

BILFINGER

now!

we can

Precision plant qualification is key to process safety

we care

State-of-the-art respiratory protection keeps workers safe

we create

PERFECTLY UNDER CONTROL

Producing active ingredients is complex.
Now, quality can be controlled in real time.



BILFINGER

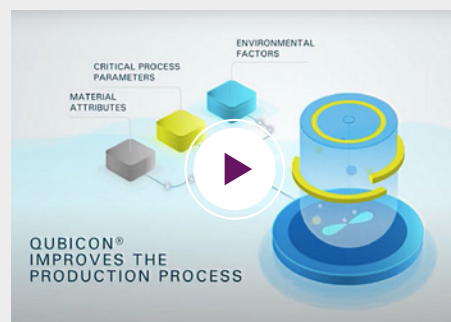
BIOTECHNOLOGY

UNDERSTANDING ACTIVE INGREDIENTS

How fast can a vaccine be developed and produced on a large scale? The spread of the novel coronavirus has focused more attention on this question than ever before. Bilfinger is currently collaborating with an international biotech company on a pilot project aimed at increasing the efficiency of new active ingredient development.

SOFTWARE FOR THE PHARMACEUTICALS INDUSTRY CONSTANTLY IN FOCUS

Qubicon ensures process transparency and efficiency



Long columns of numbers, complex data curves and regular process comparisons – employees at the research center in Switzerland have an eye on everything. Their work includes developing active ingredient candidates for treating cancer. They can now monitor the production of cell cultures in a bioreactor from a computer in real time.

Perfect conditions are required to grow cells in a bioreactor. “Temperature, oxygen supply and nutrient content all have to be finely balanced in order to produce an active ingredient of consistent quality,” explains biotechnologist Dr. Wolfgang Sommeregger. To effect optimum control of the many parameters in this complex process, he and his team at Bilfinger have developed a software solution in cooperation with the

Institute of Bioprocess Science and Engineering at the University of Natural Resources and Life Sciences in Vienna. Among other things, the software facilitates integrating spectroscopic measurement techniques and applying mathematical models in real time. This means customers can automatically calculate key performance indicators at any time and harness these data in controlling the process. Any deviation from the specified reference range immediately triggers an alert, leading to an instant automatic action or enabling operators to intervene manually in the production process. This concept is referred to as “Quality by Control,” which inspired the name of the software: Qubicon.

ALL DATA ON A SINGLE PLATFORM

One focus of the pilot project is the integration in a central platform of all the data generated in day-to-day laboratory and production operations. Ideally, this allows developers to identify process correlations that were previously undetectable. Customers can use the system autonomously but may also consult Bilfinger’s experts, such as the team behind Dr. Sommeregger, at any time for advice. The success of the software platform is measured above all by the efficiency and reproducibility of the process and by the consistent quality of the active ingredient.

What happens in a bioreactor can be visualized and controlled in real time with the Qubicon® software.



Talks about his cooperation with Bilfinger: Prof. Gerald Striedner

Professor Gerald Striedner is Deputy Head of the Institute of Bioprocess Science and Engineering at the University of Natural Resources and Life Sciences in Vienna and has provided academic support for the research project to develop Qubicon in cooperation with Bilfinger.

What potential do you see for a software solution like Qubicon in the pharmaceuticals industry?

The market for biopharmaceuticals is marked by very high growth rates with a large number of newly approved active ingredients. However, the products are expensive and thus exert enormous cost pressure on public healthcare systems. Ensuring that these drugs are widely available to society can only be achieved by significantly reducing manufacturing costs. This is why the authorities and industry have devised an approach for the direct in-process control of product quality. Intelligent software solutions such as Qubicon are of elementary importance here. This new approach to quality assurance will likely be accepted and become the recognized standard in pharmaceuticals production.

Why are solutions like this not yet in widespread use?

