finish

INSIGHT INTO THE WÖRWAG COMPANY

2013

Sustainability in new markets

WÖRWAG

Published by Karl Wörwag Lack- und Farbenfabrik, Strohgäustrasse 28, 70435 Stuttgart, Germany **Project Management, Editor-in-Chief** Daniela Renzo **Concept** Arnold.Kircher-Burkhardt, Stäfa, Zurich, Switzerland **Layout, Implementation and Image Selection** Doris Oberneder **Project Management** Rahel Frick **Editing and Text Production** Kircher-Burkhardt Stuttgart, Elmar Brümmer, Reiner Schloz, Michael Thiem, Christiane Wild-Raidt **Print** RöslerDruck GmbH, Schorndorf, Germany **Translation** SoundsWrite GmbH, Switzerland

Photos: Laurent Burst, Gilles Mermet / Science Photo Library, Audi AG, Wirtgen, USM Modular Furniture Systems, Maquet; illustration: Grafilu; cover illustration: Arnold.KircherBurkhardt

EDITORIAL

No secret recipe

When we opened our first office in China over ten years ago we were entering a completely new environment, business and work culture. Although it was tricky sometimes, we have now learned how our own culture and the Chinese culture fit together. As they say in my favorite sport, "If you can't use the sails, you have to row." We are used to tricky challenges. So we did what we have done many times before in the one hundred-year history of our Swabian family business: We simply worked on finding the best recipe for our coatings. Tinkering and developing on a daily basis takes more than a little knowledge and a few robots. That's why our recipe remains inquisitive employees. They have the creative ideas and do the developments that shape and secure our future. So we foster friendship, ensure training and encourage dialogue, enabling our employees to feel comfortable with us both now and into the future. This is something that is noticed by our customers – who also know that they can rely on Wörwag quality all over the world. Last year, we launched our new magazine for customers and employees. Starting with this issue, we are inviting a broader readership to delve into its pages and take a closer look inside our paint pots: We will talk about all the places you find paintwork and explore the many colorful worlds where Wörwag products are making a difference. In this issue, we will even journey as far as China, to our factory in Langfang. Enjoy your reading!

HANNES WÖRWAG,
MANAGING DIRECTOR

The calm after the storm

Audi acoustics experts hunt down noises in the car interior, and silence them with a special haptic coating. An acoustic test drive into the realm of onomatopoeia. Text: Michael Thiem

Audi uses Wörwag anti-squeak coatings in the car interior. Go on a journey of discovery – touch to find it.

Photo: Audi AG

Phooh. That's how it starts. Two minutes later, it is more of a phooohh. And as every second goes by, more Os are added. What you sense changes rapidly – like the temperature in the interior of the Audi Q5. In the motionless air, your palms turn moist and your pulse rises. It's hot. And it's going to get hotter fast. You know the feeling, when it's a sunny 25°C and you don't wind down the car windows. It is quiet. But it's hardly relaxing! The air conditioning is off. The fan is off. No radio. Just your own pulse – and the first beads of sweat. The aim of this unusual test drive at Audi's Ingolstadt test track is to detect noises and to find their causes: creaking leather, vibrating plastic parts, or metal rubbing. Sounds that can easily steal a new car owner's joy. Once found, the noises can be eliminated – with, among other things, the help of a special haptic coating that enhances the interior while also making it more resistant to wear. Thanks to the haptic coating, 10 to 15 percent of noises in the vehicle's interior can be eliminated.

Eavesdropping

Günter Klos hears everything. He works in the Total Vehicle Quality Control as head of "Watertightness and Noises". This makes him Audi's "reference ears". Internally, they refer to this department as the "rustle and click team". Every time 47-year-old Günter gets into a car, it's time for onomatopoeia – a term that school kids learn by the age of 13, but soon forget. We recognize it most as the description of the sound effects in comics. Onomatopoeia is painting sound with letters. Like "bumpabumpabumpa" when a ball bounces down the stairs. Or "grmpf" when Donald Duck is annoyed again. As Klos says, "The Eskimos have a hundred words for snow; we have our own vocabulary for noises in the interior of a vehicle."

Audi has had this department for more than 25 years, and it has a clear mission: To carefully listen to the sounds in the vehicle's interior. Klos and his team of eight start work long before there is anything to hear. Almost three years before production begins, the experts monitor the development process and study the digital models, plans, and computer simulations. They "hear" with their eyes. "We go through all the metal tight spots with the designers," says Klos. "We know, for example, that during coating, liquids won't flow properly if the distance between two metal plates is less than two millimeters." So later, this can lead to cracking noises. Welding points are also studied early on in the development process, because in the worst case, there may be rubbing at these spots later. "Criiick, creeeek, buzzz, whirrr," are some of the onomatopoeic sounds Klos uses to summarize the acoustic perceptions. "We have a checklist that we go through meticulously," says Klos, who sees himself more as a detective than as an engineer. "Actually, we are technicians. We just wear casual clothing instead of ties. This is because sometimes we have to literally crawl into the vehicles. It can get sweaty. So we often need a fresh change of clothes." It can take days of perspiration to isolate a specific noise. Metal sounds are particularly challenging and hard to identify. On one Audi A7, they even had to cut open a side panel. The source of the metallic cracking sound was finally traced to an absorber bearing. An isolated incident, which you could say is routine in this job – new challenges are the norm.

Once the first prototypes and pre-production vehicles are ready to roll, they hit the road. Tenacity and physical fitness are essential for the acoustic test drives. One guy is at the wheel, and his colleague might be in the back seat or

> "Criiick, creeeek, buzzz, whirrr." The Eskimos have a hundred words for snow, we have our own vocabulary for noises in a vehicle."
>
> Günter Klos

MICHAEL LEINMÜLLER

completed his Wörwag training as a coatings lab technician in 1982. Today he is a market manager responsible for automotive interior coatings worldwide. "My job is particularly nice because the look and the quality of our soft coatings make life more enjoyable."

Photo: Jürgen Krämer / Medikanto

the trunk with a flashlight in one hand and a stethoscope in the other. "Once we had someone perched on the fender with the hood open!" They are listening for where it squeaks, buzzes, or crunches. Every sound is recorded using Audi's established expressions. The whole team knows immediately what is being discussed. They speak the same sound language.

The acoustics experts travel the world 130 days of the year. Every week they cover around 5,000 kilometers. The climate is an all but constant companion – where they go, it is always extremely cold or extremely hot. This is because temperature has a huge impact on the sounds in the vehicle's interior. Materials expand in the heat. Leathers and plastics become brittle when it is very cold. Klos explains, "The warmer, the cracklier." All sounds are neatly listed and scored. A score of 1 means the driver needs to pull over and investigate, while a score of 10 means there is no issue and things can continue on. With a score of 5 on the Audi acoustic rating system, it is assumed that a critical customer will take the car into the repair shop and complain.

Once a year there is a special acoustic test drive with the entire model range. Audi has been doing that for 20 years. All the models are driven a punishing 10,000 kilometers on some very bad roads. Then Klos and his team are invited to do a sound check because Audi wants all their cars to be free of irritating noises, not only when they are brand new but also after years on the road. The critical points are the armrests, central console, door trims, and door handles. Klos is on the alert whenever two plastic parts are clipped together. A central console consists of about 200 parts. Over the years they will develop a small amount of play, which leads to squeaks, creaks, and crunches. In order to take the right precautions, Audi conducted a special study with different coatings – and opted for Wörwag's anti-squeak paint. "Compared with the alternatives, the results were significantly better," says Klos.

During pre-production testing of an Audi A3, 175 noises were identified and documented. To find the sources of the noises and prevent their recurrence in later production models, the acoustic experts put the vehicle on a "hydro-pulse" system. Four computer-controlled hydraulic cylinders make the car move rapidly up and down, setting up vibrations at all the frequencies that require investigation. "This is a tool that allows us to get the whole vehicle vibrating in any way we want to," says Klos, inviting us to join in on the fun. Did you have a good breakfast? How much can you take?

The frequency begins to rise steadily. Your knee whacks the central console and your breakfast bun collides with your stomach walls. "We set the frequency so that we can constantly hear a certain noise. Then we can track it more easily," says Klos. Watch your head! The passenger's hand slaps against the window pane. The car keeps swinging back and forth, skipping and hopping. The frequency increases, a seat belt buckle starts buzzing like a swarm of bees. The rear shelf rattles, the armrest creaks, and the visor whimpers. By now the message is very clear: To hear it, you have to feel it. It is obviously an extreme laboratory scenario; no road in the world could treat a car this badly. Klos recalls a situation a while back where the zipper on the first aid pack started buzzing. The problem was solved by swapping the zipper for a cord tie. As Klos says, "It only takes one or two sounds to spoil a car's impression of high quality."

Quality assurance includes testing the sound system, since the interiors of many vehicles are increasingly becoming mobile concert halls. This is why Klos has a special sound CD with extremely low and super-high frequencies. When you're testing the frequency range from 447 hertz down to 35 hertz, you feel it in your stomach – like being in the first row at a Metallica concert. The sonorous bass of David Munyon's "Four Wild Horses" would be totally ruined by any buzzes or rattles. To test this, the volume is turned up to a predefined level. Klos himself drives an Audi A6. Sometimes he even stops to track down an unusual noise, much to the chagrin of his wife. It's a rare exception for him to put up with unusual sounds in his car. Like Latin American reggae. "Ah! – that must be my son's CD," he laughs. ■

WET-ON-WET METHOD

Helpful and high-quality

Automobile manufacturers have been successfully manufacturing using the wet-on-wet method developed by Wörwag since 2006. Without oven-drying, a water-based haptic coat is applied five to seven minutes after the first coating has been applied. This coat has a dampening effect and positively enhances the interior acoustics. The composition complies with the common interior specifications of premium manufacturers for use on materials such as ABS, PC/ABS and PC. Basically, any component made of one of these materials can be coated.

