.

The figure of the great inventor makes a clear statement: this is a place of academic study, teaching, and scientific research. Heriot-Watt University was founded in 1821. It is in fact considered to be the world's first technical academy. Known as HWU for short, the institution was originally located in the centre of Edinburgh. It began gradually relocating outside the city from 1966 onwards, as space became tight. There have long been additional HWU outposts: two in the UK, and one each in Dubai and Malaysia. Over 9,000 students are enrolled at HWU in the UK. It has some 31,000 students worldwide, including many on distance-learning courses. The university prides itself on its international reach, and particularly targets students from Asia.

Marc Desmulliez's office is located in the Microsystems Engineering Centre, where almost 40 scientists are engaged in research and teaching. Desmulliez has headed the centre for 15 years. He greets his visitor with a friendly smile. It is not only his surname that reveals the 52-year-old's origins: he still retains a charming French accent. But other than that, well, he has of course long since acquired a tartan kilt.

One project in which he played a key role was named FAMOBS. The interdisciplinary project,

funded to the tune of over €2.5 million by the EU, involved contributions from more than a dozen research partners from a variety of countries, including the Fraunhofer Institute for Manufacturing Engineering and Automation in Stuttgart. "This is what we developed," Marc Desmulliez says, tapping his finger on a hollow rectangular object made of steel on the desk in front of him, looking like a miniature skyscraper with no windows. "It's a compact, open microwave oven for precision setting of adhesives in industrial manufacturing." The use of microwaves enables some materials to set as much as 10 times faster than in convection ovens. This speeds up the production process, and also means it consumes less energy than traditional setting methods. Those are attractive attributes, in view of the global race towards ever lower manufacturing costs of ever smaller portable electronic devices.

The oven system, including software to precisely control the heating temperature and operating time, can be integrated directly into fully automated assembly lines in a range of different industries. The technology is particularly attractive to the microelectronics and microsystems engineering sectors, such as in the production of semiconductor chips. "With the aid of the oven, we can fix components very precisely on the circuit board without heating up adjoining components and so possibly damaging them. That can significantly reduce production reject rates," Marc Desmulliez comments.

He is convinced that there are wide-ranging potential applications for the oven: not just in chip manufacture, but also in the production of steel, in the automotive industry, or in the food industry, such as for melting chocolate. The only question is: has industry taken the bait? "Some have, some haven't," Marc Desmulliez replies. "There is a lot of inter-





Photo: © AFP PHOTO/DEREK BLAIR

**EDINFERNO**

Neighbouring England may be the birthplace of football, but Scotland can still hold its own. For some years now, computer scientists from the University of Edinburgh have taken part in the world robot football championships, called "RoboCup".

est, but since the oven is a truly innovative solution which cannot be integrated into existing production processes without some adaptation, companies are reluctant to make the necessary investment." Discussions are currently in progress on whether to set up a national grant-funding programme to develop the oven within a specific industry.

From the little to the large; from the dry to the wet environment of the ocean: David Flynn's office is just a few steps away from that of Marc Desmulliez, but his work is in quite a different area. The 35-year-old's project, sponsored by power company Scottish and Southern Energy, is concerned with predicting the service lives of underwater power cables.

The Scot grew up in Perth, north of Edinburgh, so he has always had a love of the sea. And that feeling comes out strongly when he reports on his research, gesticulating animatedly and talking loudly. The ocean world is brought to life for a few moments: its black depths, where cables – some of them many hundred of kilometres long – stretch along the sea bed, exposed to cold, corrosion, vibration, and the sharp-edged anchors of fishing vessels. Conditions are extreme. And the demands made of the materials are correspondingly great; faults occur regularly.

The wider energy policy framework within which the project is being carried out is also a key concern to Flynn. "European energy policy is increasingly focusing on offshore wind, wave and tidal sources. So underwater cables have to be as reliable as possible," he says. But that is not yet the case. Cables are susceptible to failure. 80 % of all offshore insurance claims relate to undersea cable. Damage occurs in Winter especially. "It is an issue that is damaging to the reputation of renewables generally, and it also

drives up energy prices," Flynn laments. Because repairing a cable is complex and costly. A ship is sent out to locate the cable. Divers inspect it, localise the fault, and carry out the repair. All that takes a lot of time and costs a lot of money: "Around £8 million for every two kilometres of cable," Flynn reports. "Ultimately it is the consumers who pay, through their electricity bills."

Flynn's solution: a "smart" integrated hardware and software system that utilises large volumes of data to predict the service lives of cables and recommend when a cable ought to be replaced. To come up with the solution, Flynn and his team conducted laboratory experiments investigating how various cable materials corrode in sea-water over a given period of time, and how the abrasion process progresses. The objective was to create a new industrial standard defining what types of cable are most appropriate to which oceans.

In parallel, the team developed a kind of sensor collar, which can be attached to a cable and monitors the motion of the cable on the sea bed. The team also incorporated shipping data into the system so as to statistically calculate the probability of cable damage by ships at anchor. And finally, historical data indicating when and where faults had previously occurred in which cables was applied. The outcome from all the team's work was a software tool capable of predicting cable life to the maximum possible degree of precision. Flynn reports: "Our field tests were successful. We are able to predict with 90 % probability that a cable is going to pose problems in the next three months, and why." David Flynn is optimistic: "We are in a position to roll out the system at any time and test it on a larger scale. We are ready!"



„Unsere größte Herausforderung ist der Wandel – wir wollen ihn nicht nur mitgehen, wir wollen ihn aktiv gestalten.“

Michael Teigeler  
Geschäftsführer der DKE

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# Europe must invest more in its workforce



## How do people living on Europe's periphery view the Union's progress on the issues of work and prosperity? Professor Marcel Jansen teaches at the Universidad Autónoma de Madrid, and we were in the Spanish capital to talk with him.

Interview: Laurin Paschek | Photography: Marvin Zilm

It is a hot summer's day in Madrid, and the motionless air in the city's streets is unable to provide even the slightest relief in the form of a breeze. In these conditions, it is a real pleasure to enter the air-conditioned rooms of Spain's celebrated Fedea research institute. We sit down on an elegant sofa. Professor Jansen has been delayed slightly. The receptionist provides us with cold drinks. When the professor arrives, he is a bit agitated, and not due to the heat alone. He has just come from a meeting with the university's administration, where a new researcher was to be hired, and he grouses about the bureaucracy involved. It seems that his preferred candidate made a formal error and was immediately disqualified for the position, despite, as he says, her having the ideal qualifications for the job.