Implementing them represents a major interdisciplinary challenge and many pharmaceuticals manufacturers, software developers and engineering companies have already developed their own solutions for certain segments. However, until now, there was no all-in-one software solution like Qubicon on the market that unifies, stores, processes and analyzes all data in one system and enables automation. Drawing on its expertise in biopharmaceutical plant equipment, Bilfinger has developed the software to allow flexible integration into existing systems and precision tailoring to customers’ needs.

You’re already working on a follow-on project. What is its objective?

We’re looking at continuous production processes and full-scale integration of the individual process steps – from the cell culture through separation of the product from the cells to final purification of the product. The software will be enhanced for use in the fully automated, continuous production of biopharmaceuticals.

Cover illustration: Jochen Stuhmann, Photo: Shutterstock; Photos: Bilfinger



Seals of approval: Thanks to specialized equipment, our experts are optimally protected.



Precisely checking equipment is a matter of life or death.



Checking equipment is precision work requiring exact measurements.

When it comes to respiratory protection and measuring devices, we rank among the best. That's because we invest heavily in our equipment and employees' qualifications."

ANDREAS WICHT, HEAD OF GAS AND RESPIRATORY PROTECTION

RCI). We make use of the very latest technology and testing software in order to repair and regularly calibrate devices." Thanks to this service, the equipment is ready for use again in next to no time. That means downtimes are few and far between, which saves our customers time and money – a major advantage.

A roughly 20-strong team is deployed at our customers' sites around the clock, seven days a week, especially in the summer months. That's peak season because it's when industrial facilities are shut down on a wide scale for a general overhaul. "While a number of our customers are in the oil and gas industry, our expertise lets us also serve companies in other sectors – doing work they can no longer carry out themselves or prefer to out-source," says Osteresch. "This includes chemicals companies, works fire departments as well as the automotive and aviation sectors where a lot of paintwork is performed. In those instances, our expertise and equipment provide significant added value to our customers."

Another of Bilfinger EMS' areas of activity is training courses, which are regularly held at our own or the cus-

tomers' premises. Participants receive instruction on all aspects of respiratory protection, including the relevant equipment. But the way the human body works and how people behave in certain situations is also a part of it. "Often, using respiratory protection devices is pretty much a case of mind over matter," says Andreas Wicht. The course also covers first aid and instructions on how to use the lifesaving equipment. Sometimes, team members even step in to help with fighting fires under challenging conditions, such as when hazardous materials are involved. Thanks to their relevant experience and what are on occasion extremely high safety requirements, the Bilfinger EMS team is very well versed in matters of occupational safety. "We can't afford to make any mistakes in our line of work," emphasizes Theodor Osteresch. "After all, it's always about protecting each and every one of our employees – and for us, that takes top priority."

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GAS AND RESPIRATORY PROTECTION

NOT FOR THE FAINT-HEARTED

With his frogman-style chemical protection suit and respiratory mask, the technician enters the tank to check the seals. Outside, the temperature is 38 degrees, but it's even a lot hotter inside. For Bilfinger experts, getting the job done under extreme conditions is all in a day's work.

The position of head of gas and respiratory protection is not one for the fainthearted. Andreas Wicht has been with Bilfinger for more than twelve years and knows all the ins and outs of respiratory protection. "Many of our customers have extreme safety requirements. On every job – some of which involve coming into contact with hazardous substances, such as mercury – we have to be prepared for all eventualities. Because when it comes to the crunch, human lives depend on our work," says Wicht, who heads up gas and respiratory protection at Bilfinger EMS. Based in Cloppenburg, Germany, the company is a specialist in this field. The team is also responsible for all aspects of maintaining the equipment. "It's one of our areas of expertise," says Theodor Osteresch, one of two CEOs at Bilfinger EMS. "We carry out this work either at our own premises or directly at the customer's. Our colleagues receive regular training either from equipment manufacturers or the relevant professional associations, such as the German Social Accident Insurance Institution for the Raw Materials and Chemical Industry (BG

3 questions for...
Andreas Wicht



Andreas Wicht is head of gas and respiratory protection. He loves how varied his job is.

Andreas Wicht heads up gas and respiratory protection at Bilfinger EMS. The trained heating engineer with more than 20 years' experience knows that acquiring a certain routine in this line of work is a long road.