Audi uses the haptic coating R6483 H. The principle of the wet-on-wet coating with a suitable top coat is also used by BMW. Other manufacturers are planning to introduce this concept in their production lines.

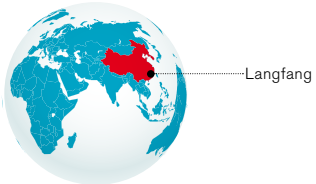
Rising Sun

There is a clear plan for the new China. Growth in the Middle Kingdom will be socially and environmentally sustainable as Wörwag illustrates at its plant in Langfang. And employee Julie Sun exemplifies the good prospects – a life rising. Text: Michael Thiem; photos: Laurent Burst

Julie Sun radiates joy. She works at Wörwag as a quality manager.

On the way home: Julie Sun has purchased an apartment in an exclusive gated community in the east of Langfang.

Infographics: Vectorstock



Julie Sun holds up her key like a small trophy between her thumb and index finger. The security guard at the heavy iron gate standing watch over the entrance to the exclusive gated community in the east of Langfang, looks critical. But then he nods and opens the gate a crack. For Julie, the key opens more than her new three-bedroom apartment, it's her ticket to the middle class. It means social advancement, recognition, and beginning a life of relative prosperity and material security. It is a reward for Julie, who at the age of 38 has worked hard for the past ten years at Wörwag as a quality manager saving two thirds of her monthly salary. Rising Sun. Her plan has paid off.

Committed to optimism

Julie Sun is not the only one on the move. China is changing constantly and daily. In fact it is changing at a dizzying pace. If you want to visit a restaurant in the evening, you had better call in advance. Not to reserve a table, but to make sure that the restaurant is still there. It's a country in mad transition. On TV there is an advertisement for growth pills. Add between 6 to 15 centimeters to your height within six months! A bold promise in an even bolder country. But now one thing is certain, suddenly it pays to work. That's why people are moving in droves into the cities that are changing so fast that a reliable road map is hard to come by. But that, like everything else, is cause for optimism and celebration. In China, the words for crisis and opportunity are each composed of two characters. In both words the character Ji is used. So the Chinese conclude that every crisis is an opportunity. Committed to optimism. ➜

“It is important to think about products, the market and the prices. But it is equally important to treat the employees well.” Junxue Qin

➜ That is true for Julie Sun, who faces the future with confidence and with a raft of personal goals. She commutes to work on a bicycle, but soon she hopes to swap it for a car – preferably a VW Polo. She stands in the kitchen of her new apartment and cranes her neck out the window. She should almost be able to see the Wörwag plant. It is only three kilometers as the crow flies but the road is still unfinished. A construction fence and trees obscure the view. In a couple of months construction will continue all the way from here to her work place. The entire residential complex consists of several 18-storey blocks. 5000 people will be moving into the new apartments by the end of the year. They will live in the middle of a green oasis; an idyllic development reminiscent of a holiday resort. There are ornate paths, romantic waterways with small bridges, cozy seats, shade trees and a huge playground. No wonder the development is called Huaxi Zhuoan, which means “flower garden”. Half of Langfang is plastered with adverts for this residential area marketed with the slogan “Sunny and colorful days”. When Julie Sun talks about her home she is radiant. It is everything she imagined. And it was planned by the Chinese government.

Revamping the image of a town

Langfang is located some 70 kilometers south of Beijing. More than four and a half million people live here and more are arriving every day. A thousand companies have moved to Langfang. With Wörwag, there are 200 from Germany. It is a strategic location. Many automotive manufacturers and suppliers of major brands have settled around Beijing, and a second capital airport will open in the south of the city by 2018.

Julie left her hometown Chifeng in Inner Mongolia in 2002 along with her childhood sweetheart Zhidong Wu. Seven years ago, their daughter Wu Mingyang was born. They want her to have a better future, surrounded with greenery and trees, not just in picture books, but in a real and healthy environment. All of the conditions are right. Langfang is an official eco-development zone. It is all happening very fast. In late 2012, Jiutian Leisure Valley opened in the city center. It is an artificial indoor recreation park with a huge rainforest, a hotel, restaurants and leisure activities. The park has 100 000 square meters under continuous irrigation. In the city center, malls, residential complexes and hotels are springing up like mushrooms. Neon signs and giant screens light up the evening sky. In between them parks are being created and mature trees planted. On the green central reservations boxwoods are carefully pruned. The transformation into a model city is in full swing. Planners are addressing the past mistakes of unchecked, extremely rapid industrial growth as quickly as possible; but some plans still take time.

Germany, the model

Wörwag understands the need for patience, and is now being rewarded for the long-term strategy it adopted when it came to China. A small sales office in Shanghai became a Wörwag subsidiary in 1997, and the Langfang presence was established in 2003. The current plant was opened in 2008. Now revenues are 18 times above the 2004 level and rising. “That’s a huge development,” says Junxue Qin, who has been General Manager since 2005. He still remembers one of his first management moves: “We had to build toilets. People were always driving home to use the bathroom.”

Qin studied business administration in Mannheim in 1988. “I consider myself very socially responsible, which is something I learned in Germany,” says the 56-year-old. “It is important to think about products, the market and prices but it is equally important to treat the staff well and pay them fairly.” This ultimately pays off in their identification with the company, their performance and motivation. Our employees have realized that Wörwag is offering great ways to get qualifications, build a career and assume greater responsibility. Julie Sun is an example of someone who has seized the opportunity.

Read more on page 16.

“During my visit to Stuttgart, I was trained in the new technologies.”

Julie Sun

Photo: Luxwerk

Wörwag has been operating in Langfang since 2003. Employee benefits include two free meals a day.

In China, quality control is stringent.

INTERVIEW

"Sustainability starts with the employees"

The new Managing Director for technology Dr. Achim Gast explains why sustainable corporate policies are vital for commercial success in new markets.

Interview: Michael Thiem; photo: Jos Schmid

We want “made in China” to mean the same quality as “made in Germany”.

Dr. Achim Gast

Dr. Gast, you decided to leave a large corporation to join a family business. What do you feel is the biggest difference between the two?
Dr. Gast: Definitely the corporate climate. Here at Wörwag, I felt from the very first minute that people are central.

Did you expect that?
I knew that holding each individual in high esteem was one of the key corporate values but it is important to experience values being lived out. At Wörwag that happens every day. That made settling in easy for me.

Do you have an example of that esteem?
During the first work week, we celebrated the ten-year anniversary of one of our colleagues. All of the employees and management were invited. Although this is only a small gesture, we celebrated together and that highlights the culture of personal esteem that Wörwag fosters. You should know that Wörwag has a comparatively high number of long-term employees and a growing workforce. Sustainability begins with the employees. Wörwag wants to encourage employees to stick with the company by offering both individual development opportunities and long-term prospects with the company. This applies to all of our locations, including China.

Does that work in a market like China where qualified employees are highly sought after?
Yes, even in China, we have a large number of colleagues who have been working for us for a very long time by Chinese standards. Some have even been with us since the establishment of the subsidiary. For long-term success in this market, you need a good and stable local team.

To develop new markets, knowledge transfer is necessary. Isn’t that one of the biggest challenges?
It is indeed. We have to have a well-trained team if we want to be successful in the long term. Wörwag will continue to rely on intensive training of colleagues at the various locations. We want “made in China” to mean the same quality as “made in Germany,” which is why we have many employees coming to Stuttgart for training. That is the only way to ensure consistent Wörwag quality in the application of special technologies in China or other countries.

What role does innovation play?
Innovation helps us and our customers to be more competitive in the long term. Therefore, it is crucial that we keep asking ourselves how we can maintain and increase our leadership in our strategic business fields. Recent innovations in film coatings are just one example.

Are innovative products the main factor for sustainable development?
No, although such products matter, they are only one part of our overall concept. Another element would be, for example, sustainably optimized manufacturing processes for customer plants that we offer via specially tailored services.

Wörwag’s market entry in China was rather unusual. Why did you decide on a subsidiary and not the usual joint venture?
To establish a wholly-owned subsidiary is probably the most difficult way for a firm to get a foothold in China. But the point is that Wörwag is not looking for the easiest route, but rather for the one that leads us reliably and consistently to our goal. That is the Wörwag way.

Are there any other examples of sustainable development opportunities?
The trend towards electric mobility springs to mind. An associated increase in the use of plastics for auto body parts will certainly mean that more environmentally friendly film technologies will be needed. Perhaps the delivery of ready-coated modules will make paintshops redundant. Our management and our engineers will be working with experts from car manufacturers and their suppliers to understand these future technologies.

Are customers also looking for sustainable behavior when selecting suppliers?
Sustainability is not a marketing gimmick. It is a serious requirement for our customers and for society. For our work in the field of paints and coatings, this means we have to keep finding more environmentally friendly and resource-efficient products and processes. Sustainable solutions are usually also cheaper in the long run. Our sustainability may, however, also support customers in their competitive context, and ideally this will help us to develop lasting customer relationships. So you see, sustainability is always important at Wörwag throughout the company. ■

DR. ACHIM GAST
Born in 1962, married with two sons.
Career: Chemist. Prior to joining Wörwag as Managing Director for technology in July 2013 he worked for BASF Coatings for more than 20 years in various managerial positions in the automotive OEM and industrial coatings fields.

➜ The Chinese subsidiary Worwag Coatings (Langfang) Co., Ltd. is located at 11, Baihe Street. Above the blue corporate names are their corresponding Chinese characters. The company site is about as big as a football field – but Wörwag outgrew it a long time ago. Nearly 100 people are employed here, 30 of them in a rented office building three kilometers away.