### Professor Jansen, you have been living in Madrid for a long time and have seen the effects of the crisis up close. How are people managing now?

Three years ago, when the crisis was at its very worst, if you went to the cinema in Madrid, you could very well find yourself alone in front of the screen. The city's restaurants were empty too. People were in a state of shock, so they stayed at home and spent as little money as possible. Today, however, the mood of many Spaniards has improved because people with work are spending money again. And other people are finding employment: right now, the country's economy is generating between 500,000 and 600,000 new positions a year.

### So can you say that the Spanish job market has recovered from the crisis?

Unfortunately, the problems run deeper. You need to understand the mechanisms underpinning the job market. The classic approach is to view it in terms of the supply and demand of employees. In a state of equilibrium, pay levels would continually adjust and supply and demand could balance each other out. This would result in an efficient mechanism, without state regulation. Unemployment would only arise if the state intervened in the market, for example by introducing a minimum wage or requiring redundancy pay. However, unemployment is not a static concept. In the USA for example, four million people leave the unemployment statistics every month to take up new positions,

while another four million lose their jobs. In other words, labour markets are subject to gigantic movements and fluctuations.

### What got out of control in Spain during the crisis?

It is of course obvious that unemployment increases during a recession. However, the situation in Spain was particularly severe after the collapse of Lehman Brothers in 2009. One reason was the strict division in the country's labour market between people with and without permanent contracts. Here, it is very expensive for companies to give permanent contracts to people who were previously on limited-term contracts. There are several reasons, for example stringent laws against dismissal and substantially higher pay stipulated by collective bargaining agreements. These factors meant that about one-third of the Spanish workforce had limited-term contracts before the recession hit, and when it did, their contracts were simply not extended. This way, 1.3 million people lost their jobs within just six months. The severe discrepancy in protection for permanent and non-permanent staff adds excessive volatility to the labour market. Its response to economic cycles is always extreme: during a boom, lots of jobs are created very quickly, but they disappear just as fast during a downturn.

### Why is that so problematic?

You can view it like a couple's relationship. When two people know they are going to split up soon, they have little incentive to invest in their relationship. This situation is like fixed-term contracts. Employers invest little in these employees and don't provide them with further training. At the same time, the employees do the barest minimum expected of them. They do little to acquire skills and knowledge, and what they do actually acquire is very company-specific, so their productivity suffers. As a result, however, it is particularly difficult for young people to make progress in the world of work and attain a good level of productivity quickly. In Spain, people embarking on their careers typically spend five years treading water in fixed-term jobs

40°23'N 3°43'W  
MADRID



**Upturn**  
In Spain, more than 500,000 new jobs are being created each year. Yet you can't tackle unemployment overnight. The unemployment rate in May 2015 was still 22.7 per cent – and even as high as 49.2 per cent amongst young people under 25 years of age.

that are repeatedly interrupted by spells of unemployment before they get a permanent position.

#### **What impact does this have on the Spanish economy?**

To start with, it means that Spain has a large cohort of employees with low qualification and productivity levels. In addition, pre-crisis collective bargaining agreements for people with permanent contracts meant that this group saw their wages rise despite the economic turmoil. These factors meant that Spain, like all of the crisis-hit countries in southern Europe, saw a dramatic drop in competitiveness against their northern European peers, above all Germany. You can even put a precise figure on this situation. Since the crisis, labour costs in Germany have fallen by some 15 per cent compared with the European average. Here in Spain, however, they have risen by 18 per cent. In other words, in terms of unit labour costs, Spain lags 33 percentage points behind Germany. We have seen the same phenomenon in all southern European countries. Nominal wages have simply risen too fast.

**Marcel Jansen** has lived in Madrid for 14 years. Alongside his employment at the university, he also works for the renowned think tank "Fedea", which is supported by large banks and companies and uses empirical research to advise institutions such as the Spanish government and the "Troika" of the European Union.

#### **How do you believe this trend can be turned around?**

We have to ensure that pay changes in Europe correlate as much as possible to productivity levels. This is the only way to prevent peripheral countries from suffering an even greater loss in competitiveness. Furthermore, we need more integration within Europe, such as a European "budget for jobs" or a stabilisation mechanism for unemployment insurances on a Europe-wide scale. Labour market reforms are essential if we want to prevent repeated crises from happening in Europe. Spain has already done a lot in this regard, but I believe that we still need more reforms.

#### **What kind of reforms do you envisage?**

In my view, southern European countries need more active labour market policies. Madrid merely manages unemployment: its systems are limited to providing the unemployed with financial support. What the national employment authority does not do, for example, is register what qualifications jobseekers possess. This information could be used for actively guiding the movements and changes we see in the labour market. These kinds of measures are particularly important during phases of economic recovery so companies have access to employees who are suitable for long-term positions.

#### **How important is it to train employees?**

If you don't give employees systematic training and education and provide them with suitable jobs, they will at best find themselves working in low-qualification settings with a poor level of productivity and value creation. These are not business sectors that generate high exports. Spain can only recover from the mistakes of the past if high-qualification, export-oriented companies invest in the country and are successful here. Ultimately, this is the key to recovery for all of southern Europe.

#### **What contribution can Germany make?**

Lots of countries can learn from Germany's vocational training system and sandwich courses. Viewed internationally, however, Europe as a whole is not a shining example when it comes to training and educating young people. Why don't we have a European institution similar to the Massachusetts Institute of Technology? The nearest comparison, if it exists at all, is the UK's leading universities with similar facilities. Europe must invest more in training its workforce. Regarding Germany, my general preference would be to see higher investment to generate more growth, because growth in Germany is also good for the countries on Europe's periphery.