What was the most exciting assignment you worked on so far?

Actually, every job is exciting because no two are the same. Safety requirements vary from industry to industry. Our working environments are also very diverse: We work on ships, at industrial facilities or in tanks with a diameter of up to 25 meters. There's definitely never a dull day in this job.

Do you get your equipment regularly checked by a technical inspection association?

All regular inspection intervals are defined by law. Inspections have to be conducted every four weeks depending on the industry or the equipment. Since we have the requisite qualifications to maintain gas and respiratory protection equipment, we test all of our own gear as well as that being used by

our customers ourselves. That means our customers enjoy an all-inclusive carefree package.

Why is maintaining the equipment so demanding?

The individual components built into gas measuring devices are highly complex. Prices range from 500 to 25,000 euros. Over the past few years, the devices have advanced

by leaps and bounds. Plus, some of the new regulations and legal requirements we need to comply with are so exacting that only a handful of devices are at all capable of taking those kinds of measurements. And due to stricter threshold values, technicians will increasingly need to wear more respiratory protection in the future. So our skills as technical service providers with the relevant equipment to hand are called for.

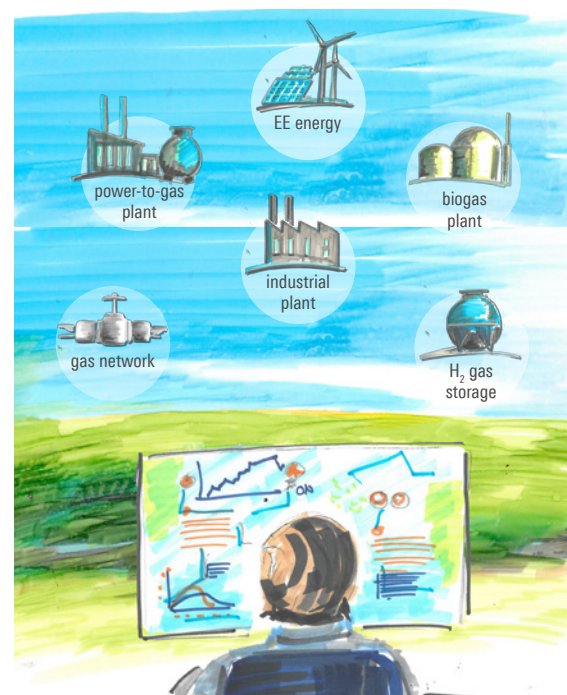
DIGITAL SOLUTIONS

REMOTE MAINTENANCE VIA VIRTUAL REALITY

Industrial plant operators are currently reducing the number of employees in many areas on site in order to prevent the spread of the novel coronavirus. To ensure that plants still run smoothly, Bilfinger is helping businesses to maximize the number of operations they can perform remotely.

Offering quick, customized assistance on site – despite being miles away – is possible thanks to virtual industrial services. This enticingly simple idea is now within reach thanks to cutting-edge technology. There are two ways of providing convenient support from any location: Firstly, an expert located anywhere in the world can access systems to control and monitor production via a secure, specially configured Internet connection. With the second option, an off-site expert gets to see whatever is within an on-site colleague's field of vision, making it easy to troubleshoot the problem in real time and provide the necessary help. So how does it work? It's all done digitally with a pair of augmented reality (AR) glasses.

Bilfinger Maintenance, for instance, uses AR glasses wherever specialist knowledge is required for specific maintenance and repair tasks. Rather than traveling to the relevant location, the expert can use software to connect with a colleague on site. Despite being hundreds of kilometers away, the expert is able to view the plant in real time through a camera in the local colleague's AR glasses and simultaneously discuss the issue with him over the phone. If necessary, additional maintenance or repair information – be it technical data or manufacturer specifications – can be transmitted from a screen into the colleague's field of vision. The colleague on site has



Working side by side hundreds of kilometers apart: A secure connection allows experts to access key systems.

his hands free and can carry out the necessary repair or maintenance.

