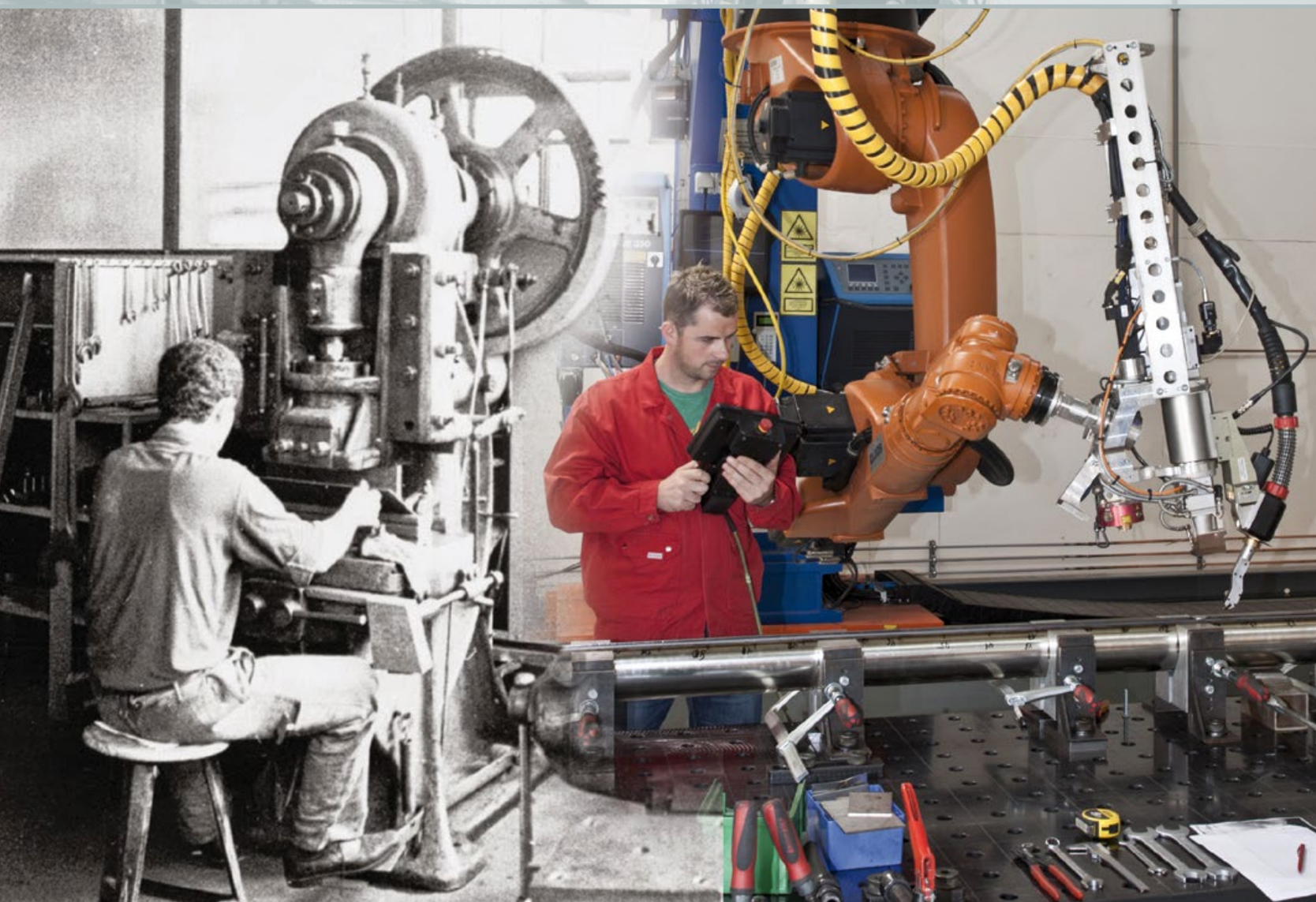
FORUM

Forum 44 | 09/14 | For the customers, partners and friends of Arnold AG

90 years of Arnold – History with a future



Safer tables for London trains

Fully focused on railways

Increased safety at nuclear power plants

ARNOLD ...stark in Metall!

Editorial

Dear readers,

For the past 13 years, we have been offering you our FORUM magazine, and with it, plenty of suggestions and advice. This may seem a little direct at times, but that's what we think open and constructive communication is all about.
It seems to work – we've received a lot of praise from you for it. Still, not everybody appreciates the advice and guidance we provide, and we are fully aware of this. We are deeply convinced, however, that honesty and open-minded dialogue help to overcome any obstructions that we may encounter, and that they will build trust and mutual understanding. This issue of FORUM includes an interview with me where you can read more about these ideas.
Without having a firm grasp on who we are, who knows where we'd be today. As it stands, we were very proud to be celebrating our 90th company anniversary this August. It's a festive occasion for us, but we also know who has made it possible: You, our business partners, many of whom we have been maintaining close and trusting relationships with for several decades. Of course, our ongoing success is also due to the tireless work of our dedicated and creative team members, who don't shy away from the daily challenge of turning our customers' wishes into reality.
I hope you'll enjoy reading FORUM's 44th issue, which once again provides many insights into current projects and our company history. Naturally, we can't help ourselves from giving you some real-world advice, too – this time, it's in the form of an article about additive manufacturing processes, which are becoming increasingly versatile and also increasingly important to our industry.

Best regards,

Uwe Arnold

On 5 August 2014, Arnold AG celebrated its 90th anniversary. From page 10 onwards, this issue of FORUM focuses on our varied and interesting company history.
Images: Arnold/M. Pyper

Contents

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Image: Cobot

Products created from scratch

The idea isn't entirely new: Creating products completely from scratch was first offered by stereolithography, a technology developed in the US more than 30 years ago. Initially intended exclusively for prototyping, the technology has evolved into a much broader form today, satisfying the requirements of DIY enthusiasts and complex serial production runs alike.

Frankfurt's 'Euromold' trade fair is a get-together for those people in the industry who develop products from the initial idea right through to serial production – in other words, designers, engineers, tool and mould makers, and many more. The most recent Euromold impressively demonstrated just how much has changed in this sector as of late: Almost every stand featured 3D printers, with nearly every one of them promising to output its three-dimensional models just as easily as a two-dimensional drawing. Admittedly, a lot of the developments didn't seem fully matured yet, but the overall trend was unmistakable.

Some of the presented successes were nothing but spectacular. In Bavaria, for example, an entire building was constructed using 3D printing. The individual building parts were produced by Voxeljet, a market leader in industrial 3D printing systems. The micro apartment was conceived and designed by Professor Peter Ebner, who runs FutureLAB of Architecture, and his team of students. The researchers are currently looking into the next level of construction: The deployment of mobile printing systems, some of which may even process concrete.

In the world of manufacturing, methods such as these are already commonplace in areas such as medical technology, where components often need to be matched to individual patients. A good example for this is dental crowns. These are typically produced in large runs using direct metal laser sintering.

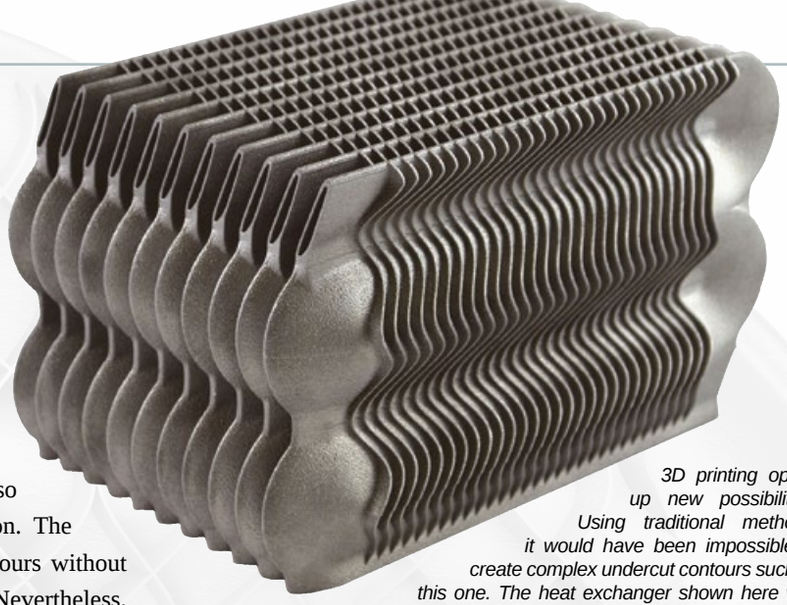
A UK supermarket chain, on the other hand, has started offering customers miniature 3D reproductions of themselves. The process is essentially very similar to taking passport photos. The customer stands in a booth and is circled by a scanner for twelve seconds; the printed figurine, which stands around 20 centimetres tall, is ready a few days later and costs around €75 (£60).