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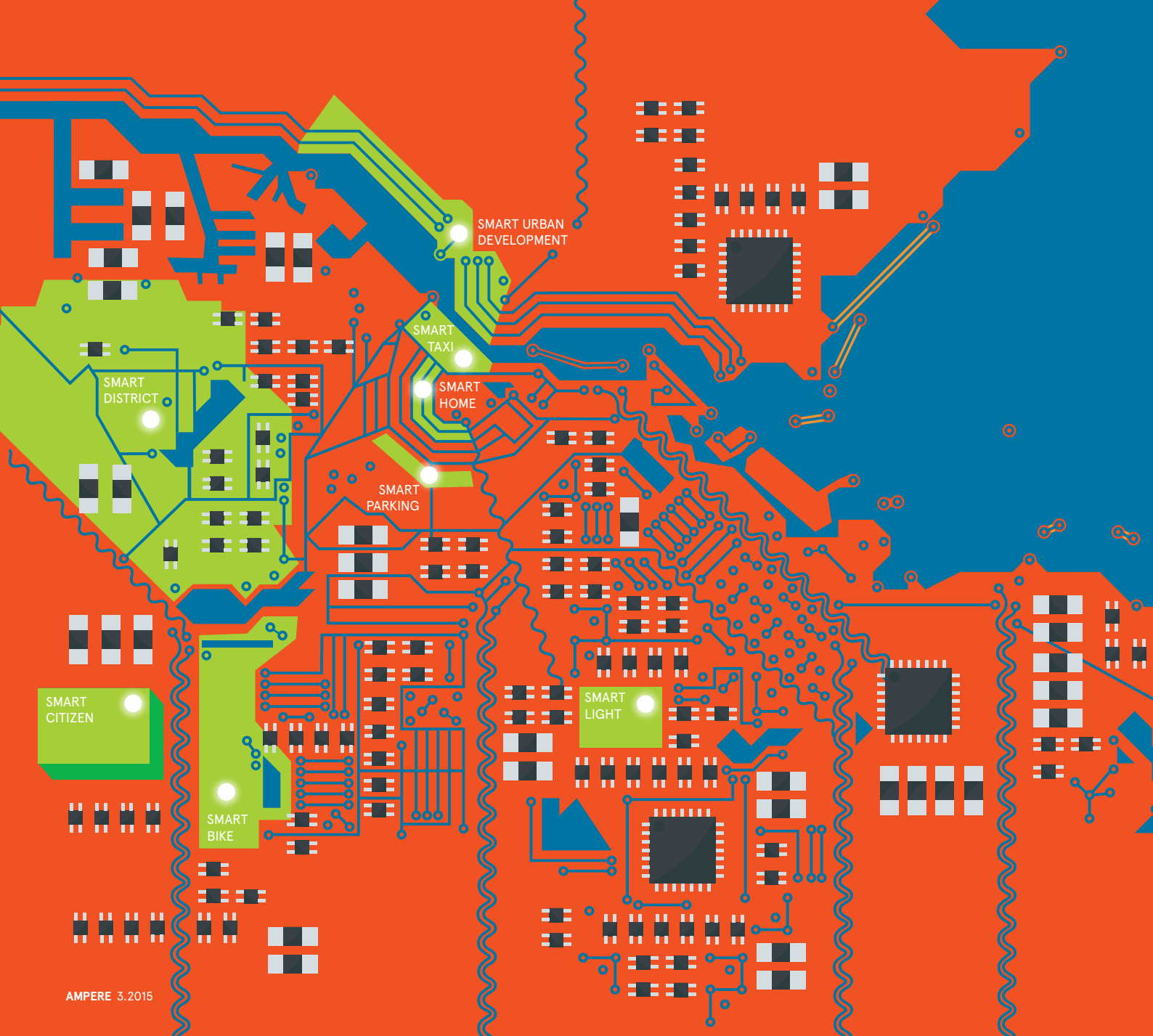
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The Dutch capital Amsterdam is well advanced on the way to becoming a “smart city”. The “Amsterdam Smart City” programme relates to almost every area of life: from housing, through mobility, to urban development.

Text: Laurin Paschek | Graphics: Monika Fauler

# On the “Smart Dam”





### Smart Parking

You need plenty of luck to find a parking space in Amsterdam. But you can make your own luck: the “Mobypark” platform enables private individuals, public operators, hotels and hospitals to report available spaces in real time. Motorists can then reserve one over the internet or using an app. This saves time, as well as money, because the spaces are as much as 70 per cent cheaper than conventional multi-storey car parks.



### Smart District

The “Citizen” project is investigating energy efficiency technologies in terms of their actual benefit – in an actual residential district in the west of Amsterdam. The concept involves the installation of solar power plants, distributed heating stations featuring heat pumps that recover thermal energy from sewage, as well as a smart grid that uses multiple sensors to control local power infeed and tapping.



### Smart Home

Amsterdam’s first smart residential building is located in Herengracht. The demo house set up by the BeNext company features more than 60 automation systems controlling functions including the air-conditioning, energy and water consumption, and security. It has resulted in a €63 cut in monthly electricity, gas and water bills.



### Smart Taxi

It’s a common occurrence at transport hubs: passengers taking different taxis to similar destinations. They just don’t know that they are. This is where the “Yeller” taxi app steps in. Users enter their destination and departure time, and when a suitable fellow traveller has been found they can book a shared taxi directly using the app.



### Smart Bike

Fancy a bicycle ride through the woods and then on to the shopping district? In a city with more bikes than people, the “Ring-Ring” project is an especially rewarding way of doing it. A smartphone app records how far every registered user has cycled, and allocates a credit of 10 Euro-cents for each kilometre travelled. Cyclists can then use the voucher system to pay for items or get discounts in any shops signed up to “Ring-Ring”.



### Smart Urban Development

Urban development is usually planned by small committees of experts. Amsterdam is taking a different approach to the transformation of the former industrial park at Buiksloterham, a 100-hectare site not far from the central railway station. The project is including current and future residents, as well as visitors, in drawing up a development plan for the quarter.



### Smart Citizen

What is the quality of life like in my city? The “Smart Citizen Kit” relies on residents collecting temperature, humidity, air quality, noise and light emission data themselves. Participants mount the measuring equipment on the facades of their houses or on their balconies. They can then use their PC or an app to access all the data in real time. These kinds of networks have been established in Amsterdam, Barcelona, Manchester and Wales, to date comprising a total of 1,116 stations with 5,580 sensors.