For a current project in Poland, Bilfinger provided one of the customer's employees with AR glasses in order to gain virtual access to the facilities. Bilfinger staff were unable to enter the plant at short notice due to the COVID-19 pandemic.

MEETING TOUGH ASSIGNMENTS

"AR glasses save time, cut travel costs and reduce health risks associated with the current situation," says Jörg Stieglitz, Rollout Manager Digital Solutions at Bilfinger Maintenance. "We provide the hard- and software to match colleagues' and customers' individual needs."

The demanding on-site conditions in the process industry set the bar high for AR glasses and the software used. In hazardous – for instance, potentially explosive – areas of a plant, safe use in line with applicable standards must be ensured. And even with loud background noise, the employee on site still has to be able to operate the AR glasses by voice control.



With this in mind, Bilfinger Digital Next selected the models best suited to industrial services from the wide range on the market. Bilfinger's digitalization subsidiary has spent the past few years developing and testing remote maintenance via AR glasses for use within the Group. Now that the technology has been handed over to Bilfinger Maintenance, it is being put to practical use in the remote maintenance business. "We will continue to expand our range of services going forward," says Stieglitz. "Given the current surge in demand, we are now exploring ways in which involving remote experts can also work with standard software and equipment such as cameras or smartphones."

SAFE REMOTE ACCESS TO IT

Bilfinger GreyLogix offers another solution for operating plants with reduced on-site personnel. Systems engineer Marvin Dunn sets up direct, encrypted access to industrial customers' systems for the purposes of controlling and monitoring their production facilities. When customers log into their plant systems via a virtual private network (VPN), it's as if they were personally on site. "It's basically like a virtual extension cable connecting the computer to the plant IT systems," Dunn explains. "The computer can access the systems as if it were actually connected to them via a physical cable."

Besides setting up remote access for customers, the Bilfinger GreyLogix team carries out the necessary security updates on an ongoing basis. "Our experience in industrial services is a real advantage in this regard. We have

been familiar with many of our customers' plants, systems and requirements for years," says Marvin Dunn.

A few weeks ago, Dunn was asked by a customer of Bilfinger GreyLogix' Hamburg office to set up remote access to that customer's systems: "As a result, our customer is not only saving time and effort as well as costs, but they are also protecting the health of their employees. After all, they no longer need to send someone to the plant just to access the production systems."

Alongside access to a plant's control systems from any location, Bilfinger GreyLogix provides additional virtual plant solutions. On request, our colleagues can also be tasked with regularly checking plant data and alerting plant operators to any irregularities. With its sites in Germany, Austria, Switzerland, the Netherlands and Russia, the Bilfinger subsidiary also has the capacity to record and store data as well as to update and maintain IT infrastructure at industrial plants. In this way, plants can be "virtualized" gradually.

Jörg Stieglitz and Marvin Dunn agree: "While technologies such as AR glasses and remote access to plant control systems are the way of the future, that future began long ago at Bilfinger. These technologies are fully developed and successful projects already testify to their benefits. The significant surge in demand triggered by the current situation can serve our customers as a springboard into the world of virtual industrial plants."

With maintenance information displayed on their special glasses, on-site colleagues have their hands free to perform the job.

Illustration: Nils Meßmer Photo: Bilfinger

AR glasses save time, cut travel costs and reduce health risks associated with the current situation."

JÖRG STIEGLITZ, BILFINGER MAINTENANCE

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TRANSFORMATION

REAL SOLUTIONS FROM THE DIGITAL WORLD: HOLOSUITE

There's just one word to describe a visit to the Microsoft HoloSuite – awe-inspiring. Located at Schiphol Airport's industrial estate in Amsterdam, the space features 360-degree projections, which allow visitors to explore whole new worlds. Here, Bilfinger is working with Wortell and Microsoft on digitally transforming industry.