Only just a few days ago, Amazon has launched a new web shop for customisable plastic products. This gives customers the opportunity to express their own designs. Individualised product fabrication of this kind is also known as 'fabbing'. The products currently available are still limited by size, but there are already around 200 different objects to be found in categories such as jewellery, toys and décor. While still associated with the classic prototyping market, there's a new device that ups the ante to XXL size: The 'X line 1000R' laser cusing system from automotive manufacturer Daimler, jointly developed by the Fraunhofer Institute for Laser Technology (ILT) from Aachen and Concept Laser from Lichtenfels (both Germany).

The 'X line 1000R' is used for producing mechanical and thermal load-bearing metal parts of unprecedented sizes. Identical for the purposes of serial production, these parts may consist of tool steel, aluminium or titanium alloys, nickel-based superalloys or cobalt-chrome and noble metal alloys. Compared to common laser melting systems, the high-power laser deployed here operates in the kilowatt range and increases productivity by up to tenfold.

Continued over >>

Looking to the future: In a recent project, a layering process was used to create these two building halves from only sand and a binding agent within just 60 hours. Testing is currently underway to see if the same principle can be applied at construction sites using concrete. Photo: 3M Germany/Florian Holzherr



3D printing opens up new possibilities: Using traditional methods, it would have been impossible to create complex undercut contours such as this one. The heat exchanger shown here was produced using a laser sintering system from EOS. Image: EOS/Within

Versatile production methods

3D printing is generally considered to be an 'additive manufacturing' method. Originally often referred to as 'rapid prototyping', later also as 'rapid tooling' or 'rapid manufacturing' (for the manufacture of tools and parts respectively), this new technology was initially used to quickly and cost-efficiently produce prototypes and one-off designs. Today, it is also becoming increasingly popular in serial production. The range of methods available today for shaping contours without the use of external tools is nothing but staggering. Nevertheless, there are a few basic principles and areas of application that are encountered throughout.

Here is an overview of the main processes:

Selective stereolithography is the original technology that 3D printing is based on. It was invented in the US in 1983 by Shuck Hull. In stereolithography, a laser solidifies a photosensitive polymer such as epoxy resin. The object is created layer by layer from a vat of liquid polymer. The laser sweeps accurately across the area to be solidified; the object is then lowered one layer further into the vat so that the next layer can be applied and in turn solidified. This production process is very precise.

Selective electron beam melting is related to stereolithography. It is used to produce metal parts from a powder base. The electron beam melts and fuses the metal powder layer by layer; a wiper is used to add new layers of powder.
Similarly, ***selective laser melting*** deploys a laser for melting and fusing metal or ceramic materials. The raw material, which is again supplied as a powder, is thinly spread over a substrate, where it is fully melted. Once the melted powder hardens, it becomes a solid layer of material. As in stereolithography, the substrate is lowered and a wiper is used to apply a new layer of powder. Excess powder can be shaken off, and the part is immediately ready for use.

Multi-jet and poly-jet printing is similar to conventional office inkjet printing. The material, which is a waxy thermoplastic, is added droplet by droplet and polymerised using UV rays or similar. A number of hybrid methods involving stereolithography have also emerged. By combining different substrates and adhesives, some of these permit the use of metal and glass powders that are subsequently sintered. Any existing pockets in the metal can be filled using infiltration.

Most 3D printers destined for home or office use are based on FDM or ***fused deposition modelling***. The principle behind this is not unlike that of a hot air gun. A string of plastic or waxen material is liquefied and extruded by a heating nozzle. This is a very cost-efficient process, but because of the relatively large droplet size and the ongoing movement of the model, it isn't particularly accurate. Finishing is often needed to achieve an acceptable surface quality.

By now, some of these processes are also being combined. One objective, for example, is to simultaneously build up different plastic materials with different colours and rigidity levels to provide different functions all within the same model.

'Cobot' offers a new approach

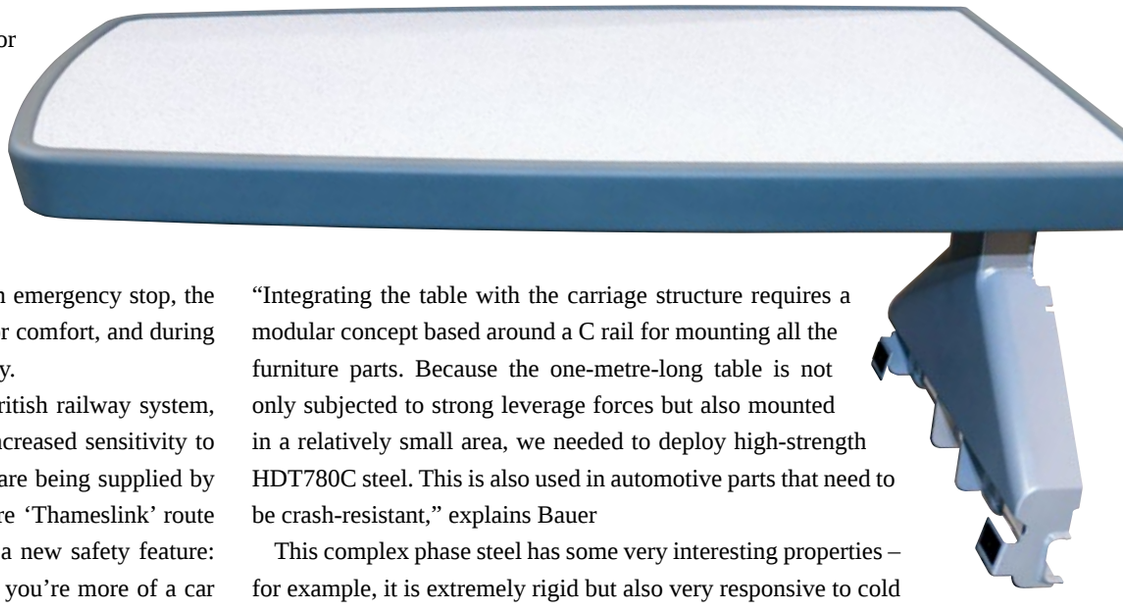
Image: Cobot

Many FDM-based 3D printers suffer from the lack of precision caused by the model's movements. Three students from Offenbach's Hochschule für Gestaltung (HfG) design school decided to rectify this after their recently-purchased 3D printer just didn't perform as expected. Their 'Cobot' printer has a revamped axis design. Here, the axes manipulate the heating nozzles rather than the model, which results in a much better output quality, as Nils Mayer explains. The printer is made up of as few parts as possible in order to limit the number of failure sources. For example, the housing consists of a single part and holds all of the axes. As an added benefit, this also makes the printer very compact. A dual-head extruder makes it possible to produce complex models with support structures. It simplifies operation, too. "To use a 3D printer today, you still need a lot of prior expertise, and you need to conduct quite a bit of your own research. We want to change that," says Mayer. The team's research has now concluded, and there is a very real possibility that the student project will soon be produced on a large scale. This, by the way, would involve Arnold AG, who is pegged to handle production thanks to the efforts of the students' professor, Peter Eckhart.

www.cobot.de

Safer tables for London trains

Following several fatal railway accidents in the UK, the British have developed a strong focus on train passenger safety. The new regional trains of the Greater London area supplied by Siemens Rail Systems will feature a new type of compartment table that buffers heavy impacts.



Train passengers always seem to go for them: Those select few seats that are accompanied by tables. Tables are great for holding laptops and lunchboxes, they seem to encourage conversation with fellow passengers, and they provide more legroom than ordinary seats. Unfortunately, tables also have their downsides. During an emergency stop, the hard table edge can quickly get too close for comfort, and during a train crash, it can even cause serious injury.

Following a string of accidents in the British railway system, the governing bodies have developed an increased sensitivity to safety issues. The new regional trains that are being supplied by Siemens Rail Systems for the 225-kilometre 'Thameslink' route between Brighton and Bedford will debut a new safety feature: Passenger tables that give way to stress. If you're more of a car driver than a train passenger, your thoughts will immediately turn to airbags, but in fact, there is a much simpler solution. With this design, a spring mechanism ensures that the table gives way to heavy impacts while still being entirely solid during regular travel motion.