### Smart Light

At locations such as the Amsterdam Arena, which are only occasionally busy, smart street lighting can help improve safety and security and save energy. As an example, lights can be lit by means of motion sensors or by remote control when large numbers of people are passing by. When it is less busy, the lights remain unlit to save energy. Street lights can also light up in different colours, to guide streams of pedestrians in a specific direction, for example.

# Benvenuto in Germania?

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The Politecnico in Turin is one of Europe's best-respected technical academies. But jobs in Italy are rare. So graduates like Giuseppe Barillaro are drawn to Germany. **The 24-year-old electronics engineer is currently working near Stuttgart. Here he talks about his plans for the future.**

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Text: **Peter Gaide** | Photography: **Marvin Zilm**







**W**ho would ever have thought that I would be living in a provincial town in south-west Germany! But I am: my current home is here in Illingen near Stuttgart. I work in the nearby town of Mühlacker. That is where my employer, Gutmann, is based. It is a subsidiary of the Italian kitchen appliances manufacturer Elica. Gutmann make ventilation systems for kitchens – especially extractor hoods.

I am a product developer, thoroughly testing the electronics inside the ventilation systems – for the mostly based on computer simulation, in fact. At the same time, thanks to my language skills, I also act as a kind of hinge-point between my Italian and German colleagues and the locations in the two countries. I like both roles very much. Our work here is highly concentrated, but we have a lot of fun too. My colleagues are very understanding of my still rather shaky German, and they help me a lot! At present I am still in my trial period, but I really want to stay here a few years, and it looks like I will be able to. I am working as hard as I can to make that happen! I cannot imagine a better way of gaining work experience and learning German.

#### **I can organise myself**

From 2009 to 2014, I studied electrical and electronic engineering at the Politecnico in Turin. I believe it is the best technical academy in Italy, even ahead of Milan. The levels of technical know-how and teaching are high, as are the demands made of the students. Many are unable to handle it, and have to leave their course. I personally did not find the studies

45° 4' N 7° 41' E

TURIN



### Shopping instead of production

Turin, the capital of Piedmont, has been an industrial city since the 19th century, but its significance has waned over the last 20 years. Until recently, Fiat had its headquarters here – and the centrally located factory in Lingotto was once the largest automobile production plant in the world. This monument to industry is nowadays a cultural forum and shopping centre.

grant-aided stay at one of the Fraunhofer Institute centres in Garching near Munich. I spent a few months there doing research for my masters, analysing test routines for encryption systems. It was a very rewarding time for me – not least because of the expertise and helpfulness of my German colleagues.

I can well recall my first day in Munich: I remember quite clearly seeing the sign “München Ostbahnhof” out of the train window as we pulled into the Munich East

difficult, even though it was hard work, of course. I believe I am highly disciplined, and am very good at organising myself. I spent several hours a day focused on my studies, trying to really get a grasp of the subject matter. And I generally succeeded in doing so. If you manage to do that, then you can enjoy going out of an evening, meeting friends and having fun.

I inherited my passion for electronics from my father Vincente, who runs a small electrical business in my home village of Mammola in Calabria. You might say I grew up among circuit boards and soldering irons. Gaming machines, washing machines, fridges: there is nothing my father cannot repair, and I admire that! My father always encouraged me to study, but he did not put undue pressure on me. His advice was: “Do something you love!” – that’s how he brought up my younger brother and me.

### No better place

I got my Bachelor’s degree in 2012. In July 2015 I was awarded the title of “Master of Science in Electronic Systems”. Why did I go to Germany? Firstly, because it’s hard to find a job in Italy. Companies are reluctant to take on new people. Some companies offered me internships, but to be honest that was not enough – after all, I am a university graduate. I want to work and advance myself! The second reason in favour of Germany: in my view, there is nowhere better in Europe in the field of advanced electrical and electronic engineering. If not before, that special quality was very much made clear to me while on a

station, and excitedly thinking to myself: “OK, this is where it starts!” I liked the city from the very first moment: how clean it was, the efficient transport system, the Englischer Garten park, the relaxed and welcoming ambience of the beer gardens.

### Germans are also Italians at heart

There are, of course, also a few things from home that I miss. It is much more of an open-air life in Italy than in Germany. Squares and streets are stages on which people meet. They have a coffee together at a cafe in the morning, and meet on the market square of an evening. Family and friends all mix together; everyone is constantly bumping into someone they know. In Germany, things are rather more reserved. It might sound banal, but I think it has a lot to do with the weather. Rain and cold quite simply keep you indoors. That has an influence on people’s character. And as soon as the sun shows itself, the Germans love to dash outdoors too. I see that as proof that Germans are a bit like Italians too at heart!