The HoloSuite forms part of a customer experience center and showcases application prototypes developed by Microsoft in cooperation with customers and partners. One example is a system that scans avocados on a conveyor belt to assess their ripeness and appearance, allowing for fast, accurate sorting. Visitors can also experience a system comprising smart cameras and artificial intelligence that was developed by the Dutch Rijkswaterstaat (Directorate-General for Public Works and Water Management) and BAM Infra to improve traffic safety. And that's just a taste of the many and varied possibilities. Microsoft's Redmond campus outside Seattle is home to the only other comparable but smaller customer experience center.

A large room with video screens for walls, the HoloSuite uses projections to create a realistic environment around visitors. Yet the facility's main purpose is not to entertain: "This room is where we work with customers on new applications to optimize their operational processes," says Patrick van Loon. As the Industry Executive for Microsoft Western Europe, he serves customers from the manufacturing industry. "Our team acts as a bridge between Microsoft and our customers' day-to-day activities. Instead of waiting for assistance requests, we take a proactive approach, seeking dialog with companies and delving into the problems that give them headaches. Only then do we get together with industry experts to determine which IT solution is best suited to resolving the issue."

VISIONARY COMPANY

During development, Microsoft also sets store in partners' expertise. One such partner is Dutch IT company Wortell. Danny Burlage is the founder, CEO and owner. "We are a partner to Microsoft, but also to Bilfinger Industrial Services. Together, we create innovative solutions to simplify or improve workflows. Bilfinger displays a very visionary approach. Here's a partner who takes a close look at the market, potential solutions and new technologies. By responding with solutions specifically tailored to customer requirements, the company gains a valuable competitive advantage, keeping it a vital step ahead of other businesses in the industry. At present, we are working with Bilfinger on a new scaffolding concept. We faithfully recreate a factory environment in the HoloSuite and use the HoloLens to project visual instructions for erecting the perfect scaffolding. Incorporating the HoloLens lets us combine reality with a projected vision. The projection shows the areas where the supports need to be positioned. What's more, we also explain why the scaffolding needs to be positioned where it is and why it must be constructed in a particular way."

DIVERSE APPLICATIONS

The Bilfinger project is just one of many on a list that keeps growing. According to van Loon: "The varied nature of projects is testimony to the HoloSuite's wide range of possibilities. Another recent assignment was for a major steel producer's rolling mill. In this instance, we overlaid the steel company's video footage with an image identifying sensor locations, highlighting where information is collected and consequently what control data can be derived from it in the control room. This makes it possible to intervene without de-

lay whenever any anomalies – even tiny ones – are detected in the steel production."

CHALLENGING ENVIRONMENT

Some companies still view new technologies with a certain skepticism. It's something van Loon has also noticed: "And it's often with good reason." He explains that, "Implementing artificial intelligence and machine learning in a real factory setting poses a challenge. Take, for instance, a current project where product defects were to be pinpointed using image recognition. But the 4K images – a resolution four times sharper than full HD – overloaded the data network. These kinds of practical problems aren't currently given the attention they deserve. Much like the question of whether really everything belongs in the cloud. While there are, of course, numerous previously unimaginable advantages to cloud computing, sometimes local storage is the better option – as has been proven time and again."