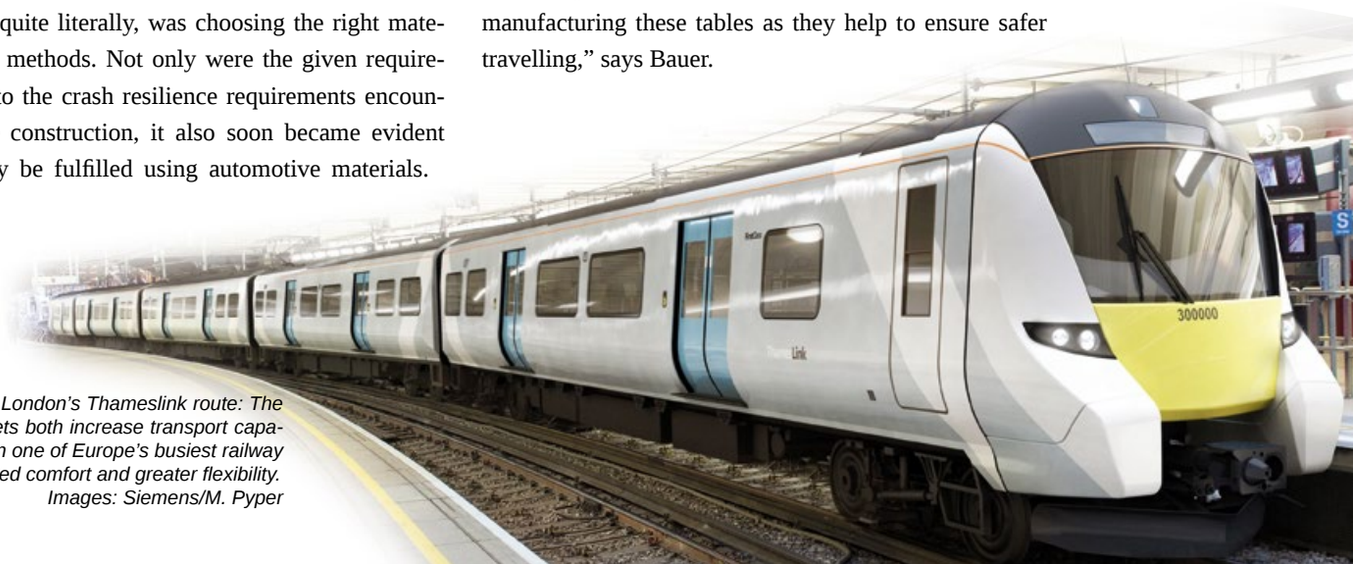
Automotive steels

"In the UK, the requirements for personal safety and fire protection are very strict," says project leader Felix Bauer. "In fact, they are quite a bit stricter than the railway safety regulations in Germany, which are very demanding already." The envisioned type of table didn't exist previously, which is why Siemens needed to develop them first – which they did jointly with ThyssenKrupp. The actual production of the tables was tendered to Arnold AG, who in turn first needed to optimise the sophisticated design to suit serial production.

The hardest part, quite literally, was choosing the right materials and machining methods. Not only were the given requirements very similar to the crash resilience requirements encountered in automotive construction, it also soon became evident that they could only be fulfilled using automotive materials. "Integrating the table with the carriage structure requires a modular concept based around a C rail for mounting all the furniture parts. Because the one-metre-long table is not only subjected to strong leverage forces but also mounted in a relatively small area, we needed to deploy high-strength HDT780C steel. This is also used in automotive parts that need to be crash-resistant," explains Bauer

This complex phase steel has some very interesting properties – for example, it is extremely rigid but also very responsive to cold forming. The other steels used in the components have similarly been picked very carefully. S700MC steel again is usually more at home in automotive manufacturing, where it is used for vehicle frames and axles. "For components to be mounted on C rails, we first needed to find a suitable producer in Germany who not only had the required presses and expertise but also was willing to deliver much smaller quantities than those encountered in the automotive industry." For this, Bauer managed to find a coachbuilder in Bavaria who specialises in building prototypes.

However, Arnold AG itself also needs to conduct an ample share of primary research. "As far as we knew, steels like these had never been used in the construction of trains. Our welding engineer Thomas Dornheim had to investigate extensively to find out all the correct welding fillers, welding sequences, possible warping etc." The diligence paid off – by now, Arnold is delivering several hundred serially-produced tables to Siemens Rail Systems per year. "Our team members always look forward to manufacturing these tables as they help to ensure safer travelling," says Bauer.



Siemens' Desiro City train for London's Thameslink route: The new electric Class 700 trainsets both increase transport capacities and improve reliability on one of Europe's busiest railway routes. Passengers enjoy added comfort and greater flexibility.
Images: Siemens/M. Pyper

90 years of ‘There’s nothing we can’t do’

It happened on 5 August: On this day exactly 90 years earlier, locksmith Karl Arnold founded a company in Frankfurt am Main. Karl Arnold was the grandfather of Uwe Arnold, who runs the same company today – Arnold AG. Karl Arnold’s guiding principle has remained the company motto to this day: “There’s nothing we can’t do!”

What was Germany like in 1924? The First World War had finished six years earlier, but the country was only just beginning to recover. Instead of running the country on a regular budget, the government was still having to rely on an emergency funding law. Vladimir Ilyich Lenin had died at the beginning of the year, and the Soviet Union was now fronted by Joseph Stalin. The first Winter Olympics were held in Chamonix, France. George Gershwin’s ‘Rhapsody in Blue’ was premiered in New York. The US launched a food aid programme for German women and children in need. Starting on 5 August, a delegation of the German Empire headed by Chancellor of the Republic Wilhelm Marx joined the Allied forces’ reparations talks. Marx and British Prime Minister James Ramsey MacDonald negotiated an end to the military occupation of the Ruhr region.

While politics were still tough, this was also the age of the ‘Wild Twenties’ – an era of unbridled vivacity and the onset of modernism. It was in this time that Karl Arnold decided to try his luck as an entrepreneur. Frankfurt was bustling with activity. A month earlier, Südwestdeutsche Luftverkehr AG was founded, the venerable predecessor of today’s Fraport AG. Over the years, the Arnold company completed many an exciting job for the airport. Dr h. c. Ludwig Landmann, who had one of Frankfurt’s main arterial roads named after him, succeeded Dr Georg Vogt as mayor of the city. Höchst AG, one of the world’s biggest chemical producers, opened an administrative building designed by Peter Behrens; it was to become known as one of the most important examples of expressionist architecture.

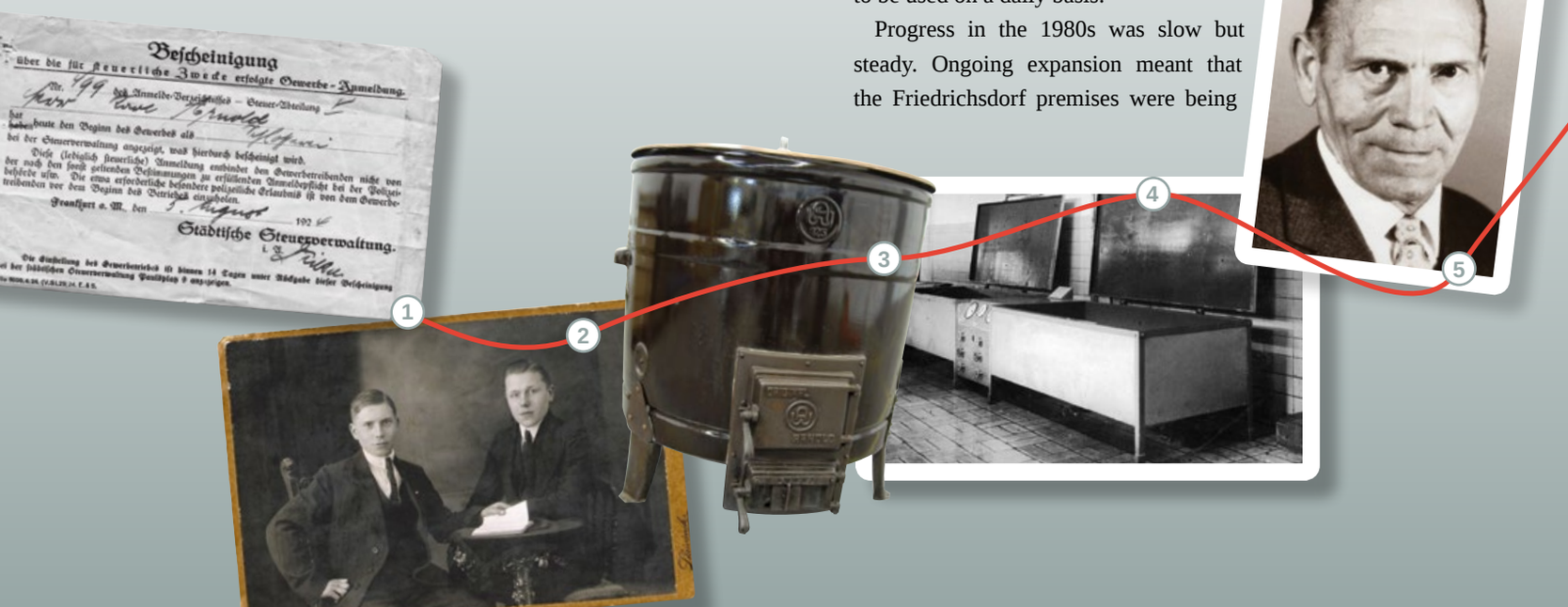
Curiosity and ambition

The public mood was torn between resignation and new vigour. Karl Arnold managed to succeed because he dared to undertake projects that most would shy away from. While these didn’t always make sense in terms of company profits, Arnold’s innate curiosity and ambition nevertheless paid off in the long term, resulting in new processes, improved designs and a slew of patents. The company is maintaining this bold take on innovation to this day.