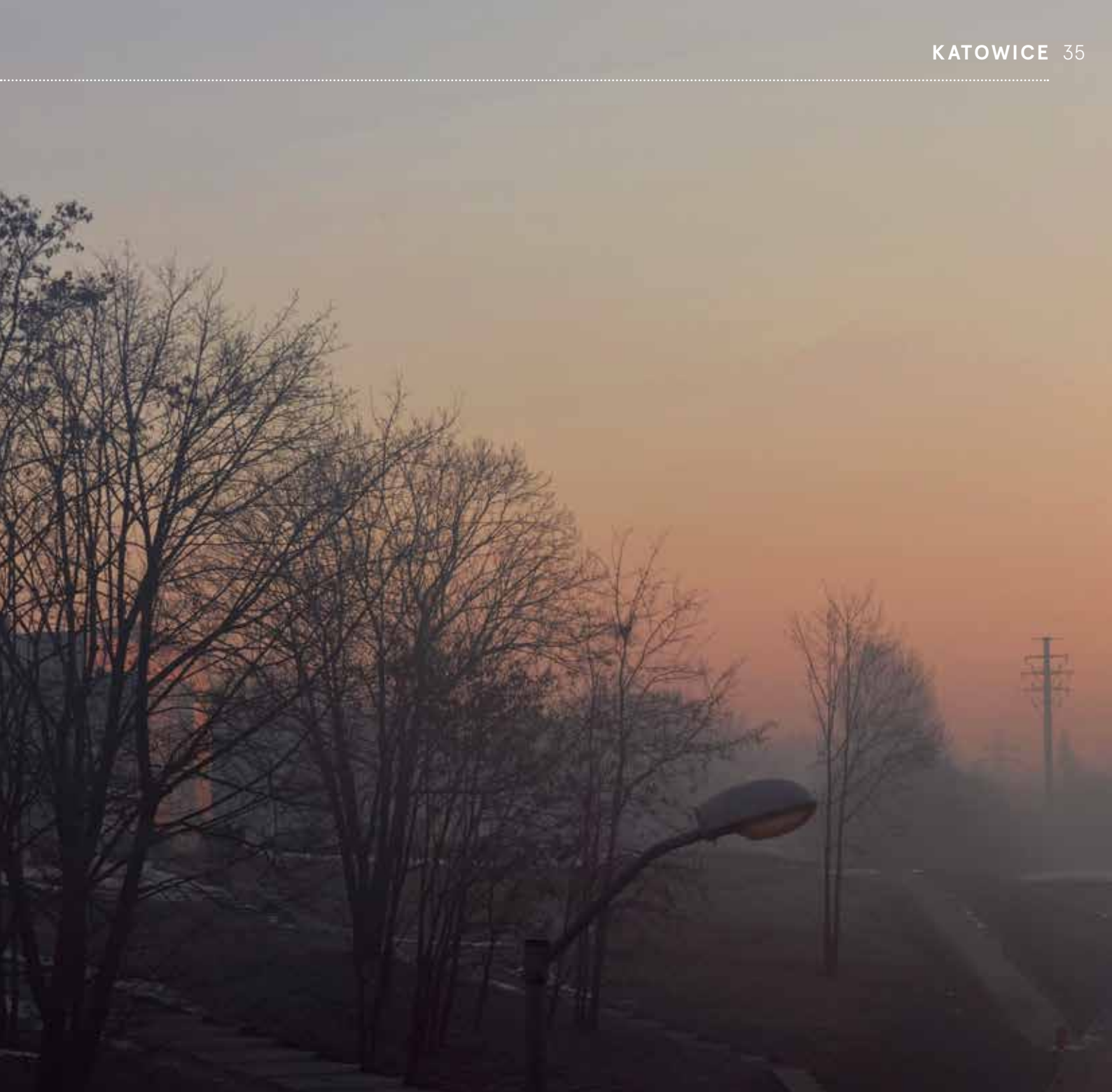
What lies in store for me over the years ahead? Who knows. I don’t have a masterplan for my life, and I really don’t want one. Things tend to turn out different to what you expect anyway. I certainly do want to learn a lot more – and my current employer is a great help in achieving that. Maybe I’ll have the opportunity to travel to the USA too? Or go back to Italy? Or perhaps I’ll join a German car manufacturer, and head up a team of product developers? Let’s wait and see!



Age:  
24  
Home:  
Mammola, Calabria  
Studied in:  
Turin, Piedmont  
Degree:  
Master of Science in  
Electronic Systems  
Interests:  
Running, football,  
hip-hop, drumming  
Favourite football  
team:  
Juventus Turin  
Motto:  
Give everything - and  
always be open to new  
things



# Changing times in the coalfield



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A centre of competence in energy efficiency and renewable energy sources has been created in recent years in Katowice in the Upper Silesia region of Poland. The operators are utilising their own buildings as a test bed for new technologies. **The German state of North Rhine-Westphalia is involved in the undertaking as a partner to the Silesian region.**

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Text: Laurin Paschek | Photography: Robert Skorek



On the 35-kilometre drive from the airport to the centre of Katowice, they are already evident: the coal-fired power stations of Upper Silesia, which together with the supplying mines dominate much of the region's landscape. Upper Silesia is one of mainland Europe's longest-standing traditional coalfields, along with the Donbass region of eastern Ukraine and Germany's Ruhr area. As in the partner state of North Rhine-Westphalia, however, extraction costs here are nowadays well above world market levels, and many pits are operating at a loss. Consequently, the Polish government is planning to shut down a number of mines. To replace them, Poland is turning more and more to energy efficiency and renewable energy sources. The clearest sign of this trend is Poland's new Renewables Act, which provides for fixed grid infeed payments on the eco-power generated primarily by solar plants in southern Poland.

The change in the law is creating a new market in Poland. Over the next five years, Poland must increase the renewables share of its energy mix from 10 to 15 per cent in order to meet the EU's climate goals. On February 20th this year, the Polish parliament passed a law promoting renewable energy sources. With fixed grid infeed tariffs for plants up to 10 kilowatts, the Renewables Act focuses on the lower end of the power range, meaning primarily photovoltaic plants, though it does explicitly include small-scale wind and hydro power plants. The payment to plants up to 3 kilowatts is set at around 18 Euro-cents per kilowatt-hour; plants up to 10 kilowatts receive around 16 Euro-cents per kilowatt-hour. The grid infeed tariffs are fixed for a period of 15 years. A tendering model is stipulated for higher power ranges. The Act, signed into law by the country's president on March 11th, was the subject of protracted controversy. Its passing was quite a surprise. It marks a turning point in Polish energy policy.

In the south-east of Katowice, on the edge of a modest housing estate, the new era has already begun. In the middle of a science and technology park is a building of strikingly modern architectural design, but which is notable above all for the many solar panels in front of it, on its facade, and on its roof. "This is the most energy-efficient building in the whole of eastern and south-eastern Europe," asserts Patryk Bialas, Director of the Euro-Centrum science and technology park's operating company, Park Naukowo-Technologiczny sp. z o.o. The passive building is part of a science and technology park comprising office blocks and manufacturing units that has grown up on the site of a former chemical plant works since 2006. "We run four of the total of 15 buildings here," Bialas reports. The buildings not only serve as offices and manufacturing centres, but also as a test bed. The Euro-Centrum GmbH not only leases out the buildings,

it also acts as an energy agency for Silesia and the whole of Poland. "The units here represent a test bed for a range of technologies in the fields of insulation, heating, air-conditioning and building automation. Our aim is to raise awareness of energy efficiency and renewables in Poland."

The new passive building is a focus of research and a beacon project. It won the European Commission's "Green Building Award" in 2013 – a year before it actually opened. On the roof, there are 10 hot water solar collectors and 231 solar modules set at the standard 30 degree tilt angle. Together with a further 108 modules mounted vertically on the building's facade, 80 modules above the windows, and 36 moveable solar modules in front of the building that track the sun, the installation generates a maximum power output of 107 kilowatts. In the basement, there are six heat pumps, arranged in a cascade system, that extract geothermal energy from a depth of 50 metres. Water pipes for cooling and heating are installed in the concrete ceilings. Heat exchangers recover 80 per cent of the heat from the exhaust air. Automatic blinds, facade insulation and triple-glazing round off the passive building concept.