Ten employees are based at customer premises. The Wörwag site is surrounded by a brick wall. Standing in the courtyard, you can see man-sized red letters on the inner wall. On one wall it says, "Safe production is the priority." The corporate values, "Innovation, quality, service and performance," are painted on another wall in Chinese and German. Everyone, including Junxue Qin, knows how important the "Made in Germany" label is. "We are customer-oriented and always up to date with the latest developments. Our products contain German know-how," the general manager says. "Therefore, all of our products are extremely innovative. We can offer performance that competitors can not match." Customer satisfaction rates are posted each month on the blackboard in Langfang. The goal for 2013 is 98 percent. Apart from a drop in April, the Wörwag subsidiary has exceeded the goal by a wide margin. Wörwag's plan to enter new markets is working.

Employees see good prospects

In Langfang, like in other international locations such as the USA, South Africa, Switzerland, Poland and Spain, Wörwag has invested in more than technology and machinery. The key to its success are the employees. When Julie Sun comes to work shortly after seven o'clock in the morning, her first stop is breakfast with her other colleagues. Wörwag is the only company in the Langfang industrial zone offering both lunch and a second free meal. For breakfast is Chinese bread that resembles a whitish steam bread, soup, roasted vegetables and tea. In the past everyone ate on the way to work at the mobile roadside food stands. "That was not very hygienic. People were always sick," said Qin, "I would rather pay for their breakfast and have fewer absentees." The employees appreciate this added value. They identify with the company, which results in people staying with the company for many years, longer than normal in China.

People have to eat in shifts because the two breakfast rooms are always overcrowded. In recent years the company has been growing at a rate of 10 to 15 new employees per year. Now, almost all of the offices at the company premises are too small. Growth means constant improvisation. This is especially true for the warehouse. Coordinating incoming and outgoing goods requires plenty of organizational talent.

Yi Ding seems to have it. He is 33 years old and started working for Wörwag in June 2013. He proudly shows off his new office, a flat-roofed extension opposite the canteen. "My job satisfaction comes from seeing the company flourishing," says Ding. The German standards and specifications for his work are a daily challenge. Everyone is well aware that Wörwag sets the highest standards. But the effort is worth it. That is what everyone, especially the younger employees, like about their jobs.

"My aim is to ensure that our employees develop and grow old with the company." Junxue Qin

The average age of the workforce is just under 30, so the work teams often get together after work. Julie Sun, for example, often meets her department colleagues for dinner. Tonight, the Le Mur Huan Ren restaurant is serving lamb, meat and shrimp skewers, mushrooms, vegetables and beer. The mood is relaxed. Everyone is chatting, sharing experiences, laughing and joking around. Everyone is enjoying the evening. "We don't talk about work now," says Julie Sun, "we do that all day."

Julie Sun is an important contact person both in China and abroad. She is the connection to Germany on a whole range of topics, which is why she has been to Stuttgart for training three times already. The international activities are coordinated by the International Technology Management (ITM) department at the head office. Friendships have developed, and now the Stuttgart team is not just there to provide support in a crisis. When Julie Sun was in ➜

Develop, test and ship –
the final quality is what counts.

Julie Sun meets regularly with her departmental colleagues for dinner.

It is all about the right formulation. Chinese colleagues get precise data from Germany.

➜ Germany in June 2013, she gave a DVD set with a Chinese language course to Giuseppe Polito, the Regional Manager responsible for the Chinese market. Of course, he was quite amused because he knew how much he needed to learn some Chinese. "We are the interface with the market."

His colleague Georg Bussmann stood in the lab in China ten years ago mixing the first batch of paint with two pots and a bead mill. Today he is head of ITM and spends several weeks a year traveling in China, mainly for customer projects. "We define success based on quality, not volume." It is important to adapt and transfer our expertise. But the whole thing is not just a one-way street. We need feedback. That is why English is a Wörwag employment criterion in China. "So when questions suddenly arise, every employee is able to report directly to Germany," explains Bussmann.

The efforts and investments are paying off. Wörwag was one of the first companies to successfully offer water-based coats in China. A Wörwag technician and his personal translator spent almost a year working on the production floor of the customer's plant. "That was hard work but they finally saw that our products were better than those of our competitors'," said Qin. Although water-based paints currently account for just ten percent of sales, the General Manager is sure that it is well worth the effort. "If we don't get in now, we have no chance. It's the future." The fact that Wörwag's latest technology is always introduced almost simultaneously in all markets underlines the importance of regions like China. ➜

The Wörwag plant in Langfang

Employees: Approximately 100
Capacity: 6000 metric tonnes per year
Number of products: approx. 100
Product range: Solvents and hydro-primer, solvent-based paints, hydro-based paints and topcoats, hydro-soft lacquer and hydro KU coatings, zinc-rich primer, industrial primer and topcoats
OEMs: all major European car manufacturers
Contact: Joanne Wang, Sales Dept., Worwag Coatings (Langfang) Co. Ltd. joanne.wang@woerwag.com.cn

The Chinese employees are very proud to produce the same quality products as their German counterparts.

The face of Langfang is changing daily. Shopping centers, hotels and restaurants are springing up.

➜ In the search for a larger facility in Langfang, Qin has been discovering that you cannot always make your own plans for the future. In his office is an award that honors Wörwag for being a good taxpayer in 2012. Hopefully that will help in the search for a new construction site. The pace of Wörwag growth in China remains high. Within the next five years, revenues are expected to double. At the same time the number of employees at Langfang will also increase. However long Junxue Qin has to wait for a new plant in Langfang, the firm's plans give Julie Sun a sense of security in her own planning. Rising Sun. No doubt: this is true in China for Wörwag. ■

KEVIN KRIESSLER

works closely with the team in China. In the Development/Engineering Department in Stuttgart, he is responsible for the application of all the liquid coatings on the LabPainter: "Everyday is different, there is always something new to consider."

Photo: Jos Schmid

One language

The LabPainter is an all-rounder that simulates a variety of future production line conditions. Using this test method, Wörwag is able to manufacture products of consistent high quality in growth markets such as China. Text: Michael Thiem; photo: Laurent Burst

Head of Process Engineering, Materials Engineering and Analytics, Dr. Alexander Gissel can watch the LabPainter working at the Chinese Langfang site, even though he is 8000 kilometers away in Stuttgart. The remote link is a major strength of this test process. Gissel can access all the conditions and parameters of the process in China and compare them with other locations. The device was put into operation in late 2012 in Langfang following the successful implementation of a system in the American Wörwag site in Lafayette, Indiana.

From Stuttgart, Gissel has constant access to the facilities in the USA and China. Wörwag is concocting the perfect formulation, like a chef collecting the best seasoning tips from all over the world. "We developed the machine concept, application methods and process engineering, and demonstrated and documented it all in Stuttgart," says Gissel. "A nomenclature was also defined for the the every aspect of the process so that Wörwag application technologists can all speak the same language all over the world."

The parameters of the LabPainter in China can be reviewed online in Germany.

Development pioneer

Liang Wang knows the code. The painter in the test lab in China is preparing for the next round of experiments. Using a paper funnel , he carefully pours paint into the flow cup of the LabPainter. 100 milliliters of lacquer suffice. A geared pump then delivers the liquid via a four millimetre thick hose directly to the high-speed rotary atomizer. The miniature paint system, largely developed by Wörwag and implemented in 2004, simulates in minute detail the painting processes of automobile manufacturers and their suppliers. Basically, Wörwag can use the LabPainter today to test the painting processes of tomorrow. This is the key to the successful development of new paint formulations.

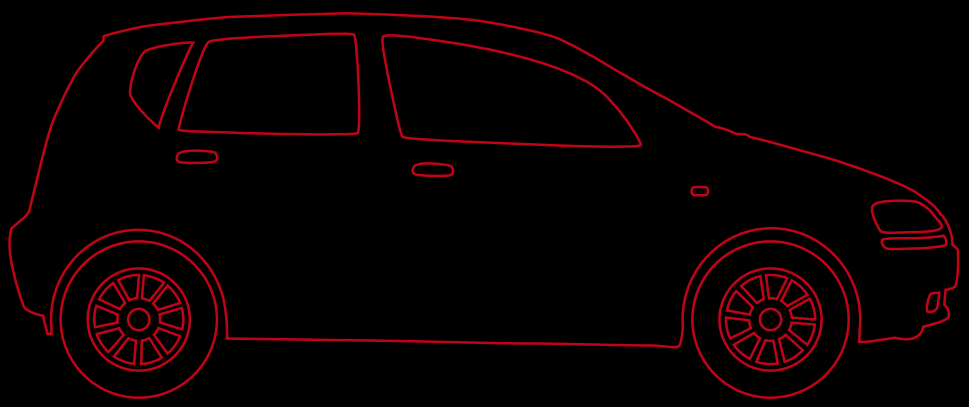
In the four-by-three-meter spray booth, it is 23°C and humidity is 70 percent. Controlling the ambient conditions is an energy-intensive process but one that is fundamental for the high reproducibility of the coatings. Silver is applied – Diamond Silver for Mercedes. Wang adjusts the substrate facing the atomizer. He closes the door. Then, looking at the screen, he activates the electrostatic high-speed rotary atomizer. The substrate is sprayed automatically. After venting, the paint is allowed to dry before the clear coat is applied. Then, after more venting, Wang puts the substrate back into the oven to dry. This process is repeated with different formulations. The LabPainter is a tireless marathon runner. With perfect preparatory work and two shifts, up to 80 sprays per day are possible .