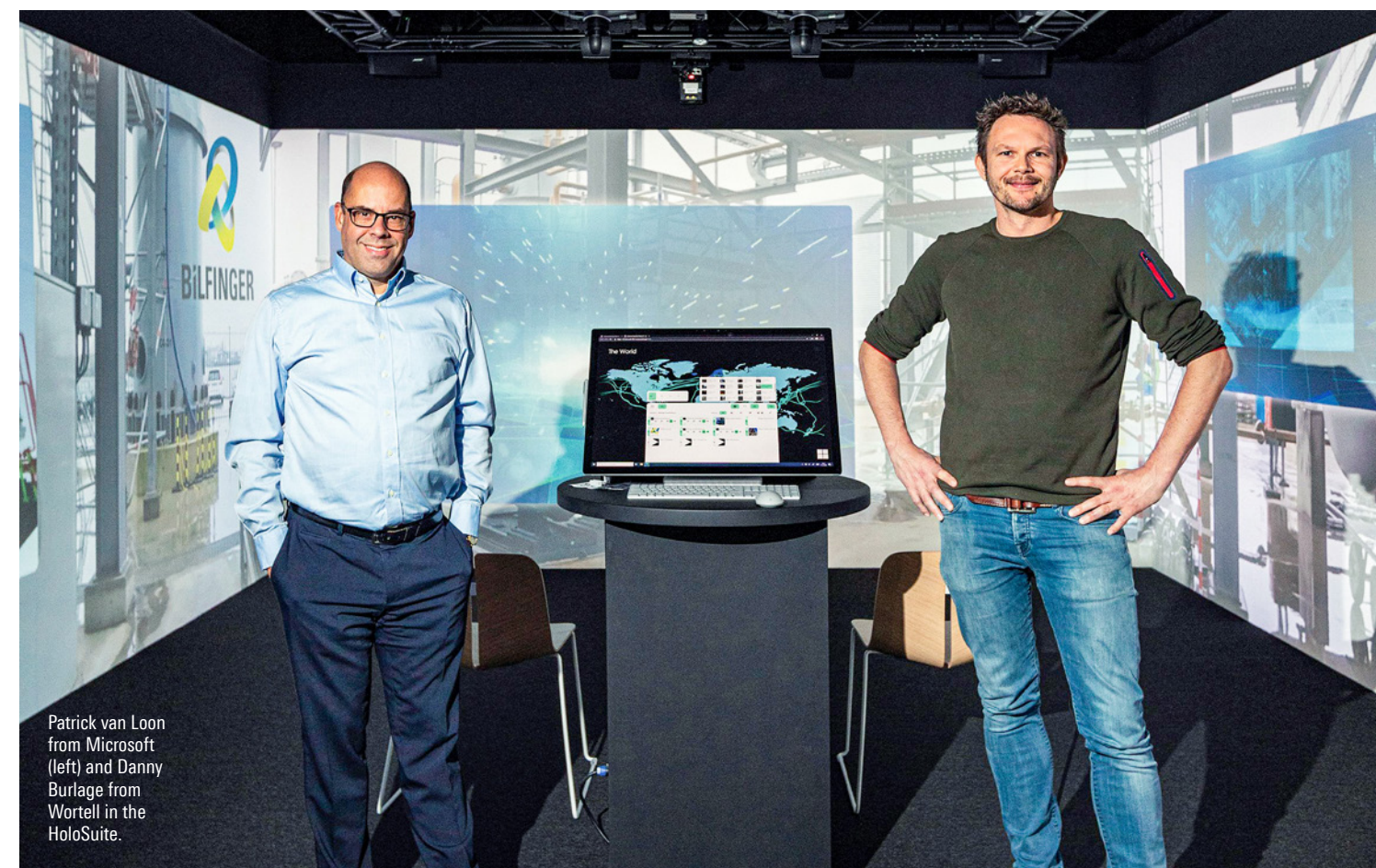
INTELLIGENT EDGE

Burlage adds, "Microsoft has recently made a big push to transfer computing power to local equipment. This is what we call Intelligent Edge. It goes without

saying that extensive data memory capacity and computing power are transferred to the cloud. But there are also devices that require computing power directly on site. In certain situations, you don't want to depend on the cloud. After all, connecting to cloud services can be an issue, as is the case with poor cell reception. Just think of self-driving cars: The decision to brake must be made in a split second. There's no time to send a request to the cloud." As van Loon points out, "The situation is much the same in a production environment. Instant action must be taken if something isn't working properly. So local computing power is essential; after all, no business-critical process should be dependent on an Internet connection."

Even if the vast digital possibilities don't always map perfectly onto practical realities, the HoloSuite projects generate a lot of excitement. "Aside from the examples already described, we believe there is also great potential for further training," van Loon says. "Simulations can be employed to conduct safety training. With uses ranging from safety measures and training to process and efficiency optimization, the HoloSuite opens up a wealth of opportunities."

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Patrick van Loon from Microsoft (left) and Danny Burlage from Wortell in the HoloSuite.