### Efficiency and awareness

The heart of the system is a central controller to which all the other buildings in the science and technology park are connected. "Our building management system optimises energy consumption by controlling parameters such as room temperature and humidity," Bialas explains. "It incorporates not only the passive building, but also conventionally renovated buildings and a neighbouring energy-efficient building." He is not only concerned about efficiency, however, but also about research findings. "By continuously collecting data, we are able to validate the individual measures in terms of their actual effect. We were thus able to demonstrate that the heat consumption of the passive building is just 15 kilowatt-hours per square metre per year. The figure for our energy-efficient building is 32 kilowatt-hours, and for a conventional building in Silesia around 120 to 150 kilowatt-hours," Bialas concludes.

Euro-Centrum utilises the findings obtained as the basis for its consultancy operations. The private company has been receiving grant aid from the European Union since 2008. But that aid will shortly be expiring, and the company, with its workforce of some 40 people, will have to stand on its own feet – with an extensive portfolio of services for public bodies, small and medium-sized enterprises and private developers all over Poland. Alongside energy advice, services include market analyses, technology audits, thermographic analyses, materials research, and training courses for installers of PV plants, solar collectors and



heat pumps. Bialas comments: “Thanks to the upfront finance from the EU, many of our customers are now able to take advantage of low-cost terms. That enables us to drive forward the installation of renewable energy and measures to enhance energy efficiency – such as based on building automation – in Silesia and throughout Poland.”

### Artificial sun

The facilities also include a test centre with an artificial sun for the testing of solar collectors and PV modules. The simulator is the only artificial sun in Poland. It was built by PSE AG of Freiburg, Germany, in cooperation with a Fraunhofer Society. On its research projects, Euro-Centrum collaborates not only with regional centres of higher education, but also with Silesia’s partner, the German state of North Rhine-Westphalia (NRW). State Governor Hannelore Kraft visited Katowice three years ago, and the Poles have also been engaged in an intensive interchange of experience with the NRW Energy Agency for many years, including as part of the “Energy-efficient and solar building”, “Photovoltaic” and “Geothermal” networks.

### Cooperation with Germany

The partnership now extends beyond merely exchanging experience. In June 2015, the Katowice science and technology park played host to the German-Polish Cooperation Exchange for the second time. The event was organised by the Centre for Innovation and Technology in North Rhine-Westphalia, “Zenit”. Zenit is a partner to the EU’s Enterprise Europe Network, which operates in 60 countries and claims to be one of the world’s largest technology transfer networks. “Poland is an interesting market for German companies,” reports Zenit project manager Agnieszka Kaminska. “At the Cooperation Exchange we bring together German vendors – of PV plants, heat pumps and electrical systems for example – with Polish vendors, project partners and distributors. This is not just about technology transfer and distribution partnerships, but also about joint development projects between German and Polish companies. The events involving the two energy agencies with Zenit have already seen a number of cooperation agreements come to fruition.” In this way, two traditional coal-mining regions are helping each other to deal with structural change.

50° 16' N 19° 1' E  
KATOWICE



### A new beginning

Poland is considered a “coal country”, and not without good reason: around 95 per cent of energy requirements are met with coal-fired power stations. Nonetheless, the country is taking its bold first steps into renewable energy. For small facilities of up to 10 kilowatts’ electrical output, there is now a grid infeed priority in place, and a corresponding tariff.

Re-industrialisation creates growth; growth creates jobs. Peter Köhler, head of the Weidmüller Group of medium-sized companies, has clear ideas about how that equation can work in an “Industrie 4.0” society. **Thanks to his involvement in the European industrial and employers’ confederation “Business Europe”, his views are also being heard in Brussels.**

Interview: Johannes Winterhagen | Photography: Marvin Zilm

## Backing from Europe

*Detmold, Germany, July 2015:* The appointment with Weidmüller boss Peter Köhler to talk about Europe has been in the diary for a long time. As the meeting gets closer, the crisis in Greece starts coming to a head. The evening before, the results of the referendum are announced, indicating that the Greek people have – for the time being at least – rejected the reforms being demanded by the other EU member states.

### What did you think when you heard the news from Greece last night?

Firstly, I was surprised; I had expected the result to be closer. But the Greek issue will have to be resolved one way or another soon anyway, because if it is not, Europe’s credibility will be dented.

### How concerned about the problem are you in fact as a business leader?

The crisis in Greece does not pose a direct problem for our business, owing to the small size of the market. But it does affect us indirectly, in terms of the volatility of the Euro, for example. We need a stable Europe.

### Weidmüller is currently growing very strongly in Asia. How important will Europe remain for you in the long term?

It is certainly true that much of the growth at present is coming from the so-called emerging economies, primarily China and other Asian countries. However, Europe – including Germany – not only accounts for around 60 per cent of our sales, but is still the leader in the field of automation. This is where the trends are being set; this is where we are primarily developing into a solution provider, such as in relation to “Industrie 4.0”.

### Considering Europe from the viewpoint of your role as Chairman of the Industrial Affairs Committee of Business Europe, where do you see the biggest need for action?

I see three major areas of focus: first and foremost, the issue of competitiveness. Then the key issue of education and training. And of course growth – particularly against the background of re-industrialisation. Only through growth can we create jobs in Europe. The previous EU Commission had already set itself the target of increasing the industrial manufacturing contribution to Europe’s GDP to 20 per cent. It is currently around 16 per cent in Europe.

### With a downward trend ...

That’s right. Essentially it’s an after-effect of the 1990s, when industrial countries in Europe such as the UK and France committed too heavily to the services sector.

### Is improved competitiveness possible without abandoning Europe’s high employment standards?

First of all we need stable conditions that do not make it difficult for industrial companies to invest in Europe. All businesses with international operations make judgements on where around the world they are going to build their next factory. Our strategy is essentially “local for local” – that is to say, we build our factories where our markets are.