Gissel is satisfied with the results from China. Evaluation of the color panels is important for the development of coatings. "Because we test the application process conditions," says Gissel, "we can find out to what degree a new color tone will be affected by variations in production line conditions and application technology."

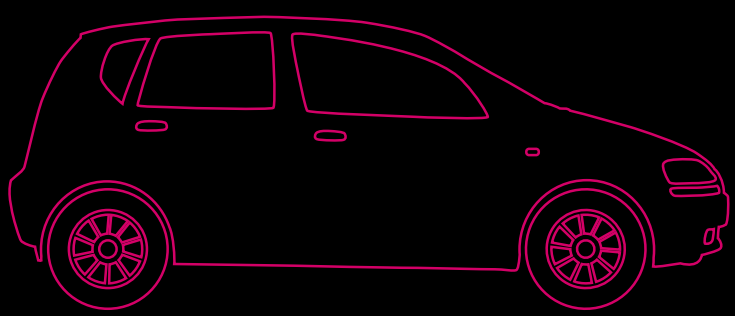
The LabPainter is flexible, easy to use and requires little space. It is suitable for water- and solvent-based coating systems. All types of atomizers can be used and it can be adapted to the latest technology. Gissel is certain of one thing: "We have to keep on top of developments. Customer demands are constantly changing." ■

Superlative China

In 2012, no other country built more cars than China. The bulk of them were destined for the domestic market, as a glance at the export figures shows, but that had little impact on car density in China.



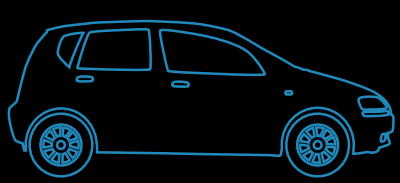
= 1 million



CAR PRODUCTION

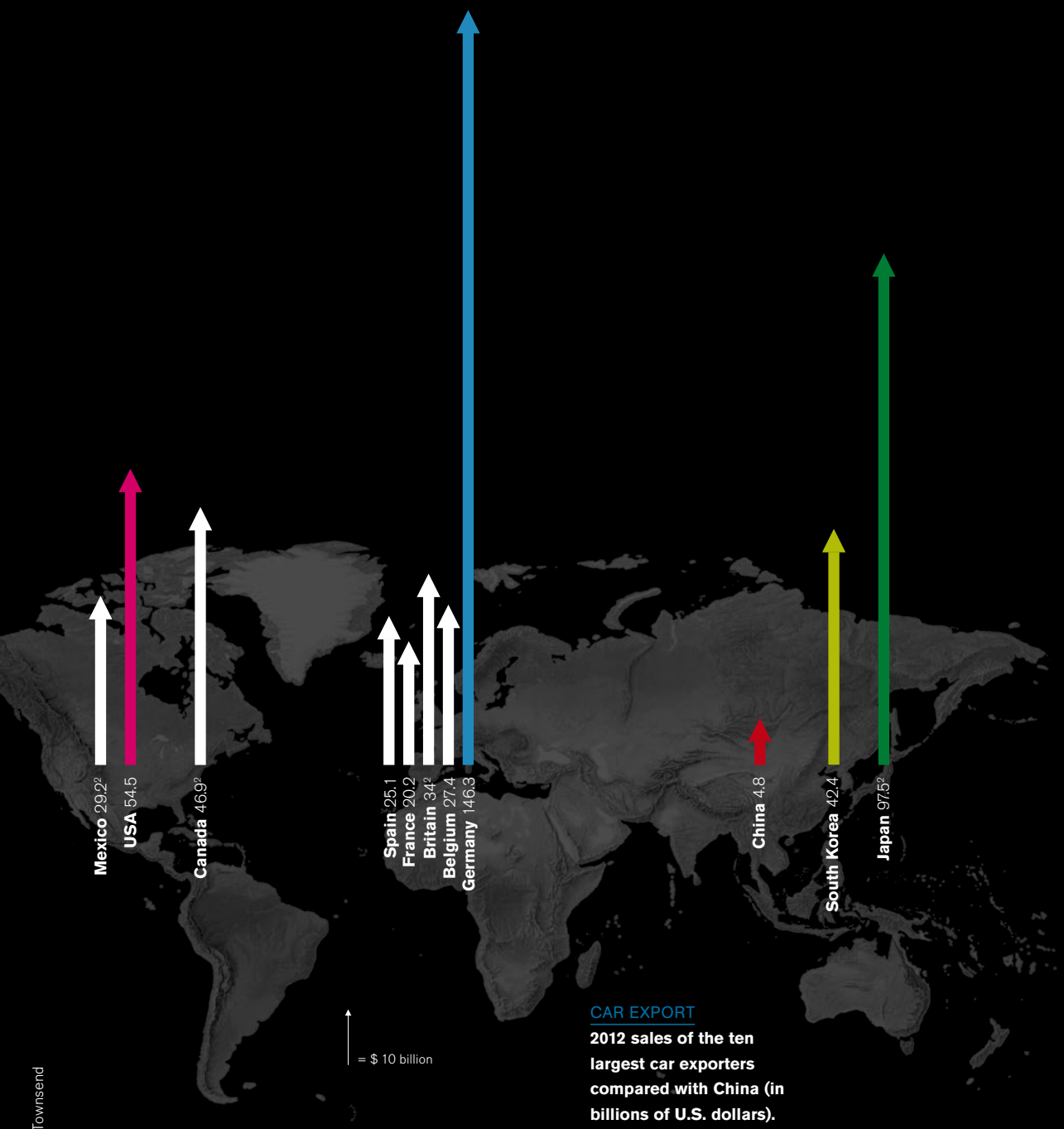
The 2012 top 5 (in million units).

Source: Association of the Automotive Industry (VDA)



CAR PRODUCTION

The five countries in the world where the most vehicles are manufactured (in millions of units). Source: VDA



CAR EXPORT

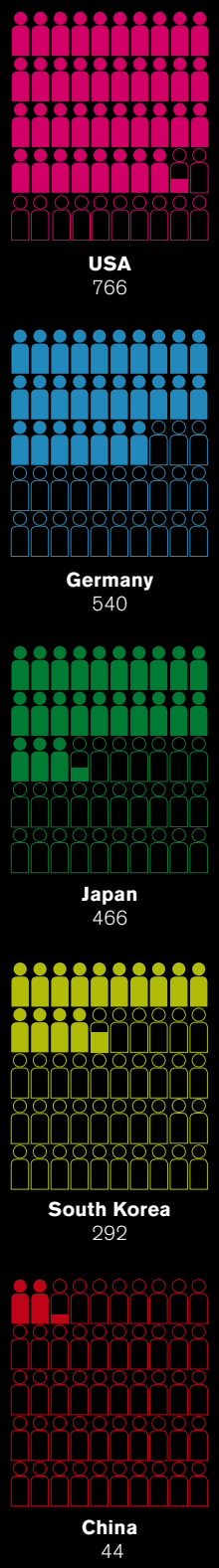
2012 sales of the ten largest car exporters compared with China (in billions of U.S. dollars).

Source: UN Comtrade

1 069 097 774

motor vehicles (cars, trucks, buses) were on the roads worldwide in 2011.

Source: Ward's Automotive Group



CAR DENSITY

In 2011, the United States was the country with the highest car ownership per 1000 inhabitants.

Source: VDA

[1] Including light commercial vehicles

[2] Estimate of the United Nations Statistics Division

Illustration: Vectorstock; map: Shaded Relief Archive / Kenneth Townsend

The robot in the combinatorial lab produces up to 140 different paint mixtures in a single night shift.

Non-stop mixing

Wörwag relies on modern high-throughput technology to develop liquid coatings. The lab robot's night shifts shorten development times and allow a reliable database to be established. Text: Reiner Schloz; photos: Jojakim Cortis, Adrian Sonderegger

Behind the glass and steel frame, it is all about extremely precise quantities and movements. Working to an accuracy of within 1/10th mm, the arm grabs an 80-ml container and moves it into position to receive a precisely defined mixture, called a formulation. After stirring the liquid, the robot closes the container with a syringe before sliding it into the horizontal position. A servomotor then comes into play, pushing the needle through a hole into the neighboring booth and spraying the contents onto a substrate, which is then passed to the next process. A second arm takes the sprayed metal or plastic pieces and hangs them in the oven to dry.

Following the pharma industry

And so it continues, fully automatically, all night long. Although the robot appears to be repeating the same task over and over again, the reality is quite different. Each formulation sprayed onto the substrate varies slightly in this hunt for the perfect mix. But Sabine Ansorge and her colleagues know what to look for. The chemical engineer from the Color and Design Department at Wörwag manages the combinatorial laboratory and reprograms her robots daily, ensuring the gripper arm can work automatically through the night on the development of the liquid coatings. Wörwag opened the lab in 2006, but the robot still seems quite exotic. "It is a prototype," says Sabine Ansorge.

The lab, hand-built by Bosch experts in collaboration with Wörwag, is an example of high-throughput technology. The inspiration came from the pharmaceutical industry. They started using automation to rapidly create a large number of different mixes, which helped to accelerate the development of new medicines. Today, high-throughput technology is also used in materials research and the development of paints and coatings. "The high-throughput technology gives us a competitive edge and allows us to specialize in certain areas," says Ms. Ansorge. Counting raw materials such as binders and pigments, the average coating consists of ten components. Finding the right formulation takes time, especially given the increasing requirements concerning adhesion, effect, color and viscosity.