Despite Karl Arnold’s numerous developments and innovations, however, the company was still only set up as a craftsman’s enterprise. Only once his son Rolf Arnold took over did the business begin to focus on supplying to the industrial sector. This didn’t diminish the original craftsmanship roots in any way. In 1961, Rolf Arnold moved the company out of Frankfurt and into the surrounding region; in Oder-Erlenbach, there seemed to be more room for expansion. Only five years later, the new premises already proved to be too restrictive, and the company moved to its current location in Friedrichsdorf.

An in-house design department helped to foster industrial development. High-quality interior fittings and technology became one of the company’s main lines of business. Frankfurt’s Alte Oper opera house was Arnold’s first major interior fitting project in the 1970s – and even then, there was a strong focus on sustainability. 40 years on, the fittings in the opera house continue to be used on a daily basis.

Progress in the 1980s was slow but steady. Ongoing expansion meant that the Friedrichsdorf premises were being



Milestones at Arnold

1) Articles of incorporation, 5 August 1924
2) Company founder Karl Arnold and his brother Rudolf
3) Original Arnold pan furnace
4) Cold pasteurisation system – 1949
5) Company founder Karl Arnold – 1965
6) New company building in Friedrichsdorf – 1966
7) Rolf Arnold lends a hand – 1968
8) Hard drive enclosure – 1973
9) Printer cabinets – 1977
10) First welding robot – 1983
11) Caracas Opera House, Venezuela – 1983
12) Rolf and Uwe Arnold in the 1980s
13) First laser stamping hybrid – 1985

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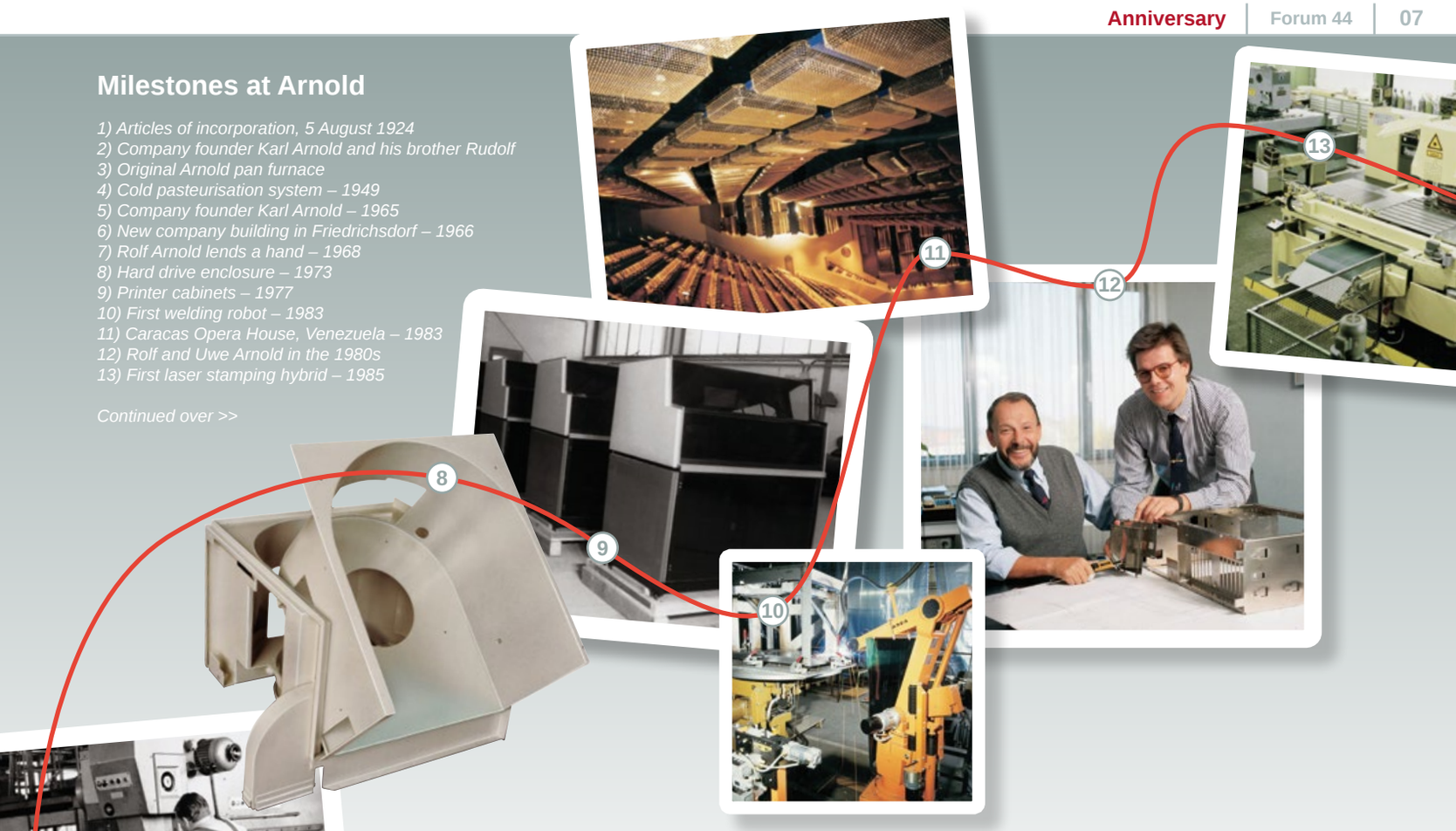


stretched to their limits; this issue was in fact only resolved a few years ago when the opportunity arose to purchase an adjacent property. Management always strove to use only the best and most modern machinery at the factory. Cutting-edge manufacturing processes such as robot welding and laser cutting were introduced very early on. Despite the physical limitations of the Friedrichsdorf premises, Arnold still managed to expand its business on a global level. Major international projects were completed in regions such as South America and the Middle East.

The much-needed space for company growth became available soon after the German reunification. A mutual acquaintance put Rolf and Uwe Arnold in touch with the Diller family from Herges-Hallenberg in Thuringia in 1991. Thanks to their entrepreneurial savvy, the Dillers had managed to hold on to their company as a family-run business despite the GDR's wide-ranging nationalisation of the private sector. Following a few shared projects, the two companies proceeded to found Arnold-Diller GmbH as a jointly-owned limited liability company.

Anybody who hasn't seen the suburb of Herges in Steinbach-Hallenberg in the last quarter century will hardly believe their eyes when they see it now. Arnold and Diller were true pioneers of the business frontier in post-reunification Hallenberg; not only were they the first to create new jobs as part of a housing development, they also provided the vital impetus for a industrial park that keeps going from strength to strength. What started out as a company of eight employees has now become a plant of more than 150. The systems and production facilities at the Hallenberg premises have been upgraded several times already. Today, Arnold's Thuringia location is predominantly focusing on large-scale serial production of housings and containers. It also features a fast-growing art department that produces sculptural metal works for renowned artists from all over the world.

While industrial supply still made up around 80 per cent of total turnover in the 1970s, two decades later, the turnover of 40 million Deutschmarks achieved by our 200+ employees was evenly spread between industrial supply and architectural design constructions. Today, Arnold AG has around 350 permanent employees and 35 trainees. In 2013, annual turnover reached around €48 millions; by then, 60 per cent of this was achieved through design constructions and 40 per cent through industrial supply.

In the autumn of 1999, Uwe Arnold, a tool maker and chartered industrial engineer, took over the company from his father and grandfather before him. One of the most important years under his leadership to date was 2001, when the two companies were first merged into a single GmbH (limited liability company under German law) and then an AG (stock corporation under German law). All of the shares issued by the corporation are owned by the families and the employees, ensuring that everybody can take part in the company's success. (For more on this, please read the interview with Uwe Arnold over the next two pages.) The biggest goal at the moment, which has also been a strategic programme for several years now, is 'Arnold 100' – the company's 100th anniversary in 2024.