51°56'N 8°53'E  
DETMOLD



**Typically German**  
As with many German companies in the electronics industry, Weidmüller is deeply rooted in its home region. The manufacturer of electrical connection solutions, which is amongst the world leaders, has its traditional headquarters in Detmold. The town, with its population of 75,000, is located in the Ostwestfalen-Lippe industrial region.





**What do you mean in concrete terms by “stable conditions”?**

The key is the ability to plan for the long term, such as with regard to energy prices.

**There is no consensus in Europe on a joint energy policy, though.**

In the new EU Commission, there is at least a consensus as to how the issue needs to be addressed. Whereas in the past, the competing competencies of some Commissioners resulted in incoherent policy, the competencies are now consolidated in a single Vice-President. That is a major step forward.

**Do you believe the European carbon trading system is fulfilling its function?**

Ultimately, it's another question of the reliability of political statements. When you introduce an instrument of such a kind for environmental policy reasons, you can't be continually intervening, such as through “backloading”, by which carbon certificates are kept in artificially short supply in order to increase prices. Such interventions doubtless cause uncertainty among potential investors.

**Is over-regulation – resulting in continual amendments to rules – not a fundamental problem of European politics?**

In the past, we often had an over-regulated system, comparable to a system of equations using too many variables, making it unresolvable. It is precisely for that reason that the approach of Juncker's Commission – addressing issues on a consolidated basis, across departments – is to be welcomed. This should ensure that economic and ecological aspects are considered equally when decisions are being made.

**To what extent should Brussels be actively setting industrial policy at all?**

I do think that we in Europe should be taking care to ensure that our value chains do not break. The semiconductor industry is an example of that.

**All state intervention – including in Germany – has had little effect to date.**

And nevertheless, we need to make sure that the few chip manufacturing sites we still have in Europe are not moved to Asia. Because when the manufacturing moves away, the R&D soon follows – and then there will be no more innovation in the field from Europe.



Physicist **Dr Peter Köhler** was born in 1958, and is Chairman of the Management Board of the Weidmüller Group of medium-sized companies. His appointment in 2011 – initially as Spokesman of the Management Board – marked a return to one of his old employers, as he had previously been a member of the Weidmüller management team between 1996 and 2002. In the years in-between, he headed the Precious Metals/Technologies division of the Heraeus.

**Is current research support adequate to maintain Europe's technology lead?**

A big problem in the past was that many issues were addressed by a scatter-gun approach. The new Commission has adopted a better approach in this respect too: the €70 to 80 billion of research funding being provided through the “Horizon 2020” programme will no longer be spread across as many research institutes as possible. Rather, a cluster approach is being adopted which will ensure that companies and university research centres are interlinked.

**In fact, you have a local digital manufacturing technology cluster of your own in the Ostwestfalen-Lippe region, named “It's OWL”.**

I believe we have created an ideal structure, developed over a period of decades. It involves industrial companies from the region working closely with universities and research institutes on the automation of the future. Being chosen as a Leadership Cluster represented a major opportunity for all involved. And we will doubtless be retaining the strategy when the Cluster comes to its scheduled end after five years.

**Despite all the enthusiasm: is it really transferable to other regions in Europe which do not have such a broad industrial base?**

If we want to set up such clusters on a European level, then we do certainly need to interlink strong regions

and key players through networking. I can also very easily imagine virtual clusters being set up, focused on specific topics, and receiving massive support in their efforts. In today's world, the success of a project should no longer depend on whether two of the partners are 60 or 600 kilometres apart.

**Are such clusters enough to keep up with the global competition in Industrie 4.0 against China and, most especially, the USA?**

From the perspective of a single, globally operating business, that competition exists only to a limited extent. Some major German corporations are at the same time also members of the US "Industrial Internet Consortium". Conversely, our German platform also includes US IT companies such as IBM. It is not about Europe against the USA, or Europe against China. We just have to be aware that other regions around the world are also working on Industrie 4.0-type development. China, for instance, spends 300 billion every year on researching this field. Assuming the right backing is provided, Industrie 4.0 can help add value and create jobs in Europe – including in regions with less well-developed structures. That is a major opportunity.

**What hurdles do you still see for Europe on the way to the Industrie 4.0 society?**

We are concerned that Europe is still not acting in unison on some matters. We have 28 different data protection laws, for example. This poses enormous problems to small and medium-sized enterprises. European policy-making should provide us with the backing we need; speed is key.

**Speed is not exactly one of the virtues of European politics.**

I hope that we will succeed in implementing the EU Commission's planned "Single Digital Market" rapidly. It needs to be clarified in the next two years, otherwise we will have a problem. And then all the other ideas – such as the creation of a dedicated infrastructure for secure data transfer – will also come to nothing.

**To create jobs, there have to be people available to recruit. Is a European immigration policy needed?**

A managed, skills-based immigration policy should of course be put in place – urgently! Otherwise the shortage of skilled industrial labour will become a massive issue from around 2025 onwards. Although we do have more students studying the so-called MINT subjects in Germany than ever before, falling student numbers in each year will mean that alone will not save us.

**Attitudes have hardened against Europe in many member states. What do you think can be done to counteract those attitudes?**

Where do negative attitudes come from? They arise because social development creates winners and losers. People who lose their jobs for example. Or are even born into unemployment. Growth is the essential prerequisite for turning such people back into winners.

**What will make all of Europe a winner?**

Germany's relatively high level of industrialisation and its Agenda 2020 programme enabled it to get through the global economic crisis well – and that is good for the whole of Europe. But there are lots of other winners that should not be overlooked. First and foremost I would cite the UK, which is investing heavily in re-industrialisation. Or Iceland, for example, whose banking system was completely destroyed in the financial crisis. The country is now building on its strengths – primarily its enormous renewable energy resources – and attracting energy-intensive industries. Or Spain, which has achieved a turn-around and is growing again. They all demonstrate that trends can be reversed even under the current conditions. We should utilise that momentum throughout Europe.

In addition to his primary role, since mid-2012 Dr Köhler has also been Chairman of the Industrial Affairs Committee of the European industrial and employers' confederation "Business Europe".

Dr Peter Köhler is married, and has four children. He likes to spend his leisure time doing sports, including surfing on the North Sea.