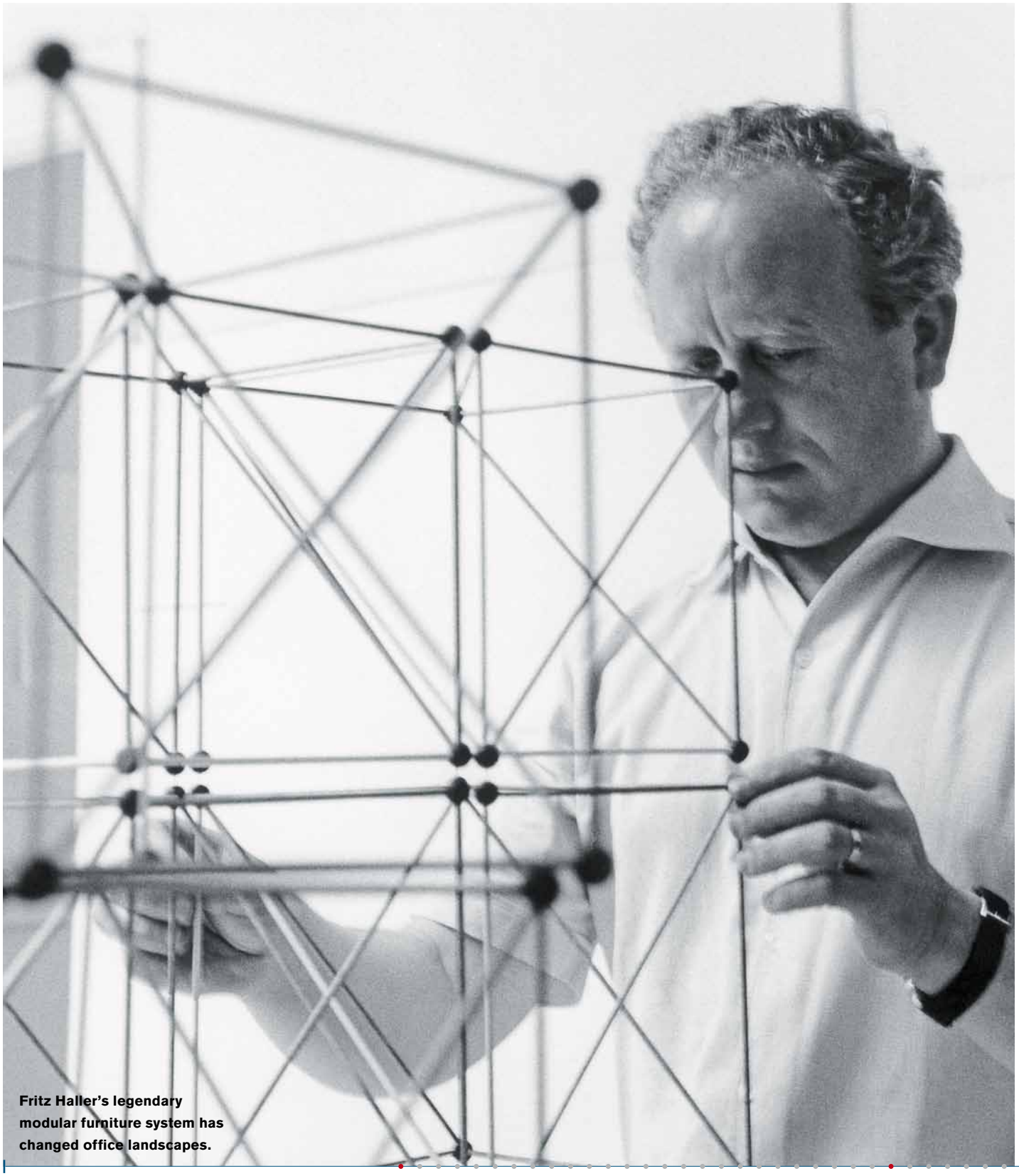
Enormous time and material savings

Painting techniques are also becoming more complicated. The days when the base coat was first applied and dried, and then sprayed with a clear coat are long gone. Premium colors are now applied wet-in-wet onto the metal: two coats, one drying stage. In addition to that process, the Wörwag system can also simulate a process called IPP (Integrated Paint Process) where the primer is still wet when the color-defining base coat layer is applied. Says Sabine Ansorge, "It is important for us to be able to adapt the lab to the latest requirements."

Of course, a reliable night worker needs a lot of support. Containers and syringes have to be cleaned every day, and more thorough cleaning is necessary on a weekly basis. The joints and movements of the robot arm are similar to the human arm, and it is able to work accurately to a tenth of a millimeter. Says Sabine Ansorge, "If any dirt accumulates in the system, our robot can get really capricious." But provided everything is clean, it will mix non-stop. In a 17-hour shift, the robot can create 70 samples with a two-layer coating, i.e. a total of 140 different formulations, which are specified by barcode. Afterwards, the results are evaluated, helping designers determine which mixes give the best quality results. The time and material savings are enormous. A lab technician mixing by hand needs between 500 grams and one kilogram of liquid paint per mixture, and can produce about ten formulations per day. When you look at it like that, the combinatorial lab robot is the hands-down winner during the development phase. The robot arm high-throughput technology is a massive process accelerator. ■

JILL REZES

completed her training as a paint laboratory technician at Wörwag three years ago and is part of the team of three in the robotic laboratory. "It takes a lot of technical knowledge about the plant to respond appropriately to unexpected events."



Fritz Haller's legendary modular furniture system has changed office landscapes.

Photos: Helke Rodemeier, Köln, USM Modular Furniture Systems

1885
Ulrich Schärer founds a hardware store and locksmith business near Berne (Switzerland)

1920
Manufacture of window locks starts

1946
Metal construction and sheet metal processing starts

CUSTOMER PROFILE

Raster men

A world, a sphere, a ball made of metal with a diameter of 25 millimeters, and six holes. For furniture manufacturer USM, this is the center of the universe. The story of a design classic that has revolutionized offices. Text: Elmar Brümmer

Who would have thought of that! Basing the company furniture on the factory building construction plans, and then turning that idea into a raster system to organize the whole world. Well, the office world at least … No, it's not science fiction. It's a story that began in the Swiss canton of Berne around 50 years ago.

In 1961, Paul Schärer Jr. joins the family business that was founded in 1885, with the goal of transforming a traditional manufacturing company into a modern industrial enterprise. As a metal working company, they are obliged to build with steel. Architect Fritz Haller is charged with designing the skeleton. The logical development of the concept leads to an aesthetically perfect and flexible industrial architectural system. It is modular, extendable and adaptable: Schärer and Haller go on to apply the concept to the interior design of the USM (Ulrich Schärer Münsingen) building. The tubular steel prototypes being used in their own office furniture so impress visitors that it is not long before mass production of the furniture begins.

A spot in the Museum of Modern Art

The words "raster" or "grid" sound limiting if you misunderstand them. According to USM Haller the raster or grid is a support framework or system that is liberating and not limiting because creativity naturally emerges when individuals develop their ideas systematically. The rigorous grid thinking of Schärer und Haller led to a new and influential interplay of buildings, rooms and furniture designs. And this led to the grid furniture system being given a place in the permanent design collection of the Museum of Modern Art in New York.

From point to line to surface; the most important elements have not changed – metal ball joints, chrome-plated 19-millimeter tubes, and rectangular, powder-coated sheet metal panels. The ball joint has six threaded holes through which the tubes can be elegantly attached with the help of a clever tool. It is the ingenious mechanical secret behind the USM Haller ➜

1961 Paul Schärer Jr, Engineering Graduate of Swiss Federal Institute of Technology in Zurich (ETHZ), joins USM

1963 The USM Haller modular furniture system is created by Fritz Haller

1985 USM 100th anniversary events

1986 Total reorganization of the business operations

1987 The first powder-coating facility is installed and collaboration with Wörwag begins

1992 Production of window locks is halted in favor of the USM modular furniture system

1993 The fourth generation: Alexander Schärer, Engineering Graduate of the École Polytechnique Fédérale de Lausanne

2001 The USM Haller modular furniture system is inducted into the Museum of Modern Art (MoMA) collection in New York

2002 The new U.S. headquarters complete with showroom opens in SoHo, Manhattan

2009 USM showrooms open in Dusseldorf and Tokyo

2012 New website online

2013 The new paintshop is opened. Wörwag adjusts the parameters

“Everyone can create works of art. I chose construction as a path to understanding myself and everything that happens.” Fritz Haller

A vision with foresight: well-established furniture design classics.

➜ modular furniture. The panel elements in 14 colors and the additional options of glass and perforated metal produce a virtually unlimited number of possible combinations. All product innovations are developed with “backward compatibility” in mind, ensuring that each new system component can be integrated into existing structures.

But timeless design depends on the materials and processing being durable. To this end, high-precision processing and very robust raw materials are used. From earliest days, paints for the sheet steel used by USM were mainly supplied by Wörwag. It was the meeting of two companies that were equally committed to making no compromises on material or product quality.

Wörwag is dedicated to long-term relationships. Now the Wörwag subsidiary in Switzerland, All-Chemie, is USM’s supportive partner. USM remains loyal to its location in Switzerland and continuously invests in efficient manufacturing processes, because consistency depends on renewal, and continuity depends on innovation. For instance, this year a new powder-coating facility was built at the USM site. Now the parameters are being fine-tuned. It is a technical gem linked to existing shop floors but located underground, which is beneficial for reducing temperature fluctuations and managing dust. Of course, USM wouldn’t be USM without added value. So, employee parking spaces were included in the development, and the space freed up by the old powder-coating facility can now be used for expansion of the manufacturing facilities.

Does furniture reflect a person’s character? The clarity of the USM modular furniture system allows the unobtrusive and timeless combination with any other style or interior design concept. And it adapts to suit changing habits and workflows.

Having become a workplace classic, USM has also managed to establish a presence in people’s homes. “Reduce to the max” has be-

Furniture as style elements of modern interior design.