The advantages of being a stock corporation

In August this year, Arnold AG turned 90 – in ten years, we'll be 100. Considering that 13 years have passed already since the company became a stock corporation, this doesn't seem very far away. The FORUM team spoke to CEO Uwe Arnold to gain both a historical perspective and a forecast of things to come.

Mr Arnold, in 2001, the owners of the limited liability companies Arnold in Friedrichsdorf and Arnold-Diller in Steinbach-Hallenberg decided to merge into a stock corporation. How can a medium-sized enterprise in Germany afford this?

In essence, it's the legal structure and the size of a company that determine how that company needs to document its business. For us, there is no significant, let alone costly difference between defining ourselves as a GmbH (limited liability company under German law) and an AG (stock corporation under German law). GmbHs frequently have an advisory board in order to develop business ideas and to communicate with the CEO or owner on matters that go beyond daily operations. In the AG, we have the supervisory board, which acts in a similar way to an advisory board but also provides additional security to our employees – as well as to our business partners. The members of this supervisory board aren't mere puppets; they bear very real responsibilities, and they supervise the management board members who are responsible for operations. In addition, the members of the supervisory board are contributing their valuable expertise and life experience to the company's strategic outlook.

Legally, the supervisory board of an AG has a very strong standing. In your experience, would you say this has been beneficial to the company?

The point is not to have a strong supervisory board but a competent one. Even before we legally became an AG, the long-standing members of what was to become the supervisory board had already sat on the former advisory board and oversaw our transition into a stock corporation. While they do exert control, they also contribute valuable impulses and help to steer our company in the right direction. On top of that, they assist the management board – as advisors, as dialogue partners and quite simply as human beings. When you run a company, it's very useful to have access to people who not only have plenty of professional expertise but also know and understand the context of your work. But don't get me wrong – when we have meetings with the supervisory board, nobody minces their words. The discussions sometimes get very heated and some points may be debated for weeks on end, but in the end, all decisions are made by consensus. In this regard, the company is greatly benefiting from having experienced professionals on its side who aren't caught up in daily operations and who have a clearer external view of the company.

Members of the management board are often said to easily lose touch with the employee base. Would you see that as a danger?

In the case of Arnold AG, the three members of the management board are tightly integrated into our daily business and market activities, which means we actively engage with the customers. We aren't interested in playing out strategic scenarios in the drawing room or in controlling the lives of our employees. We position ourselves right at the forefront of the company, and we each carry a lot of responsibility for our customers and our market share. We know first-hand what it feels like to fail and succeed. We are in no danger whatsoever of locking ourselves away in an ivory tower.

Continued

14) Sought-after Diller products: Tin opener and Lago thread cutting set
15) New factory building in Thuringia – 1992
16) Rolf and Uwe Arnold at the roofing ceremony of the new Arnold-Diller GmbH building
17) Zurich stock exchange – 1992
18) Industrial-scale security: For many years now, Arnold has been producing housings for bag scanners
19) Canopy and awnings for a new terminal at Moscow Airport – 2008
20) Embracing freight haulage technologies – 2009
21) Forum 'Expedition Future 2024' – 2010
22) 'Sphere', Deutsche Bank – 2011
23) Robot arm with laser welding attachment – 2012
24) Jaroslawl artwork – 2013
25) Generational shift in 2013: Ingo Stemmer (left) and Christoph Ebert (right) succeed Dieter Stemmer as members of the management board; Uwe Arnold continues in his role as Chief Executive Officer
26) New supervisory board as of 2014: Professor Dr -Ing. Holger Techen (left), Dieter Stemmer (centre), Detlef Walter (right)

Images: Arnold AG/Bombardier/G.Castegini/M.Pyper

An important incentive has been, and still is, for employees to be able to buy company shares so they can directly benefit from Arnold AG's success. How is this working out?

We've been offering this to employees for ten years now. There is no share premium like with a company listed on the capital market. Our employees can buy shares in Arnold AG at their current actual value, which is based on the most recent annual statement. This means they are not prone to the kinds of fluctuations that may be caused by speculative activities. By now, there are more than 80 employees and stock owners who hold shares making up 14 percent of the total share volume. Close to a quarter of the people working at Arnold AG, then, seem to think that their company is a worthwhile investment. On the one hand, this demonstrates how much we are trusted by our employees; on the other, it also means we have a greater responsibility to them, as they are investing their personal savings in us. Arnold AG shares are a very good indicator of how well the company is doing: When we all work together well and the company turns over a profit, everybody benefits. So far, a dividend has been paid out every year. Seeing how low the interest rates of regular savings accounts are, this in itself makes it worth investing in the company.

How do customers, suppliers and other business partners stand to benefit from our legal structure as a stock corporation?

Our aim is to be a reliable and anticipatable partner to everyone involved. A good financial standing is crucial to this, and it takes a lot of hard work to secure this. Like any other German stock corporation, we trade publicly and are evaluated by independent rating agencies. We maintain an excellent credit rating, and we make sure to let any potential new customers know about this, too. When a customer knows that they are awarding their contract to a proven, dependable company, it gives them a lot more security. Some might say that our products and services are overly expensive – and at first glance, that may indeed seem true. However, our pricing structure is in no way linked to our legal structure. The reason why our prices may be higher than expected is because we strive to be more diligent and thorough in our work than the competition. Also, we accompany every order with a service package, which makes it difficult to isolate product prices for comparison. Also, on the upside of charging: We always manage to pay our bills, and we always pay them on time.

Arnold AG's FORUM magazine has been criticised as being something of a luxury. What are your thoughts on this?

Definitely no – the FORUM magazine is one of our main channels of communication with our partners. We invest comparatively little into traditional advertising and PR, because we have come to realise that the magazine is the best tool for providing our partners with specific information. This was proven by a recent reader survey, which contained a lot of praise for our selection of topics and the magazine's overall format. By the way, most of those surveyed stated that they preferred the printed version to the online version, which is interesting given the increasing popularity of tablet computers. Nevertheless, the online version gets downloaded a lot, which further goes to show that our mix of information and advice is well received. Issue 38, which was for the spring of 2013, was downloaded close to 14,000 times – a circulation well above the print run. Some of our partners also regularly enquire when the next issue will be published.

Mr Arnold, if you had to do it all again, would you still have chosen to form a stock corporation?

Absolutely – I have no regrets whatsoever! This year alone, Arnold AG's shareholders have boosted the company's capital to €7 million. That's about as unequivocal a commitment to your own company as you can get. Of course, we keep bolstering the foundations of our success every single day. Everything else – gaining new customers, infiltrating new markets, expanding internationally – happens on an operational level; these matters are informed by our business strategies and are entirely unrelated to our legal structure. Our main goal has been, and continues to be, 'Arnold 100'.

Lufthansa counter with stainless steel stylings

While Lufthansa's old counters had an outstanding, eye-catching design, the time was ripe for an upgrade. Given huge new airport developments such as the A-Plus gate in Frankfurt and the new Satellite terminal in Munich, this was the perfect opportunity to introduce a new generation of counters. Lufthansa contracted Frankfurt design agency Hollin+Radoske, who specialise in interior design concepts, to develop the new counter.

The previous counter design used by Lufthansa was a huge success. Given such a popular and well-proven predecessor, the designers didn't need to change the counter's functionality much at all. The new concept mainly focuses on replacing much of the distinctive Corean, which is a mineral-filled plastic, with stainless steel. While Corean was previously used extensively on the exterior, it now only makes up the worktop. The new eye-catcher is a large, stainless steel-framed glass plate in Lufthansa yellow; even from afar, this clearly signals which airline the passenger is dealing with.

Drawing on many years of experience working in this field, Arnold's project leader Carsten Hoffmann knew exactly what Lufthansa and the airport operators were after. For example, many of the drawers and trolleys needed to be dimensioned so they could accommodate proprietary Lufthansa equipment. "Thanks to our experience with the previous design generation, we had a lot of expertise and tips to contribute." This is also confirmed by Andreas Weihnacht from gmp Architects (Hamburg), who was the sub-project leader for the interior fittings of the A-Plus gate.

While counters need to be tough and resilient to all kinds of stresses, they also need to be very flexible. The equipment fitted into the counters may change every couple of years, but the counters themselves remain the same. How does this work? The answer is thought-out, innovative design concepts. Take, for example, the side table. "We simply fitted this table with a removable top. If there is any equipment needing to be upgraded, all that needs to be replaced is the top, not the entire table," explains Hoffmann.