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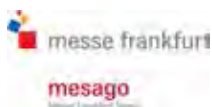
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The next issue will be released in November on the following topic  
**The city of the future: a higher quality of life thanks to smart infrastructure**



# “Living in urban centres”



**Janneke Berndt (15) has already started thinking whether she wants to study science or music when she leaves school. She spoke to Eberhard Veit, chairman of automation specialists Festo AG, about what it will be like to live and work in the city of the future.**



**Imagine you're visiting a city in 20 years' time – what will be the biggest differences from today?**

We don't have to look that far into the future. I think that industrialised countries will undergo a very significant transformation within the next ten years. City centres will become more or less car-free zones. Pollution will play a major role in this. Just like the toll that London has imposed on traffic in the city centre, other big cities will come up with similar systems.

**How will people travel?**

Lots of cities will expand their public transport networks. The megacities in developing countries will catch up quickly in this regard too. The view people have of cars will also change at the same time: more and more young people won't own a car, but instead they'll share them. In addition, living and working in the centre will become more important in a growing number of towns and cities, while work will be subdivided into specialist areas. Transport and traffic will change to suit this situation. For example, there might be special zones where people can park their cars and then use bicycles or electric mopeds to get to the car-free city centre.

**Do you think that cars will be completely self-driving while passengers read their e-mails?**

Let's start with public transport. My assumption is that the job of being a train and tram driver will soon become redundant. Things are moving in a similar di-

rection with cars. Acatech, Germany's National Academy of Science and Engineering, has started a project in the Industrie 4.0 field. I am part of the project, which looks at issues such how city centres will benefit from driverless cars. At the edge of the city, the vehicles can log into a system that will then guide them to their destination. There will be fewer accidents, and vehicles will select the best routes, which will be of obvious benefit to the environment.

**Lots of technological innovations have already been developed for driverless vehicles. What is preventing their introduction?**

Many issues are still problematic – insurance policies, laws and data protection for example. However, people often overlook one particular point: for driverless cars to function, they have to connect with other vehicles and the infrastructure by means of data transfers. Our networks are not fast enough to handle this. The chairman of a carmaker's supervisory board has said that, at present, we can't use driverless cars to travel at speeds of over 17 km/h because network capacities can't cope with them.

**Innovations in urban technology need a lot of energy. How will we generate this?**

I'll start by saying one thing: we already consume far too much energy. One solution would of course be to enhance the



output of renewable energy sources. Above all, however, we have to start becoming more energy efficient. The technology necessary for this has also been available for a long time. Our new multi-storey building over there [Veit gestures towards a blue, glass-clad ultra-modern building visible through the window] has a fully automatic heating and cooling system that it regulates by

itself. It is an example of a "zero-energy building". To make do without fossil fuels, we included an ice storage unit: it uses heat pumps to provide the energy for keeping the building cool in summer and warm in winter. Using similar approaches, we can also generate energy in cities and so compensate for the problems of climate change.

**What is Festo's approach to the challenges posed by urbanisation?**

Industrie 4.0 is a major topic at our company. Increasingly, factory staff will more likely monitor production processes instead of actually performing manual work themselves. Within this context, we are focusing a lot of attention on networking machines and entire factories around the world. Yesterday, we activated a Chinese customer's production unit remotely from our Esslingen base. This is what the future will look like, and the same will apply to lots of other jobs, for example teams working together in virtual offices around the world.

**Won't these developments lead to fewer jobs?**

No: the number of jobs will remain the same. It's the tasks that will undergo significant changes: people will remain in control and machines will do even more of the work.

**Regarding your own life and how you live, what technical innovation would you like to see in the next ten years?**

One thing I'd like – and it can't come soon enough – is an easier way to travel. My job means I often have to fly all over the world. I could of course use video conferences to discuss projects, but nothing can really replace face-to-face contact with other people or the immediate impression you get when you visit a company or a plant. So I'd really like some kind of innovation that took some of the arduousness out of travelling. All the same, it doesn't have to be transporters like in Star Trek!

Text: **Marc-Stefan Andres**  
Photography: **Dominik Gigler**



# A successful bond



**T**he frigatebird is found only in the southern hemisphere and generally congregates in large colonies. Once a year, the males become very restless. A few peers form groups and start performing spectacular courtship displays. Each male frigatebird tilts his head back and inflates his scarlet neck pouch until it is almost as big as his body. Among birds, courtship displays are a widely used strategy for finding a mate – or at least the next mate. Evolutionarily speaking, puffed-up feathers and colourful neck adornments have guaranteed success.

However, businessmen's ties are not something their wearers picked up from studying avian behaviour. Instead, the tie is something that can be described as a "top-down" innovation. According to the legend, French "Sun King" Louis XIV was very taken with a parading mounted regiment of Croats: the soldiers wore a kind of scarf knotted in a bow over the chest. The king adopted this decorative necktie and, before long, he had his own personal cravatier. The eye-catching accessory spread particularly quickly among the aristocrats at court – after all, whatever the king thought was beautiful must indeed be beautiful.

Recently, however, beauty has not always been the hallmark of ties, and there are probably still some drawers out there containing examples waiting for the opportunity to show off their comic-book motifs. Sporting a tie can be a very different affair, as demonstrated by Germany's "tie-wearer of the year" prize,

presented every year by an association dedicated to this item of clothing. Past winners have included such urbane figures as Willy Brandt and Kurt Biedenkopf, but little-known TV presenters have recently dominated proceedings – maybe an omen of the tie's imminent demise?

If you look at the figures assembled at business conferences such as the ZVEI's annual congress in Berlin, ties still take pride of place. They instantly signal "I am a member of this exclusive club of entrepreneurs and leading managers". However, these events also feature a growing tie-free contingent, most of them media types, junior politicians and figures from the start-up scene. While Germany's former foreign minister Joschka Fischer combined an open shirt collar with jeans and trainers, the tie refuseniks of today prefer fine suits and exquisite footwear. This is a social code all of its own – though tieless, they can identify their peers as quickly as the female frigatebird spots a potential partner. I would say that going without a tie conforms just as much to a specific role. I've decided to go to the next re:publica Internet conference – in a tie, for a change.

**Text: Johannes Winterhagen | Illustration: Inhouse**

*Johannes Winterhagen, AMPERE's Editor-in-Chief, spends a lot of time travelling for work: he sleeps in a hotel bed some 100 nights a year. On the last page, he has some observations from his travels to share with you.*



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