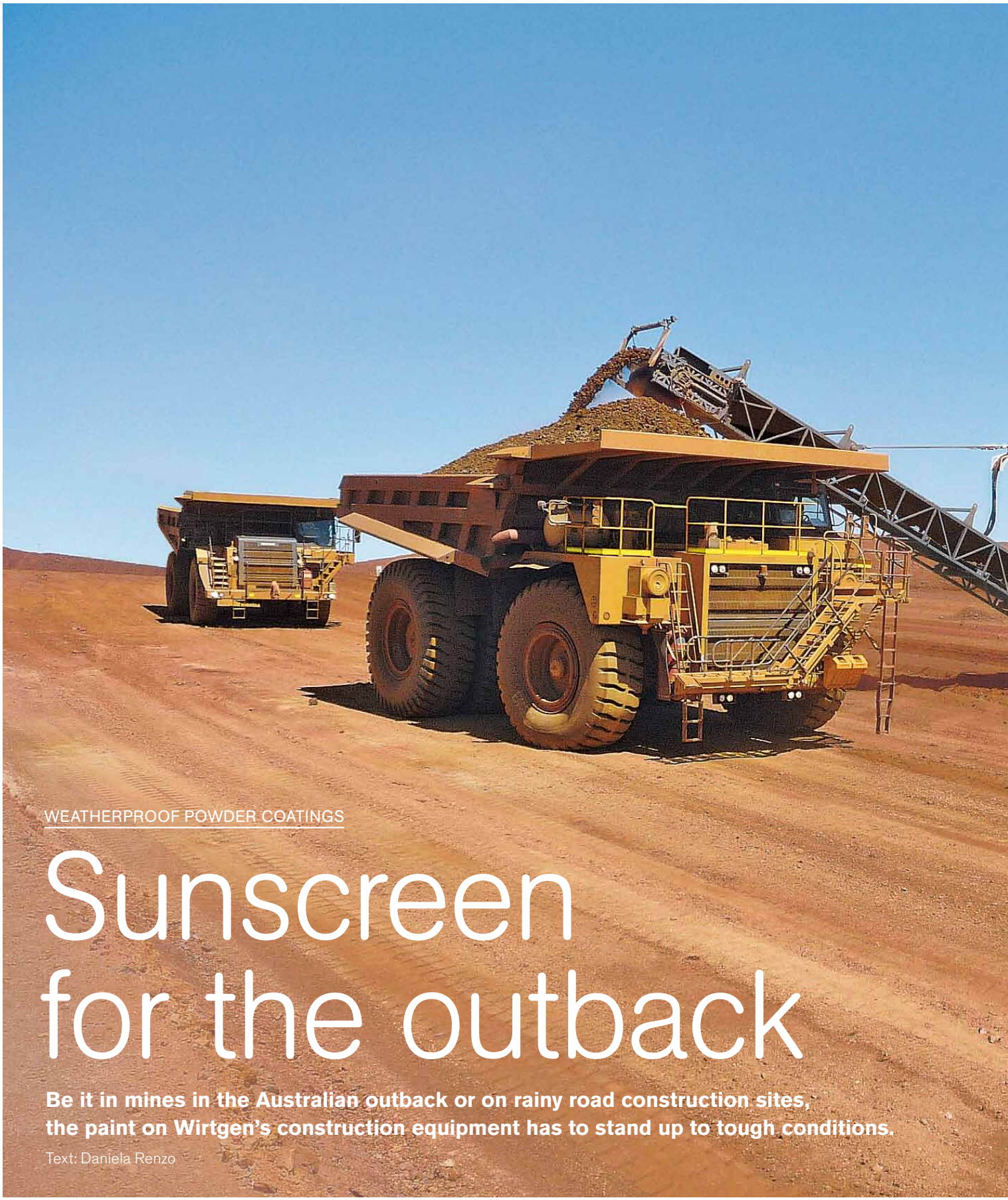
Photos: USM Modular Furniture Systems, Jos Schmid

come a global philosophy. People say we can do without 80 percent of the things we own, and still manage just fine, provided the other 20 percent are well considered. In other words, to become classic, furniture needs to combine quality and utility, form and function.

The Porsche 911, born the same year as the USM concept, is an example of the celebrated notion that form follows function. But classic doesn't mean static. Part of Fritz Haller's legacy was the maxim, "Everyone can create works of art." He also said, "I chose construction as a path to understanding myself and everything that happens." His discovery seems to be that ultimately, it's all a question of principle. ■

REGINA NEUBAUER

enjoys the direct customer contact that she has as Head of Customer Laboratory for Powder Coating. She says, "The company's family atmosphere played a decisive role in my decision to join Wörwag in 1997."



WEATHERPROOF POWDER COATINGS

Sunscreen for the outback

Be it in mines in the Australian outback or on rainy road construction sites, the paint on Wirtgen's construction equipment has to stand up to tough conditions.

Text: Daniela Renzo

Photo: Wirtgen GmbH

Protective clothing: Massive demands are made on the coating of the Surface Miner in Australian iron ore mines.

It is one of those days on the construction site when the rain seems to come from every direction. Despite gumboots, raincoats and hats, the water streams down the necks of the road crew workers. But they have to keep going because of course the sun will shine again.

Meanwhile, the rain simply drips off the colossal machines, like Wirtgen's new WR 250 cold recycler and ground stabilizer with 777 horsepower and a weight of 31 metric tonnes. With a process width of 2.4 meters, the machine's mill rotors pulverize asphalt that can be up to 25 centimeters thick. In a single day, one such machine can transform nearly two and a half acres – an area roughly the size of three American football fields – into a stable road subsurface. In a single process, the WR 250 grinds up damaged roads, granulating the material and adding the right amount of binder and water to form a perfect mixture "on the fly". This creates a new subsurface that is laid down ready for the addition of a new pavement by the waiting road pavers and steam rollers.

Obviously rain can hardly affect such huge machines. But small stones are another matter. Despite their diminutive size, with the right velocity they can wreak havoc on a painted surface. Add a little humidity or rain, and rust will be inevitable. And not even steel giants are immune to corrosion. In time, water, soil and the atmosphere can make steel as brittle as a cream cracker.

From rain to heat

Mining companies that use heavy equipment such as the Surface Miner, used in Australia to mine iron ore, are all too well acquainted →

How the powder-on-powder method works

The primer protects the surface from corrosion, while the final coat of paint protects the primer from UV radiation and weather effects. The powder paint is applied using the tribo charging technique (rubbing the powder grains gives them an electrostatic charge). The technique involves the use of a spray pistol mounted on a long handle that enables the painter to reach every part effortlessly.

In the final step, the two coats are bonded in the oven to form a single unit. Once the part cools down for about an hour it is ready for delivery. This method has proven ideal for both Wörwag and Wirtgen, because it eliminates the energy- and cost-intensive step of intermediate curing. The products were designed so that the final paint layer bonds perfectly with the primer paint. W 880 (super-durable polyester) is specially made for surfaces that have to stand up to severe weather conditions.

"Of course, we protect our parts with suitable paints." Johann Kroheck

➜ with the damaging effects of UV radiation and soil. These mining machines, with 1623 horsepower and weighing up to 200 metric tonnes, are on the job around the clock. Once again these machines do everything in a single step. They cut, crush and load stone with no need for drilling or blasting. "In the mines our cutting tools are pushed close to their limits. Iron ore is an extremely hard material," says Johann Kroheck, Head of Surface Technology at the German construction machine manufacturer Wirtgen. "The Surface Miner's paint also has to stand up to the extreme conditions present at the work site. We cannot afford to have quality problems because parts have corroded due to coatings that do not last." In mining in particular machines have to be available at all times. Any downtime means material recovery is delayed, and that costs lots of money. "Of course, we protect our parts with suitable coatings. There are a number of products that are good against corrosion," says Kroheck. "But we want a resource-efficient method and we have closely examined the pre-treatment of parts."

50 per cent increase in capacity

At Wirtgen's company location in Windhagen in the German state of Rheinland-Pfalz there is a large-component coating plant where steel elements weighing up to 30 tons are pre-treated and coated. Hanging on the chains above the conveyor system as they move from station to station, the massive parts seem so light. First they go to the automatic spraying system where the surface is freed of any residues, such as rust, scale and slag. Previously, some of these surfaces had to be sanded so that the primer coat would adhere better. "This pre-treatment is critical because the quality of the surfaces can vary considerably." Such surfaces are even more robust when the paint is applied in two coats (dual-layer paint system). However, this also drives up costs, as the paint has to be cured between coats and that costs energy. Kroheck smiles, relaxed. "With Wörwag we are able to avoid that. We do powder-on-powder coating with no curing in between. We apply the primer and the final coating before putting the part in the oven. We do it all in one step, just like our machines."

"Building up the right layer thickness is particularly important on joints – where the surface intersects with edges or seams," says Jochen Reihs, Head of the Wörwag Customer Laboratory for Construction and Agricultural Machines. "That is why the powder has to be statically charged in a specially adapted application process to ensure that it protects these sensitive areas as well," says the coating chemist. "The new plant has been in operation for three years without a hitch," says Kroheck.

Since last year, Wirtgen has been coating more than half of its parts with powder coatings using the new process. This has boosted the efficiency of the plant by 10 to 15 percent and reduced the dwell time of parts in the plant by half. The coatings applied to these massive machines fulfil the conditions for the most demanding category of corrosion resistance and are suitable for coastal areas, high humidity, and aggressive atmospheres. The parking spaces around the production plant in

A question of size: A special plant is needed to paint construction machinery.

A question of technique: Experts coat construction machinery by hand in a sheath of protective powder paint.