Image: Lufthansa

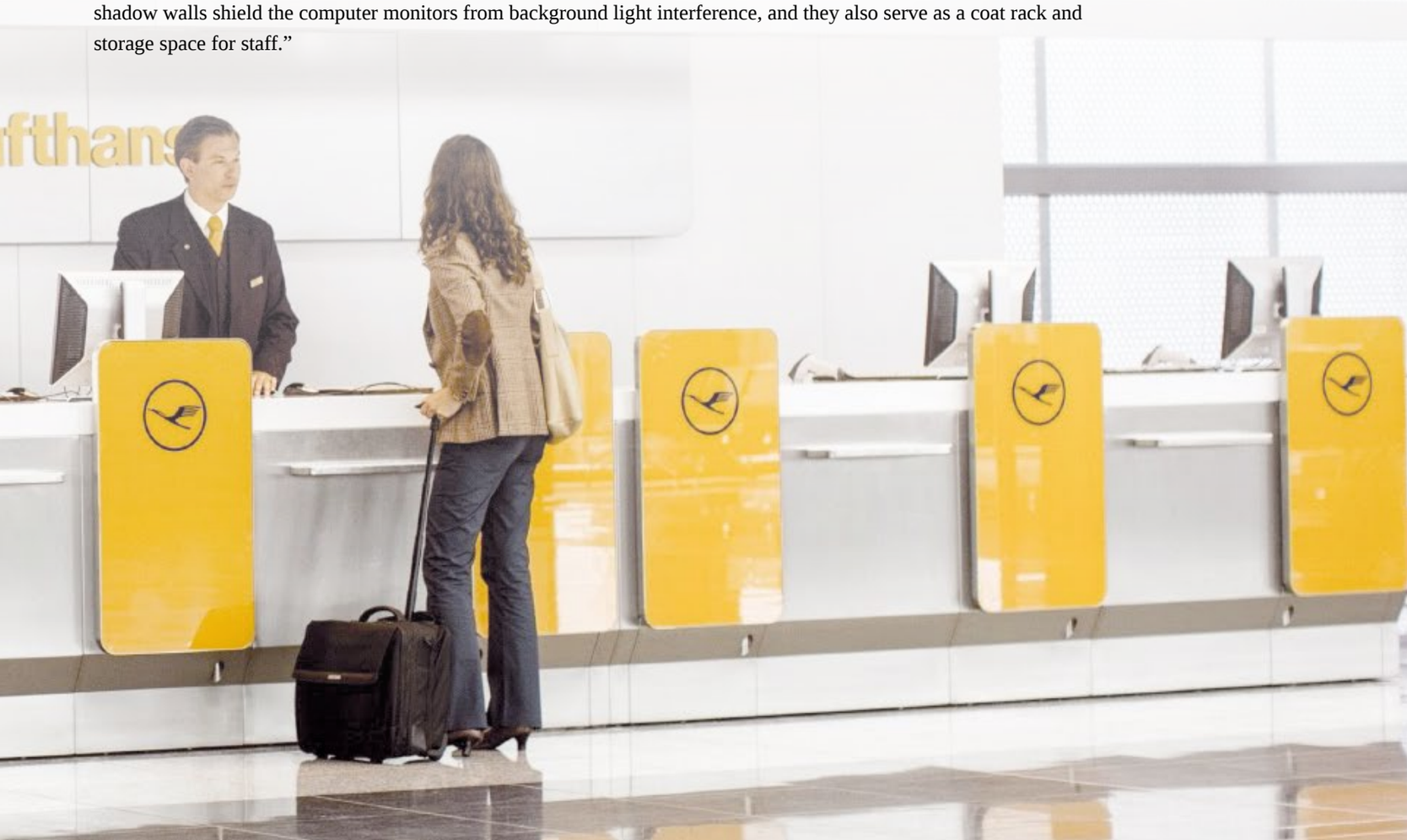
It's this kind of detailed customer knowledge that Weihnacht appreciates about working together with Arnold. Also very useful was Arnold's expertise in processing and finishing stainless steel. "Together, we were able to optimise many important details such as joint widths, material transitions and bends, ensuring they fitted both visually as well as technically." While Weihnacht would have liked some of the details to be even more sophisticated from a design perspective, he knows full well that "ultimately, robustness rules over all-out aesthetics."

Getting more compact in Munich

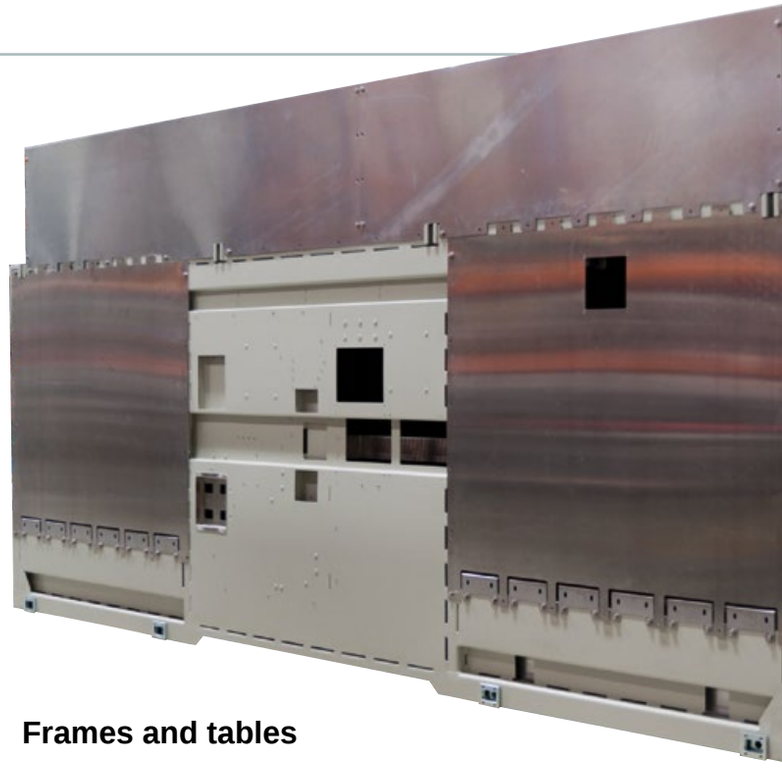
After Arnold AG and its partner, the joinery Hubl & Hubl from Florstadt who also fitted the counters, had supplied and installed around 200 customised counters to everyone's satisfaction in Frankfurt, a second order was received from Munich Airport. The state of Bavaria is currently investing €650 million into expanding the airport's Terminal 2, which will be used by Lufthansa and its affiliates. 27 aircraft will be able to dock here once the 125,000-square-metre building is completed in 2015. The new terminal will have an annual passenger throughput of eleven million.

Ample space, then, for accommodating the counters that had just been installed in Frankfurt – or so you'd think. In the end, general contractor FM Bau decided that the counters needed to be narrower by ten centimetres. The reason for this was that computer keyboards, monitors and peripherals are getting smaller, which means that the counters can also be made smaller in order to provide a closer customer experience. "For safety reasons, we first built another prototype to test on location whether this new variant would be in any way inferior to the model used in Frankfurt," says Hoffmann. After all, the order was for a total of 280 counters.

In Munich, Arnold is supplying more than just the counters themselves. One of the products required an entirely new design: Swinging doors that automatically close again after use. "After failing to find any solution on the market that wasn't priced prohibitively, we decided to develop our own swivel mechanism," explains Hoffmann. In addition, Arnold is producing gate dividers for the terminal; these are room dividers used to direct traffic flows. Arnold is also producing shadow walls, which are cabinets with flange-mounted, toned screens placed behind the counters. "The shadow walls shield the computer monitors from background light interference, and they also serve as a coat rack and storage space for staff."



Fully focused on railways



It was a difficult start but the effort paid off in the end. Around ten years ago, Arnold AG decided to take on railway technology. As it turned out, the world of railways is tightly delimited by many unique safety standards and regulations. After a lot of preparatory work, Arnold AG now has all the required certification, as well as plenty of experience in the field. Our Customer Team 2 is where all the efforts are coordinated from.

"After attaining EN 15085-2 welding certification, we are now compliant with Deutsche Bahn's 951.0010 Guideline on the Welding of Rail Cars. We have furthermore gained the 'A1' top approval level acc. to DIN 6701 for 'Gluing in Rail Car Construction', which means we are free to decide ourselves how something is to be glued," Gerardo Arcuri is proud to announce. Arcuri is the head of Customer Team 2, and his team members all have many years of experience in railway technology to offer the customers from this sector.