Photo: Studio Oostrum

We cordially invite our customers to visit the HoloSuite. Interested? Then please contact Jeff Mansveld:

jeff.mansveld@bilfinger.com

THE BILFINGER MOMENT

GREENLIGHTING NEW PLANTS

Machines for manufacturing medicines must meet strict regulatory requirements. By qualifying this equipment, our team at Bilfinger helps guarantee process safety.



Photo: Boehringer Ingelheim

An isolator ensures that no active ingredients come into contact with employees or the environment.

Few industries are as strictly regulated as the pharmaceuticals sector. And those regulations entail adhering to good manufacturing practice (GMP), which encompasses specific quality assurance guidelines for the production process and environment. Commissioning a new plant for manufacturing or packaging medicines without the appropriate qualification in line with health authorities' requirements? Out of the question! Everything from the materials, through piping and seals, to surface finishes and high-purity media must undergo the same level of precision testing and validation as the cleaning and manufacturing processes or plant control systems. Any changes to the production plant have to be documented and approved. That requires expertise and an exacting approach.

That's exactly what defines the experts at Bilfinger Peters Engineering, who have been working with chemicals and pharmaceuticals businesses for 25 years. In 2010, the company moved into plant qualification. What started out with just two people has subsequently evolved into a full-fledged team under the leadership of Daniel Effertz, deputy site manager in Ingelheim, who heads up qualification/validation and documentation at Bilfinger Peters Engineering. Most of his colleagues are process technology engineers but

they also include pharmaceutical engineers. This pool of expertise makes Bilfinger a reliable partner in plant qualification and validation. "We take on re-qualification needs arising from refurbishment or plant upgrades as well as first-time or prospective qualification, as when customers invest in new plants," explains Daniel Effertz.

After entering the pharmaceuticals market with Boehringer Ingelheim in 1997, Bilfinger forged a long-standing cooperation that endures to this day. Several Bilfinger staff members are a firm feature at the plant in Ingelheim, ensuring that they are on hand whenever equipment needs to be commissioned or processes altered. For example, when a project called for the installation of three new isolators. These were key to hermetically sealing modules, mixing robots or screening systems, thus preventing the active ingredients to be produced from coming into contact with the environment. Daniel Effertz's team handled all the steps in the process, from defining product specifications to reviewing and evaluating quotes received, from assessing risks and drafting performance specifications to testing as well as from acceptance to the plant's eventual qualification, including precise documentation.

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IN BRIEF

WARSAW | POLAND

DISINFECTANTS INSTEAD OF COSMETICS



Bilfinger is helping French cosmetics manufacturer L'Oréal to further improve hygiene standards at its site in Warsaw, Poland. This is important because, during the coronavirus outbreak, the company is switching over to producing disinfectants, redesigning areas between hygiene zones and overhauling logistics processes.

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MUNICH | GERMANY

ONWARDS AND UPWARDS

While air travel is only starting to pick up again, all the signs at Munich Airport point to growth in the long term. Plans are underway to extend the eastern apron by 2021 and to enlarge Terminal 1 by 2023. Involved in both projects, Bilfinger is responsible for fully installing the kerosene pipelines used to refuel the aircraft. This will include engineering, delivery, manufacturing and assembly work as well as commissioning.

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LINZ | AUSTRIA

STAYING POWER

Bilfinger Industrial Services commissioned four new UPS units for Fresenius Kabi Austria at its Linz site. Uninterruptible power supply (UPS) systems ensure that operations are not disrupted during brief power outages. The new units enhance operational safety at the international health care group's facilities.

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SEEN IN ...

Zofingen, Switzerland: Spectacular! No, it's not an action movie. It's the Bilfinger Industrial Services chemical defense academy in Switzerland. Our seasoned specialists hold courses for customers and colleagues on the 12,000 square-meter training grounds. Topics covered include fires, chemicals, tactics and respiratory protection. Up to 2,000 participants from around the world are put through their paces every year.

Photos: Bilfinger, iStockphoto

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