Photos: Daniela Renzo, Jürgen Krämer / Medikanto

Windhagen are reminiscent of a science fiction film. There are rows of construction machines some 25 meters long and three meters high, waiting to be picked up by their new owners. You could get lost among them. Every broom, every tool has its place. But the Swiss cowbell that hangs decoratively in the plant does not fit into the scene. "That is a trychel cowbell. It is recognizable by its surface, which is hammered, rather than cast like a normal bell," explains Jochen Reihs, who regularly shares his vast knowledge in Wörwag training classes, "The Swiss plant manufacturer MS Oberflächentechnik gives one to every new customer." ■

JOCHEN REIHS

is an expert in powder coatings and regularly conducts training on the topic. "As the head of the customer laboratory for construction machinery, I can offer a lot of helpful tips and I am happy to share my knowledge."

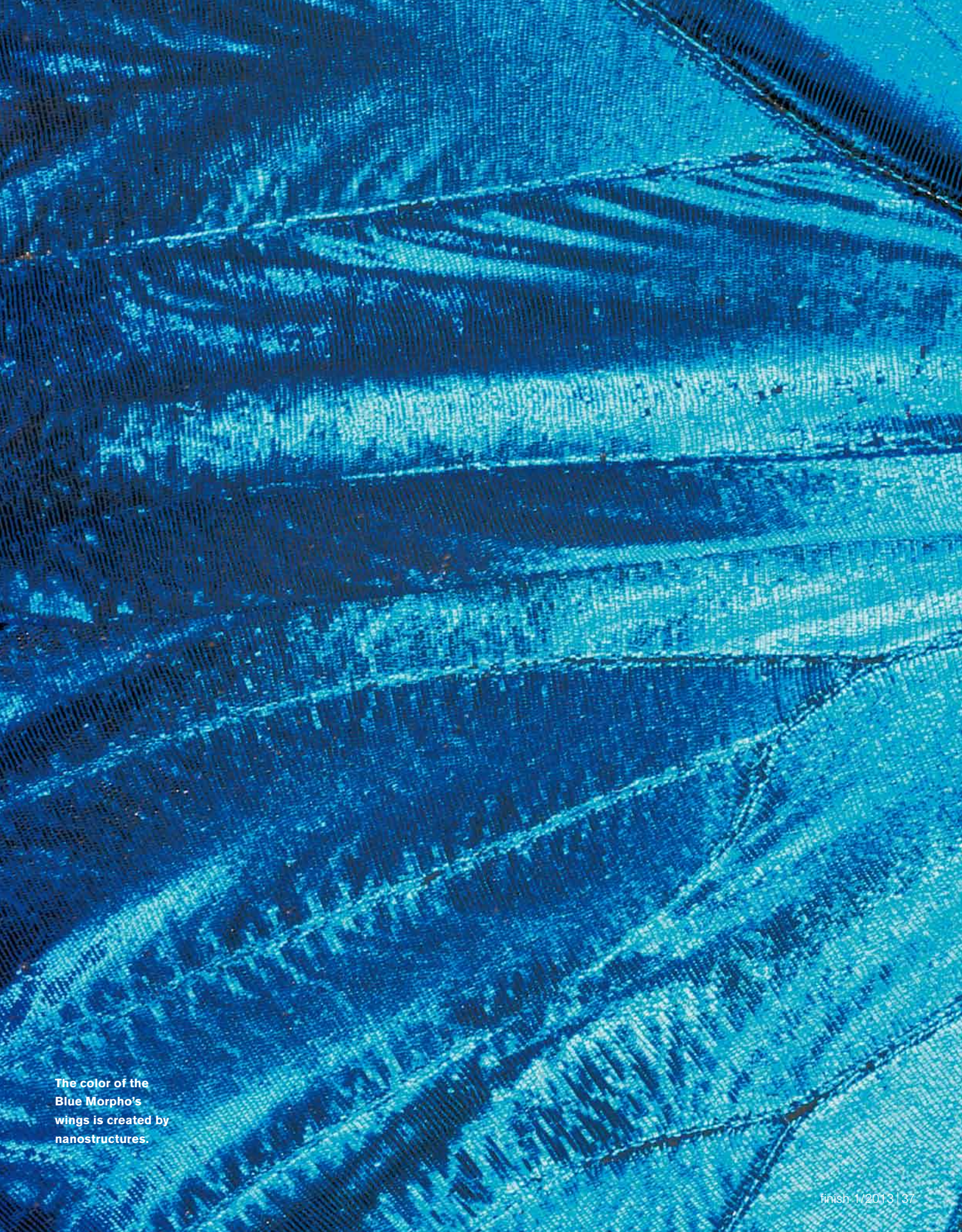
PAINT DESIGN

From nature's paint box

Many species of butterflies have multicolored iridescent wings. The effect is the result of the interaction of light and surface structure. A visit to the Butterfly House in Mannheim.

Text: Christiane Wild-Raidt

Photos: Gilles Mermet / Science Photo Library



The color of the Blue Morpho's wings is created by nanostructures.

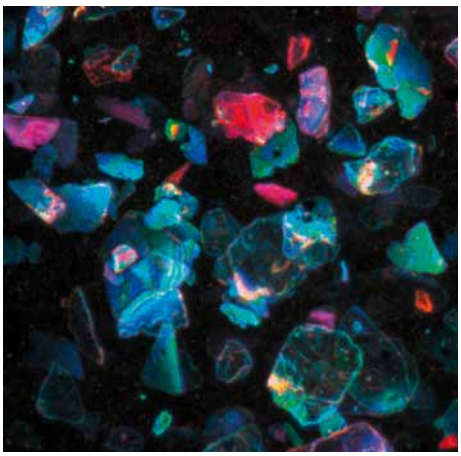
They flutter through the air in their hundreds, colorful and dazzling. Watching them fly among the palm trees, exotic flowers, and banana leaves is a dizzying experience that is amplified by the high humidity and heat in the Butterfly House of Mannheim's Luis Park. When you enter the house of colorful butterflies, you leave temperate latitudes behind you and suddenly find yourself in the middle of the tropics. It's a sweaty affair for visitors, but worth it. Because in the wild, butterflies are shy beauties, and they are usually gone long before you can take a closer look. But in Mannheim, visitors can admire a colorful community of 300 butterflies living in the Butterfly House, which holds 20 tropical species with a range extending from the rain forests of Africa and Asia to South America. And the variety of color is simply overwhelming.

Magical attraction

Ursula Jünger is a graduate biologist who has been working in the Butterfly House since it opened in 1996. She has observed thousands of butterflies in that time, and has even planned her own garden at home to support the largest possible variety of species. She knows what type of nectar the Peacock butterfly prefers and what colors magically attract the Common Brimstone. Of course, she also knows a lot about the tropical species that live in the Butterfly House. "Some are attracted to a specific aftershave, other to a flashy color. For the butterflies, visitors who exude a certain scent or wear a colorful shirt appear to be a huge wandering flower," says Jünger.

The insect's colorful wings are an adaptation to the lush flora and fauna of the tropics. Depending on the light and perspective, the color of some species even seems to vary. This effect is known as "iridescence" or "pearlescence". But what underlies these different shades of color, the iridescence and the luminescence? "Butterfly wings are made of chitin, which is colorless," says Jünger. "The colorful appearance is a product of the interaction with a broad-spectrum light source." However, a distinction can be made between pigments and structural colors. Pigments include natural colorants that absorb the light of a particular wavelength. So, for example, if a wing appears red, that is because the pigment absorbs all wavelengths except those corresponding to the color red. If every wavelength is reflected, then the color is white. Pigments are incorporated into the chitin: "Melanins, for example, produce a reddish, brown or black color," explains Jünger. The color black serves an additional purpose: It absorbs more solar radiation than lighter colors, meaning more heat is absorbed.

Light is refracted by the scales of the butterfly's wings (here under the microscope).



The same principle holds with paint: Tiny particle structures create the color effect.

"The colorful appearance depends on the interaction with a broad-spectrum light source." Ursula Jünger

Millions of tiny scales

Unlike pigment colors, structural colors arise from way that light is refracted by nanostructures on the wing surfaces. "Looking at the wings under the microscope, you see a structure that resembles a Christmas tree," says

REINHARD KIEFEL

began his career with the company 18 years ago as a color technician and is now Head of Color Development. "Wörwag allows me the chance to implement my own ideas."

Jünger. Millions of tiny scales are arranged like roof tiles, 0.1 mm long and 0.05 mm wide, with fine grooves that refract light.

This is how the gorgeous iridescence of the South American Blue Morpho is produced. "The scales can be thought of as different tiers," explains Jünger. "Each tier reflects the light differently." A fraction of the incident light is reflected immediately, while some of the light penetrates deeper into the structure before being reflected. The waves of the returning light overlap, resulting in amplification or attenuation at different wavelengths in a process called interference. As a result, the color impression changes depending on the viewing angle. In nature, the colors of the wings in many species are the result of a combination of pigmented and structured scales: The iridescence is generated against a colored background. The brilliant blue of the Blue Morpho butterfly looks so intense because of the refraction of light on the scales of its wings. Pigments are not involved.

Do not touch!

Just as the climate is more temperate in our latitudes, the colors of our butterfly species are more subdued compared to their tropical relatives. But they are nonetheless colorful. "There are a variety of reasons for the intense colors of some butterflies. The most important reason is pairing; butterflies need to be attracted to the opposite sex and draw attention to themselves," explains Jünger. Some species camouflage themselves by adapting to their environment, others have coloring that resembles that of a wasp, serving as a deterrent to birds, which are among their natural enemies. Mankind has also had an impact on some species: The peppered moth originally used to be white like the trunk of the birch tree, but is now darker. The change in color is a result of industrialisation, which has polluted the air, in turn leading to darker birch trunks. "The modern color of the peppered moth is thus an adaptation to changing environmental conditions," explains Jünger.