As Arcuri explains, it's rare to be able to provide both welding and gluing expertise at the same time. Gluing is clearly becoming the preferred approach. This isn't so much due to affordability but rather to the advantages gluing offers over welding, such as that the components are in no danger of warping from the welding heat. "We are in a position where we can give customers very reliable advice on exactly which joining technology is the most suitable for a given application."

The effort involved in this process is considerable, as Arcuri is quick to explain: "Our main authorities in this regard are Oliver Drawer, a gluing engineer, and Thomas Dornheim, a welding engineer. Between them, they decide which method is more suitable." The gluing process demonstrates the other steps that are required: "Both in Friedrichsdorf and Steinbach-Hallenberg, we have technicians specialised in gluing. They write detailed work instructions and monitor the gluing sequence." The gluing itself is performed by our shop floor team members. Having such a threefold division makes for the most reliable outcome. This is very important, "as particularly in the railways sector, badly glued parts such as an external screen can cause serious accidents if they come unstuck."

Frames and tables

Arnold's railway work began in 2003 with supplying power converter containers for tram cars made by Bombardier Transportation, one of the world's biggest manufacturers of rail cars. Although Arnold was initially lacking the necessary experience in railway technology, we did already have a lot of expertise in building housings and containers. Thanks to this, we were able not only to supply the converter containers to the customer's satisfaction but also to gradually introduce our own design engineering expertise. "Today, we often develop and design the components together with the customer; this shows that we have become a trusted partner," says Arcuri.

The collaborative project was a success, and five years later, Arnold was awarded the first large-scale contract. Bombardier was manufacturing 1,500 high-power engines for freight haulage in China. Arnold was tasked to build the power converter frames for these, each of which was several cubic metres in size. Assembly was gradually shifted to Bombardier's designated Chinese supplier.

After numerous further contracts for containers in public transport rail vehicles, the latest highlight – according to Arcuri – is the 'Haramain High-Speed Rail Project'. This route will create a link between the two most holy sites of Islam, Mecca and Median, and initially feature 36 high-speed 'Talgo 350' trains. For this joint project of Bombardier and Spanish rail car manufactu-

Focused on railways – Arnold AG's Customer Team 2 (left to right): Juan Fernandez, Andreas Hunnenmörder, Danh Ta, Artur Grüner, Dennis Jäger, Carsten Ellenberger, Jens Wagner, Gerardo Arcuri (team leader).
Image: Arnold

Today, Arnold AG is supplying power converter containers of all shapes and sizes, fitted in vehicles ranging from tram cars through to heavy-duty freight engines.
Photo: M. Pyper

rer Talgo, the trains will be built in Spain. Team leader Arcuri is very pleased with this as he is fully fluent in Spanish, "and communication has been excellent." Between the members of his team, another five languages are spoken besides German: Italian, French, Vietnamese, Russian and, of course, English.

With our new customer Siemens Rail, on the other hand, we are benefiting from our many years of experience in high-quality interior fittings. For its current railway project in the UK, Siemens is needing special tables that can buffer crash impacts and that are compliant with the UK's stringent railway safety requirements (for more details, see page 5). Success and quality, it seems, make for a good reputation in the railways industry. "By now, we are also increasingly receiving orders from suppliers to railway manufacturers, which means we are getting more and more work," says Arcuri.

InnoTrans
Internationale Fachmesse für Verkehrstechnik
23.–26.09.2014

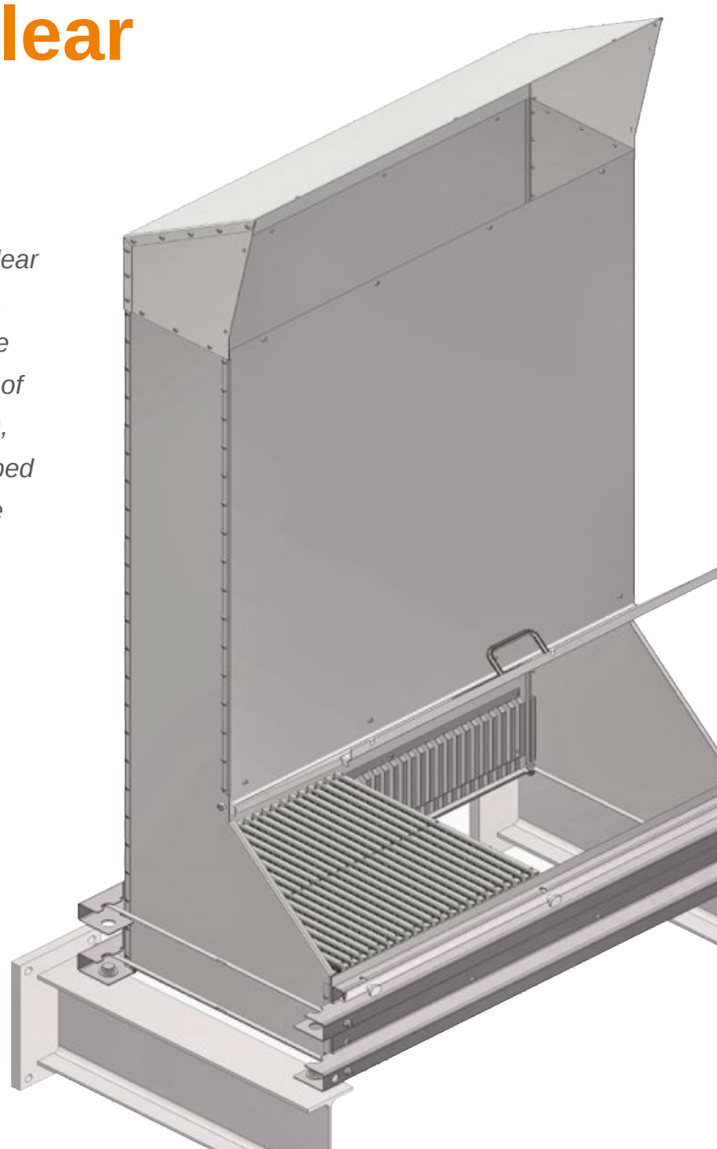
Arnold at InnoTrans

Arnold AG is again participating in InnoTrans, the International Trade Fair for Transport Technology which will be held at Messe Berlin from 23 to 26 September. The last time InnoTrans was held in 2012, it had more than 126,000 attendees from a total of 140 countries. More than 2,500 companies from 49 different countries were presenting their innovations to the international railways industry in 2012. This year, more than 2,700 exhibitors are expected. The trade fair consists of five main areas: Railway Technology, Railway Infrastructure, Public Transport, Interiors and Tunnel Construction. Arnold AG will be located in the Railway Technology area in Hall 8.2 (1st floor), Stand 222. Arnold will be showing how to meet technological railway requirements by evolving products from the initial drawings through to the finished item. Arnold will also show how to flexibly participate in a customer's logistics chain. Our developmental and production expertise will be demonstrated on a Bombardier housing and on the Arnold 'A' logo, both of which have been subjected to a wide range of techniques. These include complex sheet metal bends, laser and other welding methods, gluing technology and others.

www.innotrans.de

Increased safety at nuclear power plants

Fukushima and Chernobyl both demonstrated very dramatically that the biggest danger posed by a nuclear meltdown comes from the hydrogen that is released. If there is a hydrogen explosion, this can damage the reactor's containment shell and thereby disable one of its most vital protective barriers. As far back as 1989, the engineering company Siempelkamp NIS developed a method to make the hydrogen harmless, much like the catalytic converters used in cars.



"Reducing instead of igniting" was the daunting challenge that nuclear power plant operator RWE issued to NIS Ingenieurgesellschaft mbH in 1989. At the time, the systems in use all relied on a flame that needed to be ignited in order to burn off the released hydrogen. NIS tried a different approach: A catalytic converter was to break down the hydrogen, without requiring any human input or external power and remaining fully functional even when subjected to steam, humidity or liquid.

Continued over >>

A crucial advantage of the NIS PAR modules: They can be placed almost anywhere within the nuclear power plant's containment building, such as on this crane bridge.
Images: NIS Ingenieurgesellschaft

The question was, what type of material would achieve this? After some searching, a suitable candidate was identified: A porous, palladium-coated pellet material with an extremely large surface area would be able to effectively break down the explosive gas. The hydrogen would react with oxygen and be turned into harmless steam. To ensure this would also work under challenging environmental conditions, the engineers impregnated the material with a water repellent. Thus the NIS PAR was created. 'PAR' is short for 'Passive Autocatalytic Recombiner' – 'passive', because there are no components requiring external power to run, and 'autocatalytic', because the pellets automatically take effect as soon as they encounter the hydrogen.