Whether brilliantly colored or more subdued – all types of butterflies have one thing in common: Their scales and thus their beautiful colors are damaged and destroyed by touch. ■

DEVELOPMENT

A fleeting model

Vehicle paint has nothing to do with butterflies wings – at first glance. In the Development Department at Wörwag they know better.

The orange paint of the sports car parked near the Wörwag office in Zuffenhausen shines and glitters in the blazing sun. Depending on your viewing angle, the color shifts from yellowish to reddish. "This color effect also depends on the angle of the sun's rays," says Jürgen Ortmeier, Development Manager at Wörwag. "It's the same principle as applies with the structural colors of butterflies."

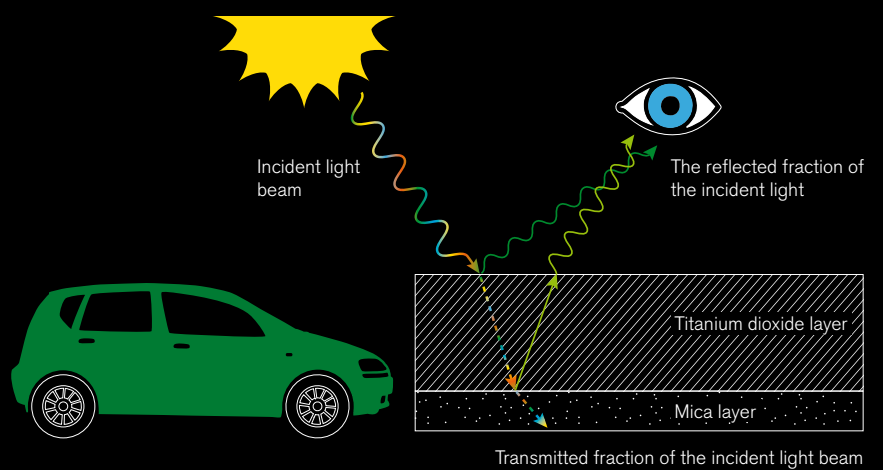
For industry, nature is like a giant test lab. Over the course of thousands of years, many plants and animals have adapted to perfectly fit their environment, securing their survival. It's therefore no surprise that researchers and technicians look to nature for answers to complex technical challenges. "As a paint and coatings manufacturer, we can learn a lot from nature," says Ortmeier. "In nature, colors serve as signals to warn or attract, and the appearance can differ depending on the surface structure and refraction of light."

Since the 1960s, scientists have been studying a field known as bionics – where biology meets technology – which is a relatively young field of research. Instead of trying to copy nature, it is an attempt to learn from it and to draw conclusions: As with butterfly wings, different color effects on vehicles can be created with nanostructures. Nano means very small: The thickness of such structures is in the range one tenth of a micron. A micron is 0.001 millimeters.

It all began with "fish silver"

Vehicles paintwork consists of up to four layers of paint. "The color is determined by the base coat," says Herbert Kost, Head of Color and Design for Wörwag. "This first coat contains the color pigments and mica, which contributes to the pearlescent effect." Natural shine and shimmer have fascinated people for a long time. The oldest pearlescent pig- ➜

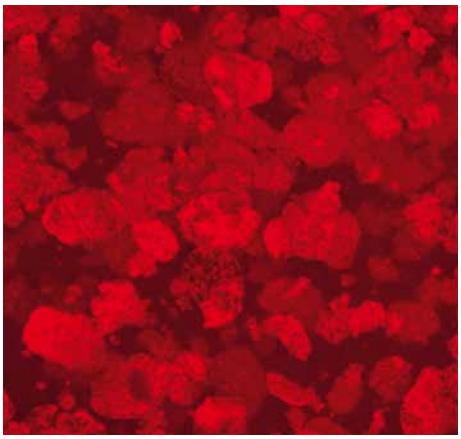
The light is reflected differently depending on the incident angle and surface structure. The result: The nanostructures allow for different color effects.



Photos: Eye of Sciene / Science Photo Library, Wörwag, Jos Schmid; infographics: Arnold.KircherBurkhardt; illustration: Vectorstock

Cars like this Mercedes SL are often enhanced with pearlescent effects. The coating consists of four layers. The basecoat contains the minerals and coloring pigments.

Close-up of the surface structure of Wörwag paint.



➜ ment, called "fish silver", was made in the 17th century from the scales of the white fish – a type of carp. "The scales were milled in water until the shimmering material could be separated out," says Kost. It was a huge effort: 100 tons of fish were required for two kilograms of fish silver. So the search for a more efficient production method began.

Paint with color flop effect

Today, a special raw material is used to produce the pearlescent effect. "We use mica, which comes from India. The mineral is mined, then it is cleaned, ground, and coated with titanium dioxide, which is a metal oxide," Ortmeier explains. Both mica and titanium dioxide are semi-transparent. Some of the light penetrates the outer layer of titanium dioxide, while some is reflected. The portion of light that penetrates is refracted at the interface with the mica. The waves of the returning light overlap, resulting in amplification or attenuation at different wavelengths in a process called interference. This phenomenon results in the iridescence or pearlescence that we also observe with butterfly wings.

"In the coatings industry, this is called the color flop effect. Whether the light is reflected at this boundary layer of mica or titanium dioxide, or goes through unbroken, depends on the angle of incidence of the light. If the titanium dioxide layer is very thin, the effect is silver-white. Thicker layers result in darker interference colors. From matte mother-of-pearl shimmers to the full spectrum of rainbow colors, anything is possible. Although we don't have the roof tile structures of butterfly scales for car paintwork, the principle is the same," explains Ortmeier.

Obviously, Ortmeier and Kost have a strong professional interest in the array of color found in nature. "I have been to the Butterfly House many times and I find butterflies fascinating," says Ortmeier. Herbert Kost also went on vacation in Central America, where he was impressed by the colorful diversity of butterflies.

Still, Kost says they would not go as far as nature does with iridescent colors for car paintwork. People want the color flop effect for vehicles – but in moderation. "After all, you still have to like your car ten years later." ■

"The principle of absorption and reflection of light waves is the same for car paintwork and butterflies."

Jürgen Ortmeier

Photos: Mercedes, Wörwag

A splash of color

Wörwag, Wörwag, everywhere! You come into contact with Wörwag products in daily life, much more often than you might think. Here's a little tour.

Photo: Braun

Safe cut

Product: Epilator
Customer: Procter & Gamble (Walldürn, Germany)
Paint: Topcoat R2612
Application: Housing finish
Used on this product since: 2001
Special feature: Wörwag provides the metallic base coat for this high-quality epilator. The models are available in seven colors; at the end of the year three more will be added.

Ready to roll

Product: Transport vehicle
Customer: Scheuerle (Pfedelbach, Germany)
Paint: Three-layer structure W610, W726 and W755
Application: Coatings for a broad range of exceptionally heavy transport vehicles
Used on this product since: 2000
Special feature: Increased corrosion protection, reduced-solvent paint system with a high solid content. Applied by up to four painters.

Photo: Scheuerle


Otto
SCHEUERLE
ALMA

Treadmill

Product: Bicycle
Customer: Gazelle (Dieren, the Netherlands)
Paint: Grey primer F0002, F0001 black basecoat, clear acrylic powder coating W845 or clear matte W847
Application: Pannier rack, frame, fenders and fork (except forks with suspension)
Used on this product since: 2011
Special feature: Scratch- and knock-resistant e.g. against stones on the road.

Photos: Royal Dutch Gazelle, Maquet

High-tech

Product: Operating room cushion
Customer: MediKomp (Rastatt, Germany)
Paint: Woeropur paint color Black R4206
Application: Coating of foamed cushions for operating tables
Used on this product since: 1990
Special feature: Highly elastic and conductive, enabling electricity to flow out through the operating table when a defibrillator is used for reanimation.

ESSAY

Orange

By Elmar Brümmer, magazine author,
who enjoys writing about driving, colors and forms

It was a color that is now produced exclusively for BMW as "Valencia Orange". The classified ad only said "C Model", nothing about that wonderful added bonus – the paint, the orange … such a brilliant orange, on this seventies Opel. That paint kept us together for three years. Flower power as a standard feature, pop art in the used-car market. The neighbors called it the Kadettilac. This is how that orange entered my life and became an emotion. In Buddhism, it's the color of the highest level of human enlightenment. With the Kadett, this feeling of enlightenment would begin to surface after the occasional battery replacement. Oh how orange! The tequila sunrise of colors, a beautiful cocktail of red and yellow … supposedly the rarest color on the national flags of the world. All you heads of state, relax. That Opel began to teach us color psychology: Orange stands for closeness, activity, passion, fashion. And for sociability, warmth, originality and pleasure. It could be the color to represent the land of milk and honey. No, orange is definitely not tacky; after all, it's not plastic. Orange possesses value, it strengthens the immune system and has a relaxing effect. It's kind of funny that only cars are painted this color and not school walls, waiting rooms and government offices. But what's even nicer: Orange never grows old! It holds out the dream of eternal youth. Why is it that children go crazy when they see goldfish? From a psychological perspective, the part of the spectrum that constitutes orange also stands for communication, which made the Kadett so appealing. I took the car off the road a long time ago, but the carefree memories have remained. ■



Wörwag has been supplying Valencia Orange for production lines since March 2011. The color was first used for the BMW 1 series M Coupe. It is currently available for the X1 and 1 models, the Z4 and as a special order color.

Photos: Wörwag

LOCATIONS

Wörwag worldwide

Research and Development

Production

Service

Marketing

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