The biggest remaining challenge was to figure out how to best place the pellets in the hydrogen's path. The most feasible solution ended up being stainless steel containers holding cartridges. The catalytic agent is stored in the cartridges, which in turn are held in the container vertically so that they create flow channels between each other. The 'cold combustion' of the hydrogen reacting with the catalytic agent does produce some heat; however, this is quite useful, as anyone who has ever lit a grill with a charcoal chimney will appreciate. In both cases, the warm air escapes upwards, which draws in fresh air from the bottom – and with it, in this instance, hydrogen. As the hydrogen passes through the catalytic cartridges, the catalytic reaction is triggered and sustained automatically, even if the hydrogen concentration is low.

When it comes to stainless steel containers, Arnold AG certainly has a lot of expertise to contribute. After their previous container supplier dropped out, the purchasers from NIS in Alzenau were looking for a metal specialist with in-depth experience in manufacturing products such as scanner enclosures, containers for rail vehicles and laboratory housings – and Arnold AG fitted the bill perfectly.

International success for NIS Ingenieurgesellschaft's PAR modules: Project leader Manfred Seidler (centre) meets a Japanese delegation at the Alzenau branch to give them a tour of the company's achievements and capabilities. Several Japanese power plants will be refitted in the near future.

"Receiving a competitively priced product coupled with helpful professional advice definitely convinced us," says project leader Manfred Seidler. The chartered engineer explicitly praises Arnold's "open and honest communications and flexibility to adapt to new requirements." As well as quality and size accuracy, the NIS experts had two other major requirements, which are of crucial importance in a safety-critical area such as nuclear power generation: independent quality assurance and full traceability of the deployed materials right back to the smelter.

In the 1990s, the first German nuclear power plants were ordering NIS PAR modules. The first international experiences were made in Paks, Hungary; after that, international demand for the modules grew steadily. In 2012, Siempelkamp entered a teaming agreement with Westinghouse Electric Company in the US. Nuclear power plants in Slovenia, Japan and Brazil followed, and a plant in the Czech Republic is scheduled for 2015. Further power plant projects are planned for Japan in collaboration with Japanese corporation Mitsui.

Roof and heating system generate electricity

Our recent investment into a photovoltaic system and a heat and power cogeneration system represents more than mere lip service to the green energy movement. "It simply makes sense economically," says Christoph Ebert, member of the management board. At the same time, the new initiatives also signal that Arnold AG is an environmentally responsible company.

Mr Ebert, over the past weeks, a photovoltaic system with close to 850 solar panels was installed on the roof of Hall I10 at our Friedrichsdorf premises. Further energy saving measures were implemented below roof-level as well. Is Arnold going green?

Certainly not in the sense of adopting an image of being 'green'. But when we come across an opportunity to invest in a technology that both makes the company more economical and that helps to protect the environment, then this is a very sensible path to follow. Of course, we need to remain profitable so that the company continues to prosper in the future, but we also have a responsibility towards society. As well as the photovoltaic system, we have invested in a new cogeneration system. This provides the heat required by our new paint shop, and it also supplies electricity – which, just like our solar power, is consumed directly on site. With measures like these, of course, you can debate endlessly about exactly when and if they will pay for themselves. The fact is, we costed both of these investments very conservatively and are confident that they will make us more profitable. Both of these aspects – profitability and environmental sustainability – are part of our 'Arnold 100' strategy leading up to our 100th anniversary in 2024.

In recent times, there has been an increasing tendency to doubt the long-term viability of such investments. How did you ensure these measures would work out?

Last year, we needed to rebuild the paint shop at our Friedrichsdorf plant, which was an excellent opportunity to get in an energy consultant to evaluate how we use energy at the plant.

In order to be able to attribute the consumption of energy to its respective consumers, and thereby be able to make meaningful before-and-after comparisons, we introduced an energy management system. All of the main consumers now have sensors fitted that are connected to a central server. An analysis software package developed by Econ Solutions – which, incidentally, started out as a metal processing company – provides us with all the relevant consumption data as it occurs. Another factor was that we needed to get rid of one of our three condensing boilers anyway, and on top of that, the energy required for a paint shop is actually very well matched to the output of a cogeneration system running most of the time. The consultant's evaluation also revealed a few other things. For example, we ended up replacing the weld shop's lighting system with induction lamps; these are both brighter and provide more pleasant lighting without any flickering, and they only consume about half the amount of power.

Is the power produced by the photovoltaic system fed into the public grid or is it used directly on location?

We always use our own power first. Our system has an output of around 200 kWp, which covers 10 to 15 per cent of our annual power consumption. In the rare event that we generate more power than we can use, the excess power is indeed fed into the public grid. The remuneration for this is around €0.10; if we use the power ourselves, we save around €0.11 per kilowatt hour.

What's next in terms of reducing energy consumption?

We are quite happy with the level we've reached now, and for the next two to three years, we'll see how well the photovoltaic system performs. If it does as well as we hope it will, we'll most likely install such a system at our Thuringia location as well. In order to calculate the efficiency of our measures, we convert their savings into equivalent CO_2 values. Before we introduced the measures, our annual CO_2 level was around 2,800 metric tons. What we are working towards as a goal is 2,000 metric tons. To reach this, however, we still need our team members to become a bit more proactive; one of the main ways to save energy is to use it more diligently. That's what we're working on at the moment.

Supplies heat and electricity: The new 'Smartblock 50' cogeneration system from KW Energie features a four-cylinder gas engine from MAN to supply the new paint shop and more.

Images: M. Pyper

An Arnold stalwart

Manfred Lang has been with Arnold for an impressive 41 years. After having worked for the company in many different roles over the years, this stalwart is now moving into retirement – and deservedly so. Lang has witnessed almost half of the company's history in person.

Manfred Lang started out at Arnold in March 1973. "Olaf Dankert, who was the production supervisor at the time, gave me a job as tool maker after I finished my military service with the federal border guard in Alsfeld," recalls Lang. The mould maker was to stay with Arnold for the remainder of his working life. Lang had trained at Jestädt in Büdingen, a company that will be celebrating its 55th anniversary this year. After completing his apprenticeship, he first worked as a tool maker for the camera manufacturer Knöss in Nidda; Knöss soon folded due to the strong decline experienced by Germany's camera industry.

Tool making was only to be a starting point for Lang. "At Arnold, I did pretty much anything that was asked of me: Tool making, quality control, project management, production supervision, and lastly, customer liaison – which today is covered by the role of 'key account manager'." A lot has changed at Arnold during Lang's tenure, and then again, a lot hasn't. "As our old boss Rolf Arnold used to say, 'there's nothing we can't do'. This motto is still true for Arnold today, so we've managed to stay very consistent."

It comes as no surprise that Lang has a few good stories to tell. He fondly remembers meeting Bruno Eberle, a purchaser for Siemens in Augsburg: "The first time I visited him in his office to present a bunch of product drawings, I had to spread them out on the floor because they were so large – he'd never seen anything like it." Lang also likes to look back on working with Harry Anuss, who was an employee at MPI (Magnetic Peripherals Inc.) in Heppenheim. MPI was manufacturing hard disk storage systems for computers. Even back then, hard disks needed their own enclosures, and Arnold was the best manufacturer to supply them. "Harry worked in quality control, and we spent quite a few evenings together." Lang will never forget working on the Frankfurt opera house 'Alte Oper', a huge project and one where the fitted equipment is still in use today. Not that the scope of the job stopped the team members from having a bit of fun: "Someone played a very clever trick on me, they somehow cut a centimetre out of my measuring tape and managed to put it back together without me noticing. I was going absolutely crazy because none of my measurements were adding up anymore!" Today, of course, all is forgiven and forgotten, and it's a good story to tell.

Lang also made sure to focus on other things apart from work in his life. He was a passionate football player, and in his day, he liked to play as a sweeper. He was one of the founding members of the SV 75 Büches club and subsequently chaired the club's board for many years. In fact, he didn't relinquish this role until a few years ago when his wife passed away, at which point his eldest daughter was appointed chair and his youngest son deputy chair. "I'm really very proud that my kids are upholding this tradition." Lang also dabbled in politics, acting as a council member in his home village for more than 20 years.

Such an extended tenure of voluntary community commitment didn't go unnoticed by the state of Hesse, which awarded him an honorary letter of commendation. As Lang explains, however, recognition was never his goal: "The way I see it, you either do something properly or you don't do it at all." That isn't set to change either, despite his upcoming retirement. Lang's new partner, his four children and six grandchildren will undoubtedly keep him "as busy as ever – I can't imagine I'll be running out of things to do!"

Outside of work, Lang dedicated himself to football: In his day, he liked to play as a sweeper. Photos: Arnold / private